Question Bank

Council of Higher Secondary Education, Odisha

PHYSICS

Fill in the blanks

Electrostatics

1. One coulomb of charge is equal to the charge on ____ electrons.
2. The charge on a particle or body can be only ____ multiple of least possible value of charge.
3. The least possible value of charge on a body can be ____.
4. When electrons are removed from a body, it becomes ____ charged.
5. Glass rod becomes ____ charged on rubbing with silk.
6. If charges q_1 and q_2 have the same magnitudes and opposite signs, $q_1 + q_2$ = ____.
7. Like charges ____ each other and unlike charges _____ each other.
8. The electric force between two charges is a _____ force.
9. If $q_1\ q_2 > 0$, the nature of electrostatic force between the charges is _____.
10. If $q_1\ q_2 < 0$, the nature of electrostatic force between the charges is _____.
11. SI unit of electric permittivity is ____.
12. Dimensional formula for electric permittivity is ____.
13. The ratio of forces between two charges separated by a certain distance in air and by the same distance in the medium is called _____.
14. The charge (in coulomb) of a $_7N^{14}$ nucleus is _____.
15. The SI unit of electric field intensity is _____.
16. Electric field intensity inside a charged conductor is _____.
17. A force of 2·25 N acts on a charge of 15×10^{-4} C. The intensity of electric field at that point is ___ .
18. The magnitude of electric dipole moment is equal to the product of one of the charges and ___of the dipole.
19. The direction of electric dipole moment is from _____ charge.
20. In stable equilibrium of an electric dipole in an electric field, the angle between the electric field intensity and the dipole moment is ____ .
21. In unstable equilibrium of an electric dipole in an electric field, the angle between the electric field intensity and the dipole moment is ___.
22. The SI unit of electric flux is ____.
23. The dimensional formula of electric flux is _____.
24. A sphere of radius 1m encloses a charge of 3μC. Another charge –3μC is placed inside the sphere. The net flux through the sphere is _____.

25. An electric dipole of dipole moment 20×10^{-6} Cm is enclosed by a closed surface. The net electric flux coming out of the surface is _____.
26. Electrostatic potential energy stored in a dipole of moment **p** placed in an external uniform electric field of intensity **E** is _____ .
27. Torque acting on a dipole of moment **p** placed in an external uniform electric field of intensity **E** is _____ .

Answers:

1. $6{\cdot}25 \times 10^{18}$
2. Integral
3. $\pm\ 1{\cdot}6 \times 10^{-19}$ C
4. Positively
5. Positively
6. Zero
7. Repel, attract
8. Central
9. Repulsive
10. Attractive
11. $C^2N^{-1}m^{-2}$
12. $M^{-1}L^{-3}T^4A^2$
13. relative permittivity
14. $11{\cdot}2 \times 10^{-19}$ C
15. NC^{-1} or Vm^{-1}
16. Zero
17. 1500 N/C
18. Length
19. – ve to + ve
20. 0°
21. 180°
22. $Nm^2\ C^{-1}$ or JmC^{-1}
23. $ML^3\ T^{-3}\ A^{-1}$
24. Zero
25. Zero
26. $\mathbf{p}\cdot\mathbf{E}$
27. $\mathbf{p}\times\mathbf{E}$

CHAPTER-2

1. The work done in moving a charge in an electrostatic field is path _____.
2. The SI unit of electric potential is ____.
3. The dimensional formula of electric potential or electric potential difference is _____.
4. The work done in moving a charge of 4C from one point to another point having a potential difference of 5V is __ .
5. 1eV = _____J.
6. 1MeV = _____J.
7. At a point mid-way between two equal and opposite charges, electric potential is ____.
8. The relation between electric field intensity and potential gradient at a point is ____.
9. The electric potential is constant in a region. There, the electric field is _____.
10. For a point charge, the equipotential surfaces are _____.
11. The equipotential surfaces are at ____ angles to the direction of electric field.
12. SI unit of capacitance is _____.
13. 1F = ___ pF.
14. The dimensional formula of capacitance is _____.
15. A parallel plate capacitor has a capacitance of 5 μF in air and 50 μF when a dielectric medium is introduced. The dielectric constant of the medium is____.
16. Three capacitors, each of capacitance 2 μF are connected in series. The resultant capacitance in farad is __ .

17. Work done to charge a 24 μF capacitor when potential difference between the plates is 500V is ___.
18. The dipole moment of non-polar molecule is ____.
19. Water has dielectric constant _____.
20. Mica has dielectric constant _____.

Answers

1. independent
2. JC^{-1} or volt
3. $ML^2\ T^{-3}A^{-1}$
4. 20J
5. $1{\cdot}6 \times 10^{-19}$
6. $1{\cdot}6 \times 10^{-13}$
7. Zero
8. E = $\vec{E} = -\vec{\nabla}\ V$
9. Zero
10. concentric spheres
11. right
12. CV^{-1} or farad
13. 10^{12}
14. $M^{-1}L^{-2}A^2T^4$
15. 10
16. $0{\cdot}67\ 10^{-6}$ F
17. 3J
18. Zero
19. 80
20. 6

Multiple Choice Questions

UNIT-I

1. The SI unit of electric field strength is

   (a) NC^{-1}

   (b) Coulomb

   (c) ab coulomb

   (d) newton

2. Three small spheres each carrying a positive charge 'q' are placed on circumference of a circle of radius 'r' to form an equilateral triangle. The electric field intensity at the centre of the circle will be

   (a) $\frac{3Q}{r}$

   (b) $\frac{3Q}{r^2}$

   (c) $\frac{Q}{\sqrt{2}r^2}$

   (d) zero

3. Two similar conducting spheres A and B are brought in contact and inshlated from with. A negatively charged ebonite rod is brought near A now.

   (a) A will have +ve and B will have –ve charge

   (b) A will have –ve charge and B will have +ve charge

   (c) Both will acquire negative charge

   (d) both will remain uncharged

4. Two identical metallic sphere A and B have exactly equal masses A is given a +ve charge q coulomb and B is given an equal negative charge. Then after charging.

   (a) Masses of A and B are equal

   (b) mass of B s greater than A.

   (c) Mass of A is greater than B

   (d) None of these

5. The magnitude of electric intensity E is such that an electron placed on it would experience an electrical force equal to its weight. E is given by

(a) mg e

(b) $\frac{e}{mg}$

(c) $\frac{mg}{e}$

(d) $\frac{e^2 g}{m^2}$

6. A charge q_1 exerts some force on a second charge q_2. It a third charge q_3 is brought near, then the force of q_1 exerted on q_2

(a) will increase in magnitude

(b) will decrease in magnitude

(c) will remain unchanged.

(d) will increase if q_3 is of the same sign as q_1 and will decrease if q_3 is of opposite sign.

7. Five balls numbered q to 5 are suspended using separate threads pairs (1,2), (2,4) and (4,1) show electrostatic attraction, while pairs (2,3) (4,5) show repulsim, therefore ball q to be zero.

(a) neutral

(b) made of metal

(c) positively changed

(d) negatively charged

8. Three charges 4q, Q and q are placed in a straight line of length l at points o, $l/2$ and l respectively. What should be Q in order to make the net force on q to be zero

(a) $-q$

(b) $-\frac{1}{2}q$

(c) 1 : 5

(d) 5 : 1

9. There are two changes 1 μc and 5 μc the ratio of the forces acting on them will be

(a) 1 : 1

(b) 1 : 25

(c) 1 : 5

(d) 5 : 1

10. A large isolated metal sphere of radius r carries a fixed charge. A small charge is placed at a distance d from its surface. It experiences a force which is

(a) independent of r and d

(b) proportional to $r^2 + d^2$

(c) proportional to r^2

(d) inversely proportional to $(r + d)^2$

11. A charge q is placed at the centre of line joining two equal charges Q . The system of the three chrges will be in equilibrium if q is equal to

(a) $\frac{-Q}{2}$

(b) $\frac{-Q}{4}$

(c) $\frac{+Q}{4}$

(d) $\frac{+Q}{2}$

12. Charge is placed at each of two opposite corners a square. A charge q is placed at each othe other corners. Given that resultant electric force on is zero. The Q is equal to

(a) $\frac{2\sqrt{2}}{9}$

(b) $\frac{-9}{2\sqrt{2}}$

(c) $2\sqrt{2}q$

(d) $-2\sqrt{2}q$

13. A point Q lies on perpendicular bisector of an elective pole of moment P. if the distance of Q from the dipole is r much larger than size of dipole, then the electric field at Q is proportional to

(a) P^{-1} *and* r^{-2}

(b) P *and* r^{-2}

(c) P^2 *and* r^{-3}

(d) P *and* r^{-3}

14. A hollow insulated conducting sphere is given a positive charge of 10 μc. What will be the electric field at the under of the use if its radius is 2m.

(a) Zero

(b) 5 μ cm^{-2}

(c) 20 5 μ cm^{-2}

(d) 325 μ cm^{-2}

15. Equal charge are given to two spheres of different radii; potential will be

(a) more on smaller sphere

(b) more on bigger sphere

(c) equal on both spheres

(d) dependant on nature of material of the spheres

16. Fight dipoles of charges of magnitude $\pm e$ are placed side a cabe . The total electric this coming out of the tube will be.

(a) $\frac{8e}{\varepsilon_0}$

(b) $\frac{8e}{\varepsilon_0}$

(c) $\frac{e}{\varepsilon_0}$

(d) zero

17. Two charges -10^{o} C + 10 C are placed 10 cm apart tential at the centre of the line joining the two charges.

(a) zero

(b) 2V

(c) -2V

(d) none of these

18. Coulomb's law is given by F=k q_1 q_2 r where n is

(a) $\frac{1}{2}$ (b) -2 (c) 2 (d) $-\frac{1}{2}$

19. Work done in moving a unit positive charge through ω distance of x meter on an equipotential surface is

(a) x *joule*

(b) $\frac{1}{x}$ joule

(c) zero

(d) x^2 joule

20. Potential diff between two parallel plate separate by 1 cm apart is 10 volt. The electric field is

(a) 10 N/C (b) 500 N/C (c) 10^3 N/C (d) 250 N/C

21. If the surface densim of charge be r, electric field near the surface would be

(a) $\frac{2r}{\varepsilon_0}$ (b) $\frac{r}{\varepsilon_0}$ (c) $\frac{3r}{\varepsilon_0}$ (d) $\frac{3r}{\varepsilon_0}$

22. A hollow metal sphere of radii 10 cm is charged such that the potential on its surface is 80 volt. The potential at the centre of the sphere is

(a) zero

(b) 80 volt

(c) 800 volt

(d) 8 volt

24. Two metallic sphere of radii 1 cm and 2 cm are given charge of 10^{-1} and 5×10^{-2} C respectively. If these are connected by a conducting wire, the final charge on the smalles sphere is

(a) 3×10^{-2} C

(b) 1×10^{-2} C

(c) 4×10^{-2} C

(d) 2×10^{-2} C

25. Three different capacitors are connected in series. Then

(a) they will have equal charges.

(b) they will have same potential

(c) both (a) & (b)

(d) none of these

26. A sheet of Aluminium is inserted in the air gap of a parallel plate capacitor without touching any of the plates of the capacitors the capacitance of the capacitor is

(a) invariant for all positions of sheet

(b) maximum when the sheet is midway between 2 plate

(c) maximum when the sheet is never to +ve plate

(d) maximum when the sheet is never to –ve plate

27. Which of the following is a volt?

(a) erg per cm

(b) joule per coulomb

(c) erg per ampere

(d) newton/coulomb $\times$ m^2

28. Two sphere each carrying a charge Q placed r meters apart repel each other with a force F. If one of the spheres is taken around the other one in a circular path of radius r the work done will be

(a) F × r

(b) F × 2πr

(c) $\frac{F}{2\pi r}$

(d) Zero

29. If one penetrates a uniformly charged spherical shell, the electric field strength E.

(a) increases

(b) decreases

(c) remains same as surface

(d) is zero at all points

30. Two condensers of capacity 0.3 μF and 0.6 μF respectively are connected in series. The combination is connected across a potential of 6 volt. The ratio of energies stored by condenser will be

(a) ½ (b) 2 (c) ¼ (d) 4

31. SI unit of permittivity is

(a) $N\ m^2\ c^{-2}$

(b) $A\ m^{-1}$

(c) $N\ C^{-1}$

(d) $C^2\ N^{-1}\ m^{-2}$

32. Two point changes at a certain distance experience a force of 5 N. Each change is doubled in magnitude and distance between the two is halved. The interacting force would be

(a) 16 N (b) 80 N (c) 5 N (d) 20 N

33. When an electric dipole is placed in a uniform electric field it expliences.

(a) a force as well as torque

(b) a torque but no force

(c) a force but no torque

(d) neither a force nor a torque

34. Torque on a dipole in an electric field in maximum when angle between $\vec{P}$ *and* $\vec{E}$ is

(a) 0^0 (b) 90^0 (c) 45^0 (d) 180^0

35. Potential energy of two equal negative point charges 2μC each held 1m apart in air is

(a) 2 J (b) 2 eV (c) 4 J (d) 0.036 J

36. The dielectric const of a metal is

(a) 1 (b) 0 (c) ∞ (d) Indefinite

37. A work of 100 joule is performed in carrying a charge of 5 coulomb from infinity to a particular point in an electrostatic field. The potential of this point is

(a) 100 V (b) 5 V (c) – 20 V (d) 20 V

38. When a charge q is moved once a circle of radius R with charge Q at the centre of circle work done is

(a) Zero

(b) $\frac{Qq}{4\pi\varepsilon_0 R}$

(c) $\frac{Qq}{4\pi\varepsilon_0 R^2}$

(d) $\frac{Qq}{R}$

39. When a capacitor is connected to a battery

(a) an althnating current flows in the CC^+

(b) no current flows at all

(c) a current flows for some time and finally decreases to zero

(d) current keeps in increasing and reaches maximum alter some time

40. A parallel plate capacitor has capacitance of 50 pF in air and 105 pF when immersed in a oil. The dielectric constant of the oil is

(a) $\frac{50}{100}$

(b) 1

(c) 2 : 1

(d) ∞

41. A parallel plate capacitors is made by stocking n equally spaced plates connected alternately. If capacitance between any two plates is x. Then total capacitance is

(a) nx

(b) $\frac{n}{x}$

(c) x

(d) (n – 1)x

42. Three capacitors of capacitance 4μF, 6μF and 12μF are connected first in series and then in parallel. What is the ratio of equivalent capacitance in the two cases?

(a) 2 : 3 (b) 1 : 11 (c) 11 : 1 (d) 1 : 3

43. The Gaussian surface for calculating the electric field due to a change distribution is

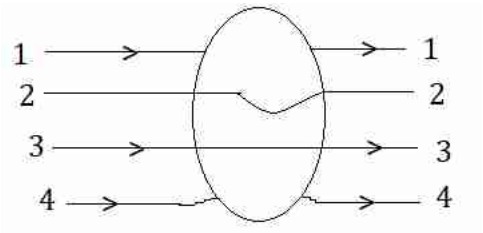
(a) any closed surface around the charge distribution

(b) any surface near the charge distribution

(c) a spherical surface

(d) a symmetrical closed surface at every point of which electric field has a single fixed value.

44. A metallic solid is placed in a uniform electric field. The lines of force follow the path (s) shown in the figure as



(a) 1 (b) 2 (c) 3 (d) 4

45. A comb run through ore's dry hair attracts small bits of paper. This is due to

(a) comb is a good conductor

(b) paper is a good conductor

(c) the atoms in the paper get polarized by charged comb

(d) the comb possesses magnetic properties

46. For a given surface the Gausis law is stated as $\int \vec{E} \cdot \vec{ds} = 0$ from this we can conclude that

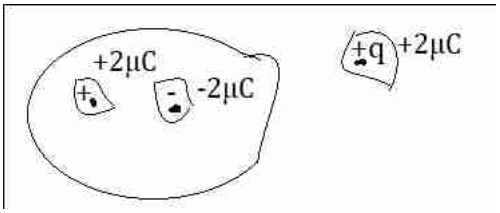
(a) E is necessarily zero on the surface

(b) E is perpendicular to the surface at every point

(c) the total flux through the surface is zero

(d) the flux is only going out of the surface

47. Shown below is a distribution of charge. The flux of electric field due to these charges. The flux of electric field due to these charges through the surface S is



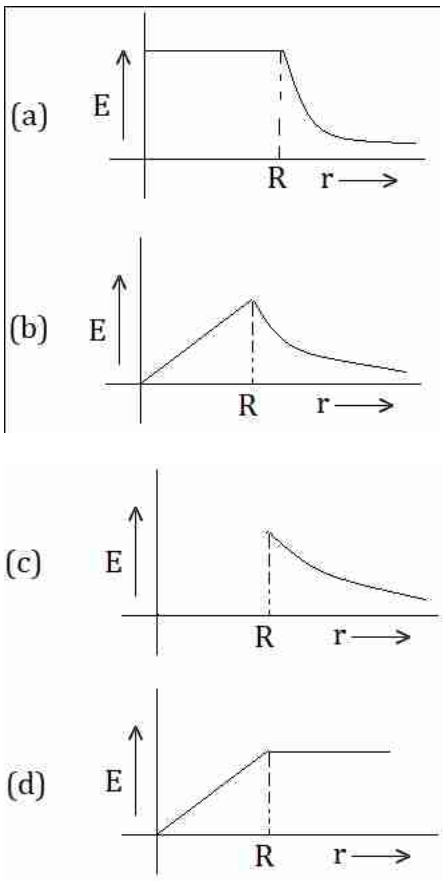
(a) $\frac{3q}{\varepsilon_0}$ (a) $\frac{6\mu C}{\varepsilon_0}$

(b) $\frac{2q}{\varepsilon_0}$ (b) $\frac{4\mu C}{\varepsilon_0}$

(c) $\frac{q}{\varepsilon_0}$ (c) $\frac{2\mu C}{\varepsilon_0}$

(d) zero (d) 0

48. The electric field due to a uniformly charged sphere of radius R as a function of the distance from its centre is represented by



49. Gausis Law is valid for

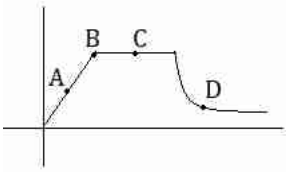
(a) Any closed surface

(b) Only regular closed surface

(c) Any open surface

(d) Only irregular open surface

50. Figure shows variation of electrostatic potential with distance for a charge distribution. At which point electric field is zero.



(a) A (b) B (c) C (d) D

51. When a bar is placed near a strong magnetic field and is repelled, then the material of bar is

(a) diamagnetic

(b) ferromagnetic

(c) paramagnetic

(d) anti-ferromagnetic

52. The permeability of a paramagnetic substance is

(a) slightly more than vacuum

(b) slightly less than vacuum

(c) much more than vacuum

(d) none of these

53. A magnet can be completely demagnetized by

(a) breaking the magnet into small pieces

(b) heating it slightly

(c) dropping it into ice cold water

(d) a reverse field of appropriate strength

54. Susceptibilty of a diamagnetic substance is

(a) zero

(b) negative

(c) < 1

(d) >1

55. For a paramagnetic material the dependence of the magnetic susceptibility X on the absolute temp is given as

(a) $X \alpha T$

(b) $X \alpha \frac{1}{T^2}$

(c) $X \alpha \frac{1}{T}$

(d) Independent

ANSWERS

1.	(a)	20.	(c)	39.	(c)
2.	(d)	21.	(c)	40.	(c)
3.	(a)	22.	(b)	41.	(d)
4.	(b)	23.	(d)	42.	(b)
5.	(c)	24.	(d)	43.	(d)
6.	(c)	25.	(a)	44.	(d)
7.	(a)	26.	(a)	45.	(c)
8.	(a)	27.	(b)	46.	(c)
9.	(a)	28.	(d)	47.	(d)
10.	(d)	29.	(c)	48.	(b)
11.	(b)	30.	(b)	49.	(a)
12.	(d)	31.	(d)	50.	(c)
13.	(d)	32.	(b)	51.	(a)
14.	(a)	33.	(b)	52.	(a)
15.	(a)	34.	(b)	53.	(d)
16.	(d)	35.	(b)	54.	(b)
17.	(a)	36.	(c)	55.	(c)
18.	(b)	37.	(c)		
19.	(c)	38.	(a)		

Electromagnetic Wave

1. Maxwell introduced displacement current to make necessary correction in which law?

   a. Faraday's law

   b. Gauss's Law

   c. Biot-Savart's Law

   d. Ampere's circuital Law

2. Electromagnetic wave is generated by

   a. Static charge

   b. Charge moving with uniform velocity

   c. Accelerated charge

   d. All of the above

3. Velocity of electromagnetic wave in free space is

   a. $\sqrt{(\mu_o \varepsilon_o)}$

   b. $1/\sqrt{(\mu_o \varepsilon_o)}$

   c. μ_o/ε_o

   d. $\mu_o \varepsilon_o$

4. What is the wavelength of light waves if their frequency is $6.0X10^{14}$ Hz?

   a. 0.50 m

   b. 5.0 mm

   c. 0.050 mm

   d.0.50 micro-m

5. How long does it take light to travel 1.0 m?

   a. 3.3 ns

   b. 3.3 micro-s

   c. 3.3 ms

   d. 3.3 s

6. What is the wavelength of a 30 MHz radio wave?

a. 10 mm

b. 10 cm

c. 10 m

d. 1.0 m

7. Ratio of amplitude of electric field (E) and amplitude of magnetic field (B) in an electromagnetic wave is

a. c

b. c^2

c. 1/c

d. $\sqrt{c}$

where 'c' is the velocity of light.

8. The angle between electric field (E) and magnetic field (B) in an electromagnetic wave is

a. $\pi/2$

b. π

c. $\pi/4$

d. 0

9. Which scientist experimentally proved the existence of electromagnetic wave?

a. Einstein

b. Maxwell

c. Hertz

d. Ampere

10. Which of the following electromagnetic waves has highest penetrating power?

a. infrared waves

b. gamma rays

c. ultraviolet rays

d. radio waves

11. Which one is the correct order of increasing wavelength?

a. X-rays, gamma rays, visible rays, gamma ray

b. gamma rays, X-rays, Ultraviolet rays, Visible rays

c. Ultraviolet rays, Visible rays, gamma rays, X-rays

d. Visible rays, gamma rays, Ultraviolet rays, X- rays

12. Which one is the correct order of increasing frequency?

a. X-rays, Ultraviolet rays, Visible rays, infrared rays

b. infrared rays, Visible rays, Ultraviolet rays, X- rays

c. Ultraviolet rays, Visible rays, infrared rays, X-rays

d. Visible rays, infrared rays, Ultraviolet rays, X- rays

Answers:

1. (d)	5. (a	9. (c)
2. (c)	6. (c)	10. (b)
3. (b)	7. (a)	11. (b)
4. (d)	8. (a)	12. (b)

MODERN PHYSICS

1. As the quantum number increases, the difference of energy between consecutive energy levels
(a) remain the same
(b) increases
(c) decreases
(d) sometimes increases and sometimes decreases.

2. Which of the following in a hydrogen atom is independent of the principal quantum number n? (Where, v & E are the velocity & energy of the electron in n^{th} orbit respectively; r is the radius of the n^{th} orbit)
(a) v×n
(b) E×r
(c) E×n
(d) v×r

3. According to the Bohr theory of H-atom, the speed of the electron, its energy and the radius of its orbit varies with the principal quantum number n, respectively, as

(a) $1/n$, n^2, $1/n^2$
(b) n, $1/n^2$, n^2
(c) n, $1/n^2$, $1/n^2$
(d) $1/n$, $1/n^2$, $1/n^2$

4. When an atomic gas or vapour is excited at low pressure, by applying external electric field, then
(a) emission spectrum is observed
(b) absorption spectrum is observed
(c) band spectrum is observed
(d) both (b) and (c)

5. As an electron makes a transition from an excited state to the ground state of a hydrogen – like atom/ion
(a) kinetic energy decreases, potential energy increases but total energy remains same
(b) kinetic energy and total energy decrease but potential energy increases
(c) kinetic energy increases but potential energy and total energy decrease
(d) kinetic energy, potential energy and total energy decrease

6. Which one of the following supports the results of the Rutherford's α-particles gold foil experiment?
(a) The nucleus of an atom is held together by forces which are much stronger than electrical or gravitational forces.
(b) The force of repulsion between an atomic nucleus and an α-particle varies with distance according to inverse square law.
(c) α-particles are nuclei of Helium atoms.
(d) Atoms can exist with a series of discrete energy levels

7. According to the Rutherford's atomic model, the electrons inside an atom are
(a) stationary
(b) not stationary
(c) centralized
(d) None of these

8. Rutherford's α-particle experiment showed that the atoms have
(a) Proton
(b) Nucleus
(c) Neutron
(d) Electrons

9. The Rutherford α-particle experiment shows that most of the α-particles pass un-scattered, while some are scattered through large angles. What information does it give?

(a) Atom is hollow.
(b) The whole mass of the atom is concentrated in a small centre called nucleus
(c) Nucleus is positively charged
(d) All of the above

10. The significant result deduced from the Rutherford's scattering experiment is that
(a) whole of the positive charge is concentrated at the centre of atom
(b) there are neutrons inside the nucleus
(c) α-particles are helium nuclei
(d) electrons are embedded in the atom

11. Rutherford's atomic model was unstable because
(a) nuclei will break down
(b) electrons do not remain in orbit
(c) orbiting electrons radiate energy
(d) electrons are repelled by the nucleus

12. According to Rutherford's atomic model, electrons would be expected to lose energy because, they
(a) move randomly
(b) jump on nucleus
(c) accelerate towards the nucleus
(d) escape from the atom

13. Bohr's atomic model is the modification of Rutherford's model by the application of
(a) Newton's theory
(b) Huygen's theory
(c) Maxwell's theory
(d) Planck's quantum theory

14. According to Planck's quantum theory any electromagnetic radiation is
(a) continuously emitted
(b) continuously absorbed
(c) emitted or absorbed in discrete units
(d) None of these

15. In the uranium radioactive series, the initial nucleus is $_{92}U^{238}$ and that the final nucleus is $_{82}Pb^{206}$. When uranium nucleus decays to lead, the number of α particles and β particles emitted are
(a) 8α, 6β
(b) 6α, 7β
(c) 6α, 8β
(d) 4α, 3β

16. The nuclear radius is of the order of
(a) 10^{-10} m
(b) 10^{-6} m

(c) 10^{-15} m
(d) 10^{-14} m

17. The radius of a nucleus is
(a) directly proportional to its mass number
(b) inversely proportional to its atomic weight
(c) directly proportional to the cube root of its mass number
(d) None of these

18. The electrons cannot exist inside the nucleus because
(a) de-Broglie wavelength of an electron is much less than the size of nucleus
(b) de-Broglie wavelength of an electron is much greater than the size of nucleus
(c) de-Broglie wavelength of an electron is equal to the size of nucleus
(d) negative charge cannot exist in the nucleus

19. A nuclei having same number of neutrons but different number of protons are called
(a) isobars
(b) isomers
(c) isotones
(d) isotopes

20. Nuclei having same number of protons but different number of neutrons are called
(a) isobars
(b) isomers
(c) isotones
(d) isotopes

21 Nuclei having same number of nucleons but different number of protons are called
(a) isobars
(b) isomers
(c) isotones
(d) isotopes

22. When the number of nucleons in nuclei increases, the binding energy per nucleon
(a) increases continuously with mass number
(b) decreases continuously with mass number
(c) remains constant with mass number
(d) first increases and then decreases with increase of mass number

23. M_p denotes the mass of a proton and M_n that of a neutron. A given nucleus, of binding energy B, contains Z protons and N neutrons. The mass M(N, Z) of the

nucleus is given
by (c is the velocity of light)
(a) $M(N, Z) = NM_n + ZM_p + B/c^2$
(b) $M(N, Z) = NM_n + ZM_p - Bc_2$
(c) $M(N, Z) = NM_n + ZM_p + Bc^2$
(d) $M(N, Z) = NM_n + ZM_p - B/c^2$

24. The mass of an atomic nucleus is less than the sum of the masses of its constituents. This mass defect is converted into
(a) heat energy
(b) light energy
(c) electrical energy
(d) energy which binds nucleons together

25. Which of the following statement is not true regarding Einstein's mass energy relation?
(a) Mass disappears to reappear as energy.
(b) Energy disappears to reappear as mass.
(c) Mass and energy are two different forms of the same entity.
(d) Mass and energy can never be related to each other.

26. The curve of binding energy per nucleon as a function of atomic mass number has a sharp peak for helium nucleus. This implies that helium
(a) can easily be broken up
(b) is very stable
(c) can be used as fissionable material
(d) is radioactive

27. Nuclear forces are
(a) spin dependent and have no non-central part
(b) spin dependent and have a non-central part
(c) spin independent and have no non-central part
(d) spin independent and have a non-central part

28. Nuclear forces exists between
(a) neutron – neutron
(b) proton – proton
(c) neutron – proton
(d) all of these

29. Neutron decay in free space is given as ${}_0n^1 \rightarrow {}_1H^1 + {}_{-1}e^0 + X$; X represents a
(a) neutrino
(b) photon
(c) antineutrino
(d) graviton

30. In a semiconductor
(a) there are no free electrons at 0 K
(b) there are no free electrons at any temperature
(c) the number of free electrons increases with pressure
(d) the number of free electrons is more than that in a conductor

31. Let n_h and n_e be the number of holes and conduction electrons in an extrinsic semiconductor. Then
(a) $n_h > n_e$ (b) $n_h = n_e$ (c) $n_h < n_e$ (d) $n_h \neq n_e$

32. A p-type semiconductor is
(a) positively charged
(b) negatively charged
(c) uncharged
(d) uncharged at 0K but charged at higher temperatures

33. Electric conduction in a semiconductor takes place due to
(a) electrons only
(b) holes only
(c) both electrons and holes
(d) neither electrons nor holes

34. The impurity atoms with which pure silicon may be doped to make it a p-type semiconductor are those of
(a) phosphorus (b) boron (c) antimony (d) nitrogen

35. The electrical conductivity of pure germanium can be increased by
(a) increasing the temperature
(b) doping acceptor impurities
(c) doping donor impurities
(d) All of the above

36. The resistivity of a semiconductor at room temperature is in between
(a) 10^{-2} to 10^{-5} Ω cm (b) 10^{-3} to 10^{6} Ω cm (c) 10^{6} to 10^{8} Ω cm (d) 10^{10} to 10^{12} Ω cm

37. In a semiconductor, the forbidden energy gap between the valence band and the conduction band is of the order is
(a) 1 MeV (b) 0.1 Mev (c) 1 eV (d) 5 Ev

38. The forbidden energy gap for germanium crystal at 0 K is
(a) 0.071 eV (b) 0.71 eV (c) 2.57 eV (d) 6.57 eV

39. In an insulator, the forbidden energy gap between the valence band and conduction band is of the order of
(a) 1 MeV (b) 0.1 MeV (c) 1 eV (d) 5 eV

40. Temperature coefficient of resistance of semiconductor is
(a) zero (b) constant (c) positive (d) negative

41. In a p-type semiconductor, the acceptor level valence band is
(a) close to the valence band of the host crystal
(b) close to conduction band of the host crystal
(c) below the conduction band of the host crystal
(d) above the conduction band of the host crystal

42. In an n-type semiconductor, donor valence band is
(a) above the conduction band of the host crystal
(b) close to the valence band of the host crystal
(c) close to the conduction band of the host crystal
(d) below the valence band of the host crystal

43. The mobility of free electrons is greater than that of free holes because
(a) they are light
(b) they carry negative charge
(c) they mutually collide less
(d) they require low energy to continue their motion

44. In semiconductors, at room temperature
(a) the conduction band is completely empty
(b) the valence band is partially empty and the conduction band is partially filled
(c) the valence band is completely filled and the conduction band is partially filled
(d) the valence band is completely filled

45. At Absolute Zero, Si acts as
(a) non-metal (b) metal (c) insulator (d) None of these

46. A strip of copper and another of germanium are cooled from room temperature to 80K. The resistance of
(a) each of these decreases
(b) copper strip increases and that of germanium decreases
(c) copper strip decreases and that of germanium increases
(d) each of these increases

47. Carbon, Silicon and Germanium atoms have four valence electrons each. Their valence and conduction bands are separated by energy band gaps represented by $(Eg)_C$, $(Eg)_{Si}$ and $(Eg)_{Ge}$ respectively. Which one of the following relationship is true in their case?
(a) $(Eg)_C > (Eg)_{Si}$ (b) $(Eg)_C < (Eg)_{Si}$ (c) $(Eg)_C = (Eg)_{Si}$ (d) $(Eg)_C < (Eg)_{Ge}$

48. If the two ends of a p-n junction are joined by a wire
(a) there will not be a steady current in the circuit
(b) there will be a steady current from the n-side to the p side
(c) there will be a steady current from the p-side to the n side

(d) there may or may not be a current depending upon the resistance of the connecting wire

49. The diffusion current in a p-n junction is from the
(a) n-side to the p-side
(b) p-side to the n-side
(c) n-side to the p-side if the junction is forward-biased and in the opposite direction if it is reverse-biased
(d) p-side to the n-side if the junction is forward-biased and in the opposite direction if it is reverse-biased

50. The drift current in a p-n junction is from the
(a) n-side to the p-side
(b) p-side to the n-side
(c) n-side to the p-side if the junction is forward-biased and in the opposite direction if it is reverse biased
(d) p-side to the n-side if the junction is forward-biased and in the opposite direction if it is reverse-biased

51. Diffusion current in a p-n junction is greater than the drift current in magnitude
(a) if the junction is forward-biased
(b) if the junction is reverse-biased
(c) if the junction is unbiased
(d) in no case

52. Forward biasing is that in which applied voltage
(a) increases potential barrier
(b) decreases the potential barrier
(c) is equal to 1.5 volt
(d) None of these

53. In V-I characteristic of a p-n junction, reverse biasing results in
(a) leakage current
(b) the current barrier across junction increases
(c) no flow of current
(d) large current

54. In a half wave rectifier, the r.m.s. value of the a.c. component of the wave is
(a) equal to d.c. value (b) more than d.c. value
(c) less than d.c. value (d) zero

55.The current flow is ----- in diodes

a.unidirectional b.bidirectional c.multidirectional d. none

56.Efficiency of half wave and full wave rectifiers are

a. 50% and 100 % b. 40.6% and 81 % c. 81% and 40.6 % d. none

57. The emitter-base junction of a transistor is ……. Biased while the collector-base junction is …….

a. Reverse, Forward
b. Reverse, Reverse
c. Forward, forward
d. Forward, reverse

58. Which of the following is true

a. Common base transistor is commonly used because the current gain is maximum
b. Common emitter is commonly used because the current gain is maximum
c. Common collector is commonly used because the current gain is maximum
d. Common emitter is the least used transistor

59. For a common base configuration of PNP transistor Ic/IE = 0.98 then the maximum current gain in common emitter configuration will be

a. 12
b. 24
c. 6
d. 5

60. Which is the least doped region in a transistor?

a. Either emitter or collector
b. Base
c. Emitter
d. Collector

61. In a PNP transistor the base is the N-region. Its width relative to the P-region is

a. Smaller
b. Larger
c. Same
d. Not related

62. Which gate is known as the universal gate?

a.NAND b.OR c.AND d.None

63. Which of the following is not a logic gate?

a.NAND b.OR c.AND d.IF

64. Which of the following gates can function on a single input?

a.NAND b.OR c.AND d.NOT

65. The following truth table represents

A	B	output
1	1	0
0	0	1
1	0	1
0	1	1

a.NAND b.OR c.AND d.NOT

66. The following truth table represents

A	B	output
1	1	0
0	0	1
1	0	0
0	1	0

a.NAND b.NOR c.AND d.NOT

Answers:

1. (c)
2. (a)
3. (b)
4. (a)
5. (c)
6. (b)
7. (b)
8. (b)
9. (d)
10. (a)
11. (b)
12. (c)
13. (d)
14. (c)
15. (a) (c)
16. (a)
17. (a)
18. (b)
19.
20. (c)
21. (a)
22. (b)
23. (c)
24. (d)
25. (a)
26. (d)
27. (d)
28. (d)
29. (d)
30. (b)
31. (b)
32. (d)
33. (c)
34. (a)
35. (d)
36. (c)
37. (c)
38. (b)
39. (d)
40. (b)
41. (c)
42. (b)
43. (d)
44. (d)
45. (a)
46. (c)
47. (a)
48. (a)
49. (b)
50. (a)
51. (a)
52. (b)
53. (a)
54. (b)
55. (a)
56. (b)
57. (d)
58. (b)
59. (b)
60. (b)
61. (a)
62. (a)
63. (d)
64. (d)
65. (a)
66. (b)

Electromagnetic Wave

State true or false

1. Microwaves are produced by special vacuum tubes called Klystrons.

2. Electromagnetic waves carry both energy and momentum.

3. Infrared waves are often called heat waves.

4. Cellular phones use _____ waves to transmit voice communication.

5. _____wave is used in microwave oven.

6._____ wave is trapped by greenhouse gases.

7.Ozone layer in the atmosphere saves us from the harmful effects of _____wave.

8. Name of the electromagnetic wave which is produced by bombarding a metal target by high energy electrons is _____.

Answers

[Ans: 1.True 2. True 3. True 4. radio wave 5. Microwave 6. Infrared 7. Ultraviolet 8. X-rays

Give one-word answer:

1. State the *SI* unit of magnetic flux.

2. What is the *SI* unit of electrical conductivity?

3. Write down a relation between current and current density vector?

4. What happens to resistivity of material of a conductor on heating?

5. Out of two bulbs marked 25W – 220 V and 100W – 220V, Which has the higher resistance?

6. Write down the relation between current and drift velocity.

7. Two copper wires A and B have their lengths in the ratio 1 : 2 . What is the ratio of their (i) resistances and (ii) resistivities ?

8. Name the physical quantity whose $S.I.$unit is A m^{-2}?

9. What happens to resistance of a conductor if potential difference across its ends are doubled?

10. What do you mean by a steady current?

11. What happens to condition of balance of a Wheatstone bridge, if the position of cell and galvanometer are interchanged?

12. What is board of Trade unit ?

13. When is a Wheatstone bridge most sensitive?

14. Write down a relation between electrical conductivity and mobility.

15. What does slope of T – E graph represent?

Single formula numerical:

1. Three resistances, each of 5 Ω, are connected to form a triangle. Calculate the resistance between two ends of any arm.

2. What is the resistance of a 100W-220V electric bulb?

3. An electric bulb marked 100W-220V is connected across a 110V supply. Calculate the electric power consumed by the bulb.

4. The slope of $I - V$ characteristic of a conductor wire is 1mA/volt. What is the resistance of the wire?

5. What are the limitations of Ohm's law?

6. Define resistivity of material of a conductor and write down its $S.I$ unit.

7. Five identical cells each of emf 2V and internal resistance 0.3 Ω are connected in series. Calculate the current through an external resistance of 3.5 Ω due to this combination.

8. Deduce the relation,

$$r = \left(\frac{E - V}{V} \right) R$$

Where, the symbols have their usual meaning

9. A wire of resistance 10 Ω is doubled on itself. What is the new resistance?

10. What is the time required by a 50 Hz. AC to attain its peak value?

11. What are the characteristic features of a material to be used as a fuse wire?

12. A wire is stretched so that its length increased by 10% . Calculate the percentage increase in length of the wire.

13. The change flowing through a circuit varies with time as per relation,

$$q = 2t^2 + t + 1$$

Where q is in μc and t is in second. Calculate instantaneous value of current at the end of 2 sec.

14. The magnitude of current flowing through a circuit varies with time as, $I = 3t^2 + 2t + 1$, where I is in μA and T is in second. Calculate the amount of charge transferred between 2 sec to 5 sec.

15. Two cells marked $(2V, 0.2\,\Omega)$ and $(3V, 0.4\,\Omega)$ are connect in parallel. Calculate effective emf of the combination

16. A current of 2 A flows through a resistance of 10 Ω for 5 minutes. Calculate heat energy generated in joule.

17. What is the nature of filament of a zero watt electric bulb?

18. You are given two electric bulbs marked 60W-220 V and 100 W – 220 V . Which of them glows brighter when connected (i) in series and (ii) in parallel.

Electromagnetic Wave

Correct the statements:

1. Light is a longitudinal wave.

2. The basic difference between various types of electromagnetic waves lies in their velocities.

3. Electromagnetic wave of frequency of the order giga hertz are called radio waves.

4. Electromagnetic waves does not exert pressure.

5. Electromagnetic waves need medium for their propagation.

6. The self inductance of a coil is **inversely** proportional to the number of turns in it.

(Correct the sentence by changing he underlined word, if necessary.

[Ans: 1. transverse wave 2. in their frequencies or wavelengths 3. Microwaves 4. they exert pressure called radiation pressure. 5. do not need medium 6. directly)

Definitions / Statements /Laws

1. Why the classical Rutherford model for an atom of electron orbiting around nucleus is not able to explain the atomic structure

2. Define ionization energy

3. Write the expression for Bohr's radius in hydrogen atom.

4. State Rohr's quantisation condition for defining stationary orbits.

5. In the Rutherford scattering experiment .how the distance of closest approach for an α particle is related to Kinetic energy.

6. How the distance of closest approach in Rutherford scattering experiment is changed when the α particle is replaced by protons.

7. Express De-Broglie wavelength associated with electrons, when they are accelerated by voltage V_d.

8. What is the stopping potential applied to a photoelectric cell when the maximum kinetic energy is 5 eV.

9. The wavelength of a photon is 400nm. Find its energy is eV.

10. Find the energy of a photon having wavelength 6000 A^o in Joules.

11. An electron and proton are having same momentum. Compare their DE-Broglie wavelength.

12. What is the trajectory of α-particle in Rutherford scattering experiment?

13. How density of a nucleus is dependent upon the mass number?

14. Why nuclear force is a short range force?

15. An electron and alpha particle have same de-Broglie wavelength associated with them. How are their kinetic energy related to each other?

16. State two characteristic properties of nuclear force.

17. Two nuclei have mass number in the ratio 1 : 2. What is the ratio of their nuclear densities?

18. Two nuclei have mass number in the ratio 1 : 8. What is the ratio of their nuclear radix?

19. Can photoelectric effect be explained by wave theory of light?

20. Write the mathematical form of Bohr's postulate regarding emission of photon.

21. Write down the laws of radioactivity.

22. Write the mathematical expression for packing fraction.

23. What is the mass of proton in amu?

24. What is the speed of $\gamma - rays$ in vacuum?

25. Why $\gamma - rays$ are not deflected by magnetic fields?

26. What is the energy equivalent of 1 kg of matter?

27. Explain why nuclear fusion reaction can't take place in laboratory.

28. What is the nuclear radius of X^{125} If that of Al^{27} is 3.4 fm?

29. Which process is responsible for the source of stellar energy?

30. The minimum number of diodes used in full wave rectifier.

31. What is forbidden gap?

32. Draw a circuit diagram of P-N junction in reverse bias.

33. State the laws of electromagnetic induction.

34. State and explain Ohm's law.

35. The current in a circuit with a cell of emf 6V and internal resistance 0.1 Ω is 2A. Find the value of the external resistance in it.

36. State Lens's law of electromagnetic induction and mention its significance.

37. State faraday's laws of electromagnetic induction.

38. State Joule's law of heating.

39. Define electric dipole moment.

40. Define terminal velocity.

41. State Kirchhoff's Voltage Law.

42. Define critical angle in refraction.

43. Write down the relationship between the refractive index and critical angle?

44. State faraday's Laws of electromagnetic induction.

45. Define self inductance of a coil.

Small Derivations:

1. What is self induction? Find an expression for the self – inductance of a circular coil of N turns.

2. Derive an expression for the electrical conductivity of a metal in terms of the drift velocity of the electron.

4. State and explain Biot-Savart law.

6. Write the expression for impedance in a series LCR circuit connected to an ac source and identify the symbols used. Write the expression for resonance frequency.

9. Write down the relation between current and drift velocity. Express different terms used in he expression.

10. Deduce Ohm's law from the concept of drift velocity

11. Define internal resistance of a cell. What are the factors on which it depends?

12. What should be the value of series resistance to be connected across an electric bulb marked 100W – 200 V when connected across a 300V electric supply?

13. State and explain maximum power transfer theorem.

14. The effective resistance of two resistors when connected in series is 25 Ω but 4 Ω when connected in parallel. Calculated the individual resistances.

15. Discuss the principle of working of meter – Bridge.

16. Discuss the principle of working of a potentiometer for comparing emfs two cells.

Explanations:

1. Mention four properties of electromagnetic wave.

2. Explain displacement current.

3. If the relative permeability and relative permittivity of the medium is 1·0 and 2·25, respectively. Find the speed of the electromagnetic wave in this medium.

4. If the total energy of an electromagnetic wave falling on a surface is 6×10^5J, then calculate total momentum delivered by the wave on the surface.

5. Why do we prefer a potentiometer to measure emf of a cell rather than voltmeter?

6. Distinguish between emf and terminal potential difference.

Long Questions:

1. State Kirchhoff's laws for an electrical network. Use them with a neat circuit diagram to obtain the condition of balance for a Wheatstone's bridge. (2023,2019)

2. An AC emf. $E = E_0 \sin\omega t$ is applied to a circuit containing pure inductance (L) only. Obtain an expression for current (I) in the circuit . Explain the phase relationship between E and I, and show it graphically.

3. An AC emf $e = e_0 \sin\omega t$ is applied to a circuit containing resistance R, inductance L and capacitance C in series. Write the expression for currecnt in the circuit. Obtain the condition of resonance. In a series L-C-R Circuit, R = 60 Ω, L = 40 mH and C = 400 μF. Determine the resonant frequency.

4. State Biot and Savart law. Derive the expression for the magnetic field at any point on the axis of a circular current carrying loop. Find its value at the center of this loop.

5. Define drift velocity. Derive an expression for drift velocity of electros in a metal when subjected to a potential difference V.

6. Deduce an expression for emf induced in a coil as it rotates in a uniform magnetic field 'B' with a constant angular velocity 'w' . Also discuss the nature of emf and current

7. State Biot-Savart's law. Apply it to calculate magnetic field induction at a point on the axis of a circular current carrying coil.

8. State Amp[ere's circuital law. Apply it to determine magnetic field induction at a point due to a long straight current carrying cinductor.

9. Two cells A & B having emfs E_1 and E_2 and internal resistances r_1 and r_2 are connected in parallel Deduce he expression for current flowing through a resistance 'R' connected across the combination.

10. Deduce an expression for effective resistance of combination of resistances (i) in series and (ii) in parallel.

Council of Higher Secondary Education ,Odisha
Question Bank
Sub: Chemistry

Topic: Solutions (Unit- I)

One mark questions

1. What is the freezing point of water at 1 atm pressure in Kelvin scale?
2. Vapour pressure of a liquid _____ with rise of temperature.
3. Viscosity of a liquid _____ with rise of temperature.
4. Between water and ether _____ has higher vapour pressure.
5. Solubility of a saturated solution _____ with increase in temperature.
6. When 1gm equi. Of a solute dissolved in 1 lit. of solution. It is called _____.
7. What is the SI unit of viscosity?
8. What is the SI unit of surface tension?
9. When 1 gm mole of a solute dissolved in 1 lit. of solution. It is called _____.
10. Cleaning action of soap is due to
    (a) viscosity of water
    (b) surface tension of water
    (c) polarity of water
    (d) high boiling point of water
11. The unit of viscosity in CGS system
    (a) Dyne cm^{-1}
    (b) Dyne
    (c) Dyne $cm^{-2}sec^{-1}$
    (d) Dyne cm
12. The effect of pressure on solubility of gas is described by which law?
    (a) Boyle's law
    (b) Charle's law
    (c) Henry's law
    (d) Ostwald's dilution law
13. Mole fraction of solute × solute =

    (a) $\frac{No.\ of\ moles\ of\ solute}{No.\ of\ moles\ of\ solute + No.\ of\ moles\ of\ solvent}$

    (b) $\frac{No.\ of\ moles\ of\ solvent}{No.\ of\ moles\ of\ solute + No.\ of\ moles\ of\ solvent}$

    (c) $\frac{No.\ of\ moles\ of\ solute}{No.\ of\ moles\ of\ solute + No.\ of\ moles\ of\ solution}$

    (d) None of these

14. Parts per Million (ppm) =

(a) $\frac{Mass\ of\ solute}{Mass\ of\ solution} \times 10^6$

(b) $\frac{Mass\ of\ solute}{Mass\ of\ solution} \times 10^5$

(c) $\frac{Mass\ of\ solvent}{Mass\ of\ solution} \times 10^6$

(d) $\frac{Mass\ of\ solute}{Mass\ of\ solvent} \times 10^5$

15. Molality =

(a) $\frac{Moles\ of\ solute}{Mass\ of\ solvent\ in\ kg}$

(b) $\frac{Mass\ of\ solute}{Mass\ of\ solvent\ in\ kg}$

(c) $\frac{Mass\ of\ solvent}{Mass\ of\ solute\ in\ kg}$

(d) $\frac{Mass\ of\ solute}{Mass\ of\ solution}$

16. Ideal solutions obey which law?

(a) Henry's law
(b) Roult's law
(c) Boyle's law
(d) Charle's law

17. For an ideal solution $\Delta H_{mix} =$

(a) Zero
(b) One
(c) Two
(d) Not known

18. The properties of dilute solutions which depend on the number of solute particles are called _____.

19. Which of the following are colligative properties?

(i) Elevation in boiling point
(ii) Depression in freezing point
(iii) Viscosity

(a) (i) **(c) All of the above**
(b) Both (i) & (ii) **(d) Both (ii) & (iii)**

20. Vant-Hoff's factor =

(a) $\frac{observed\ value\ of\ colligative\ property}{calculated\ value\ of\ colligative\ property}$

(b) $\frac{calculated\ value\ of\ colligative\ property}{observed\ value\ of\ colligative\ property}$

(c) $\frac{No.\ of\ moles\ of\ solute}{No.\ of\ moles\ of\ solvent}$

(d) None of the above

21. The boiling point of water in a pressure cooker is
(a) Below 100^0C
(b) Above 100^0C
(c) 100^0C
(d) None of the above

ANSWERS

1. 273 K
2. Increases
3. Decreases
4. ether
5. Increases
6. Normality
7. Pascal × sec or Kg m^{-1} sec
8. Newton/mt
9. Molarity
10. (b)
11. (c)
12. (c)
13. (a)
14. (a)
15. (a)
16. (b)
17. (a)
18. colligative properties
19. (b)
20. (a)
21. (a)

2 Mark questions/ 3 Marks questions

1. What is a saturated solution? What is the effect of temperature on solubility of saturated solution?
2. Explain why NaCl is not soluble in CCl_4.
3. What is the effect of temperature and pressure on solubility?
4. Define Normality of a solution. Give the formula.

5. **If 20 gm of NaOH is dissolved in 500 mL of solution. What is the normality.**
6. **Define Molarity of a solution. Give the formula.**
7. **How many grams of Na_2CO_3 is required to make 500 mL of 0.01 M solution?**
8. **Define Molality of a solution. What is the effect of temperature on Molality?**
9. **Calculate the Mass to Mass percentage if 10 gm of solute in 50 gm of solution.**
10. **Calculate the Molality of 2.5 gm of ethanoic acid in 75 gm of benzene.**
11. **What is the Molality and Normality of 49 gm H_2SO_4 dissolved in 1 lit of solution.**
12. **What are the factors on which the solubility of a gas in liquid depends?**
13. **Define vapour pressure of a liquid. What is the SI unit?**
14. **Define boiling point of a liquid. Plot the variation of vapour pressure of liquid with temp. for water.**
15. **What are the characteristics of ideal solutions?**
16. **Define a non-ideal solution.**
17. **State and Explain Roult's Law.**
18. **Define colligative properties of a solution. Give examples.**
19. **What is elevation of boiling point (ΔT_b)? How to find out molecular mass of solute using ΔT_b ?**
20. **What is depression of freezing point? How to find out molecular mass of solute using ΔT_f ?**
21. **Define osmosis. How it differs from diffusion?**
22. **What do you mean by osmotic pressure? Define an Isotonic solution.**
23. **Derive Vant-Hoff's equation for dilute solution.**
24. **What is Vant-Hoff's factor? Discuss its applications.**
25. **A 5% solution of $CaCl_2$ at 0^0C developed an osmotic pressure of 15 atmosphere. Calculate the degree of dissociation.**

7 Mark questions

1. **Write notes on**
   (a) Viscosity (b) Osmosis
2. **Explain the effect on the boiling point and freezing point when non-volatile solute is dissolved in a solvent.**
3. **State Roult's law. Derive its mathematical expression for a solution of a non-volatile solute in a volatile solvent.**
4. **Discuss Minimum boiling azeotropes and maximum boiling azeotropes.**
5. **What is Abnormal Molecular Mass? Discuss its being in Molecular Association/Dissociation.**
6. **What is Vant-Hoff factor? How it helps in the determination of degree of dissociation.**
7. **(a) Define the terms osmosis and osmotic pressure.**
   (b) Calculate the boiling point of a solution prepared by adding 15 gm of NaCl to 250 gm of water. (K_b for H_2O = 0.512 Kg mol^{-1}, Molar mass of NaCl = 58.5 gm).
8. **(a) Why elevation in boiling point is a colligative property?**
   (b) Calculate the osmotic pressure in pascal exerted by a solution prepared by dissolving 1 gm of polymer of molar mass 1,85,000 in 450 mL of water at 37^0C.

****

Unit – II

Electrochemistry

One Mark questions:

1. **Write down the unit of cell constant.**
2. **The quantity of charge required for the reduction of Al^{3+} to Al is _____.**
3. **The product of electrolysis at cathode using Ag electrode in an aq. solution of $AgNO_3$ is _____.**
4. **The SI unit of molar conductivity is _____.**
5. **Electrical conductance of metal _____ with increase in temperature.**
6. **A galvanic cell directly converts _____ energy to electrical energy.**
7. **What is standard electrode potential?**
8. **Protection of Fe by coating with Zn is called _____.**
9. **Write down the expression for conductivity (k).**
10. **How molar conductivity of a weak electrolyte varies with concentration.**
11. **Write down the relation between** ΔG & E_{cell}.
12. **Define a primary cell.**
13. **Which electrolyte is used in fuel cell?**
14. **Which one of the following is not a good conductor of electricity?**
    (a) CH_3COONa
    (b) C_2H_5OH
    (c) NaCl
    (d) KOH
15. **The number of e^- s required to balance the following equation** $NO_3^- + 4H^+ + e^- \rightarrow 2H_2O + NO$ **is**
    (a) 5
    (b) 4
    (c) 3
    (d) 2
16. **What amount of electric charge is required for the reduction of 1 mole of** $Cr_2O_7^{2-}$ **into Cr^{3+}**
    (a) 6 F
    (b) 3 F
    (c) 1 F
    (d) 4 F
17. **One Faraday of electricity is passed through a solution of $CuSO_4$. The mass of Cu deposited at cathode is _____ (At mass of Cu = 63.5 amu)**
    (a) 2 g

(b) 12.7 gm
(c) 63.5 gm
(d) 31.75 gm

18. An increase in equivalent conductance of a strong electrolyte with dilution is mainly due to
(a) Increase in number of ions
(b) Increase in ionic mobility of ions
(c) 100 % ionization of electrolyte at normal dilution
(d) Increase in both i.e. number of ions & ionic mobility of ions.

19. $\Lambda_m^0(NH_4OH)$ **is equal to**
(a) $\Lambda_m^0(NH_4OH) + \Lambda_m^0(NH_4Cl) - \Lambda_m^0(HCl)$
(b) $\Lambda_m^0(NH_4Cl) + \Lambda_m^0(NH_4OH) - \Lambda_m^0(NaCl)$
(c) $\Lambda_m^0(NH_4Cl) + \Lambda_m^0(NaCl) - \Lambda_m^0(NaOH)$
(d) none of these

20. In a galvanic cell, the salt bridge
(a) Participate chemically with cell reaction
(b) stops diffusion of ions from one e^- to another
(c) is not necessary for the occurrence of cell reaction
(d) increases the mixing of two electrolytic solutions

ANSWERS

1. cm^{-1}
2. 3×96500 **C**
3. **Ag**
4. Sm^2mol^{-1}
5. **Decreases**
6. **Chemical**
7. **potential at 298 K, 1 atm pressure and 1M solution**
8. **Galvanization**
9. $k = \frac{1}{R} \times cell\ const.$
10. **Increases with decreases in cm.**
11. $\Delta G = -nFE_{cell}$
12. **Redox reaction occurs only once**
13. **Concentrated aq. KOH**
14. **(b)**
15. **(c)**
16. **(b)**
17. **(d)**
18. **(b)**
19. **(b)**
20. **(b)**

2 Mark questions/ 3 Mark questions

1. **What is the use of salt bridge in galvanic cell?**
2. **What is the free energy change for (a) galvanic cell (b) electrolytic cell?**
3. **Can we store $ZnSO_4$ solution in a Cu container. Give reasons.**
4. **What is an electrochemical series? Write any two applications.**
5. **Give the relationship between equivalent conductance and molar conductance of a given solution.**
6. **Write down the expression for degree of dissociation (α) relating to molar conductivity.**
7. **Define electrode potential.**
8. **Why does Zn react with dil. H_2SO_4 but Cu does not?**
9. **Write Nernst equation to calculate the cell potential of** $Mg(s)\left|Mg^{2+}(aq)\right\|Ag^{+}(aq)\left|Ag(s)\right.$.
10. **State and explain Kohlrausch's law.**
11. $2AgCl(s)+H_2(g)(1atm)\rightarrow 2Ag(s)+2H^{+}(0.1M)+2Cl^{-}(0.1M)$ **for the above reaction** ΔG^0 **= - 43600J at 25⁰C find out** ΔG^0.
12. **Calculate the emf of the cell in which the following reaction takes place.** $Ni(s)+2Ag^{+}(0.002M)\rightarrow Ni^{2+}(0.16M)+2Ag(s)$ **Given that** $E^0_{cell}=1.05V.$
13. **If a current of 0.5 amp flows through a metallic wire for 2 hours, then how many** $e^{-}s$ **flow through the wire.**
14. **At 25⁰C the standard EMF of the cell** $Zn(s)\left|Zn^{2+}(1M)\right\|Cu^{2+}(0.1M)+Cu(s)$ **is 1.3 volt. Calculate the emf of the cell.**
15. **Conductivity of 0.00214 M acetic acid is 7.8×10^{-5} S cm^{-1}.**
    (i) Calculate its molar conductivity. Given that Λ^0 **= 390.5 S cm^2 mol^{-1}.**
    (ii) Calculate degree of dissociation.
16. **Predict the feasibility of the reaction.**
    (i) Ag^{+}(aq) with Cu (s) $E^0_{Ag^{+},Ag}=0.8V,\ E^0_{Cu^{2+},Cu}=0.34V.$
    (ii) Fe^{3+}(aq) with Ag (s) $E^0_{Fe^{3+},Fe^{2+}}=0.77V.$
17. **State and explain Faraday's laws of electrolysis.**
18. **Differentiate between fuel cell and batteries.**
19. **What are the different types of fuel cells.**
20. **What is corrosion? Explain the different types of it.**

****

Unit – III

Chemical Kinetics

Group - A

MCQ:

1. **What is the unit of zero order reaction?**
   (a) moles/lit^{-1}/sec^{-1}
   (b) sec^{-1}
   (c) mole^{-1}.lit.sec^{-1}
   (d) mole^{-2}.lit^{2} .sec
2. **Unit of first order rate constant is:**
   (a) sec^{-1}
   (b) moles. lit^{-2}.sec^{-2}
   (c) mole^{-1}.lit.sec^{-1}
   (d) mole^{-2}.lit^{2} .sec^{-1}
3. **Which of the following is the unit of second order rate constant?**
   (a) sec^{-1}
   (b) moles. lit^{-2}.sec^{-2}
   (c) mole^{-1}.lit.sec^{-1}
   (d) mole^{-2}.lit^{2} .sec^{-1}
4. **Which of these is the relation between half-life and rate constant for first order reaction?**
   (a) $\frac{0.693}{K}$
   (b) $\frac{2.303}{K}$
   (c) 0.693 K
   (d) $\frac{a}{2K}$
5. **The specific rate constant of a first order reaction depends on the**
   (a) concentration of the reactant
   (b) concentration of the product
   (c) time
   (d) temperature
6. **What will be a constant of** $^{53}1^{128}$ **left after 50 minutes ($t_{1/2}$ == 25 minutes)**
   (a) ½
   (b) ¼
   (c) 1/3
   (d) 1/8

7. 75 % reaction is completed 3n 32 minutes. 50 % of the reaction will be completed is
(a) 24 minutes
(b) 16 minutes
(c) 8 minutes
(d) 32 minutes

8. The hydrolysis ethyl acetate in acid medium is a reaction of the:
(a) Zero order
(b) First order
(c) Second order
(d) Third order

9. The hydrolysis of ester in acidic medium is:
(a) Third order reaction
(b) Zero order reaction
(c) First order reaction
(d) Second order reaction

10. The rate expression of a chemical change is $\frac{dx}{dt} = K[A]^2[B][C]^0$ **. The order of the reaction is:**
(a) 2
(b) 3
(c) 1
(d) 0

11. The half-life period if a reaction is 100 seconds in 400 seconds the initial concentration of 2.0 g will be come:
(a) 0.25 g
(b) 0.35 g
(c) 0.125 g
(d) 30.3 g

12. When a graph is plotted between is K cased $\frac{b}{T}$ **for a first order reaction. We get a straight line. The slope of the these is equal to:**

(a) $-\frac{E_a}{2.303}$

(b) $-\frac{2.303}{E_a.K}$

(c) $\frac{E_a}{2.303K}$

(d) $-\frac{E_a}{K}$

13. Which one of the following did not influence is the rate of reaction:
(a) Nature of reactant
(b)Temperature
(c) Molecularity

(d) Concentration of the reactant.

14. In which of the following cases does the reaction go through to completion:
    (a) $K = 10^2$
    (b) $K = 10^{-2}$
    (c) $K = 10$
    (d) $K = 1$
15. For an endothermic reaction where ΔH is the enthalpy of reaction in kg/mole. The minimum value of activated energy will be:
    (a) Less than ΔH
    (b) Zero
    (c) Equal to ΔH
    (d) More than ΔH
16. What is the unit of second order rate constant?
17. Name any two factors that influence rate of reaction.
18. Give one example of zero order reaction.
19. Calculate the order of the reaction having rad expression. Rate = $K[B]^{1/2}\ [B]^{3/2}$
20. Write the expression for Arrhenius equation for reaction rate.
21. The rate constant of a first order reaction is 8.93×10^{-4} sec^{-1}. The Half-life period is _____.
22. The hydrolysis ester in acid medium is _____ order reaction.
23. Saponification ester is a _____ order reaction.
24. The rate of the reaction having unit of rate constant $mol^{-1}.lit.sec^{-1}$ is _____.
25. The Threshold energy (E_{th}) and Activation energy λE_0 are related as _____.

ANSWERS

1. (a)
2. (a)
3. (c)
4. (a)
5. (d)
6. (b)
7. (b)
8. (b)
9. (d)
10. (b)
11. (c)
12. (c)
13. (c)
14. (a)
15. (c)
16. $Lmol^{-1}s^{-1}$
17. Temperature, Concentration of reactant
18. $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$
19. Second order
20. $K = A.\ E^{-Ea/RT}$
21. 10^3 sec

22. **First order**
23. **Second order**
24. **Second order**
25. **$E_a = E_{ts} - E_r$**

2/3 Marks

Group – B

1. **Define rate of reaction write its unit.**
2. **Define order and molecularity with examples.**
3. **Define activation energy. Explain with diagram.**
4. **What are the factors that influence rate of reaction?**
5. **Derive the relation between rate constant and half-life of a first order reaction.**
6. **The half-life period of a first order reaction is 100 sec. What is the rate constant?**
7. **A first order is completed 50% in 30 minutes. How much time it will take to complete 75% of the reaction?**
8. **Write notes in half-life period.**
9. **A reaction is completed 20% in 20 minutes. How much time it will take to complete 80% of the reaction?**
10. **Calculate the rate constant of first order reaction. Which is 90% complete in 10 minutes?**
11. **The rate of chemical reaction doubles for an increase of 10 K in absolute temperature from 298K. Calculate E_a.**
12. **What are the differences between order and molecularity with example?**
13. **Define effective collision.**
14. **What is zero order reaction give one example?**
15. **Derive an expression for the half-life period of a zero-order reaction.**
16. **What is Threshold and Activation energy? Explain with examples.**
17. **What is the effect of temperature on rate of reaction?**
18. **The decomposition of Hydrocarbon follows the equation. $K = (4.5 \times 10^{11} s^{-1}) e^{-28000K/T}$. What is the value of E_a?**
19. **According to collision theory. What is the expression for rate of reaction?**
20. **What is the effect of catalyst on rate of reaction explain with diagram?**

Long Questions

1. **Derive an expression for the rate constant of a first order reaction. What is the relation between half-life and rate constant?**
2. **Derive an expression for zero order rates constant. Derive an expression for half-life of a zero-order reaction.**
3. **(a) Difference between order and molecularity with example.**
   (b) Derive Arrhenius equation of reaction rate.

****

Unit – IV

d and f – block elements

Group – A

Short Question (1 Mark):

1. **Which one of the following is a Transition element?**
   (a) Ca
   (b) Al
   (c) Co
   (d) Na
2. **Which one of the following is a d-block element?**
   (a) Ca
   (b) U
   (c) Mn
   (d) Al
3. **Which of the following statements about transmission element is wrong?**
   (a) They form colored compounds
   (b) All their compounds are diamagnetic
   (c) They exhibit variable valency
   (d) They contain partially filled d-orbital.
4. **LunarCaustic is**
   (a) $AgNO_3$
   (b) $MgNO_3$
   (c) $(CH_3COO)_2Pb$
   (d) $CuSO_4$
5. **The Matte obtained in the extraction of copper contains:**
   (a) $FeSiO_3$
   (b) $FeS + SiO_2$
   (c) $FeS + Cu_2S$
   (d) $CuS + SiO_2 + FeO$
6. **Purest form of Iron is:**
   (a) Cast Iron
   (b) Pig Iron
   (c) Wrought Iron
   (d) Steel
7. **Mohr's salt is a**
   (a) Normal Salt
   (b) Acid Salt
   (c) Basic Salt
   (d) Double Salt
8. **Rust is:**
   (a) $Fe_2O_3 . 2H_2O$
   (b) $FeO .2H_2O$

(c) $Fe_3O_4.H_2O$
(d) Fe_2O_3

9. **Copper is extracted from Sulphide ore using the method:**
   (a) Carbon reduction
   (b) Base reduction
   (c) Carbon monoxide reduction
   (d) none of the above
10. **Which is used for stopping bleeding?**
   (a) $FeCl_3$
   (b) Mohr's Salt
   (c) Green vitriol
   (d) Sodium Nitro-pruside
11. **ZnO is:**
   (a) Acidic
   (b) Basic
   (c) Amphoteric
   (d) None
12. **Which one of the following is a f-block element?**
   (a) Cu
   (b) U
   (c) Fe
   (d) Al
13. **What is the Oxidation number of Mn in $KMnO_4$?**
   (a) +6
   (b) +7
   (c) +3
   (d) +1
14. **Name the member of Lanthanoidseries which is will know to exhibit +4 oxidation state:**
   (a) Ce
   (b) La
   (c) Eu
   (d) Lu
15. **The most common oxidation state in Lanthanoid:**
   (a) +3
   (b) +2
   (c) +4
   (d) +1
16. **Which one of the following is colored?**
   (a) Zn^{2+}
   (b) Hg^{2+}
   (c) Sc^{3+}
   (d) Fe^{2+}
17. **Which one of the following is diamagnetic?**
   (a) Zn^{2+}
   (b) Sc^{2+}
   (c) Fe^{2+}
   (d) Mn^{2+}
18. **What is the general electronic configuration of transition elements?**
19. **Between Fe^{2+} and Fe^{3+} in paramagnetic.**
20. **Name one ore of Iron.**

21. **Give electronic configuration of Cu.**
22. **Give the formula of amine complex of copper.**
23. **What is the formula its copper pyrite?**
24. **Define Transition element.**
25. **What is the oxidation number of Mn in MnO_4?**
26. **What are refers present in will metal?**
27. **Why $FeCl_3$ is a Lewis acid?**
28. **Why Transition metals are paramagnetic?**
29. **Why transition elements are used as catalyst?**
30. **What is percentage of carbon in steel?**

ANSWERS

1. **(c)**
2. **(c)**
3. **(b)**
4. **(b)**
5. **(c)**
6. **(c)**
7. **(d)**
8. **(a)**
9. **(d)**
10. **(a)**
11. **(c)**
12. **(b)**
13. **(b)**
14. **(a)**
15. **(a)**
16. **(d)**
17. **(a)**
18. **$(n-1)d^{1-10}nS^{1-2}$**
19. **Fe^{3+}**
20. **Hematite**
21. **$[Ar]_{18}3d^{10}4s^1$**
22. **$\{(Cu/NH_3)_4\}SO_4$**
23. **$CuFeS_2$**
25. **+7**
26. **Cu and Sn**
30. **2%**

Two/Three marks:

1. **Mention any two characterization of Transition element.**
2. **How do your account for the variable oxide on state of transition elements?**
3. **What happens when KI solution is added to $CuSO_4$ solution?**
4. **Why Iron become passive with conc. HNO_3 acid solution?**
5. **Why chromium has higher boiling point then zinc?**
6. **Why transition metal compounds are colored?**

7. **Silver atom has completely filled outermost orbit in its ground state. Why it is a transition element?**
8. **How would you account for the increasing oxidizing power in the series?**
   $$VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$$
9. **How would you account for the irregular variation of ionization enthalpy is in the first-row transition series?**
10. **Which is a stronger reducing agent Cr^{2+} or Fe^{1+}.**
11. **Why is the highest oxidation state of a metal exhibited in its Oxides or Fluorides? Why?**
12. **Calculate the magnetic moment of Mn^{2+}.**
13. **Between Fe^{2+} and Fe^{3+}. Which is more magnetic and why?**
14. **What is meant by disproportionation of an oxidation state? Give an example.**
15. **Lanthanides have variable oxidation state. Why?**
16. **What is Lanthanide contraction?**
17. **What are the Oxidation states exhibited by Lanthanoids?**
18. **The enthalpies of atomization of the transition metals are high.**
19. **Transition metal their compossible are very good catalyst. Why?**
20. **The 'd' configuration in very unstable. Explain.**

Long Questions

1. **Define Transition element. Discuss three Characteristics of transition element.**
2. **What is Lanthanoid contraction? Write down the consequence of Lanthanide contraction.**
3. **Write the electronic configuration of Lanthanoids. Why the Lanthanoids has might stable oxidation +3?**
4. **Give reasons of the following:**
   (i) The lowest oxide of transition metal is basic whereas the highest oxide is. amphoteric or acidic.
   (ii) The highest oxidation is exhibited in oxo-anions of a metal.
   (iii) The generally the transition metal compound are colored.
5. **(a) Why the transition metal form compose compound?**
   (b) What is Effective atomic number rule?
   (c) What are interstitial compounds?

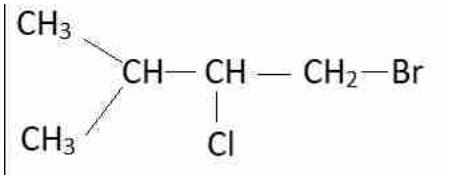
****

Unit – VI

Haloalkanes and Haloarenes
Group - A

Multiple Choice questions (1 Mark Each)

1. Write the IUPAC Name of the following compound



(a) 4 – Bromo – 3 – chloro – 2 – methylbutane
(b) 1 – Bromo – 2 – chloro – 3 – methylbutane
(c) 1 – Bromo – 2 – chloro – 2,2 – dimethylpropane
(d) 2 – methyl – 2 – chloro – 3 – bromopropane

2. Which one is optically active compound?
(a) $CH_3 – CH(Cl)C_2H_5$
(b) $CH_3 – CH(Br) – CH_3$
(c) $C_2H_5 - C(Cl) - CH_2 - Cl$
(d) $CH_3 – CH_2 – CH_2 – Br$

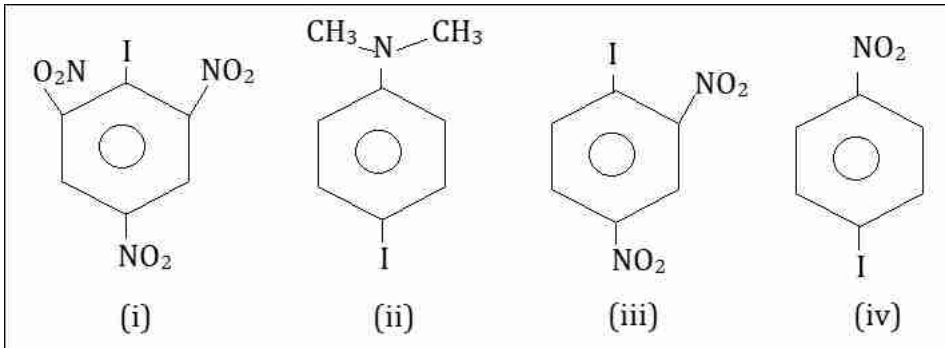
3. Which of the following will not give iodoform reaction?
(a) Propanone
(b) Acetaldehyde
(c) Ethyl alcohol
(d) Methanol

4. When Propyl alcohol reacts with phosphorous tri-halide the product obtain is:
(a) Isopropyl halide
(b) 1 – halo propane
(c) 3 – halopropane
(d) Propanal

5. Alkyl halide reacts with alcoholic KOH to give
(a) Alcohol
(b) Alkyne
(c) Alkane
(d) Alkene

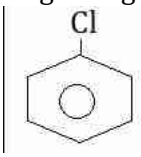
6. What is the correct of reactivity of halogen acid towards alcohol?
(a) HI > HBr > HCl
(b) HCl > HBr > HI
(c) HCl > HI > HBr
(d) HI > HCl > HBr

7. Correct order of reactivity towards nucleophilic substitution reaction of the compounds



(a) (i)(ii)(iii)(iv)
(b) (ii)(iii)(i)(iv)
(c) (i)(iii)(iv)(ii)
(d) (ii)(iii)(iv)(i)

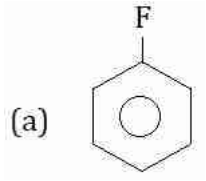
8. Which compound has highest melting point?
   (a) P – Dibromobenzene
   (b) M – Dibromobenzene
   (c) O – Dibromobrnzene
   (d) Bromobenzene
9. Sulphonalin of Chlorobenzene produces major product:
   (a) 2 – Chlorobenzene sulphonic acid
   (b) 4 – Chlorobenzene sulphonic acid
   (c) 2,4 – Chlorobenzene disulphonic acid
   (d) 3 – Chlorobenzene sulphonic acid
10. Which statement is incorrect for the following assumption between chlorobenzene and methyl chloride regarding bond length between "C – Cl":

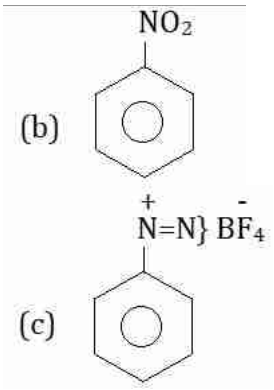


$CH_3 - Cl$

(a) sp^2 hybridised 'C' atom	sp^3 hybridised 'C' atom
(b) resonance in a bone structure	Inductive effect
(c) % of 'S' character	% of 'S' – character
(d) + I effect	- I effect

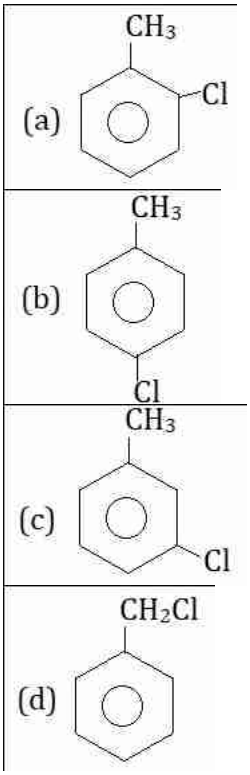
11. $C_2H_5 - Br + C_2H_5\overset{\ominus}{O}K^+ \rightarrow C_2H_5 - O - C_2H_5 + KBr$. The name of the above reaction is:
   (a) Relmer Tiemann reaction
   (b) Aldol condensation
   (c) Williamson synthesis
   (d) Kolbe's reaction
12. Aniline when treated with $NaNO_2$(HBr) at 273 K will produce:





(d) None of these

13. Toluene when treated with chlorine gas in presence of sunlight will give:



14. Ethyl iodine reacts with sodiumpropoxide will generally yield
    (a) Ethylpropyl ether
    (b) Diethyl ether
    (c) Pentane
    (d) Propoxy ethane
15. DDT is used for
    (a) powerful insecticide
    (b) powerful fungicide
    (c) preparation of detergent
    (d) none of these
16. What happens when 2 – propanal is treated with thionylchloride? Give equation:
17. Complete the reaction $R-CN \xrightarrow{Na/C_2H_5OH} R-CH_2-NH_2 \xrightarrow[\Delta]{NaNO_2/HCl} ?$
18. Why boiling point of alkyl halide is higher than the corresponding hydrocarbon?
19. Write the name of the monomer of Teflon.

20. How many δ and π – bonds are present in Isopropyl chloride?
21. What is Wurtz –Fittig reaction?
22. Complete the reaction $CH_3 – CH_2 – I + AgCN \rightarrow$
23. Chlorobenzene is less reactive towards nucleophilic substitution reaction, why?
24. What is freons?
25. What happen when bromobenzene reacts with nitric acid in the presence of sulphuric acid.
26. Write the use of trichloromethane.
27. What is Sandmeyer reactions?

28. $CH_3 - CH_2 - Cl \xrightarrow[\text{Ether}]{CH_3 - CH_2 - COOAg} ?$ Complete the reactions.

29. $CH_3 - CH_2 - Cl \xrightarrow[\text{alcohol}]{KCN} A \xrightarrow{H_3O^+} B$ Complete the reaction.

30. Write the product. $R - NC \xrightarrow[\triangle OH]{\text{Reduction}}$

31. In Williamson's reaction, an alkyl halide is treated with which reagent. Give equation for this.
32. Complete the reaction

$$CH_3 - CH = CH_2 + HBr \xrightarrow{\text{Peroxide}} \text{'B'}$$

$$\downarrow \text{ No peroxide}$$

'A'

33. Complete the reaction

(a) $CH_3CH_2OH + PCl_5 \rightarrow$_____ + _____+ HCl

(b) $CH_3CH_2Br + KOH$ (alc) →_____ + _____ + _____

(c) $CH_3CH_2 – COOAg + Br_2 \rightarrow$ _____ + _____ + _____

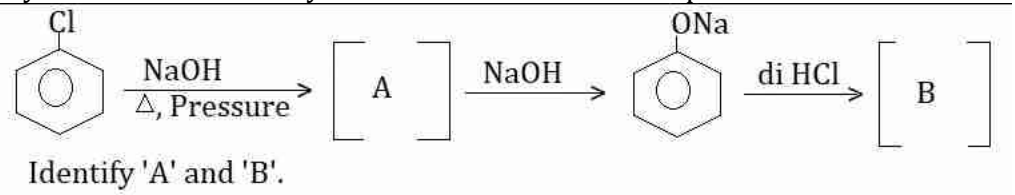
34. Which one has higher boiling point and why? $C_2H_5 – Cl$, $C_2H_5 – Br$, $C_2H_5 – I$
35. In the pair $(CH_3)_3C – Cl$ and CH_3Cl, which one undergo SN^2reaction and why?
36. Explain SN^1 mechanism in tert.Butylbromide with aq. KOH solution.

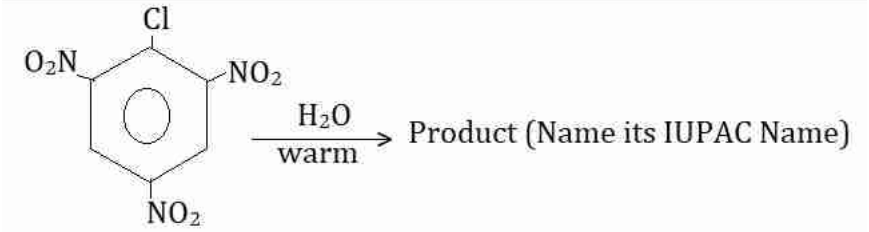
ANSWERS

1. (b)
2. (a)
3. (d)
4. (b)
5. (d)
6. (a)
7. (c)
8. (a)
9. (b)
10. (d)
11. (c)
12. (a)
13. (d)

14. (a)
15. (a)

Two/ Three- Mark Questions:

1. Write a note on D.D.T.
2. How can you prepare diethyl ether from ethyl chloride? Give equation.
3. What happens when silver acetate is treated with bromine? Give equation.
4. Identify A, B and C in the following reaction $C_2H_5OH \xrightarrow{conc.H_2SO_4} A \xrightarrow{Br_2} B \xrightarrow{alc\ KOH} C$
5. Explain, why alkyl halide of lower alkane when treated with metallic sodium give higher alkanes?
6. Explain, why for a given alkyl group, the order of reactivity is RI > RBr > RCl > I?
7. Convert Toluene to benzyl alcohol.
8. How can you convert aniline to chlorobenzene?
9. How will you distinguish between benzyl bromide and p-bromotoluene?
10. Explain, chlorine present in chlorobenzene is ortho and para –directing.
11. How can you convert Benzene to 4 – Bromonitrobenzene?
12. Aryl halides are extremely less reaction towards nucleophilic substitution reaction why?
13. 

Identify 'A' and 'B'.
14. How Benzene Hexachloride is prepared from Benzene? Give equation. Write one important use of BHC.
15. Complete the reaction:


16. If Cl_2 gas is passed for a larger time through toluene, then what product is obtained at the last?
17. What is diazotization reaction? Explain with example.

Long Questions

1. How can you prepare chlorobenzene from
   (a) benzene diazonium chloride
   (b) benzene
   What happens when chlorobenzene reacts with
   (a) aq. NaOH at 300^0C under pressure
   (b) Cl_2 in presence of Anhydrous $FeCl_3$
2. Describe the general method of preparation of an alkyl halide. How does it react with?
   (a) NH_3
   (b) Metallic sodium
   (c) dilute caustic potash

3. Write notes on
   (a) Iodoform reaction
   (b) Williamson synthesis
4. Write state notes on
   (a) Wurtz – Filtig reaction
   (b) Ullaman reaction
5. Write notes on
   (a) Freons
   (b) Chloroform
   (c) DDT
6. What are the various methods of preparing ethyl iodide? How does it react with?
   (i) Aqueous KOH
   (ii) Sodium ethoxide
   (iii) Ammonia
   (iv) Alcoholic KOH solution
7. Bring about the following conversion.
   (i) Methane to Methyl cyanide
   (ii) Ethane to Ethyl alcohol
   (iii) Methyl alcohol to Acetic acid
8. Give two examples for the electrophilic substitution in chlorobenzene. Also write the mechanism of reaction.
9. Write the preparation and uses of the following:
   (i) DDT
   (ii) $CHCl_3$
   (iii) BHC

****

Unit – VII
Alcohols, Phenols & Ethers
Group - A

MCQ:

1. How many alcohols can be possible with molecular formula $C_4H_{10}O$? Which are chiral in nature?
   (a) 1
   (b) 2
   (c) 3
   (d) 4
2. Which of the following is most acidic compound?
   (a) Benzyl alcohol
   (b) Cyclohexanol
   (c) Phenol
   (d) M-chlorophenol
3. What is the correct order of reactivity of alcohols in the following reaction?
   $C_2H_5OH + HCl \xrightarrow{ZnCl_2} C_2H_5 - Cl + H_2O$
   (a) $3^0 > 1^0 > 2^0$
   (b) $1^0 < 2^0 < 3^0$
   (c) $3^0 > 2^0 > 1^0$
   (d) $1^0 < 3^0 < 2^0$
4. $CH_3 - CH_2 - Cl_2 - OH$ can be converted to $CH_3 - CH_2 - Cl$ by using
   (a) $LiAlH_4$
   (b) $KMnO_4$
   (c) PCC
   (d) H_2/Ni
5. Order of reactivity of alcohols towards sodium metal is
   (a) Primary > Secondary > Tertiary
   (b) Primary > Tertiary > Secondary
   (c) Primary < Secondary > Tertiary
   (d) Primary < Secondary < Tertiary
6. In the following sequence of reactions
   $CH_3 - CH_2 - OH \xrightarrow[\Delta]{P/I_2} A \xrightarrow{Mg} B \xrightarrow{HCHO} C \xrightarrow{H_2O} D$. The compound D is
   (a) n-Propyl alcohol
   (b) Propanol
   (c) Butanal
   (d) n-Butyl alcohol
7. In the following reaction, identify 'X'
   $$\text{Formal dehyde} + \text{Methyl Magnesium halide} \xrightarrow[\text{ether}]{\text{dry}} \text{Intermediate} \xrightarrow[H_3O]{HCl} \text{'X'}$$
   (a) CH_3COCH_3
   (b) $CH_3 - O - CH_3$
   (c) $CH_3 - CH_2 - OH$
   (d) HCHO
8. Oxidation of Phenol with CrO_3 gives
   (a) Cyclohexane
   (b) P – Benzoquinone

(c) Benzoic acid
(d) none

9. Hydroboration – Oxidation reaction in propane will yield
(a) n – propyl alcohol
(b) Isopropyl alcohol
(c) Propanal
(d) Propanone

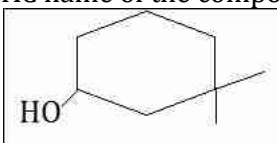
10. Which alcohol gives positive iodoform test?
(a) Ethyl alcohol
(b) tert. Butyl alcohol
(c) Phenol
(d) Propanol – 1

11. Lucas' reagent is
(a) Conc. HCl
(b) $SOCl_2$
(c) Conc. HCl + Zn Cl_2
(d) Conc. HCl + anhy. $MgCl_2$

12. Order of acidity of following compounds is:
(i) Phenol
(ii) O-nitrophenol
(iii) M-nitrophenol
(iv) P-nitrophenol
(a) (iv) > (i) > (ii) > (iii)
(b) (iv) > (iii) > (i) > (ii)
(c) (iv) > (iii) > (ii) > (i)
(d) (iii) > (i) > (ii) > (iv)

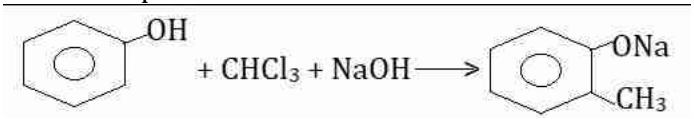
13. Which compound has highest boiling point?
(a) Ethanol
(b) Butan – 2 – ol
(c) Propan – 1 – ol
(d) Butan – 1 – ol

14. The IUPAC name of the compound



(a) 3, 3 – Dimethyl – 1 – hydroxyl – cyclohexane
(b) 1, 1 – Dimethyl – 3 –cyclohexanol
(c) 3, 3 – Dimethyl – cyclohexanol
(d) 1, 1 – Dimethyl – 3 – hydroxy cyclohexane

15. The electrophile involved in this reaction is



(a) $\oplus CHCl_3$

(b) $\overset{\oplus}{:}CCl_2$

(c) $:\overset{\ominus}{C}Cl_3$

(d) $:\overset{\ominus}{C}Cl_2$

16. In the following sequence of reaction, the compound 'B' is:

$$CH_3 - CH_2 - OH \xrightarrow{P + I_2} A \xrightarrow[ether]{Mg} B$$

(a) Ethyl Iodide
(b) Ethyl Magnesium iodide
(c) Ethanal
(d) none

17. o – Nitrophenol is less soluble in water than p – and m – nitrophenol because
(a) o – Nitrophenol shown intramolecular H – bonding
(b) o – Nitrophenol shown intermolecular H – bonding
(c) Melting point of o – Nitrophenol is lower than those of m- and p – isomer
(d) O – Nitrophenol is more volatile in steam than m- and p – isomer

18. $C_6H_5 – O – CH_3$, when treated with HI at 373K, the following are the products
(a) $CH_3 – OH$ and C_6H_5I
(b) C_6H_5I and CH_3I
(c) CH_3I and C_6H_5OH
(d) C_6H_5OH and $CH_3 – OH$

19. Ether reacts with conc. H_2SO_4 to form
(a) Alkyl free radicals
(b) Oxyanion
(c) Zwitter ion
(d) Oxonium ion

20. Formation of starch solution to ethyl alcohol does not require
(a) Diastage
(b) Invertage
(c) Maltage
(d) Zymase

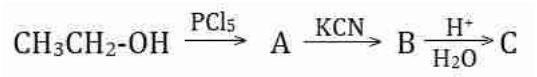
ANSWERS

1. (a)
2. (d)
3. (c)
4. (c)
5. (a)
6. (a)
7. (c)
8. (b)
9. (a)
10. (a)
11. (c)
12. (b)
13. (d)
14. (c)
15. (b)

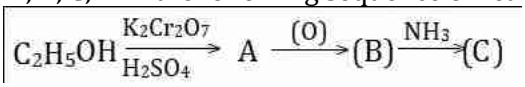
16. (b)
17. (a)
18. (b)
19. (d)
20. (b)

Two- or Three-Mark Questions:

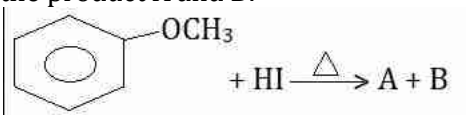
1. Write the equations, what happens when ethyl alcohol vapour is passed over reduced copper at 300^0C.
2. Complete the reaction: $R-CH_2-OH \xrightarrow{PI_3} A \xrightarrow{ASNO_2} (B)$
3. Complete the reaction:



4. How will you convert methanol to ethanol and vice versa?
5. Explain, why ethanol is less acidic than phenol?
6. How will you convert ethanol to 2 – hydroxylbut-3-enoic acid?
7. Identify A, B, C, D in the following sequence of reaction.



8. How can you carry nitration in phenol? Give equation.
9. What is Reimer –Tiemann Reaction?
10. How can you prepare aspirin from salicylic acid? Give equation.
11. Explain acidity of Phenol. How substituents affect acidity of phenol.
12. Complete the reactions: $C_6H_5OH + CHCl_3 + KOH \rightarrow$
13. Convert phenol to picric acid.
14. Write the mechanism of the reaction of HI with methoxymethane.
15. Predict the product A and B:



16. Give an example for the synthesis of unsymmetrical ether by Williamson synthesis.

Long Questions:

1. Discuss the electrophilic substitution reaction like halogenations, nitration and Friedel Craft reaction of Aryl Alkyl Ether.
2. Describe general method of preparation of alcohols (any two). How does it react with?
   (a)Na
   (b) PCl_5
   (c) CH_3COOH
3. How can you distinguish between 1^0, 2^0 and 3^0 alcohol by oxidation method?
4. (a) How ethanol is manufactured from starch?
   (b) What happens when conc. H_2SO_4 reacts with excess of ethanol?
5. Describe the preparation of phenol from benzene sulphonic acid. How phenol reacts with?
   (a) Sulphuric acid (conc.)
   (b) dil. HNO_3
   (c) CH_3Cl in presence of anhy. $AlCl_3$
6. (a) Write down the preparation of ethyl alcohol from ethylene.
   (b) What happens when ethyl alcohol is heated with (i) iodine/NaOH (ii) PCl_5 (iii) CH_3COOH.

Unit – VIII

Aldehyde, Ketones & Carboxylic acid
Group - A

MCQ:

1. The compound that reduces Tollen's reagent is _____
   (a) CH_3COCH_3
   (b) CH_3CHO
   (c) CH_3COOH
   (d) CH_3CH_2OH

2. 40% aqueous solution of formaldehyde is called
   (a) Formation
   (b) Urotropine
   (c) Bake lite
   (d) None of these

3. _____ respond Cannizzaro reaction.
   (a) HCHO
   (b) C_6H_5CHO
   (c) CC_3CHO
   (d) all of these

4. _____ respond Aldol condensation.
   (a) CH_3CHO
   (b) C_6H_5CHO
   (c) HCHO
   (d) None of these

5. _____ do not respond iodoform reaction.
   (a) HCHO
   (b) CH_3CHO
   (c) CH_3COCH_3
   (d) CH_3CH_2OH

6. The reagent with which both acetal dehyde and acetone react easily is _____.
   (a) Tollen's reacgent
   (b) Schiff's reagent
   (c) Fehling reagent
   (d) Grignard reagent

7. When acetal dehyde react with Fehling solution. It gives a precipitate of _____.
   (a) Cu
   (b) CuO
   (c) Cu_2O
   (d) None of these

8. Aldehyde can be distinguished from ketone by using _____.
(a) Schiff's Reagent
(b) Conc. H_2SO_4
(c) anhydrous Zn
(d) resorcinol

9. Formaldehyde react with Ammonia to give _____.
(a) Urotropine
(b) Formalin
(c) Bakelite
(d) None of these

10. Which reduce Tollen's reagent?
(a) CH_3COOH
(b) $C_6H_5COCH_3$
(c) HCHO
(d) None of these

11. $CH_2 = CH_2 \xrightarrow{HBr} X \xrightarrow{Hydrolysis} Y \xrightarrow[I_2]{NaOH} Z$
(a) C_2H_5I
(b) CHI_3
(c) C_2H_5OH
(d) CH_3CHO

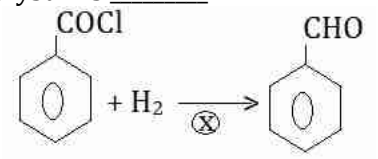
12. Cannizzaro's reaction is an example of _____.
(a) Oxidation
(b) Reduction only
(c) Disproportional
(d) None of these

13. Formation of Cyanohydrin from a ketone an example of _____.
(a) Electrophilic addition
(b) Nucleophilic addition
(c) Nucleophilic substitution
(d) Electrophilic substitution

14. Phenol-formaldehyde resin is called _____.
(a) Nylon
(b) Bake lite
(c) Iodoform
(d) None of these

15. Calcium formate heated to give _____.
(a) HCHO
(b) CH_3CHO
(c) CH_3COCH_3
(d) CH_3CH_2OH

16. Acid chloride can be reduced to Aldehyde with H_2 in boiling xylene using Pd as catalyst supported by $BaSO_4$ is called _____
    (a) Stephen's reduction
    (b) Rosenmond reduction
    (c) Aldol condensation
    (d) Clemmenson's reduction
17. The catalyst X is _____.



    (a) Pd + $BaSO_4$
    (b)CrO_2Cl_2 + CCl_4
    (c)$SnCl_2$ + HCl
    (d) CrO_3
18. The conversion of toluene to benzaldehyde in presence of CrO_2Cl_2 and CCl_4 is called _____.
    (a) Etard's reaction
    (b) Stephen's reduction
    (c) Gatterman reaction
    (d) Sand Meyer's reaction
19. X is _____.

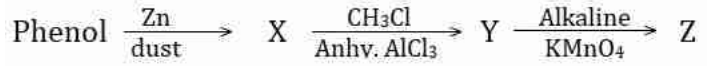
$$CH \equiv CH + H_2O \xrightarrow[HgSO_4 + H_2SO_4]{60^0C} X$$

    (a) HCHO
    (b) CH_3CHO
    (c) CH_3COCH_3
    (d) CH_3CH_2OH
20. Which acid is strongest?
    (a) CCl_3COOH
    (b) $Cl_2CHCOOH$
    (c) $ClCH_2COOH$
    (d) CH_3COOH
21. HCOOH is soluble in water due to _____.
    (a) Inter molecular 'H' bonding
    (b) Intra molecular 'H' bonding
    (c) All of these
    (d) None of these
22. Which of the following cannot reduce Fehling solution?
    (a) Acetic acid
    (b) Formaldehyde
    (c) Acetaldehyde
    (d) Formic acid
23. _____ reduce $HgCl_2$ to Hg_2Cl_2:
    (a) HCOOH
    (b) NH_3
    (c) CCl_4
    (d) CH_3COOH
24. 'B' is _____.

$$R - X \xrightarrow{KCN} A \xrightarrow[H_2O]{H^+} B$$

(a) Carboxylic acid
(b) Aldehyde
(c) Ketone
(d) Amines

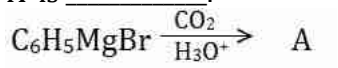
25. 'Z' is _____.



(a) Benzene
(b) Benzoic acid
(c) Benzaldehyde
(d) Toluene

26. HCOOH can not be distinguished from CH_3COOH by _____.
(a) Na_2CO_3
(b) Tollen's reagent
(c) Fehling solution
(d) Schiff's reagent

27. 'A' is _____.



(a) Benzaldehyde
(b) Benzoic acid
(c) Phenol
(d)Benzophenone

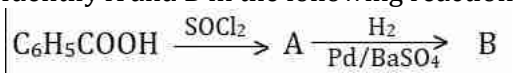
28. Strings of bee contain _____.
(a) Formalin
(b) Formic acid
(c) Benzene
(d) Acetic acid

29. _____ weakest acid.
(a) F – CH_2COOH
(b) Cl – CH_2COOH
(c) Br – CH_2COOH
(d) I – CH_2 – COOH

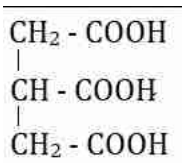
30. _____ is stronger than benzoic acid.
(a) P – Methyl benzoic acid
(b) P – Chloro benzoic acid
(c) P – Nitro benzoic acid
(d) O – Chloro benzoic acid

Group – B

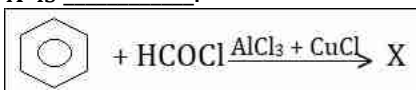
31. Methyl Cyanide on hydrolysis gives _____.
32. Identify A and B in the following reaction.



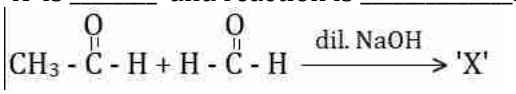
33. What is vinegar?
34. Which acid does not contain – COOH group?
35. What is Tollen's reagent?
36. Write the IUPAC name of



37. Name the compound which ozonolysis to give only Acetaldehyde.
38. 'X' is _____.

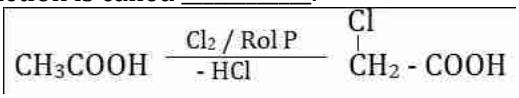


39. 'X' is _____ and reaction is _____.



40. Write the structure of urotropine.
41. Urotropine used as _____.
42. What is Fehling solution?
43. Calcium acetate heated to give _____.
44. Name the functional isomer propanone (CH_3COCH_3).
45. Which reagent distinguish pentan- 2 - one and pantan – 3 – one?
46. Write the decreasing order of acidity of O – Toluic acid, Benzoic acid, M – Toluic acid, P – Toluic acid.
47. 'A' is _____.

48. This reaction is called _____.



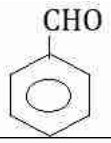
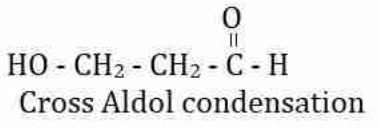
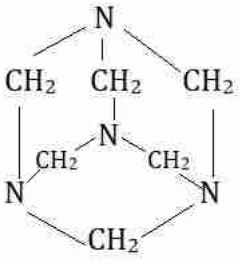
49. Write one use of HCOOH.
50. Which acid reducing tollen's reagent and fehling solution?
51. $2C_6H_5CHO$ + conc. NaOH → X + 4
52. In esterification _____ of alcohol and _____ of Carboxylic acid are removed as water.
53. Ethanamide an heating with P_2O_5 gives _____.
54. Williamson's synthesis involves the reaction of _____ with _____.
55. Alkaline hydrolysis of ester is called _____.
56. Ketone on reduction in neutral or alkaline medium give _____.
57. Sodalime decarboxylation of sodium propionate gives _____.
58. Toluene an oxidation with CrO_2Cl_2 gives _____ and the reaction is called _____.
59. Monocarboxylic acid reacts with _____ to give pure acid chloride.
60. Isopropyl alcohol an oxidation gives _____.

Group – A (ANSWERS)

1. (b)
2. (a)
3. (d)
4. (a)
5. (a)
6. (d)
7. (c)
8. (a)

9. (a)
10. (c)
11. (b)
12. (c)
13. (b)
14. (b)
15. (a)
16. (b)
17. (a)
18. (a)
19. (b)
20. (a)
21. (a)
22. (a)
23. (a)
24. (a)
25. (b)
26. (a)
27. (b)
28. (b)
29. (d)
30. (a)

Group – B (ANSWERS)

31. CH_3COOH
32. A → C_6H_5COCl
    B → C_6H_5CHO
33. 6 – 10% dilute solution of CH_3COOH
34. Picric acid
35. Ammoniacal solution of $AgNO_3$ solution
36. Propane – 1, 2, 3, - tricarboxylic acid
37. $CH_3 – CH = CH – CH_3$
38.  (benzal dehyde)
39. 
    Cross Aldol condensation
40. 
41. urinary antiseptic
42. Alkaline solution of $CuSO_4$ contains Sodium PotasiumTartarate

43. Acetone (CH_3COCH_3)
44. Propanal (CH_3CH_2CHO)
45. $NaOH + I_2$
46. O – Toluic acid > Benzoic acid > M – Toluic acid > P – Toluic acid
47. $C_6H_5CH_2OH$
48. Hell – Vohlard Zelinsky reaction
49.
50. HCOOH
51. X = $C_6H_5CH_2OH$
    Y = C_6H_5COOH
52. H and OH
53. Ethanenitrile
54. RX and R-O-Na
55. Saponification
56. Pinacols
57. Ethane
58. Benzaldehyde, Etard's reaction
59. $SOCl_2$
60. Acetone

Group – C

Two and Three Marks each

1. Discuss Reimer – Tiemann reactions.
2. Which is more acidic and why HCOOH and CH_3COOH.
3. Why Cl – CH_2 – COOH is stronger than CH_3COOH?
4. Convert HCOOH to CH_3COOH and vice versa.
5. Convert HCOH to CH_3CHO and vice versa.
6. Write the uses of Benzoic acid.
7. What is Cannizzaros reaction?
8. Discuss Iodoform recation.
9. Compare the acid strength of Carboxylic acid and Phenol.
10. How will you distinguish between CH_3CHO and HCHO?
11. Distinguish between CH_3CHO and C_6H_5CHO.
12. What happens when benzaldehyde is treated with Fehling solution and why?
13. Write with equation how urotropine is formed.
14. Give two test to distinguish between HCOOH & CH_3COOH.
15. Why aldehyde are more reactive than ketone?
16. Explain Clemmension's reduction with examples.
17. Convert Benzene to Benzoic acid.
18. How Benzoic acid converted to Benzaldehyde?
19. $C_2H_5OH \xrightarrow{PCl_5} A \xrightarrow{KCN} B \xrightarrow{H_3O^+} C \xrightarrow{SOCl_5} D$ Identify A, B, C, D.
20. What is esterification? Give examples.
21. How will you distinguish between benzoic acid and phenol?
22. How acetaldehyde is prepared from
    (i) Calcium acetate
    (ii) CH_3CN
    (iv) CH_3CH_2OH
23. How HCHO is prepared from

(i) CH_2Cl_2
(ii) $(HCOO)_2Ca$
(iii) CH_3OH

24. How benzoic acid is prepared (any three)?

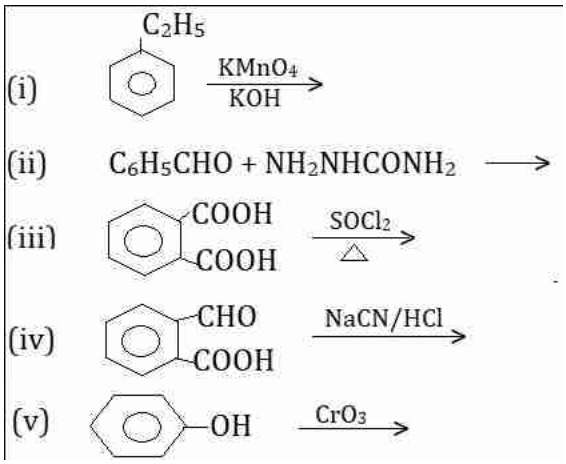
25. Discuss Etard's reaction.

26. Compound 'A' C_5H_2O O form phenyl hydrazone and gives negative tollen's reagent and iodoform test. Compound 'A' on reduction gives n-pentane. Write the structure of 'A'. Explain the reaction.

27. How HCHO react with
(i) HCN
(ii) $NaHCO_3$
(iii) CH_3MgBr

28. How C_6H_5CHO react with
(i) NH_3
(ii) Conc. HNO_3
(iii) Conc. H_2SO_4

29. How tert. Butyl alcohol is prepared from CH_3COOH?
30. What happens when CH_3CHO react with iodine in dil. NaOH. Give equation.
31. How will you prepare phenyl hydrazone of acetone? Indicate with equations.
32. Why Methanal is a gas but Methanol is a liquid.
33. How will you differentiate
(i) Ethyl alcohol and acetone
(ii) Acetaldehyde and Acetic acid
34. Explain why HCHO is more reactive than CH_3CHO.
35. Give simple chemical test to distinguish between. The following pairs of compounds
(i) Benzaldehyde and Acetophenone
(ii) Ethanal and Propanal
(iii) Phenol and benzoic acid
36. Why carboxylic acid is stronger than phenol although phenoxide ion has a greater number of resonating structures?
37. Highly brunched carboxylic acids are less acidic than unbranched acid, why?
38. Why pure HCN between to react with aldehyde?
39. Why boiling point of carboxylic acid are higher than those of Aldehyde and Ketones?
40. Convert CH_3COOH to CH_3NH_2.
41. How Acetone is obtained from Ethanol.
42. An organic compound 'A' (C_3H_4) on hydration in presence of $H_2SO_4/HgSO_4$ gives compound 'B' (C_3H_6O) compound 'B' gives white crystalline product (C) with sodium hydrogen sulphite. It gives negative tollen's test and form test 'A'. Identify A, B, C and write.
43. It is necessary to control the PH of medium during the reaction of aldehyde and ketone with Ammonia derivative. Explain.
44. Complete the reaction.



45. What is mean by the following term? Give an example in each case?
    (i) Cyanohydrin
    (ii) Semicarbazide
    (iii) Aldol
    (iv) Oxime
    (v) 2,4 – DNP derivative.
46. Show how the following compound can be converted to benzoic acid.
    (i) Ethyl benzene
    (ii) Acetophenone
    (iii) Styrene
47. Convert the following in two steps
    (i) Propanone to Propene
    (ii) Benzoic acid to Benzaldehyde
    (iii) Benzaldehyde to 3 – Phenyl Propanol
48. HCHO gives Cannizzaro reaction but CH_3CHO does not. Why?
49. $CH_3COOH \xrightarrow{NH_3} A \xrightarrow{\Delta} B \xrightarrow[(excess)]{Br_2+KOH} C \xrightarrow{heat,CH_3I} D$ identify A, B, C, D.
50. Write the increasing order of acidity of the following compound with proper reason. HCOOH, C_6H_5COOH, CH_3COOH.

Group - D

Long Questions:

1. Describe two general methods of preparation of ketones. State with equation how acetone reacts with
   (a) Phenyl hydrazine
   (b) HCN
   (c) I_2 + NaOH
2. How acetone is prepared. How acetone react with
   (a) NH_2OH
   (b) 2, 4 – DNPH
   (c) CH_3MgBr
3. How Benaldehyde is prepared from
   (a) Toluene
   (b) Benzoyl Chloride.

How does it react with (i) HCN, (ii) Conc. HNO_3 (iii) Cl_2 + Anhy. $AlCl_3$.

4. How Acetaldehyde is prepared (any three). How does it react with
   (a) NaOH
   (b) $NaHSO_3$
   (c) Tollen's reagent
5. How Acetaldehyde and Acetone are distinguished. How does Acetaldehyde react with?
   (a) Phenyl hydrazine
   (b) Fehling solution
   (c) I_2 + NaOH
6. How Acetic acid is prepared from CH_3MgBr what happens when acetic acid reacts with
   (i) NH_3
   (ii) $LiAlH_4$
   (iii) C_2H_5OH
   (iv) PCl_5
7. How monocarboxylic acid is prepared from ester and alkyl cyanide. How does it react with?
   (a) $SOCl_2$
   (b) $NaHCO_3$
   (c) P_2O_5
8. How benzoic acid is prepared from
   (a) Toluene
   (b) Grignard Reagent
   How CH_3 – COOH can be converted to Ethane. Explain its acidity with Acetic acid.
9. How Acetic acid is prepared from
   (i) CH_3MgBr
   (ii) $CH_3COOC_2H_5$
   (iii) CH_3CH_2OH
   (iv) CH_3CN
   Compare the acidity of CH_3OH, F – CH_2 – COOH, Cl – CH_2 – COOH.
10. How Acetic acid is prepared from vinegar process. How does CH_3COOH react with (i) PCl_3 (ii) P_2O_5 (iii) C_2H_5OH (iv) Na.
    Write two uses of it.
11. Describe two method of preparation and four chemical properties of Acetone.
12. Explain the following with examples
    (a) Cannizzaro's reaction
    (b) Aldol condensation
    (c) Iodoform reaction
    (d) Perkin reaction
13. An organic compound contains 54.54% Carbon, 9.1% Hydrogen and rest oxygen. The vapour density of the compound is 22. The compound formed a crystalline compound with $NaHSO_3$solution, and it gave red ppt. with Fehling solution. Identify the compound and give the reaction involved.
14. How HCHO is prepared (any two) how does it react with
    (a) NH_3 (b) conc. NaOH
    (c) Tollen's reagent (d) CH_3MgBr
15. An organic compound (A) molecular formula $C_8H_{16}O_2$ was hydrolyzed with dil. H_2SO_4 to a give Carboxylic acid (B) and on alcohol (C) oxidation of 'C' with Chromic acid produce (B). (C) On hydration gives butene. Write the equation for the reaction involved.
16. Compound A($C_6H_{12}O_2$) on reduction with $LiAlH_4$ yielded two compounds 'B' and 'C'. The compound 'B' an oxidation gave 'D' which when treated with aqueous alkali and subsequent

heating give 't' which hydrogenation gives 'C'. The compound 'D' was oxidized further to give 'F' which was a monoboric acid.(M.wt = 60) Deduce the structure of A, B, C, D, E and F.

17. Discuss the reaction used to distinguish between Aldehyde & Ketone. Write the order of reactivity of HCHO, CH_3CHO, CH_3COCH_3.
18. How can you convert:
    (a) Acetaldehyde to Acetone
    (b) Methanal to Ethanal
    (c) Acetylene to Acetone
    (d) Ethanal to 2 – hydroxy – propanoic acid
19. What happens when
    (a) Acetyl chloride treated with H_2 in presence of $Pd/BaSO_4$
    (b) Mixture of Calcium acetate and Calcium formate is heated
    (c) Propyne treated with dil. H_2SO_4 in presence of $HgSO_4$
    (d) HCHO treated with NH_3.
20. Discuss the following Name reaction
    (a) Rosenmond reduction
    (b) Stephen reduction
    (c) Clemmenson's reduction
    (d) Wolf-kishner reduction
    (e) HVZ reaction
    (f) Kolbe's reaction
    (g) Schmidt reaction

****

Unit – IX

Amines
Group - A

MCQ:

1. Reaction between primary amine, $CHCl_3$ and alcoholic KOH is called _____.
   (a) Aldol condensation
   (b) Cannizzaro's reaction
   (c) Fridel-craft reaction
   (d) Carbylamine reaction
2. In Hoffmann's Bromamidereaction, an amide is converted to _____.
   (a) Primary amine
   (b) Secondary amine
   (c) Tertiary amine
   (d) All of these
3. Acetamide is converted to Methylamine when it is heated with
   (a) H_2SO_4
   (b) NaOH + Br_2
   (c) aq. KOH
   (d) $NaNO_2$ + HCl
4. The product formed during hydrolysis of methyl cyanide in acid medium:
   (a) CH_3CONH_2
   (b) CH_3COOH
   (c) CH_3CHO
   (d) CH_3CH_2 – COOH
5. Which of the following gives dyes test?
   (a) Aniline
   (b) Methylamine
   (c) Ethylamine
   (d) Diphenyl amine
6. $C_6H_5NO_2 \xrightarrow{Sn+HCl}$ 'X': 'X' is _____.
   (a) $C_6H_5NH_2$
   (b) $C_6H_5NO_2$
   (c) C_6H_5 – NH - NH_2
   (d) C_6H_6
7. Which of the following will react with CH_3COCl
   (a) Dimethyl amine
   (b) Trimethyl amine
   (c) Dimethyl ether
   (d) None of these
8. Which of the following Reagent convert Nitrobenzene to Aniline?
   (a) Sn
   (b) Sn + HCl
   (c) $LiAlH_4$
   (d) $SnCl_2$

9. Acetamide treated with _____ reagent to give $CH_3 - NH_2$.
   (a) PCl_5
   (b) Sodalime
   (c) conc. H_2SO_4
   (d) $NaOH + Br_2$
10. Conversion of phthalimide to primary amine is called _____ reaction:
   (a) Gabiel Phthlimide
   (b) Schmidt
   (c) Mendius
   (d) Curtius reaction
11. $R-COOH + N_3H \xrightarrow[\Delta]{conc.H_2SO_4} R-NH_2 + N_2 + C_2$, this reaction is called _____.
   (a) Gabiel Phthlimide
   (b) Schmidt
   (c) Mendius
   (d) Curtius reaction
12. When alkyl isocyanates are boiled with alkali and undergo hydrolysis to give _____.
   (a) 1^0 amine
   (b) 2^0 amine
   (c) 3^0 amine
   (d) None of these
13. $R - NH_2 + CHCl_3 + 3KOH \rightarrow R\text{-}\underline{\mathbf{X}} + 3KCl + 3H_2O$, '**X**' is _____.
   (a) R – CN
   (b) $R - NH_2$
   (c) R – NC
   (d) R – OH
14. Aniline reacts with Bromine – water to form_____.
   (a) 2, 4, 6 – Tribromoaniline
   (b) p-bromoaniline
   (c) o-bromoaniline
   (d) m- bromoaniline
15. Which give carbylamine test?
   (a) $CH_3 - NH_2$
   (b) $CH_3 - NH - CH_3$
   (c) $(CH_3)_3N$
   (d) None of these
16. Which of the following will most stable?
   (a) $CH_3 - \overset{+}{N}_2X^-$
   (b) $C_6H_5\overset{+}{N}_2X^-$
   (c) $C_2H_5\overset{+}{N}_2X^-$
   (d) $C_6H_5CH_2 - \overset{+}{N}_2X^-$
17. $C_4H_{11}N$ has _____ no of isomer.
   (a) 2
   (b) 6
   (c) 4
   (d) 8

18. 'X' is _____.

$$CH_3 - CONH_2 \xrightarrow[ether]{LiAlH_4} 'X'$$

(a) $CH_3CH_2 - NH_2$
(b) $CH_3 - NH_2$
(c) CH_3NC
(d) None of these

19. Hinsberg Reagent is _____.
(a) C_6H_5Cl
(b) $C_6H_5SO_2$
(c) $C_6H_5SO_2Cl$
(d) C_2H_5Cl

20. IUPAC name of $(CH_3)_2$ CH – Nh_2.
(a) Propanamine
(b) Propan – 2 – amine
(c) Propan – 1 – amine
(d) N – methyl ethanamine

Group – B

21. Nitrosoamine is insoluble in water on heating with conc. H_2SO_4, they give secondary amines. The reaction is called _____.
22. Primary amine reacts with $NaNO_2$ and HCl gives _____.
23. $CH_3CN + 2H \rightarrow X \xrightarrow[\triangle]{H_3O^+} Y$, Y is _____.
24. Which amine does not react with acetyl chloride?
25. When CH_3CONH_2 react with NaOBr, The product is _____.
26. Among Methyl amine, Dimethyl amine, trimethyl amine which is strongest base.
27. Primary amines are identified by _____ reaction.
28. Mendius reaction converts Alkyl cyanide to _____.
29. An organic compound 'A' in treatment with NH_3 gives 'B' which an heating gives 'C'. 'C' on treating with Br_2 and KOH gives ethyl amine. 'A' is _____.
30. Nitrogen in amine is _____ hybridized.
31. Lower amines are soluble in water due to _____.
32. Basic nature of amines is due to _____.
33. Aniline on heating with fuming sulphuric acid gives _____.
34. This reaction is called _____.

$$C_6H_5\overset{+}{N}_2Cl^- \xrightarrow[\triangle]{HF/BF_3} C_6H_5F$$

35. When B.D.C. react with CuCl and HCl, it forms chlorobenzene the reaction is called _____.
36. B.D.C. when react with phenol in alkaline medium (PH = 9 – 10) at 0^0C gives _____.
37. 'X' is _____.

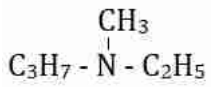
$$C_6H_5NH_2 \xrightarrow[0^0C]{NaNO_2 + HCl} X$$

38. 'Y' is _____.

$$C_6H_5\overset{+}{N}_2Cl^- \xrightarrow{CaCN/KCN} 'X' \xrightarrow{H_2O/H^+} 'Y'$$

39. B.D.C. can be converted to phenyl hydrazine in presence of _____.

40. Phenol react with NH_3 in presence of $ZnCl_2$ at 300^0C to produce _____.
41. $A(C_3H_9N)$ react with benzene sulphonyl chloride to give a solid substance insoluble in alkali. Give a structure 'A'.
42. Write the IUPAC name of



43. Lower aliphatic amines are soluble in water due to _____.
44. $C_6H_5NH_2 + CHCl_3 + 3KOH \rightarrow$ 'X' + KCl + $3H_2O$. 'X' is _____.
45. Which isomeric amine with formula C_3H_9N is least basic?
46. Give an example of Sandmeyer reaction.
47. Which indicator is obtained by coupling diazonium salt of sulphanilic acid with N, N – dimethyl aniline?
48. Reaction of HNO_2 with primary amine in the cold gives _____.
49. Action of HNO_2 an ethyl amine gives _____.
50. $CH_3Cl \xrightarrow{KCN} A \xrightarrow{Ni/H_2} B$, identify 'B'.

Group – A (ANSWERS)

1. (d)
2. (a)
3. (b)
4. (b)
5. (a)
6. (a)
7. (a)
8. (b)
9. (d)
10. (a)
11. (b)
12. (b)
13. (c)
14. (a)
15. (a)
16. (b)
17. (d)
18. (a)
19. (c)
20. (b)

Group – B (ANSWERS)

21. Liberman's nitroso reaction
22. Primary alcohol
23. $CH_3 - C \equiv N + 2H \longrightarrow CH_3 - CH = NH \xrightarrow[\Delta]{H_2O} CH_3CHO$
24. Tertiary amine
25. $CH_3 – NH_2$
26. Dimethyl amine
27. Carbylamine
28. Primary amine
29. $CH_3CH_2 – COOH$
30. SP^3
31. Hydrogen bonding
32. lone pair of electrons
33. Sulphanilic acid
34. Baltz – Schiemann reaction
35. Sandmeyer reaction
36. P – Hydroxy Azobenzene
37. $C_6H_5\overset{+}{N}_2Cl^-$ (B.D.C.)
38. Benzoic acid
39. $SnCl_2 + HCl$
40. Aniline
41. $CH_3 – CH_2 – NH – CH_3$
42. N – Ethyl – N – methyl propanamine
43. Hydrogrn bonding
44. Phenyl isocyanide (Carbylamine)
45. $(CH_3)_3N$
46. $C_6H_5\overset{(+)}{N} \equiv \overset{(-)}{N}Cl \xrightarrow{CuCl/HCl} C_6H_5 - Cl + N_2$
47. Methylorange
48. Diazonium salt
49. C_2H_5OH
50. $CH_3 – CH_2 – NH_2$ (ethylamine)

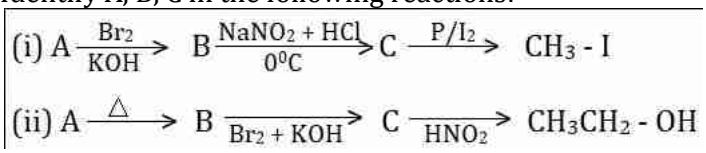
Group – C

Two/ Three Marks each:

1. Discuss carbylamines reaction.
2. What is Hofmann bromamide reaction?
3. Why Aliphatic amines are stronger base then aromatic amines?
4. Which is more basic $CH_3 – NH_2$ or Aniline ($C_6H_5NH_2$)?
5. Convert
   (a) Aniline to nitrobenzene
   (b) Aniline to chlorobenzene
6. Convert
   (a) nitrobenzene to B.D.C.
   (b) B.D.C. to benzoic acid
7. Illustrate the following reaction with an example.

(i) Sandmeyer reaction
(ii) Coupling reaction

8. Why Amines are more basic than alcohol?
9. Distinguish between ethylamine and aniline.
10. Arrange the following compound in an decreasing order of basic strength in their aqueous solution. NH_3, $CH_3 - NH_2$, $(CH_3)_2NH$, $(CH_3)_3N$. Explain why?
11. Draw the structure of
    (i) prop-2-en-1-amine
    (ii) N-methyl ethanamine
    (iii) M-methanol Propanamine
12. How can you convert
    (i) aniline to nitrobenzene
    (ii) Aniline to chlorobenzene.
13. What is diazotization reaction?
14. Why in non-polor solvent, aniline form a mixture of 4-bromoaniline(major) and 2-bromoaniline (minor) product with Bromine and not 2, 4, 6 – Tribromo aniline although – NH_2 group in aniline is o – and p – directing? Explain.
15. An aromatic compound 'A' on treatment with aqueous ammonia and heating form compound 'B' which on heating with Br_2 and KOH forms compound 'C' of M.F. C_6H_7N. Write the structure and IUPAC name of compound A, B, C.
16. Aniline does not undergo Fridel-Craft reaction. Explain.
17. Distinguish
    (a) Ethylamine and diethyl amine
    (b) Di-ethylamine and Triethylamine
18. Identify A, B, C in the following reactions:



(i) $A \xrightarrow[KOH]{Br_2} B \xrightarrow[0^0C]{NaNO_2 + HCl} C \xrightarrow{P/I_2} CH_3 - I$

(ii) $A \xrightarrow{\triangle} B \xrightarrow[Br_2 + KOH]{} C \xrightarrow[HNO_2]{} CH_3CH_2 - OH$

19. Explain why
    (i) Primary amines have higher boiling point than tertiary amine.
    (ii) Amides are weaker base than amines
20. Discuss the following reaction
    (a) Gottermann reaction
    (b) Gumberg reaction
    (c) Schotter – Baumann reaction
21. Convert
    (i) Toluene to P – toluidine
    (ii) Aniline to P – nitrobenzene
22. How can you prepare the following from aniline?
    (a) Iodobenzene
    (b) Nitrobenzene
    (c) Chlorobenzene
23. Convert
    (a) Benzene to B.D.C.
    (b) nitrobenzene to benzene
24. How the following compound are synthesized from B.D.C.
    (a) Phenol
    (b) Benzene
    (c) Diphenyl

25. Discuss the term
    (a) Ammonolysis
    (b) Acetylation
    (c) Acylation
    (d) Zwitter ion
26. How can you prepare p-hydroxy azobenzene from nitrobenzene?
27. $C_6H_5N_2Cl \xrightarrow{CuCN} A \xrightarrow{H_2O/H^+} B \xrightarrow{NH_3} C$, identify A, B, C. Write the structure.
28. Why excess mineral acid is used in diazo reaction?
29. Identify A, B, C

$$C_6H_5NH_2 \xrightarrow{Fe/HCl} A \xrightarrow[0^0C]{NaNO_2 + HCl} B \xrightarrow{C_6H_5OH} C$$

30. Convert Toluene to m-nitrotoluene.
31. Convert Benzene to 1, 3, 5 – tribromobenzene.
32. How p-hydroxybenzoic acid is prepared from toluene?
33. How m-Bromophenol is prepared from benzene?
34. Convert p-Toluidine to m-bromotoluene.
35. How Aniline can be converted to nitrobenzene?
36. Complete the reaction $C_2H_5OH \xrightarrow{PCl_5} A \xrightarrow{KCN} B \xrightarrow{H_3O^+} C \xrightarrow{NH_3} D$.
37. Describe a test to distinguish between Aniline, N-methylaniline, N-Ethyl-N-methylaniline.
38. How primary, secondary, tertiary amines are separated?
39. How aniline react with
    (i) Acetic anhydride
    (ii) Benzoyl chloride
    (iii) $NaNO_2$ + HCl
40. How will prepare ethyl amine from
    (i) Methyl cyanide
    (ii) Propanamide
    (iii) Nitro ethane

Group – D

Long Questions:

1. How is Benzene diazonium chloride prepared from Aniline? How does B.D.C. react with
   (a) KI
   (b) ice cold alkaline phenol
   (c) CuCN/HCN
2. How primary, secondary, tertiary amines are distinguished? Discuss the basicity of amines.
3. Describe Hinsberg test to distinguish between primary, secondary, tertiary amines. Give chemical equation. Mention its uses arrange the following in order of increasing basic strength.
   Aniline, ethylamine, ethane
4. How ethyl amine is prepared (any two)? How does it react with
   (a) Hinsberg reagent
   (b) $CHCl_3$ + KOH
   (c) C_2H_5I
5. Complete the reaction
   (a) $CH_3NH_2 + CHCl_3 \xrightarrow{KOH}$
   (b) $CH_3 - NH_2 + CH_3I(excess) \rightarrow$

(c) $C_6H_5NH_2 + CH_3COCl \rightarrow$

(d) $C_2H_5NH_2 + HNO_2 \rightarrow$

(e) $C_6H_5\overset{+}{N}_2Cl^- \xrightarrow{Cu/HCl}$

6. How the following compounds are synthesized from B.D.C.
   (a) Benzene
   (b) Phenol
   (c) Chlorobenzene
   (d) Iodobenzene
   (e) Diphenyl
   (f) Fluoro benzene
7. How methyl amine is prepared (any two)? How does it react with?
   (i) $CHCl_3$ + KOH
   (ii) HCl
   (iii) CH_3COCl
   Why $CH_3 - NH_2$ is more basic than NH_3?
8. How aniline is prepared (any two)? How does it react with?
   (i) $NaNO_2$ + HCl at 0^0C
   (ii) H_2SO_4 (conc.)
   (iii) conc. HNO_3 + H_2SO_4
   (iv) Br_2. Write its uses.
9. Convert
   (a) Toluene to p-toluidine
   (b) Aniline to benzylamine
   (c) Aniline to p-Bromoaniline
   (d) Benzoic acid to Aniline.
10. What is Aryl Diazonium salt? Why it is more stable than alkyl diazonium salt? Discuss the synthetic uses of Benzene diazonium chloride.
11. Write notes
    (a) Coupling reaction
    (b) Diazotization
    (c) Sandmeyer reaction
12. How can benzene diazonium chloride is prepared from nitrobenzene? How can you prepare (i) Iodobenzene (ii) benzoic acid from B.D.C.
13. How you will be obtained:
    (i) Nitrobenzene from azobenzene
    (ii) Iodobenzene from nitrobenzene
    (iii) nitrobenzene from azobenzene

****

Biomolecules
Group - A

MCQ (1 Mark each):

1. Which base is present in RNA but not in DNA?
   (a) Uracil
   (b) Cytosine
   (c) Guanine
   (d) Thymine
2. Vitamin 'C' is the compound called _____.
   (a) Riboflavin
   (b) Ascorbic acid
   (c) Rabinose
   (d) Thiamine
3. Which amino acid has lmidazole ring?
   (a) Alanine
   (b) Lecine
   (c) Tyrosine
   (d) Histidine
4. Helical structure of protein is stabilized by
   (a) Peptide bond
   (b) H-bond
   (c) Vander-waal's force
   (d) Dipole association
5. Which of the following monosachloride is a pentose?
   (a) Glucose
   (b) Fructose
   (c) Arabinose
   (d) Galactose
6. Starch is hydrolyzed to maltose, the enzyme used is known as:
   (a) Invertase
   (b) Maltose
   (c) Zymase
   (d) Diastase
7. Diabates is detected using _____ for testing urine of patients:
   (a) Fehling solution
   (b) Tollen's reagent
   (c) Balyer's reagent
   (d) Besedict solution
8. In Fructose the possible optical isomers are _____.
   (a) 12
   (b) 8
   (c) 16
   (d) 4
9. Which is not a reducing sugar?
   (a) Glucose
   (b) Fructose
   (c) Mannose

(d) Sucrose

10. The enzyme which is active in breaking down protein into amino acid is _____.
    (a) zymose
    (b) pepsin
    (c) insulin
    (d) amylase
11. Which of the following is an example of Globular protein?
    (a) Keratine
    (b) Myosin
    (c) Collagen
    (d) Myoglobi
12. Which of the following pair give positive Tollen's test?
    (a) Glucose & Fructose
    (b) Glucose & Sucrose
    (c) Hexanol & Hexanol
    (d) Fructose & Sucrose
13. The complete hydrolysis of cellulose gives _____.
    (a) D-fructose
    (b) D-ribose
    (c) D-glucose
    (d)L-glucose
14. Which amino acid has Phenolic-OH group as its backbone?
    (a) Glycine
    (b) Leucine
    (c) Sexine
    (d) Tyrosene
15. Which α-amino acid contain aromatic side chain?
    (a) Pyroline
    (b) Tyrosine
    (c) Valine
    (d) Serine
16. Which of the following is an example of ketohexose?
    (a) Monnose
    (b) Galactose
    (c) Maltose
    (d) Fructose
17. Which of the following is Levorotatory?
    (a) Glucose
    (b) Sucrose
    (c) Fructose
    (d) None of these
18. Enzyme is a _____
    (a) Carbohydrate
    (b) Lipid
    (c) Protein
    (d) None of these
19. Diabates mellitus is caused by the deficiency of _____.
    (a) Glucose
    (b) Insulin
    (c) Iodine

(d) Adrenaline

20. The isoelectric point of glycine is _____
    (a) 0
    (b) 6
    (c) 7
    (d) 27
21. The disease night blindness is caused due to deficiency of _____.
    (a) Vitamin – A
    (b) Vitamin – B_1
    (c) Vitamin – B_2
    (d) Vitamin - C
22. Nucleic acid are the polymer of
    (a) nucleoside
    (b) protein
    (c) nucleotide
    (d) adenine
23. Increased blood pressure may be caused by the excess secretion of _____.
    (a) Insulin
    (b) Adrenaline
    (c) Testosterone
    (d) Thyroxine
24. Amino acid are best represented as _____.
    (a) Dipolor ion
    (b) isoelectric ion
    (c) amphoteric ion
    (d) Zwitter ion
25. The main structural feature of protein is _____.
    (a) ether linkage
    (b) ester linkage
    (c) peptide linkage
    (d) all of these

Group – B

Fill in the blanks: (1 Mark each)

26. Invertase brings about the conversion of _____ to _____ and _____.
27. An example of fibrous protein is the _____ is hair.
28. _____ and _____ act as heat insulator of body.
29. Aspartic and glutamic acid contain _____ side chain.
30. _____ is the name of amide bond in protein.
31. What is the nature of peptide bond in polypeptide?
32. What is cystic fibrosis?
33. Give two examples of mono-ssacharide.
34. Which carbohydrate is called table sugar?
35. What are complex carbohydrates?
36. Name two major metabolic pathway of mono-sacuhorides catabolism.
37. Adrenaline is secreted by _____.
38. The blood clot is dissolved by the enzyme _____.
39. The helical structures of DNA was proposed by _____ and _____.
40. The two form of α-D(+) glucose and B-D(+) glucose are known as _____ of glucose.

Group – A (ANSWERS)

1. (a)
2. (b)
3. (d)
4. (b)
5. (c)
6. (d)
7. (d)
8. (b)
9. (d)
10. (b)
11. (d)
12. (a)
13. (c)
14. (d)
15. (b)
16. (d)
17. (c)
18. (c)
19. (b)
20. (b)
21. (a)
22. (c)
23. (b)
24. (d)
25. (c)

Group – B (ANSWERS)

26. Sucrose, glucose and fructose
27. Keratine
28. fat and oils
29. Acidic
30. peptide
31. The bond are rigid and planar
32. respiratory disease
33. glucose and fructose
34. sucrose
35. polysaccharides (fruits, vegetable & whole grain)
36. Glycolysis and Citric acid cycle
37. Adrenal Medulla
38. Streptokinase
39. Watson and F-crick
40. Anomers

Group – C

Two/Three mark each:

1. What are biomolecules, name any three?
2. What are carbohydrates, name any two?
3. What are polysaccharides, give example?
4. Write important function of carbohydrate.
5. Explain muta-rotation.
6. What is starch? Give example.
7. Write the structure of cellulose.
8. Write the ring structure of glucose.
9. Write the structure of sucrose.
10. What is amino acid? How they are classified?
11. Classify carbohydrate, give example in each case.
12. What are essential and non-essential amino acid? Give example.
13. What is zwitter ion? Give zwitter ion structure of glycine.
14. How do amino acid form protein?
15. State the difference between globular protein and fibrous protein.
16. What are enzymes? Give example and write its characteristics.
17. What is nuclei acid? Explain their role in replication.
18. Explain the function of nucleic acid.
19. What is the difference between RNA & DNA?
20. What is the function of lipids?
21. What are hormones, how are they classified?
22. What are vitamins, why there are essential to our body? Write its importance.
23. Write the function of RNA & DNA.
24. Match the groups correctly:

Group – A	Group – B
(a) Vitamin – D	(i) Xerophthalmia
(b) Vitamin – K	(ii) Scurvy
(c) Vitamin – A	(iii) Coagulation of blood
(d) Vitamin – B	(iv) Ricket

25. Classify the protein with example.
26. Write the importance of hormones.
27. Give the structure of proline, tyrosine, valine and serine.
28. What are glycosides?
29. Write Fischer Projection of D-Glucose and L – Glucose.
30. Why Amino acids are amphoteric in nature?

Group – D

Long Questions:

1. What are Carbohydrates? How they are classified, give examples in each use.
2. Discuss the structure of glucose.
3. Write the structure of
   (a) glucose
   (b) maltose
   (c) sucrose
   (d) α-D- fructose

4. What is protein, how are they related with amino acid? Differentiate between fibrous protein and globular protein.
5. What is protein, write their structure. Write the function of protein.
6. What are enzymes? Write their function give examples.
7. What are vitamins, how they classified? Give their source and function.
8. What is nucleic acid? Write the biological function of nucleic acid. Discuss the structure of RNA & DNA.
9. Write the characteristics of enzymes. Give mechanism of enzyme action. Write its application.
10. Write notes
    (a) Carbohydrate
    (b) Protein
    (c) Enzyme
    (d) Vitamin
    (e) Nucleic acid.

****

Question Bank

Council of Higher Secondary Education, Odisha

Mathematics

One Mark Questions

1. The number of relations from the Set A to the Set B with $|A| = 3$ *and* $|B| = 4$ is _____.
2. The number of relations on set A with $|A| = n$ is _____.
3. Is ϕ a relation from A to B?
4. Is the relation R = {(1, 1), (2, 2)} on {1, 2, 3} symmetric?
5. Give an example of a relation R on any set A such that R = R^{-1}.
6. Is the relation R = $\{(m,n): 2|m+n\}$ on set of integers transitive?
7. Is the relation R = $\{(x,y): |x-y|^2\}$ on Z a function?
8. The number of non-empty relations on A with $|A| = n$ is _____.
9. The largest equivalence relation on any set A is _____.
10. If R is relation on A such that R = R^{-1}, then R is a _____ relation.
11. If R = {(x, x^3) : x is a prime number less than 5} be a relation then the range of R is _____.
12. If $f(x) = (3 - x^3)^{1/3}$ then $fof(x)$ = _____.
13. Let $f: R_+ \to A$ defined by $f(x) = 9x^2 + 6x - 5$. Find 'A' if f is Bijective.
14. Define even and odd functions.
15. Is $g(x) = e^x + e^{-x}$ even?
16. Is the function $f(x) = 2x^2 + 5$ on R invertible?
17. $f(x) = x^3 + 1$, $g(x) = \sqrt{\sin x}$ find fog = ?
18. Is $fog = gof$. ?
19. $f(x) = \sqrt{9 - x^2}$ find range of f.
20. $f(x) = \log|x| + \log x$ find dom$f$.
21. Find domain of fog and gof where $f(x) = \sqrt{x}$ and $g(x) = 1 - x^2$.
22. If $|A| = 5$ *and* $|B| = 3$, then number of one-one function from A to B is _____.
23. If $|A| = 3$, $|B| = 2$ then how many relations are not functions from A to B.
24. If $f(x) = \dfrac{x-1}{x+1}$ *then* $f(2x)$ is

    (a) $\dfrac{f(x)+1}{f(x)+3}$

    (b) $\dfrac{3f(x)+1}{f(x)+3}$

    (c) $\dfrac{f(x)+3}{f(x)+1}$

    (d) $\dfrac{f(x)+3}{3f(x)+1}$

25. The range of the function $f(x)=\dfrac{x^2-x+1}{x^2+x+1}$, $x\in R$ is _____.

26. The domain of $f(x)=e^{\sqrt{5x-3-2x^2}}$ is _____.

27. Which of the following relation is not a function
(a) $f=\{(x,x):x\in R\}$
(b) $g=\{(x,3):x\in R\}$
(c) $h=\left\{\left(n,\dfrac{1}{n}\right):n\in Z\right\}$
(d) $t=\{(n,n^2):n\in N\}$

28. The Domain of $f(x)=\sqrt{x^2-5x+6}+\sqrt{2x+8-x^2}$ is _____.

29. Write the Domain of $f(x) = \sin^{-1}x + \cos x$.

30. If $f(x) = \sin x + 2$ in $\left[-\dfrac{\pi}{2},\dfrac{\pi}{2}\right]$ then what is the greatest value of $f(x)$.

31. If $\sin^{-1}x=\cos ec^{-1}\left(\dfrac{1}{x}\right)$ then x = _____.

32. If x + y = 4 and xy = 1 then $\tan^{-1}x + \tan^{-1}y$ = _____.

33. Find the principle value of $\tan^{-1}\left(\tan\dfrac{3\pi}{4}\right)$.

34. Find 'x' if $\sin^{-1}x+\cos^{-1}\dfrac{1}{2}=\dfrac{\pi}{2}$.

35. $\cot^{-1}\left(-\sqrt{3}\right)$is in the second Quadrant write true/flase.

36. If $A=(a_{ij})_{2\times3}$ such that $a_{ij} = i - j$ find A = ?

37. If $A=\begin{pmatrix}1&1\\1&1\end{pmatrix}$ then A^{100} = _____.

38. If det A= 3 and A is a determinate of order 3 then find the value of $a_{11}c_{11} + a_{12}c_{22} + a_{13}c_{23}$ = _____.Where Cij is the co factor of the element in the ith row & jth Col.

39. Define Singular matrix .

40. If A is square matrix of order 2 and $|A|=5$, then the matrix A. (adj A) = _____.

41. Find x and y when $\begin{pmatrix}1&3\\2&-1\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}4\\1\end{pmatrix}$.

42. Given that $\begin{pmatrix}1&w&w^2\\w&w^2&1\\w^2&1&w\end{pmatrix}\begin{pmatrix}k&1&1\\1&1&1\\1&1&1\end{pmatrix}=\begin{pmatrix}0&0&0\\0&0&0\\0&0&0\end{pmatrix}$ find k = _____.

43. If A = B + C where $A=\begin{pmatrix}1&4\\2&3\end{pmatrix}$find B and C.

44. If A and B are matrix of same order, then $AB^1 - BA^1$ is a _____ matrix.
(a) Skew symmetric
(b) Null matrix
(c) Symmetric matrix
(d) Unit matrix

45. If A is a square matrix of order 3. Write the value of n, when $|3A|=n|A|$.

46. If A is a 2 × 3 matrix and B is a matrix such that A^TB and BA^T both defined then find the order of B.

47. Find 'x' if $(x-1)\begin{pmatrix} 1 & 0 \\ -2 & 0 \end{pmatrix} = (0)$.

48. If $(4\ \ 5\ \ 6)A = (0)$ find the order of A.

49. Transform the matrix $\begin{pmatrix} 6 & 3 \\ 2 & 2 \end{pmatrix}$ into unit matrix.

50. Find the value of 'λ' for which the system of equations $x - y + z = 0$, $x + \lambda y - z = 0$ and $-x + y + z = 0$ has infinitely many solutions.

51. The value of the determinat $\begin{vmatrix} \cos^2 54 & \cos^2 36 & \cot 135 \\ \sin^2 53 & \cot 135 & \sin^2 37 \\ \cot 135 & \cos^2 25 & \cos^2 65 \end{vmatrix} =$ _____.

52. If $\begin{vmatrix} a & 5x & p \\ b & 10y & 5 \\ c & 15z & 15 \end{vmatrix} = 125$, then the value of $\begin{vmatrix} 3a & 3b & c \\ x & 2y & z \\ p & 5 & 5 \end{vmatrix} =$ _____.

53. If a system of equation $-ax + y + z = 0$, $x - by + z = 0$ and $x + y - cz = 0$, $(a, b, c \neq -1)$ has a non zero solution then $\frac{1}{1+a} + \frac{1}{1+b} + \frac{1}{1+c} =$ _____.

54. If the first and third rows of a determinate are inter changed then the value of the det is _____. (Changed, remain same)

55. The region satisfying the set of constrants and the non-negative restriction called _____.

56. Every point of the feasible region is called _____.

57. The maximum value of $z = 3x + 4y$ s.t. $x + y \leq 4$, $x, y \geq 0$ is _____.

58. The minimum value of $z = 3x + 5y$ s.t. $x + 3y \geq 3$, $x + y \geq 2$, $x, y \geq 0$ is _____.

59. The optimal value of the objective function is attained at _____, in feasible region.

60. When a LPP has infinitely many solutions?

61. Find the unit vector along $\sqrt{2}i + j - \hat{k}$.

62. If $|\vec{a}| = 7, |\vec{b}| = 1$ *and* $|\vec{a} + \vec{b}| = 10\sqrt{3}$ *then* $|\vec{a} - \vec{b}| =$ _____.

63. If the position vector of three points are $\vec{a} - 2\vec{b} + 3\vec{c}, 2\vec{a} + 3\vec{b} - 4\vec{c}, -7\vec{b} + 10\vec{c}$, then the three points are _____.
(a) collinear
(b) non-collinear
(c) coplanner
(d) none

64. If $|\vec{a}| = |\vec{b}| = |\vec{a} - \vec{b}| = 1$, then write the measure of the angle between $\vec{a}$ *and* $\vec{b}$.

65. If $\vec{a} = 2\hat{i} + 3\hat{j} - 6\hat{k}$ *and* $\vec{b} = \alpha\hat{i} - \hat{j} + 2\hat{k}$ are parallel then α = _____.

66. The vector projection of the vector $2\hat{i} - 3\hat{j} - 6\hat{k}$ *on* $2\hat{i} + 2\hat{j} - \hat{k}$ is _____.

67. If $\vec{a} = 2\hat{i} - \hat{j} - \hat{k}$ *and* $\vec{b} = \lambda\hat{i} + \hat{j} + 5\hat{k}$ are perpendicular then λ = _____.

68. Let $\vec{a}$ *and* $\vec{b}$ related by $|\vec{a} + \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2$ then find the angle between $\vec{a}$ *and* $\vec{b}$.

69. A vector $\perp_r$ to the vectors $\hat{i} + \hat{j}$ *and* $\hat{i} + \hat{k}$ is _____.

70. If $\vec{a}, \vec{b}, \vec{c}$ are non-zero vectors and $\vec{a} \times \vec{b} = \vec{a} \times \vec{c}$ then
(i) $\vec{b} = \vec{c}$
(ii) $\vec{a} \parallel (\vec{b} - \vec{c})$
(iii) $\vec{b} \parallel \vec{c}$

(iv) $\vec{b} \perp_r \vec{c}$

71. Find the unit vector $\perp_r$ to the vectors $2\hat{i}+3\hat{k}, \hat{i}-2\hat{j}.$

72. The value of $(-\vec{a}).\vec{b}\times(-\vec{c}) =$ _____.

(i) $\vec{a}\times\vec{b}.\vec{c}$

(ii) $-\vec{a}.(\vec{b}\times\vec{c})$

(iii) $\vec{a}\times\vec{c}.\vec{b}$

(iv) $\vec{a}.(\vec{c}\times\vec{b})$

73. Find the value of λ, so that the vectors $\hat{i}-2\hat{j}+2\hat{k}, \lambda\hat{i}+4\hat{j}+5\hat{k}, -2\hat{i}+4\hat{j}-4\hat{k}$ are co-planer.

74. If $[\vec{a}\ \vec{b}\ \vec{c}] = 5$, the value of $[\vec{a}+\vec{b}\ \vec{b}+\vec{c}\ \vec{c}+\vec{a}] =$ _____.

75. If $(\vec{a}+\vec{b})(\vec{a}-\vec{b}) = 12$ *and* $|\vec{a}| = 2|\vec{b}|$ *then* $|\vec{a}| =$ _____.

76. If $\vec{a} = 2\vec{b}$ *and* $\vec{c} = -3\vec{b}$ then angle between $\vec{a}$ *and* $\vec{c}$ is _____.

77. If θ is the angle between $\vec{a}$ *and* $\vec{b}$ *and* $|\vec{a}\times\vec{b}| = |\vec{a}.\vec{b}|$ then find θ.

78. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a}+\vec{b}+\vec{c} = 0$ then what is the value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$ is _____.

79. If $|\alpha\vec{a}| = 2$, then the value of α = _____.

80. If $[\vec{a}\ \vec{b}\ \vec{c}] = 3$ then the value of $[\vec{a}\times\vec{b}\ \vec{b}\times\vec{c}\ \vec{c}\times\vec{a}] =$ _____.

81. The projection of (-1, 2, 3) on yz-plane is _____.

82. The projection of (1, -2, 3) on X-axis is _____.

83. A line is perpendicular to yz-plane. Write the angle between the line with x-axis.

84. The Direction ratios of a line is unique. Write true or false.

85. The ratio in which the line joining the points (2, 3, 4) and (-3, 5 -4) is divided by xy-plane.

86. The projection of the line joining the points (2, 1, 3) and (3, 2, 4) on z-axis is _____.

87. The distance between the planes x + 2y + 3z + 1 = 0 and 2x + 4y + 6z + 5 = 0 is _____.

88. The components of the unit vector perpendicular to the plane $\vec{r}.(2\hat{i}+3\hat{j}-6\hat{k})-6=0.$

89. The equation of the plane parallel to z-axis and with intercepts 3 and 4 on x and y –axes respectively is _____.

90. Are the two points (1, 2, -1) and (2, -1, 3) lie on the same side of the plane x + 3y + z -1 = 0?

91. Write the equation of the plane 3x – 2y + z -1 = 0 in normal form.

92. If the lines $\frac{x+3}{2} = \frac{y+5}{3} = \frac{7-z}{3}$ *and* $\frac{x+1}{\lambda} = \frac{y+1}{5} = \frac{z-1}{1}$ are perpendicular, find λ = ____?

93. Write the axis to which the plane ax + by + c = 0 is parallel.

94. Find the value of k such that the line $\frac{x-4}{1} = \frac{y-z}{1} = \frac{z-k}{2}$ lies in the plane 2x – 4y + z = 7.

95. The Direction ratios of two parallel lines are equal. (write true or false)

96. Find the dis of a line which is $\perp_r$ to the lines whose direction ratios are $\langle 1,-2,3\rangle$ *and* $\langle 2,2,1\rangle$.

97. If a line is perpendicular to x-axis and makes an angle 30^0 with y-axis, then the angle it makes with z-axis is _____.

98. The line $\frac{x+1}{2}=\frac{y-6}{0}=\frac{z-4}{1}$ is _____.(parallel x-axis, perpendicular to y-axis, perpendicular to z-axis, none of these)

99. If the line $\frac{x-k}{2}=\frac{y-2}{-1}=\frac{z+1}{-5}$ lies on the plane 2x – y + z -7 = 0 then the value of k is _____.

100. The symmetric form of the line 2x + 3y + 5 = 0, 6z = 0 is _____.

101. Find the angle between the lines whose drs are proportional to a, b, c and b – c, c – a, a – b.

102. The equation of the line in vector form whose Cartesian form $\frac{x+1}{2}=\frac{x-1}{-1}=\frac{x+3}{5}$ is _____.

103. The point of intersection of the line $\frac{x-1}{2}=\frac{y-3}{1}=\frac{z+2}{3}$ with the plane x – 2y + 4z = 11 is _____.

104. If $2P(A)=P(B)=\frac{5}{13}$ *and* $P(A\setminus B)=\frac{2}{5}$ *then* $P(A\cup B)$ is _____.

105. One card is drawn from a pack of 52 cards. Write the probability that the card drawn is either a king or spade.

106. A binomial distribution has mean 4 and variance 3, then the number of trials is _____.

107. If P(A) = P(B) = x and $P(A\cap B)=P(A'\cap B')=\frac{1}{3}$ then x = _____.

108. $y=2^{2^x}$ *then* $\frac{dy}{dx}=$

(i) $y\left(\log_{10}^{2}\right)^2$

(ii) $y\left(\log_{e}^{2}\right)^2$

(iii) $y\,2^x\left(\log_{x}^{2}\right)^2$

(iv) $y\log_{e}^{2}$

109. If $f(x)=\log_e\left(\log_e^x\right)$ *then* $f^1(e)=$ _____.

110. If $f(x)=x.\tan^{-1}x$ *then* $\lim\limits_{x\to1}\frac{f(x)-f(1)}{x-1}=$ _____.

111. $x=\frac{1-\sqrt{y}}{1+\sqrt{y}}\Rightarrow\frac{dy}{dx}=$ _____.

112. If $xy=(x+y)^n$ *and* $\frac{dy}{dx}=\frac{y}{x}$ then n = _____.

113. If g is the inverse of a function *f* and $f'(x)=\frac{1}{1+x^2}$ then g'(x) is equal to

114. If *f* is an even function and $f^1(x)$ exists then $f^1(0)$ = _____.

115. y = sin (7 $\sin^{-1}$x) then $(1-x^2)y_2-xy_1=$ _____.

116. Is the function *f*(x) = x – [x] continuous at x = 2?

117. If $f(x)=\begin{cases}\frac{\sin 3x}{x} & ,x\neq0\\ \frac{k}{2} & ,x=0\end{cases}$ is continuous at x = o then k = _____.

118. If $f(x)=\begin{cases}\dfrac{1-\sqrt{2}\sin x}{\pi-4x} & , x\neq\dfrac{\pi}{4}\\ a & , x=\dfrac{\pi}{4}\end{cases}$ is continuous at $x=\dfrac{\pi}{4}$ then a = _____.

119. If f:R → R is defined by $f(x)=\begin{cases}\dfrac{1+3x^2-\cos 2x}{x^2} & , x\neq 0\\ k & , x=0\end{cases}$ is continuous at x = 0 then k = _____.

120. If f:R → R is continuous such that f(x + y) = f(x) + f(y) $\forall\ x, y \in R$ and f(1) = 2 then f(100) = _____.

121. If f(x) is increasing at x = 0 then $f^1(0) > 0$ write true or false.

122. The point on the curve $y = x^2$ where the tangent parallel to the chord joining (0, 0) and (1, 1) is _____.

123. The interval where the function $f(x) = x^3(x-2)^2$ is decreasing is _____.

124. Find the interval where $f(x)=x+\dfrac{1}{x}$ is increasing.

125. The interval where $f(x)=\dfrac{x}{\ln x},\ x>0$ is decreasing is _____.

126. If $f(x) = 2x^2 + 3x - 5$, x = 2, $\delta x = 0.01$ *then* δf = _____.

127. If the lines y = -4x + b are tangents to the curve $y=\dfrac{1}{x}$ then b = _____.

128. The distance between the origin and the normal to the curve $y = e^{2x} + x^2$ at x = 0 is _____.

129. The angle between the curves $y = x^2$, $x = y^2$ at (1, 1) is _____.

130. If the curves $y^2 = 4ax$, $xy = c^2$ cut orthogonally then the relation between a and c is _____.

131. The constant 'C' of lagrange's mean value theorem for $f(x) = 2\sin x + \sin 2x$ in $[0, \pi]$ is _____.

132. The condition that $f(x) = ax^3 + bx^2 + cx + d$ has no extreme values is _____.

133. $f(x)=(x-\alpha)(x-\beta)$ then the minimum value of f(x) = _____.

134. If $l^2 + m^2 = 1$ then the minimum value of l + m is _____.

135. $\int |x|dx =$ _____.

136. $\int e^{\log\left(1+\cot^2 x\right)}dx =$ _____.

137. $\int \dfrac{\sqrt{\cot x}}{\sin x.\cos x}dx = f(x)+C$ *then* $f(x) =$ _____.

138. $\int \dfrac{1}{\sqrt{x}+x}dx =$ _____.

139. $\int e^x \operatorname{cosec}(1-\cot x)dx =$ _____.

140. $\int \dfrac{dx}{\left(x^2+1\right)2} = a\tan^{-1}x + b.\dfrac{x}{x^2+1} + C$ then a and b = _____.

141. $\int_0^b \left(a^{-x}-b^{-x}\right)dx =$ _____.

142. $\int_{-\pi}^{\pi} x^6 \sin x dx =$ _____.

143. $\int_{-2}^{2} |[x]|dx =$ _____.

144. $\int_0^{\pi} \frac{1}{2}\left(\cos x + |\cos x|\right)dx =$ _____.

145. The area cut off by the parabola $y^2 = 4ax$ and its latus rectum is _____.

146. The area bomded by the curve y = x and $y = x^3$ is _____.

147. Find the value of C for which the area bunded by the curve $y = 8x^2 - x^5$, the lines x = 1, x = c and x – axis is $\frac{16}{3}$ is _____.

148. The area bunded by y = sin x, y = cos x and y – axis is _____.

149. Area between the curves $y = 1 - |x|$ and x – axis is _____.

150. The degree of $\left[5 + \left(\frac{dy}{dx}\right)^2\right]^{5/3} = 7.\frac{d^2y}{dx^2}$ is _____.

151. The solution of $\frac{dy}{dx} + \frac{y}{3} = 1$ is _____.

152. The order of the differential equation of the family of all concentric circles centered at (h, k) is _____.

153. The solution of $\frac{dy}{dx} + 1 = e^{x+y}$ is _____.

154. Integrating factor of $\left(x + 2y^3\right)\frac{dy}{dx} = y^2$ is _____.

155. The solution of $(x + y + 1)\frac{dy}{dx} = 1$ is _____.

156. If A and B are two independent events such that $P(A^1 \cap B) = \frac{2}{15}$ *and* $P(A \cap B^1) = \frac{1}{6}$ then P(B) = _____.

157. Three persons A, B, C in order toss a die the person who first throws 1 or 2 wins. The ratio of probabilities of their success is _____.

158. The random variable X has the following distribution

X	1	2	3	4
P(X = x)	C	2C	3C	4C

Then the value of C = _____.

159. For a Binomial distribution with mean 6 and variance 2, then first term is _____.

160. If A and B are two independent events such that $P(B) = \frac{2}{7}$ *and* $P(A \cup B^C) = 0.8$ *then* $P(A) =$ _____.

ANSWERS

1. 2^{12}
2. 2^{n^2}
3. Yes
4. Yes
5. R = {(x, y) : x = y} on {1, 2, 3}
6. No
7. No
8. $2^{n^2} - 1$
9. A × A
10. equivalence
11. {8, 9}

12. $fof\,(x) = x$
13. $[-5, \infty)$
14. $f(-x) = f(x)$ – even & $f(-x) = -f(x)$ - odd
15. Yes
16. No
17. $(\sin x)^{3/2} + 1$
18. No
19. $[0, \infty)$
20. $(0, \infty)$
21. [-1, 1] = Domfog, dom gof = R
22. No one – one function
23. 2^6 - 8
24. B
25. $\left[\frac{1}{3}, 3\right]$
26. $(-\infty, 1) \cup \left(\frac{3}{2}, \infty\right)$
27. (c)
28. $[-2, 2] \cup [3, 4]$
29. $[-1, 1]$
30. 3
31. $|x| \geq 1$
32. $\frac{\pi}{2}$
33. $\frac{\pi}{4}$
34. $x = \frac{1}{2}$
35. True
36. $\begin{pmatrix} 0 & -1 & -2 \\ 1 & 0 & 1 \end{pmatrix}$
37. 99 A
38. 0
39. A is a square matrix and $|A| = 0$
40. $\begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix}$
41. x = y = 1
42. k = 1
43. $B = \begin{pmatrix} 1 & 3 \\ 3 & 3 \end{pmatrix} C = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$
44. (a)
45. n = 9
46. Order of B = 2 × 3
47. x = 2
48. Order of A = 3 × 1
49. Use elementary row/ coloumb operation
50. λ = - 1

51. 0
52. 25
53. 1
54. changed
55. feasible region
56. feasible solution
57. 16
58. 9
59. Corner points
60. LPP has two optional solution
61. $\frac{1}{2}\left(\sqrt{2}i + j - \hat{k}\right)$
62. 10
63. (a)
64.
65. -2/3
66. $\frac{4}{9}\left(2\hat{i} + 2\hat{j} - \hat{k}\right)$
67. $\lambda = 3$
68. $\vec{a} \perp_r \vec{b}$
69. $\frac{i - j - k}{\sqrt{3}}$
70. (ii)
71. $\frac{6\hat{i} + 3\hat{j} - 4\hat{k}}{61}$
72. i
73. $\lambda = 3$
74. 10
75. 4
76. π
77. $\theta = \frac{\pi}{4}$
78. -3/2
79. $\alpha = \pm\frac{1}{|\vec{a}|}$
80. 9
81. (-1, 2, 0)
82. (-1, 2, 3)
83. 0
84. false
85. 1 : 1
86. 1
87. $\frac{3}{2\sqrt{14}}$
88. $\left(\frac{2}{7}, \frac{3}{7}, \frac{-6}{7}\right)$
89. $\frac{x}{3} + \frac{y}{4} = 1$
90. Yes

91. $-\frac{3}{\sqrt{14}}x+\frac{2}{\sqrt{14}}y-\frac{1}{\sqrt{14}}z=\frac{1}{\sqrt{14}}$
92. λ = -9
93. z - mix
94. k = 7
95. false
96. $\left(-\frac{8}{5\sqrt{5}},\frac{1}{\sqrt{5}},\frac{6}{5\sqrt{5}}\right)$
97. 60^0
98. y = mis $(\perp_r)$
99. k = 3
100. $\frac{x}{3}=\frac{y+\frac{5}{3}}{-2}=\frac{z-6}{0}$
101. 90^0
102. $\left(\hat{i}+\hat{j}-3\hat{k}\right)+\lambda\left(2\hat{i}-\hat{j}+5\hat{k}\right)=0$
103. (5, 5, 5)
104. $\frac{11}{26}$
105. $\frac{4}{13}$
106. n = 16
107. x = 1/2
108. (iii)
109. 1/e
110. $\frac{\pi+2}{4}$
111. $\frac{4(x-1)}{(1+x)^3}$
112. 2
113. $1 + \{g(x)\}^5$
114. 1
115. -49 y
116. No
117. 6
118. 1/4
119. 5
120. 200
121. false
122. $\left(\frac{1}{2},\frac{1}{4}\right)$
123. $\left(\frac{6}{5},2\right)$
124. $[1,\infty)$
125. (0, e)
126. 0.1102
127. ± 4
128. $\frac{2}{\sqrt{5}}$

129. $\tan^{-1}\left(\frac{3}{4}\right)$

130. $c^4 = 32a^4$

131. $\frac{\pi}{3}$

132. $b^2 < 3ac$

133. $-\frac{1}{4}(\alpha-\beta)^2$

134. $\sqrt{2}$

135. $\frac{x.|x|}{2}+C$

136. - cot x + C

137. $2\sqrt{\cot x}+C$

138. $2\log\left(1+\sqrt{x}\right)+C$

139. e^x cosec x + C

140. a = b = ½

141. $\frac{1}{\ln a}-\frac{1}{\ln b}$

142. 0

143. 4

144. 2

145. $\frac{8a^2}{3}$

146. ½

147. - 1

148. $\sqrt{2}-1$

149. 1

150. 3

151. $y=3+ce^{-\frac{x}{3}}$

152. 1

153. $e^{-(x+y)}+x+c=0$

154. $e^{\frac{1}{y}}$

155. x = - (y + 2) + ce^y

156. $\frac{1}{6}\ or\ \frac{4}{5}$

157. 9 : 6 : 4

158. $\frac{1}{10}$

159. $\frac{1}{3^9}$

160. 0.3

4 Marks:

Relation and Function

1. $R=\{(m,n)\in N^2 / m+n\geq 50\}$ is a relation on the set of counting number N. Verify the relation for reflexive symmetric or transitive.
2. Test whether the relation $R=\{(m,2)|2|(m+n)\}$ on Z is reflexive, symmetric or transitive.
3. Let R be a relation on Z such that *a* – b is an integer test whether R is an equivalence relation.
4. Show that f: R → R defined by $f(x)=\frac{3x+5}{2}$ is invertible and find f^{-1}.
5. Show that f: N → N given by $f(n)=\begin{cases} n+1 \ \ if \ \ n \ is \ odd \\ n-1 \ \ if \ \ n \ is \ even \end{cases}$ is bijective.
6. If R and S are two equivalence relations on any set then prove that $R\cap S$ is also an equivalence relation.
7. Find number of relations and equivalence relations on the set A = {1, 2, 3}. Also find all the equivalence relations on 'A'.
8. Show that f: R → R defined by $f(x)=|x|$ is neither one – one nor on to.
9. Prove that f: R → R given by $f(x)=\frac{2x^2}{x^2+1}$ is neither one – one nor on to.
10. Show that the relation $f=\{(a,b)/\ a\leq b^3, a,b\in\}$ is neither reflexive nor symmetric nor transitive.

Inverse Trigonmetric Function

1. Evaluate: $\tan\left[\cos^{-1}\frac{4}{5}+\tan^{-1}\frac{2}{3}\right]$.
2. Solve: $3\tan^{-1}\frac{1}{2+\sqrt{3}}-\tan^{-1}\frac{1}{x}=\tan^{-1}\frac{1}{3}$.
3. Show that: $\tan\left(\frac{\pi}{4}+\frac{1}{2}\cos^{-1}\frac{a}{b}\right)+\tan\left(\frac{\pi}{4}-\frac{1}{2}\cos^{-1}\frac{a}{b}\right)=\frac{2b}{a}$.
4. Show that: $\tan^{-1}\frac{4}{5}+2\tan^{-1}\frac{1}{3}=\frac{\pi}{2}$.
5. Show that: $\sin^{-1}\sqrt{\frac{x-q}{p-q}}=\cos^{-1}\sqrt{\frac{p-x}{p-q}}=\cot^{-1}\sqrt{\frac{p-x}{x-q}}$.
6. Solve: $\sin^{-1}\frac{2a}{1+a^2}+\sin^{-1}\frac{2b}{1+b^2}=2\tan^{1}x$.
7. Solve: $\cos\left(\tan^{-1}x\right)=\sin\left(\cot^{-1}\frac{3}{4}\right)$.
8. Show that: $\tan\left(2\tan^{-1}\frac{1}{5}-\frac{\pi}{4}\right)=-\frac{7}{17}$.
9. Prove that: $\cot^{-1}7+\cot^{-1}8+\cot^{-1}18=\cot^{-1}3$.
10. Solve: $\tan^{-1}x+2\cot^{-1}x=\frac{2\pi}{3}$.
11. Solve: $\tan^{-1}\left(\frac{1-x}{1+x}\right)=\frac{1}{2}\tan^{-1}x$.

12. Show that: $\tan^2 \cos^{-1} \frac{1}{\sqrt{3}} + \cot^2 \sin^{-1} \frac{1}{\sqrt{5}} = 6.$

13. Solve: $\cos\left(2\sin^{-1} x\right) = \frac{1}{9},\ x > 0.$

14. Prove: $\sin^{-1} \sqrt{\frac{x-q}{p-q}} = \cos^{-1} \sqrt{\frac{p-x}{p-q}} = \tan^{-1} \sqrt{\frac{x-q}{p-x}}.$

15. Show that: $\tan^{-1} \frac{a-b}{1+ab} + \tan^{-1} \frac{b-c}{1+bc} + \tan^{-1} \frac{c-a}{1+ca} = 0.$

16. Solve: $2\tan^{-1}(\cos x) = \tan^{-1}(2 \operatorname{cosec} x)$.

17. If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$, show that $x + y + z = xyz$.

18. Show that $\cos^{-1} x + \sin^{-1} x = \frac{\pi}{6}.$

Matrices & Determinants

1. If $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$, then determine A^{-1} and show that $AA^{-1} = I$.

2. If $A = \begin{bmatrix} 1 & -2 & 2 \\ 3 & 1 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 4 \\ 1 & 2 \\ 3 & -1 \end{bmatrix}$ show that $(AB)^T = B^T A^T$.

3. Find the inverse of the matrix $\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$ using elementary row transformation.

4. If $A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 3 \\ -2 & 5 & 3 \end{bmatrix}$ then verify that $A + A^T$ is symmetric and $A - A^T$ is skew symmetric.

5. Show that $\begin{bmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{bmatrix} = (a+b+c)^2.$

6. If the matrix A is such that $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix} A = \begin{bmatrix} -4 & 1 \\ 7 & 7 \end{bmatrix}$ find A.

7. Find the inverse of the matrix $\begin{bmatrix} 0 & 0 & 2 \\ 0 & 2 & 0 \\ 2 & 0 & 0 \end{bmatrix}$.

8. Show that $(a + 1)$ is a factor of $\begin{bmatrix} a+1 & 2 & 3 \\ 1 & a+1 & 3 \\ 3 & -6 & a+1 \end{bmatrix}$.

9. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, show that for what value of α, $A^2 = B$.

10. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ show that $A^k = \begin{bmatrix} 1+2k & -4k \\ k & 1-2k \end{bmatrix} k \in N.$

11. If $A=\begin{bmatrix} 0 & -\tan\frac{\theta}{2} \\ \tan\frac{\theta}{2} & 0 \end{bmatrix}$ then prove that (1 + A) $(1 - A)^{-1}$ = I.

12. Find the value of $\begin{vmatrix} 17 & 58 & 97 \\ 19 & 60 & 99 \\ 19 & 59 & 98 \end{vmatrix}$ without expanding.

13. Prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$.

14. Solve for x: $\begin{vmatrix} 15-2x & 11 & 10 \\ 11-3x & 17 & 16 \\ 7-x & 14 & 13 \end{vmatrix} = 0$.

15. If $A=\begin{bmatrix} -1 & 3 & 5 \\ 1 & -3 & -5 \\ -1 & 3 & 5 \end{bmatrix}$ find $A^3 - A^2$.

16. Prove that $A^2 - 5A + 7I = 0$ if $A=\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$.

17. Show that inverse of a matrix is unique.

18. Find the adjoint of the matrix $\begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$.

19. Find the matrix which when added to $\begin{bmatrix} 2 & -3 \\ -4 & 7 \end{bmatrix}$ *gives* $\begin{bmatrix} 4 & -1 \\ 3 & 2 \end{bmatrix}$.

20. Verify that $A=\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ satisfies the equation $x^2 - (a + d)x + (ad - bc)I_2 = 0$.

Unit – 3

1. Prove that $y = \ln\tan\left(\frac{\pi}{4}+\frac{x}{2}\right) \Rightarrow \frac{dy}{dx} = \sec x$.

2. Find $\frac{dy}{dx}$ *if* $y = 2^{x^2} + \tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$.

3. Find the derivative of $x^{\sin x}$ with respect to x.

4. Differentiate $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ *w.r.t* $\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$.

5. Find the slope of the tangent to the curve x = 2(t – sin t), y = 2(1 – cost) at $t = \frac{\pi}{4}$.

6. If cos y = x cos (*a* + y), then show that $\frac{dy}{dx} = \frac{\cos^2(a+y)}{\sin a}$.

7. Find $\frac{dy}{dx}$, *if* $x^m y^n = \left(\frac{x}{y}\right)^{m+n}$.

8. Differentiate $\sec^{-1}\left(\frac{1}{2x^2-1}\right)$ *w.r.t* $\sqrt{1-x^2}$.

9. Find y_2 if $y = x^4e^{2x}$.

10. Differentiate $y = (\sin y)^{\sin 2x}$.

11. Differentiate $y = \tan^{-1}\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}$.

12. Differentiate $y = (\sin y)^{\sin 2x}$.

13. Examine the continuity of the following function at x = 0, 1

$$f(x) = \begin{cases} 2x+1 & if \quad x \le 0 \\ x & if \quad 0 < x < 1 \\ 2x-1 & if \quad x \ge 1 \end{cases}.$$

14. If sin (x + y) = y cos (x + y) then prove that $\frac{dy}{dx} = -\frac{1+y^2}{y^2}$.

15. If $x^y = y^x$ find $\frac{dy}{dx}$.

16. If $x = a\cos^3 t$, $y = a\sin^3 t$, then find $\frac{dy}{dx}$.

17. If $e^{xy} = x^2 + y^2$, then find $\frac{dy}{dx}$.

18. Examine the continuity of the function $f(x) = \begin{cases} \frac{1}{x+[x]} & if \quad x < 0 \\ -1 & if \quad x \ge 0 \end{cases}$ at x = 0.

19. The function $f(x) = \begin{cases} \frac{x^2-3x+2}{(x-1)^2} & if \quad x \ne 0 \\ k & if \quad x = 0 \end{cases}$ is continous for all x then what is the values of k.

20. Discuss the continuity of the function $f(x) = \begin{cases} \frac{\sin 3x}{2x} & when\ x \ne 0 \\ \frac{3}{2} & when\ x = 0 \end{cases}$ at x = 0.

21. Examine the continuity of the function $f(x) = \begin{cases} \frac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1} & , x \ne 0 \\ 0 & , x = 0 \end{cases}$ at x = 0.

22. Show that the function $f(x) = x^3 - 3x^2 + 3x - 100$ is increasing for all real values of x.

23. Examine the continuity of the function at x = 0, 1, $f(x) = \begin{cases} 2x+1 & if \quad x \le 0 \\ x & if \quad 0 < x < 1 \\ 2x-1 & if \quad x \ge 1 \end{cases}$.

24. Find the intervals in which the function $f(x) = \frac{\ln x}{x}$ x>0 is increasing and decreasing.

25. Find the interval where the function is increasing y = sin x + cos x, $x \in [0, 2\pi]$.

26. Find the minimum distance of a point on the curve $\frac{4}{x^2}+\frac{1}{y^2}=1$ from the origin.

27. Write the maximum value of the function $y = x^5$ in the interval [1, 5].

28. A ballon is pumped at the rate of 2 cm^{-3}/minute. What is the rate of increase of the surface area when radius is 0.5 cm.

29. Find the interval in which $f(x)=x^{\frac{1}{x}}, x>0$ is decreasing.

30. What is the radius of a sphere if the rate of increasing of its volume is twice that of the surface area?

31. Find the maximum value of $y=(1+\cos x)\sin x, x\in\left[0,\frac{3\pi}{4}\right]$.

32. Find the maximum value of the function $f(x)=\left(\frac{1}{x}\right)^x$.

33. Integrate $\int \frac{x\tan^{-1}x}{(1+x^2)^{3/2}}dx$.

34. Evaluate $\int_0^{\frac{1}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}dx$.

35. Evaluate $\int \frac{2x+1}{\sqrt{x^2+10x+29}}dx$.

36. Evaluate $\int \frac{dx}{(1+x)\sqrt{1-x^2}}$.

37. Evaluate $\int (\log x)^2 dx$.

38. Evaluate $\int \frac{2x+9}{(x+3)^2}dx$.

39. Evaluate $\int_0^{\frac{3}{2}} [x^2]dx$.

40. Integrate $\int \frac{xe^x}{(1+x)^2}dx$.

41. Integrate $\int \frac{1+x^2}{x\sqrt{x^4+1}}dx$.

42. Evaluate $\int_0^{\frac{\pi}{2}} \log(\tan x+\cot x)dx$.

43. Integrate $\int \frac{\sin 6x+\sin 4x}{\cos 6x+\cos 4x}dx$.

44. Integrate $\int \sin^{-1}x\,dx$.

45. Find the value of $\int \frac{dx}{\cos^2 x.\sin^2 x}$.

46. If $\int_0^1 f(1-x)dx=2$, then find the value of $\int_0^{1/2} f(2t)dt$.

47. If $\int_1^2 f(x)dx = \lambda$, then what is the value of $\int_1^2 f(3-x)dx$?

48. Find $\int \frac{\cos 3x.\cos x}{1+\cos 2x}dx.$

49. Find $\int \frac{x^5}{\left(x^3+1\right)^4}dx.$

50. Integrate $\int \frac{1}{1+\sin x}dx.$

51. Evaluate $\int_0^2 \left[x^2\right]dx.$

52. Integrate $\int \sin^4 x.\cos^3 x\,dx.$

53. Evaluate $\int_0^4 \left[\sqrt{x}\right]dx.$

54. Evaluate $\int_0^1 \left[3x\right]dx.$

55. Evaluate $\int_0^4 \left(\left[x\right]+\left|x\right|\right)dx.$

56. Integrate $\int e^x\left(\cot x+\log\sin x\right)dx.$

57. Evaluate $\int_0^4 \left|8-3x\right|dx.$

58. Evaluate $\int \frac{dx}{x\ln x\sqrt{(\ln x)^2-4}}.$

59. Find the area of the region bounded by the parabola $y^2 = x$ and the ordinate $x = 4$.
60. Find the area of the trapezium bounded by the sides $y = x$, $y = 0$ and $x = 2$, $x = 4$.
61. If the area between $x = y^2$ and $x = 4$ is divided into two equal parts by the line $x = a$, find the value of a.
62. Find the area of the region banded by the curve $y = 6x - x^2$ and the x-axis.
63. Find the area of the region enclosed by the two parabolas $y^2 = 4ax$ and $x^2 = 4ay$.
64. Find the area of the circle $x^2 + y^2 = 2ax$.
65. Find the area of the ellipse $\frac{x^2}{16}+\frac{y^2}{25}=1.$
66. Find the area of the region bounded by the curve $y = 6x - x^2$, the x-axis and the ordinates $x = 0$ and $x = 9$.
67. Find the area bounded by the straight lines $y = 0$, $y = x$ and $x + 2y = 3$.
68. Find the area enclosed by the curve $y^2 = x$ and the straight lines $x = 0$, $y = 1$.
69. Find the differential equation whose general solution is $c_1x^2 + c_2y = 1$ where c_1, c_2 are arbitration constants.
70. Solve: $\frac{dy}{dt}=e^{2t+3y}.$
71. Solve: $\frac{dy}{dx}+y=e^{-x}.$
72. Find the differential equation whose general solution is $y = a\cos x + b\sin x$.
73. Find the integrating factor of the differential equation $\left(1+y^2\right)dx+\left(x-e^{-\tan^{-1}y}\right)dy=0.$
74. Solve: $(x + y)dy + (x - y)dx = 0$.

75. Solve: $x^2(y-1)dx + y^2(x-1)dy = 0$.
76. Solve: $ydy + e^{-y}x\sin s dx = 0.$
77. Solve: $\cos ecx\frac{d^2y}{dx^2} = x.$
78. Form the differential equation whose general solution is $y = a \sin t + be^t$.
79. Solve: $(x^2 + 7x + 12)dy + (y^2 - 6y + 5)\,dx = 0$.
80. Solve: $(x^2 + y^2)dx - 2xy\,dy = 0$.
81. Solve: $\ln\left(\frac{dy}{dx}\right) = 3x + 4y.$
82. Solve: $x\frac{dy}{dx} + y = y^2 \ln x.$

3 – D

1. Prove that two lines whose d.c.s are connected by the equations $l + 2m + 3n = 0$, $3ln - 4ln + mn = 0$ are perpendicular to each other.
2. Find the co-ordinates of the foot of the perpendicular drawn from the point A(1, 3, 4) with the line joining the points B(3, 0, -1) and C(0, 1, -2).
3. If A, B, C, D are the points (6, 3, 2), (3, 5, 7), (2, 3, -1) and (3, 5 -3) respectively then find the projections of AB on CD.
4. Prove that the points P(3, 2, -4), Q(5, 4, -6) and R(9, 8, -10) are collinear.
5. Prove that measure of the angle between two main diagonals of the cube is $\cos^{-1}\frac{1}{3}$.
6. Find d.c.s of a line passing through origin and lying in the first octent, making equal angles with the three co-ordinate axis.
7. Write the vector equation of the line $\frac{x-5}{3} = \frac{y+4}{7} = \frac{6-z}{2}$.
8. Show that the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ intersect.
9. Find the symmetric form of equation of the line $x + 2y + z - 3 = 0 = 6x + 8y + 3z - 10$.
10. Find the image of the point (3, 5, 7) w.r.t the plane $2x + y + z = 6$.
11. Find the shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$.
12. Obtain the equation of the line through the point (1, 2, 3) and parallel to the line $x - y + 2z - 5 = 0 = 3x + y + z$.
13. Find the angle between the lines whose d.r.s are proportional and b – c, c – a, a – b.

Vectors

1. Find the unit vector in the direction of the sum of the vectors $\hat{i} - \hat{j} + \hat{k}, 2\hat{i} + \hat{j} - 3\hat{k}$ *and* $\hat{i} + \hat{j} + \hat{k}.$
2. Find the vector joining the points (2, -3) and (-1, 1). Find its magnitude and the unit along the same direction. Also determine the scalar components and component vectors along the co-ordinate axes.
3. Using vectors show that points (3, 2, 1), (5, 5, 2) and (-1, -4, -1) are collinear.
4. If $\left|\vec{a} + \vec{b}\right| = \left|\vec{a} - \vec{b}\right|$ then find the angle between $\vec{a}$ *and* $\vec{b}$.
5. Find the scalar and vector projections of the vector $2\hat{i} - 3\hat{j} - 6\hat{k}$ on the line joining the points (3, 4, -2) and (5, 6, -3).

6. If $\vec{a} = 2\hat{i} - 2\hat{j} - 3\hat{k}, \vec{b} = -\hat{i} - 2\hat{j} + \hat{k}$ *and* $\vec{c} = 3\hat{i} + \hat{j}$ such that $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$. Find the value of λ.
7. Prove that two vectors are perpendicular iff $\left|\vec{a} + \vec{b}\right|^2 = \left|\vec{a}\right|^2 + \left|\vec{b}\right|^2$.
8. If $\vec{a} = 5\hat{i} - \hat{j} + 7\hat{k}$ *and* $\vec{b} = \hat{i} - \hat{j} + t\hat{k}$, find 't' such that $\vec{a} + \vec{b}$ *and* $\vec{a} - \vec{b}$ are perpendicular to each other.
9. Find a unit vector perpendicular to each of the vectors $2\hat{i} - \hat{j} + \hat{k}$ *and* $3\hat{i} + 4\hat{j} - \hat{k}$. Find the sine of angle between the two vectors.
10. Show that the points A, B and C with position vectors $3\hat{i} - 4\hat{j} - 4\hat{k}, 2\hat{i} - \hat{j} + \hat{k}$ *and* $\hat{i} - 3\hat{j} - 5\hat{k}$ respectively form the vertices of a right angle.
11. Obtain the area of the parallelogram whose adjacent sides are vectors $\hat{i} + 2\hat{j} + 3\hat{k}$ *and* $-3\hat{i} - 2\hat{j} + \hat{k}$.
12. Show that the vector area of the triangle whose vertices have position vectors $\vec{a}, \vec{b}, \vec{c}$ is $\frac{1}{2}\left(\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}\right)$.
13. Prove that the four points with position vectors $4\hat{i} + 5\hat{j} + \hat{k}, -\hat{j} - \hat{k}, 3\hat{i} + 9\hat{j} + 4\hat{k}$ and $-4\hat{i} + 4\hat{j} + 4\hat{k}$ are coplanar.
14. Prove by vector method that altitudes of a triangle are concurrent.
15. Find the value of the following $\hat{i}.\left(\hat{j} + \hat{k}\right) + \hat{j}.\left(\hat{j} \times \hat{k}\right) + \hat{k}.\left(\hat{i} \times \hat{j}\right)$.
16. Prove by vector method that an angle in scribed in a semi-circle is a right angle.

LPP

1. Solve the following graphically,
   Maximize Z = 20x + 30y
   Subject to 3x + 5y ≤ 15
   x, y ≥ 0
2. Find the feasible region of the following system:
   2y – x ≥ 0
   6y – 3x ≤ 21
   x ≥ 0, y ≥ 0
3. Shade the feasible region satisfying the in equations 2x + 3y ≤ 6, x ≥ 0, y ≥ 0 in a rough sketch.
4. Let an LPP be as follows:
   Maximize Z = 3x + 5y
   Subject to 5x + 3y ≤ 30
   x + 2y ≤ 12
   2x + 5y ≤ 20
   and x, y ≥ 0
   Test whether the points (2, 3) and (-3, 4) are feasible solutions or not.
5. A diet for a sick person must contain at least 4000 units of vitamins, 50 units of minerals and 1400 units of calories. Two food A and B are available at a cost of Rs. 4 and Rs. 3 per unit respectively. If one unit of A contains 200 units of vitamin, 1 unit of mineral and 40 colories and one units of B contains 100 units of vitamins, 2 units of minerals and 40 colories. Formulate the LPP to minimize the cost of foods.
6. Solve the following LPP graphically:
   Minimize Z = 4x + 3y
   Subject to 2x + 5y ≥ 10
   x, y ≥ 0

7. Find the feasible solution region of the following system: $- x + y \geq - 1$, $x + y \leq 6$, $y \leq 5$, $x \geq 0$, $y \geq 0$.
8. A farmer has 5 acres of land on which he wishes to grow two crops X and Y. He has to use 4 cart loads and 2 cart load of manure per acre for crops X and Y respectively. But not more than 18 cart loads of manure is available other expenses are Rs. 200 and Rs. 500 per acre for the crops X and Y respectively. He estimate profit from crops X and Y at the rates Rs. 1000 and Rs. 800 per acre respectively. Formulate the LPP as to how much land he should allocate to each crop for maximum profit.
9. Write the general form of an LPP and its component.
10. Solve the following system graphically:
    $x + 2y < 2$
    $2x – y + 2 \geq 0$.

Probability

1. A pair of dice is thrown. Find the probability of getting a sum of at least 9 if 5 appears on at least one of the dice.
2. Four cards are drawn successively with replacement from a well – shuffled pack of 52 cards. Find the probability distribution of the number of aces. Calculate the mean and variance of the number of aces.
3. There are 25 girls and 15 boys in class XI and 30 boys and 20 girls in class XII. If a student from a class, selected at random, happens to be a boy, find the probability that he has been chosen from class XII.
4. If A and B are independent events, show that
   (i) A^C and B^C are independent
   (ii) A and B^C are independent
5. If A, B are events such that P(A) = 0.6, P(B) = 0.4 and $P(A \cap B) = 0.2$ then find
   (i) P(B/A) (ii) $P(B/A^C)$
6. 10% of the bulbs produced in a factory are of red colour and 2% are red and defective. If one bulb is picked up at random, determine the probability of its being defective if it is red.
7. A committee of 4 students is selected at random from a group consisting 8 boys and 4 girls. Given that there is at least one girl on the committee, calculate the probability that there are exactly 2 girls on the committee.
8. Two cards are drawn simultaneously for successively without replacement for a well shuffled pack of 52 cards. Find the mean and variance of the no. of aces.
9. Find the probability distribution of number of heads in 3 tosses of a fair coin.
10. A person takes 4 tests in succession. The probability of his passing the first test is P, that of his passing each succeeding test is P or $\frac{P}{2}$, depending on his passing or failing the preceding test. Find the probability of his passing just 3 tests.

6 Marks:

Relation and Function

1. Prove that congruence modulo relation on set of integers is an equivalence relation.
2. Show that the relation ~is given by ~= {(a, b) : $\frac{a}{b}$ is power of 5} on Z – {0} is an equivalence relation.
3. Show that the relation R = $\{(m,n) | 2 | (m+n)\}$ on Z is an equivalence relation.
4. Show that f: R → R defined by $f(x) = x^2 – 1$ is not invertible in general. Find the domain and codomain where f is invertible. Also find f^{-1}.

5. Prove that the function f: (-1, 1) → R given by $f(x) = \frac{x}{1-x^2}$ is invertible & find its inverse.

6. Let f: x → y if there exists a map g : y → x such that $g_0 f = id_x$ and $f_0 g = id_y$, then show that f is bijective and $g = f^{-1}$.

7. Show that the function f: R → R defined by f(x) = cosx is neither one-one nor onto.

8. If f: N → N defined by $f(n) = \begin{cases} \frac{n+1}{2} & \text{if } n \text{ is odd} \\ \frac{n}{2} & \text{if } n \text{ is even} \end{cases}$ for all n ∈ N then find whether the function is bijective.

9. Let R be defined by (m, n) R (p, q) if mq = np where m, n, p, q ∈ z – {0}. Show that R is an equivalence relation.

10. Let n ∈ z_+ and f be a function defined as $f(n) = \begin{cases} 0, & \text{when } n = 1 \\ f\left(\left[\frac{n}{2}\right]\right) + 1, & \text{when } n > 1 \end{cases}$ then find f(35).

Inverse Trigonometric Functions

1. If $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = \pi$, prove that $x^2 + y^2 + z^2 + 2xyz = 1$.

2. If $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \pi$, prove that $x\sqrt{1-x^2} + y\sqrt{1-y^2} + z\sqrt{1-z^2} = 2xyz$.

3. If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \frac{\pi}{2}$, show that xy + yz + zx = 1.

4. Solve $\tan^{-1}\frac{1}{2x+1} + \tan^{-1}\frac{1}{4x+1} = \tan^{-1}\frac{2}{x^2}$.

5. Solve $\cot^{-1}\frac{1-x^2}{2x} = \operatorname{cosec}^{-1}\frac{1+a^2}{2a} - \sec^{-1}\frac{1+b^2}{1-b^2}$.

6. Solve $\cos^{-1}\left(x+\frac{1}{2}\right) + \cos^{-1} x + \cos^{-1}\left(x-\frac{1}{2}\right) = \frac{3\pi}{2}$.

7. If $r^2 = x^2 + y^2 + z^2$, prove that $\tan^{-1}\frac{yz}{xr} + \tan^{-1}\frac{zx}{yr} + \tan^{-1}\frac{xy}{zr} = \frac{\pi}{2}$.

8. In a triangle ABC if $m\angle A = 90^0$, prove that $\tan^{-1}\frac{b}{a+c} + \tan^{-1}\frac{c}{a+b} = \frac{\pi}{4}$ where a, b, c are sides of the triangle.

9. If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \pi$, prove that $x^4 + y^4 + z^4 + 4x^2y^2z^2 = 2(x^2y^2 + y^2z^2 + z^2x^2)$.

10. Prove that $\tan^{-1}\left[\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right] = \frac{\pi}{4} - \frac{1}{2}\cos^{-1} x, \left(-\frac{1}{\sqrt{2}} \le x \le 1\right)$.

Matrices & Determinants

1. Prove that a square matrix can be uniquely expressed as a sum of symmetric and a skew symmetric matrix.

2. Find the inverse of the matrix $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 1 & 0 & 2 \end{pmatrix}$.

3. Solve the system x + 2y + 3z = 8, 2x + y + z = 8, x + y + 2z = 6 by matrix inversion method.

4. Applying elementary operations, find the inverse of the matrix $\begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{pmatrix}$.

5. If A, B and C are matrices of order 2 × 2 each and 2A + B + C = $\begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}$, A + B + C = $\begin{pmatrix} 0 & 1 \\ 2 & 1 \end{pmatrix}$, A + B - C = $\begin{pmatrix} 1 & 2 \\ 1 & 0 \end{pmatrix}$ then find A, B and C.

$$x - y + z = 4$$

6. Show that the system of equations $2x + y - 3z = 0$ are consistant.

$$x + y + z = 2$$

7. Examine whether the following system has any nontrivial solution. If so, find it.

$$x + 2y + z = 0$$
$$3x + 5y + 2z = 0.$$
$$4x + 3y - z = 0$$

8. Express $\begin{vmatrix} a^2 & 2ab & b^2 \\ b^2 & a^2 & 2ab \\ 2ab & b^2 & a^2 \end{vmatrix}$ in the form of a perfect square.

9. Factorize the determinant $\begin{vmatrix} x^3 - a^3 & x^2 & x \\ b^3 - a^3 & b^2 & b \\ c^3 - a^3 & c^2 & c \end{vmatrix}$ without expands.

10. If A + B + C = π, show that $\begin{vmatrix} -1 & \cos C & \cos B \\ \cos C & -1 & \cos A \\ \cos B & \cos A & -1 \end{vmatrix} = 0$.

11. Prove that $\begin{vmatrix} b^2 + c^2 & ab & ac \\ ab & c^2 + a^2 & bc \\ ca & cb & a^2 + b^2 \end{vmatrix} = 4a^2b^2c^2$.

12. If A + B + C = π, prove that $\begin{vmatrix} \sin^2 A & \cot A & 1 \\ \sin^2 B & \cot B & 1 \\ \sin^2 C & \cot C & 1 \end{vmatrix} = 0$.

13. Eliminate x, y, z from $a = \frac{x}{y-z}, b = \frac{y}{z-x}, c = \frac{z}{x-y}$.

14. If $A = \begin{pmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{pmatrix}$, show that $A^3 - 23A - 40I = 0$.

15. If $A = \begin{pmatrix} 0 & 1 & 0 \\ -1 & 0 & 2 \\ 0 & 0 & 1 \end{pmatrix}$ then find the value of $A^3 - A^2 + I_3$.

16. Prove that $\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix}$ = (x – y)(y – z)(z – x) (xy + yz + zx).

17. If $A = \begin{pmatrix} 1 & -2 & 1 \\ 0 & -1 & 1 \\ 2 & 0 & -3 \end{pmatrix}$ then find A^{-1} and hence solve the system of equations x – 2y + z = 0, -y + z = -2 and 2x – 3z = 10.

18. Verify that $(AB)^T = B^T A^T$ where $A = \begin{pmatrix} 1 & 2 & 3 \\ 6 & 7 & 8 \\ 6 & -3 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 2 & 3 \\ 3 & 4 & 2 \\ 5 & 6 & 1 \end{pmatrix}$.

19. If $A = \begin{pmatrix} 1 & 1 \\ -1 & -1 \end{pmatrix}, B = \begin{pmatrix} -1 & 3 \\ -3 & 1 \end{pmatrix}$ then show that $(A+B)^2 \neq A^2 + 2AB + B^2$.

20. Find the value of x, y & z if $A = \begin{pmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{pmatrix}$ satisfies $A^T = A^{-1}$.

Continuity and Differentiability

1. Find the values of k so that the function f defined by $f(x) = \begin{cases} \dfrac{k\cos x}{\pi - 2x} & when\ x \neq \dfrac{\pi}{2} \\ 0 & at\ x = \dfrac{\pi}{2} \end{cases}$ is continuous at $x = \dfrac{\pi}{2}$.

2. If the function f(x) given by $f(x) = \begin{cases} 3ax + b & if\ x > 1 \\ 3ax + b & if\ x = 1 \\ 5ax - 2b & if\ x < 1 \end{cases}$ is continuous at x = 1, then find the values of a and b.

3. Find the value of k for which $\begin{cases} \sqrt{1+kx} - \sqrt{1-kx} & when\ 1 < x < 0 \\ \dfrac{2x+1}{x-1} & if\ when\ 0 \leq x < 1 \end{cases}$ is continuous at $x = \dfrac{\pi}{2}$.

4. Find all points of discontinuity of 'f' where f is defined as follows
$$f(x) = \begin{cases} |x| + 3 & when \quad x \leq -3 \\ -2x & when \quad -3 < x < 3. \\ 6x + 2 & when \quad x \geq 3 \end{cases}$$

5. If $(\cos x)^y = (\cos y)^x$ then find $\dfrac{dy}{dx}$.

6. If $y = x^{\sin^{-1} x} + x^3 \dfrac{\sqrt{x^2+4}}{\sqrt{x^3+3}}$ then find $\dfrac{dy}{dx}$.

7. If $e^{y/x} = \frac{x}{a+bx}$ then show that $x^3 \frac{d}{dx}\left(\frac{dy}{dx}\right) = \left(x\frac{dy}{dx} - y\right)^2$.

8. If $x = \frac{1-\cos^2\theta}{\cos\theta}, y = \frac{1-\cos^{2n}\theta}{\cos^n\theta}$ then show that $\left(\frac{dy}{dx}\right)^2 = n^2\left(\frac{y^2+4}{x^2+4}\right)$.

9. Differentiate $y = \frac{(x-1)^2\sqrt{3x-1}}{x^7(6-7x^2)^{3/2}}$.

10. If $\sqrt{1-x^4} + \sqrt{1-y^4} = k(x^2 - y^2)$ then show that $\frac{dy}{dx} = \frac{x\sqrt{1-y^4}}{y\sqrt{1-x^4}}$.

11. Find the greatest and least value of $x^4 - 2x^2 + 3$ in [-2, 2].
12. Find the maxima and minima of $f(x) = \sin x + \cos x$, $x \in [0, 2\pi]$.
13. Show that the rectangle of maximum area that can be inscribed in a circle is a square.
14. Show that the semi vertical angle of a cone of given slant height is $\tan^{-1}\sqrt{2}$ when the volume is maximum.
15. Find the coordinates of the point on the curve $x^2y - x + y = 0$ where the slope of the tangent is maximum.
16. Determine the points of extreme values on the curve $y^3 = (x-1)^2(x+2)$.
17. Evaluate $\int \frac{2\cos x + 7}{4 - \sin x}\,dx$.
18. Show that $\int_0^1 \frac{\log(1+x)}{1+x^2}dx = \frac{\pi}{8}\log 2$.
19. Integrate $\int \frac{x^2}{x^4 + x^2 + 1}\,dx$.
20. Determine $\int \frac{dx}{(x-2)\sqrt{3x^2 - 16x + 24}}$.
21. Evaluate $\int_0^{\pi/2} \frac{\sqrt{\tan x}}{\sqrt{\tan x} + \sqrt{\cot x}}dx$.
22. Evaluate $\int \left\{\frac{1}{\log x} - \frac{1}{(\log x)^2}\right\}dx$.
23. Integrate $\int_0^{\pi/2} \ln \sin x\,dx$.
24. Integrate $\int_0^1 \frac{\ln(1+x)}{1+x^2}\,dx$.
25. Determine the area included between the parabola $y^2 = x$ and the circle $x^2 + y^2 = 2x$.
26. Find the area enclosed by $y = 4x - 1$ and $y^2 = 2x$.
27. Find the area of the portion of the ellipse $\frac{x^2}{12} + \frac{y^2}{16} = 1$ bounded by the major axis and the double ordinate x = 3.
28. Determine the area of the region between the curve $y = \cos x$ and $y = \sin x$ bounded by $x = 0$.
29. Find the particular solutions of the differential equations $\frac{d^2y}{dx^2} = 6x$ given by y = 1 and $\frac{dy}{dx} = 2$ when x = 0.

30. Solve $(1 + y^2)dx + xdy = \tan^{-1}ydy$.

31. Solve $\frac{dy}{dx} + \frac{y}{x} = xy^2$.

32. Solve $\left(x + 2y^3\right)\frac{dy}{dx} = y$.

33. Solve $\left(x + y + 1\right)\frac{dy}{dx} = 1$.

34. Solve $\frac{dy}{dx} = \frac{y - x + 1}{y + x + 5}$.

35. Solve $(4x + 6y + 5)dx - (2x + 3y + 4)dy = 0$.

Vectors and Three – Dimensional Geometry

Vectors

1. Three vectors of magnitude a, 2a and 3a act along the diagonals of three adjacent faces OABC, OCDG, OAFG of a cube. Find their sum and its direction cosines.
2. Prove by vector method that altitudes of a triangle are concurrent.
3. Prove by vector method that median to the base of an isosceles triangle is perpendicular to the base.
4. Prove by vector method that measure of the angle between two diagonals of a cube is $\cos^{-1}\frac{1}{3}$.
5. Prove by vector method that in any triangle ABC, $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$.
6. If $\vec{a} = 2\hat{i} + \hat{k}, \vec{b} = \hat{i} + \hat{j} + \hat{k}$ & $\vec{c} = 4\hat{i} - 3\hat{j} + 7\hat{k}$ then find the vector $\vec{r}$ which satisfies $\vec{r} \times \vec{b} = \vec{c} \times \vec{b}$ *and* $\vec{r} \cdot \vec{a} = 0$.
7. Prove by vector method that in a triangle ABC, $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$.
8. If $\vec{a}, \vec{b}, \vec{c}$ are mutually perpendicular vectors of equal magnitude prove that $\vec{a} - b - \vec{c}$ is equally inclined to $\vec{b}$ & $\vec{c}$.
9. If the vertices A, B, C of a triangle ABC are at (1, 1, 20, (2, 2, 3) and (3, -1, -1) respectively, then using vector method, find the area of the triangle.
10. Prove that $\left[\vec{a} \times \vec{b}\ \vec{b} \times \vec{c}\ \vec{a} \times \vec{c}\right] = \left[\vec{a}\ \vec{b}\ \vec{c}\right]^2$.
11. Show that $\vec{a}, \vec{b}$ *and* $\vec{c}$ are coplanar iff $\vec{a} + \vec{b}, \vec{b} + \vec{c}$ *and* $\vec{c} + \vec{a}$ are coplanar.

Three-dimensional Geometry

1. A line makes angles α, β, γ, δ with the four main diagon of a cube. Prove that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = \frac{4}{3}$.
2. Prove that the lwo lines whose direction cosines are connected by the equations l + 2m + 3n = 0, 3lm – 4ln + mn = 0 are perpendicular to each other.
3. Show that th measure of the angles between the four diagonals of a rectangular parallelepiped whose edges are a, b, c are $\cos^{-1}\left(\frac{a^2 \pm b^2 \pm c^2}{a^2 + b^2 + c^2}\right)$.

4. Find the shortest distances between the following two lines:
$\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}; \frac{x-2}{3}=\frac{y-4}{4}=\frac{z-5}{5}$. Find also the equations of the line of shortest distance.
5. Find the distance of the point (3, -4, 5) from the plane 2x + 5y – 6z -19 = 0 measured parallel to the line $\frac{x-1}{2}=\frac{y}{1}=\frac{z+3}{-2}$.
6. Find the image of the point (3, 5, 7) with respect to the plane 2x + y + z = 6.
7. Find the foot of the perpendicular drawn from the point (5, 7, 3) to the line $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$. Find the length of the perpendicular and its equation.
8. Find the equation of the line given by the pair of equations x – y + z + 1 = 0 and x – 2y + z + 1 = 0 in symmetrical form.
9. Prove that the line joining (1, 2, 3) and (2, 1, -1) intersect the line joining (-1, 3, 1) and (3, 1, 5).
10. Find the equation of line passing through the point (1, 0, -1) and intersecting the lines x = 2y = 2z; 3x + 4y – 1 = 0 = 4y + 5z – 2.

Linear Programming

1. Solve the following LPP graphically,
Optimize z = 20x + 40y
Subject to 6x – y ≥ -6
x + 4y ≥ 8
2x + y ≥ 4
x , y ≥ 0
2. Solve the following LPP graphically,
Minimize z = 6x + 9y
Subject to x + 12y ≤ 65
7x - 2y ≤ 25
2x + 3y ≥ 10
x , y ≥ 0
3. Solve the following LPP graphically,
Maximize z = 14x - 4y
Subject to x + 12y ≤ 65
7x - 2y ≤ 25
2x + 3y ≥ 10
x , y ≥ 0
Also find two other points which maximize z.
4. Solve the following LPP graphically method
Minimize z = x + 3y
Subject to x + 2y ≥ 2
3x + y ≥ 3
4x + 3y ≥ 6
x , y ≥ 0
5. A company produces three types of cloth A, B and C. Three kinds of wool, say red, green and blue are required for the cloth. One unit length of type A cloth needs 2 metres of red and 3 metres of blue wool, one unit of length of B cloth needs 3 metres of red, 2 metres of green and 2 metres of blue wool and one unit length of type C cloth needs 5 metres of green and 4 metres of blue wool. The firm has a stock of only 80 metres of red, 100 metres of green and 150 metres of blue wool. Assuming that income obtained from one unit length of cloth is Rs. 30, Rs. 50 and Rs. 40 of types A, B and C respectively. Formulate the LPP so as to maximize income.

Probability

1. If a pair of dice is thrown thrice then find the mean & the variance of the number of doublets.
2. Two cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the probability distribution of the number of kings. Also determine the mean and the variance of the number of kings.
3. State and prove Bayes theorem.
4. There are two bags B_1 and B_2 containing 4 red, 3 black balls and 2 red, 4 black balls respectively. If the ball drawn from a bag selected at random, is red, find the probability that the ball is drawn from the bag B_1.
5. Four cards are drawn successively from a well-shuffled pack of 52 cards with replacement after each draw. Find the probability that
   (i) all four cards are diamonds
   (ii) only two cards are diamonds
   (iii) none is a diamond.
6. A box containing 20 electric bulbs includes 5 defective bulbs. Four bulbs are drawn at random with replacement. Find the probability distribution of the number of non-defective bulbs. Calculate also the mean and the variance.
7. A man is known to speak the truth 3 out of 5 times. He throws a die and report that it is 1. Find the probability that it is actually 1.
8. From a lot of 10 bulbs which includes 3 defectives, a sample of 2 bulbs is drawn at random. Find the probability distribution of number of defective bulbs also determine the man.
9. A speaks the truth is 80% of cases and B in 70% of the cases. In what percentage of cases they are likely to contradict each other in reporting the same fact.
10. Find the probability distribution of total number of heads obtained in 4 tosses of a balanced coin & also find the mean.

****

Question Bank
Council of Higher Secondary Education, Odisha

Botany

Class - XII
SEXUAL REPRODUCTION IN FLOWERING PLANTS
Group – A

1. The term used for transfer of pollen grains from anthers of one plant to stigma of a different plant which, during pollination, brings genetically different types of pollen grains to stigma, is:
(a) Cleistogamy
(b) Xenogamy
(c) Geitonogamy
(d) Chasmogamy

2. A typical angiosperm embryo sac at maturity is :
(a) 8-nucleate and 8-celled
(b) 8-nucleate and 7-celled
(c) 7-nucleate and 8-celled
(d) 7-nucleate and 7-celled

3. In water hyacinth and water lily pollination takes place by
(a) water currents only
(b) wind and water
(c) insects and water
(d) insects or wind

4. The body of the ovule is fused within the funicle at
(a) micropyle
(b) nucellus
(c) chalaza
(d) hilum

5. In some plants thalamus contributes to fruit formation. Such are termed as
(a) false fruit
(b) aggregate fruit
(c) true fruit
(d) parthenocarpic fruit

6. Which of the following is incorrect for wind pollinated plants?
(a) Well exposed stamens and stigma
(b) Many ovules in each ovary
(c) Flowers are small and not brightly coloured
(d) Pollen grains are light and non-sticky

7. Which is the most common type of embryo sac in angiosperms?
(a) Tetrasporic with one mitotic stage of divisions
(b) Monosporic with three sequential mitotic divisions
(c) Monosporic with two sequential mitotic divisions
(d) Bisporic with two sequential mitotic divisions

8. The process of removal of anther from the flower bud before it dehisces is called as
(a) emasculation
(b) bagging
(c) embryo rescue
(d) budding

9. What is the fate of the male gametes discharged in the synergid?
(a) All fuse with the egg
(b) One fuses with the egg, other (s) fuse (s) with synergid nucleus
(c) One fuses with the egg and other fuse with central cell nuclei
(d) One fuses with the egg other (s) degenerate (s) in the synergid

10. Which one of the following statements regarding post-fertilisation development in flowering plants is incorrect?
(a) Zygote develops into embryo
(b) Central cell develops into endosperm
(c) Ovules develop into embryo sac
(d) Ovary develops into fruit

11. The cross pollination within the same species is also called
(a) Hybridization
(b) Xenogamy
(c) Allogamy
(d) Autogamy

12. During fertilization male gametes are carried by pollen tube. This is called:
(a) Syngamy
(b) Mesogamy
(c) Polygamy
(d) Siphonogamy

13. In Angiosperms, the common type of ovule is :
(a) Anatropous
(b) Orthotropous
(c) Hemianatropous
(d) Campylotropous

14. In a recently fertilized ovule, the haploid, diploid and triploid conditions are respectively seen in
(a) Endosperm, Nucellus, Egg
(b) Egg, Nucellus, Endosperm
(c) Antipodals, Oospore, Primary Endosperm Nucleus
(d) Polar Nuclei, secondary nucleus, Endosperm

15. In sunflower, self pollination is avoided by
(a) Protogyny
(b) Unisexuality
(c) Self sterility
(d) Protandry

16. Sexual reproduction leads to :
(a) Polyploidy
(b) Recombination

(c) Apomixis

(d) Parthenogenesis

17. In an embryo sac, the cells that degenerate after fertilization are :
(a) Synergids and primary endosperm cell
(b) Synergids and antipodals
(c) Antipodals and primary endosperm cell
(d) Egg and antipodals.

18. While planning for an artificial hybridization programme involving dioecious plants, which of the following steps would not be relevant:
(a) Bagging of female flower
(b) Dusting of pollen on stigma
(c) Emasculation
(d) Collection of pollen

19. In the embryos of a typical dicot and a grass, true homologous structures are :
(a) Coleorhiza and coleoptile
(b) Coleoptile and scutellum
(c) Cotyledons and scutellum
(d) Hypocotyl and radicle.

20. The phenomenon observed in some plants wherein parts of the sexual apparatus is used for forming embryos without fertilization is called:
(a) Parthenocarpy
(b) Apomixis
(c) Vegetative propagation
(d) Sexual reproduction.

21. In a flower, if the megaspore mother cell forms megaspores without undergoing meiosis and if one of the megaspores develops into an embryo sac, its nuclei would be :
(a) Haploid
(b) Diploid
(c) A few haploid and a few diploid
(d) With varying ploidy

22. The phenomenon wherein, the ovary develops into a fruit without fertilization is called:
(a) Parthenocarpy
(b) Apomixis

(c) Asexual reproduction

(d) Sexual reproduction

ANSWER

Q. No.	Key	Q. No.	Key	Q. No.	Key
1	**B**	9	**C**	17	**B**
2	**B**	10	**C**	18	**C**
3	**D**	11	**B**	19	**C**
4	**D**	12	**D**	20	**B**
5	**A**	13	**A**	21	**B**
6	**B**	14	**C**	22	**A**
7	**B**	15	**D**		
8	**A**	16	**A**		

Answer the followings by changing the underlines words.

(i) Development of Pollen grain from microsporogenous tissue is known as male gametophyte.

(ii) Close end of ovule is micropyle.

(iii) Entry of Pollen tube through chalazal end is porogamy.

(iv) Seed develops from ovary.

(v) Remnant of nucellus is known as tapetum.

Answers:

(i) Microsporogenesis

(ii) Chalaza

(iii) Chalazogamy/Basigamy

(iv) Ovule

(v) Perisperm

Write the answer in one word:

(a) Opening of ovule

(b) Nutritive tissue supply food to ovule

(c) Nutritive tissue supply food for development of Pollen grain.

(d) Combination of egg &synergids.

(e) Pollination by wind.

(f) Pollination by bat.

Answers:

(a) Micropyle

(b) Placenta

(c) Tapetum

(d) Egg apparatus

(e) Anemophily

(f) Chiropterophily

Group - B

1. Write notes on the following in 2 to 5 important point.
   (a) Self sterility
   (b) Entomophily
   (c) Embryo Sac
   (d) Embryo
   (e) Polyembryony
   (f) Apomixis
   (g) Self Incompatibility
   (h) Self pollination
   (i) Parthenocarpy
   (j) Endosperm
   (k) Structure of pollen grain
   (l) Dichogamy
   (m) Tapetum
   (n) Triple Fusion
2. Differentiate between the following within 3 to 4 important point
   (a) Zoophily and Anemophily
   (b) Double fertilization and Triple fusion
   (c) Microsporogeneis and microgametogenesis

(d) Monocot& Dicot embryo
(e) Pollination and fertilization
(f) Self pollination and cross pollination
(g) Gamete and zygote
(h) Parthenogenesis and Pantherocarpy
(i) Cleistogamy and Herkogamy
(j) Coleoptile and Coleorrhiza
(k) Perisperm and Pericarp

Group – C

1. Explain double fertilization and triple fusion in angiosperm.
2. What is pollination? Describe the contrivances / adaptations (out breeding division) of cross pollination
3. Describe the development of male gametophyte in angiosperms
4. Describe the development of female gametophyte in angiosperms
5. Describe different types of agents with adaptations of flowers for cross pollination.
6. Briefly explain the pattern of development of monosporic type of Embryo sac.

***

PRINCIPLES OF INHERITANCE

Group – A

1. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits?

(a) 2
(b)14
(c) 8
(d) 4

2. Identify the indirect statement with reference to the gene 'I' controls ABO blood groups.

(a) A person will have only two of the three alleles
(b) When I^A and I^B are present together, they express same type of sugar
(c) Allele 'I' does not produce any sugar
(d) The gene (I) has three alleles

3. The number of contrasting characters studied by Mendel for his experiments was

(a) 14
(b) 4
(c) 2
(d) 7

4. The best example for pleiotropy is

(a) skin colour
(b) phenylketonuria
(c) colour blindness
(d) ABO blood group

5. Match the following columns and choose the correct option from the codes given below.

Column-I	**Column-II**
A. Pleiotropic gene	**1.** Both alleles express equally
B. Codominance	**2.** Change in nucleotides

C. Epistasis

D. Mutation

3. One gene shows multiple phenotypic expression

4. Non-allelic gene inheritance

Codes

	A	B	C	D
(a)	1	2	3	4
(b)	2	3	4	1
(c)	3	1	4	2
(d)	1	3	4	2

6. The production of gametes by the parents, the formation of zygotes, the F_1 and F_2 plants, can be understood using

(a) pie diagram

(b) a pyramid diagram

(c) Punnett square

(d) Venn diagram

7. In *Antirrhinum* (snapdragon), a red flower was crossed with a white flower and in F_1-generation, pink flowers were obtained. When pink flower were selfed, the F_2-generation showed white, red and pink flowers.

Choose the incorrect statement from the following:

(a) Pink colour in $F_1$is due to incomplete dominance

(b) Ratio of F_2 is 1/4 (Red) : 2/4 (Pink) : 1/4 (White)

(c) Law of segregation does not apply in this experiment

(d) This experiment does not follow the principle of dominance

8. Which one of the following pairs is incorrectly matched?

(a) XO type sex-determination	-	Grasshopper
(b) ABO blood grouping	-	Codominance
(c) Starch synthesis in pea	-	Multiple alleles
(d) TH Morgan	-	Linkage

9. Select the correct statement.

(a) Spliceosomes take part in translation

(b) Punnett square was developed by a British scientist

(c) Franklin Stahl coined the term 'linkage'

(d) Transduction was discovered by S Akman

10. Which of the following characteristics represents 'inheritance of blood groups' in humans?

1. Dominance

2. Codominance

3. Multiple allele

4. Incomplete dominant

Polygenic inheritance

Choose the correct option:

(a) 2, 1 and 5

(b) 1, 2 and 3

(c) 2, 3 and 5

(d) 1, 3 and 5

11. AB blood group shows

(a) Codominance

(b) incomplete dominance

(c) polygenic inheritance

(d) pleiotropy

12. In pea plants, green pod colour is dominant over yellow pods. 1000 seeds taken from a pea plant on germination produce 760 green pod and 210 yellow pod plants. The parental genotype and phenotype of the seed plant are

(a) heterozygous and yellow

(b) heterozygous and green

(c) homozygous and yellow

(d) homozygous and green

13. Which one from those given below is the period of Mendel's hybridization experiments?

(a) 1856-1863

(b) 1840-1850

(c) 1857-1869

(d) 1870-1877

14. The genotypes of a husband and wife are and one among the blood types of their children, how many different genotypes and phenotypes are possible?

(a) 3 genotypes, 3 phenotypes

(b) 3 genotypes, 4 phenotypes

(c) 4 genotypes, 3 phenotypes

(d) 4 genotypes, 4 phenotypes

15. If two people with AB blood group marry and have sufficient large number of children, these children could be classified as A blood group, AB blood group and B blood group in 1 : 2 : 1 ratio.Modern technique of protein electrophoresis reveals the presence of both A and B type proteins in AB blood group individuals. This is an example of

(a) codominance

(b) incomplete dominance

(c) partial dominance

(d) complete dominance

16. A true breeding plant is

(a) one that is able to breed on its own

(b) produced due to cross-pollination among unrelated plants

(c) homozygous and produces offspring of its own kind

(d) always homozygous recessive in its genetic constitution

17. A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F_1 plants were selfed the resulting genotypes were in the ratio of :

(a) 1 : 2 : 1 :: Tall heterozygous : Tall homogenous Dwarf

(b) 3 : 1 :: Tall : Dwarf

(c) 3 : 1 :: Dwarf : Tall

(d) 1 : 2 : 1 :: Tall homogenous : Tall heterogenous : Dwarf

18. Match the terms in column I with their description in Column II and choose the correct option.

Column-I	**Column-II**
A. Dominance	**1.** Many genes govern a single character

B. Codominance

C. Pleiotropy

D. Polygenic inheritance

2. In a heterozygous organism, only one allele expresses itself

3. In a heterozygous organism, both alleles express themselves fully

4. A single gene influences many characters

Codes:

	A	B	C	D
(a)	2	3	4	1
(b)	4	1	2	3
(c)	4	3	1	2
(d)	2	1	4	3

19. Chromosomal theory of inheritance was proposed by

(a) Sutton and Boveri

(b) Bateson and Punnett

(c) TH Morgan

(d) Watson and Crick

20. Experimental verification of the chromosomal theory of inheritance was done by

(a) Sutton

(b) Boveri

(c) Morgan

(d) Mendel

21. To make chromosomal studies easier, chromosomes are classified into certain groups. So, the chromosome number 21, 22 and Y are listed in

(a) A

(b) D

(c) E

(d) G

22. What map unit (centimorgan) is adopted in the construction of genetic maps?

(a) A unit of distance between two expressed genes representing 100% crossover

(b) A unit of distance between genes on chromosomes, representing 1 % crossover

(c) A unit of distance between genes on chromosomes, representing 50% crossover

(d) A unit of distance between two expressed genes representing 10% crossover

23. The frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes was explained by

(a) Gregor J Mendel

(b) Alfred Sturtevant

(c) Sutton -Boveri

(d) TH Morgan

24. The production of gametes by the parents, formation of zygotes, the F_1 and F_2 plants, can be understood from a diagram called:

(a) Net square

(b) Bullet square

(c) Punch square

(d) Punnett square

25. Given below are two statements:

Statement I: Mendel studied seven pairs of contrasting traits in pea plants and proposed the Laws of Inheritance

Statement II: Seven characters examined by Mendel in his experiment on pea plants were seed shape and colour, flower colour, pod shape and colour, flower position and stem height.

In the light of the above statements, choose the **correct** answer from the options given below:

(*a*) Both **Statement I** and **Statement II** are incorrect.

(*b*) **Statement I** is correct but **Statement II** is incorrect.

(*c*) **Statement I** is incorrect but **Statement II** is correct.

(*d*) Both **Statement I** and **Statement II** are correct.

ANSWER

Q. No.	Key	Q. No.	Key	Q. No.	Key
1	B	10	B	19	A
2	B	11	A	20	C
3	D	12	B	21	D
4	B	13	A	22	B
5	C	14	C	23	B
6	C	15	A	24	D
7	C	16	C	25	B
8	C	17	D		
9	B	18	A		

Answer the following questions by changing the underlined words.

(a) Phenotypic and genotypic ratio in monohybrid test cross is 3 : 1.

(b) When F_1 hybrid crosses to both the parent is known as reciprocal cross.

(c) Accepted law of Mendel is Law of dominance.

(d) If the genotype is AaBbCc then it will produce six different types of gametes.

(e) Father of Modern Genetics is Mendel.

Answers:

(a) 1 : 1

(b) Back cross

(c) Law of Segregation

(d) 8

(e) Bateson

Fill in the blanks.

(a) Mendel's laws of inheritance were first published in_____ and rediscovered in_____

(b) A trait that always appears in two contrasting conditions is called a_____ trait.

(c) A breeding experiment dealing with a single trait is called a_____ cross.

(d) An organism in which both the genes for a character are similar is known as_____

(e) Mendel noted _____pairs of contrasting traits in pea plants.

(f) A_____ cross illustrates the principle of Independent assortment.

(g) An allele of T is_____

(h) Monohybrid cross in F_2 generation yields _____ types of phenotype.

(i) Monohybrid cross in F_2 generation yields _____ types of genotype.

(j) Dihybrid cross in F_2 generation yields _____ number of phenotypes.

(k) Dihybrid cross in F_2 generation yields _____ number of genotypes.

(l) Genotype of a plant showing the dominant phenotype can be determined by _____ cross.

(m) In a cross between AaBB and aaBB, the genotypic ratio in F_1 generation will be _____

(n) The experimental plant material used by Mendel was _____

Answers:

(a) 1866, 1900
(b) Contrasting
(c) Monohybrid
(d) Homozygous (pure)
(e) Seven
(f) Dihybrid
(g) 't'
(h) Dominant
(i) Heterozygous (hybrid)
(h) two
(i) three
(j) four
(k) nine
(l) test
(m) 1:1
(n) *Pisumsativum*

Write one word answer for the following statements.

(a) Alternating form of gene present in homologous chromosome.

(b) Study about heredity and variation

(c) Morphological appearance of organisms

(d) Identical allele in homologous chromosome

(e) Many gene control one character.

Answers:

(a) Allele or Allelomorph
(b) Genetics
(c) Phenotype
(d) Homozygous
(e) Polygene

Correct the statement of each bit, if necessary changing the underlined word only:

1. The process of transfer of characters through generation is known as variation.

2. In Mendel's monohybrid cross, the dwarf phenotype is alwayshomozygous.

3. In Mendel's dihybrid cross in F_2 generation nine phenotypes are produced.

4. The phenomenon of linkage disproved the principle of independent assortment.

5. In a text cross, always dominant parent is used.

6. The distance between genes in a constructed gene map is expressed as Mendel unit.

7. Multiple alleles occupy the different locus on a chromosome.

8. There is crossing over between the members of a multiple alleles group.

Group - B

1. Write notes on the following in 2 to 5 valid & relevant point.
   (a) Law of segregation
   (b) Law of dominance
   (c) law of independent assortment
   (d) multiple alleles
   (e) Co-dominance
   (f) Recombination
   (g) pleiotropy
   (h) genes
   (i) Chromosome theory of inheritance
2. Differentiate between the following with 3 to 4 important point
   (a) Homozygous& Heterozygous
   (b) Genotype & Phenotype
   (c)Test cross & Back Cross
   (d) Qualitative and Quantitative inheritance
   (e) Codominance and Incomplete dominance
   (f) Monohybrid and Dihybrid cross

Group – C

1. Describe Mendel's dihybrid cross with a cheker board.
2. Describe Mendel's monohybrid cross and explain the law derived from it.
3. State and explain Mendel's laws of inheritance.

***

MOLECULAR BASIS OF INHERITANCE

Group - A

1. In a DNA strand the nucleotides are linked together by:
   (a) glycosidic bonds
   (b) phosphodiester bonds
   (c) peptide bonds
   (d) hydrogen bonds

2. A nucleoside differs from a nucleotide. It lacks the:
   (a) base
   (b) sugar
   (c) phosphate group
   (d) hydroxyl group

3. Both deoxyribose and ribose belong to a class of sugars called:
   (a) Trioses
   (b) hexoses
   (c) pentoses
   (d) polysaccharides

4. The fact that a purine base always pairs through hydrogen bonds with a pyrimidine base in the DNA double helix leads to:
   (a) the antiparallel nature

(b) the semiconservative nature
(c) uniform width throughout the DNA
(d) uniform length in all DNA

5. The net electric charge on DNA and histones is:
(a) both positive
(b) both negative
(c) negative and positive respectively
(d) zero

6. The promoter site and the terminator site for transcription are located at:
(a) 3' (downstream) end and 5' (upstream) end respectively of the transcription unit
(b) 5' (upstream) end and 3' (downstream) end respectively of the transcription unit
(c) the 5' (upstream) end
(d) the 3' (downstream) end

7. Which of the following statements is the most appropriate for sickle cell anemia?
(a) It cannot be treated with iron supplements
(b) It is a molecular disease
(c) It confers resistance to acquiring malaria
(d) All of the above

8. Which of the following is true with respect to AUG?
(a) It codes for methionine only
(b) It is an initiation codon
(c) It codes for methionine in both prokaryotes and eukaryotes
(d) All of the above

9. The first genetic material might be:
(a) protein
(b) carbohydrates
(c) DNA
(d) RNA

10. With regard to mature mRNA in eukaryotes:
(a) exons and introns do not appear in the mature RNA
(b) exons appear but introns do not appear in the mature RNA
(c) introns appear but exons do not appear in the mature RNA
(d) both exons and introns appear in the mature RNA

11. The human chromosome with the highest and least number of genes in them are respectively:
(a) Chromosome 21 and Y
(b) Chromosome 1 and X
(c) Chromosome 1 and Y
(d) Chromosome X andY

12. Who amongst the following scientists had no contribution in the development of the double helix model for the structure of DNA?
(a) Rosalind Franklin
(b) Maurice Wilkins
(c) Erwin Chargaff
(d) Meselson and Stahl

13. DNA is a polymer of nucleotides which are linked to each other by 3'-5' phosphodiester bond to prevent polymerization of nucleotides, which of the following modifications would you choose?
(a) Replace purine with pyrimidine
(b) Remove/Replace 3' OH group in deoxyribose
(c) Remove/ Replace 2-OH group with some other group in deoxyribose

(d) Both 'b' and *'c'*

14. Discontinuous synthesis of DNA occurs in one strand, because:
(a) DNA molecule being synthesized is very long
(b) DNA dependent DNA polymerase catalyzespolymerization only in one direction (5'-3')
(c) It is a more efficient process
(d) DNA ligase joins the short stretches of DNA

15. Which of the following steps in transcription is catalyzed by RNA polymerase?
(a) Initiation
(b) Elongation
(c) Termination
(d) All of the above

16. Control of gene expression in prokaryotes take place at the level of:
(a) DNA replication
(b) Transcription
(c) Translation
(d) None of the above

17. Which of the following statements is correct about the role of regulatory proteins in transcription in prokaryotes?
(a) They only increase expression
(b) They only decrease expression
(c) They interact with RNA polymerase but do not affect the expression
(d) They can act both as activators and as repressors

18. Which was the last human chromosome to be completely sequenced ?
(a) Chromosome 1
(b) Chromosome 11
(c) Chromosome 21
(d) Chromosome X

19. Which of the following are the functions of RNA?
(a) It is a carrier of genetic information from DNA to ribosomes synthesizing polypeptides.
(b) It carries amino acids to ribosomes.
(c) It is a constituent component of ribosomes.
(d) All of the above.

20. While analyzing the DNA of an organism a total number of 5386 nucleotides were found out of which the proportion of different bases were: Adenine = 29%, Guanine = 17%, Cytosine = 32%, Thymine = 17%.
Considering the Chargaff as rule it can be concluded that:
(a) It is a double stranded circular DNA
(b) It is single stranded DNA
(c) It is a double stranded linear DNA
(d) No conclusion can be drawn

21. In some viruses, DNA is synthesized by using RNA as template. Such a DNA is called:
(a) A-DNA
(b) B-DNA
(c) c-DNA
(d) r-DNA

22. If Meselson and Stahl's experiment is continued for four generations in bacteria, the ratio of N15/N14: N15/N14: N14/N14 containing DNA in the fourth generation would be:
(a) 1:1:0
(b) 1:4:0
(c) 0:1:3

(d) 0:1:7

23. If the sequence of nitrogen bases of the coding strand of DNA in a transcription unit is: 5'-ATGAATG-3', the sequence of bases in its RNA transcript would be;
(a) 5'-AUGAAUG-3'
(b) 5'-UACUUAC-3'
(c) 5'-CAUUCAU-3'
(d) 5'-GUAAGUA-3'

24. The RNA polymerase holoenzyme transcribes:
(a) the promoter, structural gene and the terminator region
(b) the promoter and the terminator region
(c) the structural gene and the terminator region
(d) the structural gene only.

25. If the base sequence of a codon in mRNA is 5'-AUG-3', the sequence of t-RNA pairing with it must be:
(a) 5'-UAC-3'
(b) 5'-CAU-3'
(c) 5'-AUG-3'
(d) 5'-GUA-3'

26. The amino acid attaches to the t-RNA at its:
(a) 5'-end
(b) 3'-end
(c) Anticodon site
(d) DHU loop

27. To initiate translation, the mRNA first binds to:
(a) The smaller ribosomal sub-unit
(b) The larger ribosomal sub-unit
(c) The whole ribosome
(d) No such specificity exists.

28. In *E.coli,* the lac operon gets switched on when:
(a) lactose is present and it binds to the repressor
(b) repressor binds to operator
(c) RNA polymerase binds to the operator
(d) lactose is present and it binds to RNA polymerase

29. Which of the following is a correct sequence of steps in a PCR (Polymerase Chain Reaction) ?
(a) Annealing, Denaturation, Extension
(b) Denaturation, Annealing, Extension
(c) Denaturation, Extension, Annealing
(d) Extension, Denaturation, Annealing

30. Complete the flow chart on central dogma.
(a) (a)-Transduction; (b)-Translation; (c)-Replication; (d)-protein
(b) (a)-Replication; (b)-Transcription; (c)-Transduction; (d)-protein
(c) (a)-Translation; (b)-Replication; (c)-Transcription; (d)-Transduction
(d) (a)-Replication; (b)-Transcription; (c)-Translation; (d)-protein

ANSWER

Q. No.	Key	Q. No.	Key	Q. No.	Key
1	B	11	C	21	C
2	C	12	D	22	D

3	C	13	B	23	A
4	C	14	B	24	C
5	C	15	B	25	B
6	B	16	B	26	B
7	D	17	D	27	A
8	D	18	A	28	A
9	D	19	D	29	B
10	B	20	B	30	D

Answer the followings by changing the underlined words.

(a) Smallest unit of gene is cistron

(b) Kornberg Enzyme is DNA Polymerase-III.

(c) m-RNA is known as soldier of the cell.

(d) Knicking and resealing enzyme is unwindase

(e) Initiation codon + stop codon is known as Nonsense codon

(f) Griffith proposed the double helical structure of DNA.

(g) A nucleoprotein is building block of all nucleic acids.

(h) In B DNA the helical turns are left handed.

(i) The term transforming principle was proposed by Avery.

(j) The enzyme, ligase is responsible for transcription.

(k) The enzyme gyrase is responsible for synthesis of new DNA stand on template DNA.

Answers:

(a) Muton

(b) DNA polymerase-I

(c) t-RNA

(d) Topoisomerase

(e) Punctuation codon

(f) James Watson and Francis Crick

(g) Nucleotide

(h)Z- DNA

(i) Fredric Griffith

(j)DNA dependent RNA polymerase

(k)DNA polymerase

Write the answer in one technical word.

(a) The biosynthesis process of proteins.

(b) Sites of protein synthesis.

(c) Acts as a carrier of genetic information from the nucleus to the ribosomes for the synthesis of proteins.

(d) During protein synthesis, the phase in which each of the 20 amino acids is covalently attached to a specific t-RNA.

(e) The process of synthesis of mRNA from DNA.

(f) Triplets of bases on DNA.

(g) Triplets of bases on mRNA.

(h) Triplets of bases on t-RNA

(i) Charging of t-RNA *is* catalyzed by enzyme.

(j) Primer producing enzyme

(k) Enzyme responsible for polymerization of DNA

(l) Fragments of DNA formed in the lagging strand

(m) Synthesis of protein from DNA via RNA

(n) Functional unit of gene

(o) Non-coding sequence of DNA

Answers:

(a) Translation
(b) Ribosomes
(c) m-RNA
(d)charging of t-RNA
(e) Transcription
(f) Codogen
(g) Codon
(h) Anticodon
(i) Aminoacyl t-RNA
(j)RNA primase
(k)DNA polymerase
(l) Okazaki fragments
(m) Central dogma
(n) Cistron
(o) Intron

Correct the statement of each bit, if necessary changing the underlined word only:

1. The coding sequences in between the DNA are called introns.
2. The non coding sequences are called exons.
3. Mendel and Griffithproposed the double helical structure of DNA.
4. Mendel proposed the transforming principle.
5. A-site in prokaryotes only accepts t-RNA met.
6. Avery, MC Carty and Macleod experimentally proved that the transforming principle is a protein.

Answer:

1. Exons
2. Intron

3.James Watson and Francis Crick

4.Fredric Griffith

5. P-site

6. DNA

Fill in the blanks.

(a) Protein synthesis is translation of_____
(b) Information in DNA in the nucleus is transferred to the ribosomes by_____
(c) A sequence of three nucleotides in DNA corresponds to the_____
(d) The synthesis of RNA on DNA template is called_____
(e) Transcription begins when_____ binds to a promoter site.
(f) Elongation of RNA polynucleotide chain always takes place in_____direction with new nucleotide always added at_____
(g) Termination signals on DNA template during formation of mRNA, lies in the region rich in_____
(h) Each codon on mRNA consists of_____
(i) Activation of amino acids during protein synthesis requires_____
(j) Aminoacyl synthetase enzyme takes part in_____
(k) Peptidyl and aminoacyl sites are associated with_____
(l) The first t-RNA that is brought to the initiating codon is always_____
(m) _____ codons are not recognized by any aminoacyl t-RNA.
(n) The major function of mRNA is to_____
(o) In protein synthesis, the codon used as a start signal is_____
(p) To identify criminals DNA _____ is done.
(q) The enzyme _____ hydrolyses DNA molecules.
(r) The enzyme _____ helps to join nucleotides.
(s) The segment of DNA that expresses specific character is called _____.

Answers:
(a)genetic code
(b)mRNA
(c) three nucleotides in mRNA
(d) transcription
(e)RNA polymerase
(f) 5'-3'direction and 3' end
(g) GC
(h) three nucleotides
(i) ATP
(j)activation of amino acid
(k) 70S subunit of ribosome
(l) t-RNA met-f
(m) UAA, UAG, UGA
(n)transfer genetic information into protein
(o) AUG
(p)DNA finger printing

(q) Nucleases
(r)ligase
(s)gene

Group – B

1. Write notes on the following in 2 to 5 valid and relevant point
(i)t-RNA
(ii)m-RNA
(iii)r-RNA
(iv) Split gene
(v) Central dogma
(vi) RNA- splicing
(vii) Genetic code
(viii) Nucleosome
(ix)Genetic code
(x) Transcription
(xi)Codon
(xii)Anticodon
(xiii)Translation
(xiv)Base pairing
(xv)Activation of amino acids
(xvi)Activation of ribosomes
(xvii)Role of nonsense codons in protein synthesis
(xviii) Flow of information in living organisms
(xix)Central dogma
(xx)Reverse transcription
(xxi) Operon
(xxii) HGP(Human Genome Project)
(xxiii) DNA – finger printing

2. Differentiate between the following with 3 to 4 important point

(a) Genes & Chromosomes
(b) DNA & RNA
(c) Exons & Introns
(d) Replication & Transcription
(e) Transcription & Translation
(f) Chromosomes and Chromatin
(g) m-RNA and t-RNA
(h) Codon and anti-codon
(i)Muton and Recon
(j)Replication and Transcription

Group – C

1. Describe double helical structure of DNA with a labeled diagram.
2. Explain an evidence of proof DNA as a genetic material
3. Explain the mechanism of translation in prokaryotes
4. Explain the mechanism of transcription in prokaryotes.
5. Describe the process of DNA replication

6. Explain gene regulation with the help of operon model
7. What do we mean by Genetic Code. Give properties of the genetic code.
8. List the various components of protein synthesis. Briefly outline the mode of protein synthesis in plants.
9. Describe in detail the process of translation in plants. Give appropriate diagrams wherever necessary.
10. Describe the mechanism of Replication of DNA in prokaryotes.
11. DNA as genetic material. Justify it.
12. What are three types of RNA molecules? How is each related to the concept of information flow?
13. What are major differences in protein synthesis in prokaryotes and eukaryotes?

***

MICROBES IN HUMAN WELFARE

Group - A

1. Removal of large pieces of floating debris, oily substances, etc, during sewage treatment called

(a) Primary treatment

(b) Secondary treatment

(c) Final treatment

(d) Amplification

2. During Biogas production, species used to bring about anaerobic digestion are of

(a) Sacchharomyces

(b) Pseudomonas

(c) Rhizopus

(d)Methanococcus

3. The microorganism used to produce enzyme pectinase is

(a) Saccharomyces

(b) Scrertiana

(c) Rhizopus

(d) Trichoderma

4. Which one of the following is free living bacterial biofertilizer?

(a) Azotobactor

(b)Scirotiana

(c) Rhizopus

(d) Bacillus thuringiensis

5. Which of the following is not an advantage of biogas?

(a) In burns with blue flame without smoke

(b) It helps to improve sanitation of the surroundings

(c) It is highly expensive

(d) It can be used for domestic lighting

6. Most commonly used substance for industrial production of beer is

(a) Barley

(b) Wheat

(c) Corn

(d) Sugarcane molasses

7. The vitamin whose content increases following the conversion of milk into curd by lactic acid bacteria is :

(a) digesters

(b) activated sludge

(c) chemicals

(d) oxidation pond

8. In olden days cheese was prepared by

(a) Aspergillus

(b) Rennet enzyme

(c) Clostridium bacteria

(d) None of the above

9. Which micro-organism is used in the formation of cheese

(a) Streptococcus

(b) Aspergillus

(c) Acetic acid bacteria

(d) Lactic add bacteria

10. Big holes in Swiss cheese are made by :

(a) a machine

(b) a bacterium that produces methane gas

(c) a bacterium producing a large amount of carbon dioxide

(d) a fungus that releases a lot of gases during its metabolic activities.

11. The residue left after methane production from cattle dung is :

(a) burnt

(b) burned in land fills

(c) used as manure

(d) used in civil construction.

12. Methanogens do not produce:

(a) oxygen

(b) methane

(c) hydrogen sulfide

(d) carbon dioxide

13. Activated sludge should have the ability to settle quickly so that it can :

(a) be rapidly pumped back from sedimentation tank to aeration tank

(b) absorb pathogenic bacteria present in waste water while sinking to the bottom of the settling tank

(c) be discarded and anaerobically digested

(d) absorb colloidal organic matter.

14. Match the items in Column 'A' and Column ' B' and choose correct answer.

Column A	**Column B**
(i)Ladybird	(a) Methano bacterium
(ii)Mycorrhiza	(b) *Trichoderma*
(iii) Biological control	(c) Aphids
(iv) Biogas	(d) *Glomus*

The correct answer is :

(a) (i) (b) (ii) (d) (iii) (c) (iv) (a)
(b) (i) (c) (ii) (d) (iii) (b) (iv) (a)
(c) (i) (d) (ii) (a) (iii) (b) (iv) (c)
(d) (i) (c) (ii) (b) (iii) (a) (iv) (d)

15. Conversion of milk to curd improves its nutritional value by increasing the amount of
(a) Vitamin B_{12}
(b) vitamin-A
(c) vitamin-D
(d) vitamin-E

16. *Azolla*is used as a biofertilizer because it
(a) has association of mycorrhiza
(b) Multiplies at faster rate to product; massive biomass
(c) has association of nitrogen-fixing *Rhizobium*
(d) has association of nitrogen-fixing cyanobacteria

17. Roquefort cheese is ripened by using a
(a) type of yeast
(b) fungus
(c) bacterium
(d) cyanobacteria

18. Which of the following is incorrect matched in the given table?

Microbes	Products	Applications
(a) Monascus purpureus	Statins	Lowering of blood cholesterol
(b) Streptococcus	Streptokinase	Removal of clot from blood vessel
(c) Clostridium	Lipase	Removal of oil stains butylicum
(d) Trichoderma Polysporum	Cyclosporin-A	Immunosuppressive drug

19. Match Column I with Column II and select the correct option using the codes given below:

Column-I	Column-II
A. Citric acid	1. *Trichoderma*
B. Cyclosporin	2. Clostridium
C. Statins	3. *Aspergillus*
D. Butyric acid	4. Monascus

Codes:
A B C D
(a) 3 1 2 4
(b)3 3 4 2
(c) 1 4 2 3
(d) 3 4 1 2

20. Which of the following is not used as a biopesticide?
(a) Bacillus *thurigiensis*
(b) *Xanthonomuscampestris*
(c) Nuclear Polyhedrosis Virus (NPV)
(d)*Trichodermaharzianum*

21. Which of the following in sewage treatment removes suspended solids?
(a) Tertiary treatment

(b) Secondary treatment
(c) Primary treatment
(d) Sludge treatment

ANSWER

Q. No.	Key	Q. No.	Key
1	A	12	A
2	D	13	A
3	B	14	B
4	A	15	A
5	B	16	D
6	D	17	B
7	C	18	C
8	B	19	B
9	D	20	B
10	C	21	C
11	C		

Answer the followings by changing the underlined words.

(a) The source of Acetic acid is Aspergillusniger
(b) VAM is seen in Ectomycorrhiza
(c) Swiss cheese is formed by the Fungi
(d) Antibiotics term was coined by Flemming
(e) Streptokinase produces from Yeast

Answers:

(a) Acetobacteracetii
(b) Endomycorrhiza
(c) Bacterium (propioni bacterium sharmanii)
(d) Waksman
(e) Streptococcus

Answer in one word.

(a) Bioactive molecule use as immunosupressive agent during organ transplantation.
(b) Association between higher plant root and fungi
(c) Enzyme removes oily stains in laundry
(d) Chemical retards the growth of bacteria
(e) Weeds control by fungal extracts

Answer:

(a) Cyclosporin-A

(b) Mycorrhiza

(c) Lipase

(d) Antibiotics

(e) Weedicide

Fill in the Blanks.

(a) Statins is produced by_____

(b) Clot buster is_____

(c) _____represent the amount of dissolved oxygen consumed by micro organisms growing due to sewage water

(d) _____ discovered the penicillin.

(e) Antibiotic term was given by_____

Answers:

(a) Monascus
(b) Streptokinase
(c) BOD
(d) Alexander Flemming
(e) Waksman

Group – B

1. Write notes on the following in 2 to 5 valid & relevant point

(a) Biopesticide
(b) Biofertilizer
(c) Microbes in industry
(d) Microbes in antibiotic production
(e) Microbes in sewage treatment
(f) Biogas.
(g) BOD
(h) Microbe in household

2. Differentiate between the following with 3 to 4 important point

(a)Symbiotic Nitrogen fixation &asymbiotic nitrogen fixation
(b) Chemical fertilizer and biofertilizer
(c) Ectomycorrhiza and Endomycorrhiza

***

Biotechnology and its application

Group – A

1. What is antisense technology?
   (a) When a place of RNA that is complementary in sequence is used to stop expression of a specific gene.
   (b) RNA polymerase producing DNA.
   (c) A cell displaying a foreign antigen used for synthesis of antigens.

(d) Production of somaclonal variants in tissue cultures.

2. Cry I endotoxins obtained from Bacillus thuringiensis are effective against
   (a) nematodes
   (b) bollworms
   (c) mosquitoes
   (d) flies
3. Human insulin is being commercially produced from a transgenic species of
   (a) Rhizobium
   (b) Saccharomyces
   (c) Escherichia
   (d) Mycobacterium
4. Which one of the following is commonly used in transfer of foreign DNA into crop plants?
   (a) Meloidogyne incognita
   (b) Agrobacterium tumefaciens
   (c) Penicilliumexpansum
   (d) Trichodermaharzianum
5. What is true about Bt toxin?
   (a) Bt protein exists as active toxin in the Bacillus.
   (b) The activated toxin enters the ovaries of the pest to sterilize it and thus prevent its multiplication.
   (c) The concerned Bacillus has antitoxins.
   (d) The inactive protoxin gets converted into active form in the insect gut.
6. Genetic engineering has been successfully used for producing
   (a) Transgenic mice for testing safety of polio vaccine before use in humans
   (b) Transgenic models for studying new treatments for certain cardiac diseases
   (c) Transgenic insect for pest control
   (d) Transgenic potato of more amount of starch
7. Bt cotton is not
   (a) a GM plant
   (b) insect resistant
   (c) a bacterial gene expressing system
   (d) resistant to all pesticides
8. C-peptide of human insulin is
   (a) a part of mature insulin molecule
   (b) responsible for formation of disulphide bridges
   (c) removed during maturation of proinsulin to insulin
   (d) responsible for its biological activity.
9. GEAC stands for
   (a) Genome Engineering Action Committee
   (b) Ground Environment Action Committee
   (c) Genetic Engineering Approval Committee
   (d) Genetic and Environment Approval Committee
10. α-1-antitrypsin is
   (a) an antacid
   (b) an enzyme
   (c) used to treat arthritis
   (d) used to treat emphysema
11. Human insulin is being commercially produced from a transgenic species of
   (a) Rhizobium
   (b) Saccharomyces
   (c) Escherichia
   (d) Mycobacterium
12. A probe which is a molecule used to locate homologous sequences in a mixture of DNA or RNA molecules could be:
   (a) a ssRNA
   (b) a ssDNA

(c) either RNA or DNA
(d) can be ssDNA but not ssRNA

13. Choose the correct option regarding retrovirus.
(a) An RNA virus that synthesizes DNA during infection
(b) A DNA virus that synthesizes RNA during infection
(c) A ssDNA virus
(d) A dsRNA virus

14. The site of production of ADA in the body is
(a) erythrocytes
(b) lymphocytes
(c) blood plasma
(d) osteocytes

15. A protoxin is
(a) a primitive toxin
(b) a denatured toxin
(c) toxin produced by protozoa
(d) inactive toxin

16. Pathophysiology is the
(a) study of physiology of pathogen
(b) study of normal physiology of host
(c) study of altered physiology of host
(d) none of the above

17. The trigger for activation of toxin of Bacillus thuringiensis is
(a) acidic PH of stomach
(b) high temperature
(c) alkaline PH of gut
(d) mechanical action in the insect gut

18. 'Cry protein' coded by gene Cry IAb controls
(a) Cotton bollworm
(b) Corn borer
(c) Tobacco budworm
(d) Mosquito

19. Nematode specific genes were introduced into the tobacco host plant using a vector
(a) pBR322
(b) plasmid
(c) bacteriophage
(d) Agrobacterium

20. In RNAi, genes are silenced using
(a) ssDNA
(b) dsDNA
(c) dsRNA
(d) ssRNA

21. The first clinical gene therapy was done for the treatment of
(a) AIDS
(b) Cancer
(c) Cystic fibrosis
(d) SCID(Severe CombinedImmuno Deficiency resulting from deficiency of ADA)

22. ADA is an enzyme which is deficient in a genetic disorder SCID. What is the full form of ADA?
(a) Adenosine deoxyaminase
(b) Adenosine deaminase
(c) Aspartate deaminase
(d) Arginine deaminase

23. Silencing of a gene could be achieved through the use of
(a) RNAi only
(b) antisense RNA only
(c) both RNAi and antisense RNA

(d) none of the above

24. Biopiracy means
(a) use of biopatents
(b) thefts of plants and animals
(c) stealing of bioresources
(d) exploitation of bioresources without authentic permission

25. Which one of the following is not the product of transgenic experiments?
(a) Pest-resistant crop variety
(b) High nutritional value in grains
(c) Production of insulin by rDNA technique
(d) Drought-resistant crops

ANSWER

Q. No.	Key	Q. No.	Key	Q. No.	Key
1	A	10	D	19	D
2	B	11	C	20	C
3	C	12	C	21	D
4	B	13	A	22	B
5	D	14	B	23	C
6	A	15	D	24	D
7	D	16	C	25	C
8	C	17	C		
9	C	18	B		

Group - B

1. Write notes on the following in 2 to 5 valid & relevant point
(a) Humulin
(b) Recombinant vaccine
(c) Gene therapy
(d) Bio pesticide
(e) Bio piracy
(f) Bio Patent
(g) Bio pesticide
(h) Bt Colton
(i) Sem cell technology
(j) Genetically Modified Organism(GMO)

****

ORGANISM & POPULATION

Group - A

1. To which population category India belongs?
(a) High birth rate and high mortality rate
(b) Low birth rate and low mortality rate
(c) Low birth rate and high mortality rate
(d) High birth rate and low mortality rate

2. Avicennia, Rhizophora and Atiplex are
(a) Xerophytes
(b) Halophytes
(c) Hydrophytes
(d) Mesophytes

3. Which of the following is not a hydrophytic angiosperm?
(a) Chara
(b) Hydrilla
(c) Lotus
(d) Water lettuce

4. Mechanical tissue is undeveloped in
(a) Xerophytes
(b) Hydrophytes
(c) Halophytes
(d) Mesophytes

5. Which one is partially submerged and fixed in mud?
(a) Marsilea
(b) Cyperus
(c) Eichhornia
(d) Typha

6. Xerophytes are mostly
(a) Succulents
(b) Water related
(c) Mesophytes
(d) None of these

7. Some organisms are tolerant to a narrow range of salinity and are termed as
(a) Euryhaline
(b) Stenohaline
(c) Neither (a) nor (b)
(d) Saline

8. A nonsucculent xerophyte with thick leathery leaves having white sticky waxy coating
(a) Nerium
(b) Calotropis
(c) Bryophyllum
(d) Ruscus

9. The feature of the xerophytic plant leaves are
(i) Leathery surface
(ii) Large surface area
(iii) Waxy cuticle
(iv) Sunken stomata on upper epidermis
(a) (i), (ii) and (iv)
(b) (ii) and (iii)
(c) (i), (iii) and (iv)
(d) (i) and (iv)

10. Xeric environment is characterized by
(a) Precipitation

(b) Low atmospheric humidity
(c) Extremes of temperature
(d) High rate of vaporization

11. What is wrong about xerophytes?
(a) Sunken stomata
(b) Small spiny leaves
(c) Thick Cuticle
(d) Larger number of stomata

12. Which one is not a trait of xerophytes?
(a) Thick cuticle
(b) Sunken stomata
(c) Aerenchyma
(d) Well developed mechanical tissue

13. The vegetation of Rajasthan is
(a) Arctic
(b) Alpine
(c) Deciduous
(d) Xerophytic

14. Type of plants having adaptations to check transpiration is
(a) Xerophytes
(b) Lithophytes
(c) Halophytes
(d) Epiphytes

15. Which one of the following statements cannot be connected to Predation ?
(a) It might lead to extinction of a species
(b) Both the interacting species are negatively impacted
(c) It is necessitated by nature to maintain the ecological balance
(d) It helps in maintaining species diversity in a community

16. While explaining interspecific interaction of population, (+) sign is assigned for beneficial interaction, (–) sign is assigned for detrimental interaction and (0) for neutral interaction. Which of the following interactions can be assigned (+) for one species and (–) for another species involved in the interaction?
(a) Amensalism
(b) Commensalism
(c) Competition
(d) Predation

17. Amensalism can be represented as :
(a) Species A (+) ; Species B (0)
(b) Species A (–) ; Species B (0)
(c) Species A (+) ; Species B (+)
(d) Species A (–) ; Species B (–)

18. Which of the following is not an attribute of a population?
(a) Natality
(b) Mortality
(c) Species interaction
(d) Sex ratio

19. Match the items in Column I with those in Column II

Column-I	Column-II
A. Herbivores	1. Commensalism
B. Mycorrhiza	2. Mutualism
C. Sheep Cattle	3. Predation
D. Orchid Tree	4. Competition

Codes:

A B C D

(a) 4 2 13

(b) 3 2 4 1

(c) 2 1 3 4

(d) 1 3 4 2

20. The impact immigration on population density is

(a) negative

(b) positive

(c) Both a (a) and (b)

(d) Neutralized by natality

21. Match Column I with Column II

Column-I	Column-II
A. Saprophyte	1. Symbiotic association of fungi with plant roots
B. Parasite	2. Decomposition of dead organic materials
C. Lichens	3. Living on living plants or animals
D. Mycorrhiza	4. Symbiotic association of algae and fungi

Codes:

A B C D

(a) 3 2 1 4

(b) 2 1 3 4

(c) 2 3 1 1

(d) 1 2 3 4

22. Carnivorous animals like lions and leopards, occupy the same niche but lions predate mostly larger animals and leopards take smaller ones. This mechanism of competition is referred to as

(a) character displacement

(b) altruism

(c) resource partitioning

(d) competitive exclusion

23. Between which among the following, the relationship is not an example of commensalism?

(a) Orchid and the tree on which it grows

(b) Cattle egret and grazing cattle

(c) Sea animal and clown fish

(d) Female wasp and Fig species

24. Natality refers to

(a) number of individuals leaving the habitat

(b) birth rate

(c) death rate

(d) number of individuals entering a habitat

25. Which one of the following population interactions is widely used in medical science for the production of antibiotics?
(a) Parasitism
(b) Mutualism
(c) Commenalism
(d) Amensalism

26. In a growing population of a country,
(a) reproductive and pre-reproductive individuals are equal in number
(b) reproductive individuals are less than the post-reproductive individuals
(c) pre-reproductive individuals are more than the reproductive individuals
(d) pre-reproductive individuals are less than the reproductive individuals

27. What is true about the isolated small tribal populations?
(a) Wrestlers who develop strong body muscles in their lifetime pass this character on their progeny
(b) There is no change in population size as they have a large gene pool
(c) There is a decline in population as boys marry girls only from their own tribe
(d) Hereditary diseases like colour blindness do not spread in the isolated population

28. Asymptote in a logistic growth curve. It is obtained, when
(a) The value of V approaches zero
(b) K=N
(c) K > S
(d) K < S

29. Mycorrhiza is the example of
(a) fungistasis
(b) amenalism
(c) antibiosis
(d) mutualism

30. Which of the following is correct for r-selected species?
(a) Large number of progeny with small size
(b) Large number of progeny with large size
(c) Small number of progeny with small size
(d) Small number of progeny with large size

31. If '+' sign is assigned to beneficial interaction. "–" sign to detrimental and '0' sign to neutral represented by '+' '-' refers to
(a) mutualism
(b) amensalism
(c) commensalism
(d) parasitism

ANSWER

Q. No.	Key	Q. No.	Key	Q. No.	Key
1	D	12	C	23	C
2	B	13	D	24	C
3	A	14	A	25	B
4	B	15	C	26	D
5	D	16	B	27	A
6	A	17	B	28	D
7	B	18	C	29	
8	B	19	C	30	D

9	C	20	D	31	D
10	B	21	B		
11	D	22	D		

Answer the followings by changing the underlined words

(*a*) Aerenchyma tissue is very common to Xerophyte.

(*b*) Stable population pyramid is urn shape

(*c*) Symbolically predation is +, +

(d) Association between algae and fungi is Amensalism.

(e) Parthenium root releases butyric acid

Answers:

(a) Hydrophyte
(b) Bell shape
(c) +, –
(d) Symbiosis
(e)transcinnamic Acid

Write the answer in one technical word.

(a) Plant growing on waste land.

(b) Plant growing on cold soil.

(c) Plant growing on saline soil.

(d) Plants living in water.

(e) Plants growing on sand and gravel.

(f) Plant faces only external dryness but not internal dryness.

(g) Xerophytes face both external and internal dryness.

Answers:

(a) Chresophytes
(b) Psychrophytes
(c) Halophytes
(d) Hydrophytes
(e) Psammophytes
(f) Succulent
(g) Non-succulent

Fill in the blanks.

(a) When the population pyramid is triangular, it represents_____

(b) Annual plant complete their life cycle is _____

(c) Rolling of leaves in monocot leaf is due to_____

(d) Symbolically amensalism is_____

(e) Father of Indian Ecology is_____

Answers:

(a) Population is growing

(b) Ephemerals

(c) –, 0

(d) Ram deo Mishra

Group – B

1. Write notes on the following in 2 to 5 valid & relevant point
   (a) Mutualism
   (b) Competition
   (c) Predation
   (d) Parasitism
   (e) Camouflage
   (f) Population
   (g) Population density
   (h) Age distribution graph/ pyramid
   (i) Commensalism
2. Differentiate between the following with 3 to 4 important point
   (a) Habitat
   (b) Mutualism & Parasitism
   (c) Birth rate & death rate
   (d) Fertility & fecundity
   (e) Logarithmic & Exponential growth
   (f) S – shape and J – shape curve

Group – C

1. What is population? Describe different features of population.
2. Explain different types of population interactions found in the nature.
3. Describe logistic growth model of a population with curve.

****

Ecosystem

Group - A

1. Detritus food chain starts from
   (a) Dead organic matter
   (b) Green plants
   (c) Zooplanktons
   (d) None of the above
2. In ecological crisis, whose interference play an important role
   (a) Green plants
   (b) Human
   (c) Biotic and abiotic components
   (d) None of these
3. Whale is
   (a) Primary producer
   (b) Carnivorous secondary consumer
   (c) A decomposer
   (d) Herbivorous

4. Energy enters into the ecosystem through
   (a) Herbivores
   (b) Carnivores
   (c) Producers
   (d) Decomposers
5. A plant being eaten by an herbivorous which in turn is eaten by a carnivorous makes
   (a) Food chain
   (b) Food web
   (c) Omnivorous
   (d) Interdependent
6. The bacteria these good on dead organic matter are
   (a) Producers
   (b) Herbivores
   (c) Carnivores
   (d) Decomposers
7. The ecosystem consists of
   (a) Producers
   (b) Consumers
   (c) Decomposers
   (d) All of these
8. Green plants constitute
   (a) First trophic level
   (b) Second trophic level
   (c) Third trophic level
   (d) Complete food chain
9. An ecosystem is a complex interacting system of
   (a) Individual
   (b) Population
   (c) Communities and their physical environment
   (d) Communities and their soil conditions
10. Eutrophic lakes means
   (a) Lake poor in nutrients
   (b) Lake rich in nutrients
   (c) Lake poor in flora and fauna
   (d) Lake lacking in water
11. First link in any food chain is a green plant because
   (a) Green plants can synthesize food
   (b) They can eat everything
   (c) Fixed at one place
   (d) None of the above
12. An ecosystem resists changes because it is in a state of
   (a) Imbalance
   (b) Homeostasis
   (c) Shortage of components
   (d) Deficiency of light
13. In an ecosystem, the population of
   (a) Primary producers are more than that of primary consumers

(b) Secondary consumers are largest because they are powerful
(c) Primary consumers out number primary producers
(d) Primary consumers are least dependent upon primary producers

14. Which of the following acts as ''nature's scavengers''
(a) Man
(b) Animals
(c) Insects
(d) Micro-organisms

15. Which is the correct sequence in the food chain in grassland?
(a) Grass → wolf → deer → buffalo
(b) Bacteria → grass → rabbit → wolf
(c) Grass → insect →birds→ snakes
(d) Grass → snake → insect → deer

16. The pyramid that cannot be inverted in a stable ecosystem, is pyramid of
(a) Number
(b) Energy
(c) Biomass
(d) All the above

17. In an ecosystem decomposer include
(a) Bacteria and fungi
(b) Only microscopic organisms
(c) Above two
(d) Above two plus macro-organisms

18. If phytoplankton are destroyed in the sea, then
(a) Algae will get more space to grow
(b) Primary consumers will grow luxuriantly
(c) It will affect the food chain
(d) No effect will be seen

19. In a tree ecosystem, the pyramid of number is
(a) Upright
(b) Inverted
(c) Both of the above
(d) None of the above

20. Largest ecosystem of the world are
(a) Grasslands
(b) Great lakes
(c) Oceans
(d) Forests

21. Energy store at consumer level is called
(a) Gross primary productivity
(b) Secondary productivity
(c) Net primary productivity
(d) Net productivity

22. An Ecosystem is
(a) Open
(b) Closed
(c) Both open and close

(d) Neither open nor closed

23. If the plant producer dies in the ecosystem, then the system is
(a) Seriously affected
(b) Cannot produce food
(c) Can have more producers
(d) Hardly affected

24. The character of an ecosystem is determined by the environmental factor which is shortest supply. This is the
(a) Law of minimum
(b) Law of diminishing returns
(c) Law of limiting factors
(d) Law of supply and demand

25. The trophic level of lion in a forest ecosystem is
(a) T_3
(b) T_4
(c) T_2
(d) T_1

26. What energy percentage can be captured by the organisms of next trophic level
(a) 20%
(b) 30%
(c) 90%
(d) 10%

27. In a pond if there is too much wastage, then the *BOD* of pond will
(a) Increase
(b) Decrease
(c) Remain same
(d) (a) and (b)both

28. Which of the following abundantly occurs in pond ecosystem?
(a) Producer
(b) Consumer
(c) Top consumer
(d) Decomposers

29. Which of the following is the most stable ecosystem?
(a) Mountain
(b) Desert
(c) Forest
(d) Ocean

30. Transfer of energy from one trophic level to other trophic level is according to the second law of thermodynamics. The efficiency of energy transfer from herbivorous to carnivorous is
(a) 25%
(b) 50%
(c) 10%
(d) 5%

31. The living organisms of all ecosystems collectively constitute
(a) Producers

(b) Decomposers
(c) Consumers
(d) Biosphere

32. The rate at which light energy is converted into chemical energy of organic molecules inthe ecosystems
(a) Net primary productivity
(b) Gross secondary productivity
(c) Net secondary productivity
(d) Gross primary productivity

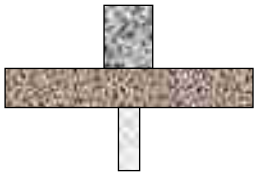
33. When spontaneous process occurs then free energy of system
(a) Decrease
(b) Increase
(c) Remains same
(d) Either can increase or decrease

34. The maximum biomass of living diatoms to be found in
(a) Marine pelagic habitats
(b) Moist soil and swamps
(c) Deep coastmines
(d) Salt lakes

35. These belong to the category of primary consumers.
(a) Snakes and frogs
(b) Water insects
(c) Eagle and snakes
(d) Insects and cattle

36. In an ecosystem
(a) Cycling of energy and nutrients is a coupled process
(b) Cycling of energy is an independent process
(c) Movement of energy is unidirectional
(d) Macro and micronutrients cycle at the same pace

37. Given below is one of the types of ecological pyramids
This type represents



(a) Pyramid of numbers in a grassland
(b) Pyramid of biomass in a fallow land
(c) Pyramid of biomass in a lake
(d) Energy pyramid in a spring

Q. No.	Key	Q. No.	Key	Q. No.	Key	Q. No.	Key
1	C	11	A	21	C	31	D
2	B	12	C	22	B	32	D
3	B	13	B	23	A	33	D
4	C	14	A	24	A	34	A

5	A	15	A	25	A	35	D
6	D	16	D	26	B	36	C
7	D	17	B	27	D	37	C
8	A	18	C	28	A		
9	C	19	D	29	A		
10	B	20	C	30	D		

Group – B

1. Write notes on the following within 2 to 5 valid & relevant point
   (a) Ecosystem
   (b) Food chain
   (c) Food web
   (d) Ecological pyramid
   (e) Phytoplankton
   (f) Energy flow
   (g) Decomposition
2. Differentiate between the following with 3 to 4 important point
   (a)Producer & consumer
   (b) Food chain & food web
   (c) Primary & secondary productivity
   (d) Pyramid of biomass& Pyramid of number

Group – C

1. What is ecosystem? Describe different components of ecosystem
2. Describe Lindeman's energy flow model/ Give an account of energy flow in an ecosystem.
3. Explain different types of ecological pyramid found in the nature.

***

Zoology

Class – XII

Group –A (1 Mark)

Choose the correct answer from the choices given under each question

1. The mammalian corpus luteum produces
   (i) Estrogen
   (ii) Progesterone
   (iii) Luteotropic hormone
   (iv) Luteinizing hormone
2. The function of the secretion of Prostate gland is to
   (i) stimulate sperm activity
   (ii) attaract sperms
   (iii) inhibit sperm activity
   (iv) nourish sperms
3. The major part of the semen is the secretion of
   (i) cowper's gland
   (ii) prostate gland
   (iii) perineal gland
   (iv) seminiferous tubules
4. In most mammals the testes are located in scrotal sac for
   (i) sex differentiation
   (ii) spermatogenesis
   (iii) more space to visceral organ
   (iv) independent functioning of kidney
5. Corpus luteum is developed from
   (i) Leftover oocyte
   (ii) nephrostome
   (iii) Leftover graffian follicle after release of ovum
   (iv) none of these
6. The sperm become motile in human being in
   (i) semini ferrous tubules
   (ii) vas deferens
   (iii) epididymis
   (iv) seminal vesicles
7. Which of the following has haploid chromosome?
   (i) oogonia
   (ii) primary oocyte
   (iii) secondary oocyte
   (iv) primary spermatocyte
8. Egg released by Graffian follicle is surrounded by
   (i) Zona pelucida
   (ii) Vitelline membrane
   (iii) Plasma membrane
   (iv) all of the above
9. A human female reaches menopause around the age of
   (i) 70 years

(ii) 25 years
(iii) 15 years
(iv) 50 years

10. The differentiation of sex takes place
(i) at the time of gamete fusion
(ii) before fertilization
(iii) at the time of gamete formation
(iv) none of the above

11. During the ovulatory phase, the structure called corpus luteum is formed from
(i) ruptured Graffian follicle
(ii) epididymis
(iii) isogamates
(iv) endometrium

12. Seminiferous tubules are found in
(i) Testis
(ii) Ovary
(iii) Liver
(iv) Kidney

13. Sterilisation technique is
(i) Loop
(ii) Diaphragm
(iii) Tubectomy
(iv) Cervical cap

14. Causes of world population explosion is
(i) Better health care
(ii) increased agricultural production
(iii) more jobs
(iv) fewer wars

15. A contraceptive pill contains
(i) progesterone and estrogen
(ii) spermicidal salts
(iii) chemicals that cause automatic abortion
(iv) chemicals that prevent fertilization of ovum.

16. An IUCD is
(i) Copper – T
(ii) Condom
(iii) Vasectomy
(iv) Pill.

17. Purpose of tubectomy is to prevent
(i) Coitus
(ii) Egg formation
(iii) Fertilization
(iv) Embryonic development

18. Which is related to males?
(i) Oral pill
(ii) Tubectormy
(iii) Vasectormy
(iv) None of the above

19. The test which is used for study of genetic and metabolic defects of an unborn baby is
(i) Amniocentesis

(ii) Erythroblastosis
(iii) cystic fibrosis
(iv)phenylketonuria

20. In which of the following methods Zygotes or early embryo and blastomeres could be transferred into the fallopian tube?
(i) GIFT
(ii) IUT
(iii) ZIFT
(iv) ICSI

21. Which of the following can be used as an emergency contraceptives to avoid possible pregnancy:
(i) Progestogens
(ii) IUD within 72 hours
(iii) Diaphragms
(iv) (i) & (ii)

22. Couple unable to produce children inspite at unprotected sexual cohabitation is termed as:
(i) Impotency
(ii) Infertility
(iii) STD
(iv) PID

23. In injectable form of the hormone based contraceptive is
(i) Norplant
(ii) Depo-prorera
(iii) Mala-D
(iv) Saheli

24. Test tube baby is the one
(i) Who is reared on artificial medium outside the womb
(ii) Growth of human baby inside the fallopian tube instead of uterus
(iii) Ova from wife/ donor(female) and sperme from husband/ donor(male) and are induced to form zygote by (INF) and then implanted in female.
(iv) Baby born after artificial insemination.

25. The tendency of population to remain in genetic equilibrium may be disturbed by
(i) random mating
(ii) Lack of migration
(iii) Lack of mutation
(iv) Lack of random mating

26. According to Darwin, the organic evolution is due to
(i) Intraspecific competition
(ii) Interspecific competition
(iii) Competition within closely related species
(iv) Reduced feeding efficiency in one species due to the presence of interfering species.

27. The process by which organisms with different evolutionary history evolved similar phenotypic adaptation in response to a common environmental challenge is called
(i) natural selection
(ii) convergent evolution
(iii) nonrandom evolution
(iv) adaptive radiation

28. Evolution of different species in a given area starting from a point and spreading to other geographical areas is known as
(i) adaptive radiation
(ii) natural selection
(iii) migration
(iv) divergent evolution

29. Which one of the following scientists name is correctly matched with the theory put forth by him?
(i) Weismann – Theory of continuity of germplasm
(ii) Pasteur – Inheritance of acquired characters
(iii) Devries – Natural selection
(iv) Mendel – Theory of pangenesis

30. Darwin's finches are an excellent example of
(i) adaptive radiation
(ii) seasonal migration
(iii) broad parasitism
(iv) connecting link

31. When two species of different genealogy come to resemble each other as a result of adaptation the phenomenon is termed
(i) divergent evolution
(ii) co-evolution
(iii) micro-evolution
(iv) convergent evolution

32. Evolutionary history of an organism is known as
(i) ancestry
(ii) paleontology
(iii) ontogeny
(iv) phylogeny

33. What kind of evidence suggested that man is more closely related with chimpanzee than with other hominoid apes?
(i) Evidence from DNA from sex chromosomes only
(ii) Comparison of chromosomes morphology only
(iii) Evidence from fossil remains and the fossil mitochondrial alone
(iv) Evidence from DNA extracted from sex chromosomes, autosomes and mitochondria.

34. Darwin in his 'Natural selection Theory' did not believe in any role of which one of the following in organic evolution?
(i) Discontinuous variations
(ii) Parasites and predators as natural enemies
(iii) Survival of the fittest
(iv) Struggle for existence

35. In which era reptiles were dominant?
(i) Coenozoic era
(ii) Mesozoic era
(iii) Paleozoic era
(iv) Archeozoic era

36. Homo sapiens evolved during
(i) Pleistocene
(ii) Pliocene
(iii) Oligocene

(iv) Miocene

37. Which of the following are homologous organs?
(i) Wings of insects and bat
(ii) gills of fish and lungs of rabbit
(iii) pectoral fins of fish and fore limbs of horse
(iv) wings of grashopper and crow.

38. Life originated on earth about
(i) 2.5 billion years ago
(ii) 3.5 billion years ago
(iii) 4.5 billion years ago
(iv) 5.5 billion years ago

39. Which is not a case of chromosomal aberration?
(i) Recombination
(ii) Inversion
(iii) Duplication
(iv) Translocation

40. Random genetic drift in a population probably results from
(i) large population size
(ii) highly genetically variable
(iii) interbreeding within this population
(iv) constant low mutation rate

41. Monocytes differentiate into which kind of phagocytic cells?
(i) B – cells
(ii) macrophages
(iii) neutrophils
(iv) T – cells

42. If a graft is always rejected, it is called:
(i) Homograft
(ii) Isograft
(iii) Autograft
(iv) Heterograft

43. The principal lines of defence in our body are
(i) one
(ii) two
(iii) three
(iv) numerous

44. Which is an autoimmune disease?
(i) Asthma
(ii) Cancer
(iii) Rheumatoid arthritis
(iv) None of the above

45. General defence system of body forms
(i) Acquired immunity
(ii) Innate immunity
(iii) Both (i) and (ii)
(iv) none of these

46. The major phagocytic cells are
(i) Lymphocytes
(ii) Macrophages
(iii) Plasma cells

(iv) Mast cells

47. Immunoglobulins are
(i) antibodies
(ii) antigen
(iii) antibiotic
(iv) antiseptic

48. LSD is derived from
(i) Cocoa plant
(ii) Poppy plant
(iii) Hemp plant
(iv) Fungus

49. Excessive consumption of alcohol damages
(i) Liver
(ii) Heart
(iii) Lung
(iv) Kidney

50. Which part of the brain has earliest ill effects in a drunk person:
(i) Cerebrum
(ii) Cerebellum
(iii) Medulla
(iv) Mid brain

51. At which stage of HIV infection does one usually show symptoms of AIDS?
(i) within 15 days of sexual contact with an infected person
(ii) when the infected retro virus enters host cells
(iii) when HIV damages large number of helper T-lymphocytes
(iv) when the viral DNA is produced by reverse transcriptase

52. Infection of Ascaris usually occurs by
(i) drinking water containing egg of Ascaris
(ii) eating imperfectly cooked park
(iii) tse – tse fly
(iv) mosquito bite

53. Ringworm in humans is called by
(i) bacteria
(ii) fungi
(iii) nematodes
(iv) viruses

54. A certain patient is suspected to be suffering from acquired immune deficiency syndrome. Which diagnostic technique will you recommend for its detection?
(i) MRI
(ii) Ultra sound
(iv) ELISA

55. A person likely to develop tetanus is immunized by administering
(i) dead germs
(ii) performed antibodies
(iii) wide spectrum antibodies
(iv) weakened germs

56. Which of the following is a pair of viral diseases?
(i) Ringworm, AIDS
(ii) Common cold, AIDS
(iii) Dysentery, Common Cold

(iv) Typhoid, tuberculosis

57. Salmonella is related with
(i) Typhoid
(ii) Polio
(iii) TB
(iv) Tetanus

58. Which one of the following is not correctly matched?
(i) Glossina palpalis – Sleeping Sickness
(ii) Culex pipiens – Filariasis
(iii) Aedes aegypti – Yellow fever
(iv)Anopheles culccfacies – Leishmaniasis

59. ELISA is used to detect viruses where the key reagent is
(i) DNA probe
(ii) RNase
(iii) Alkaline phospatase
(iv) Catalase

60. Which of these is most infectious disease?
(i) Hepatitis – B
(ii) AIDS
(iii) Cough & Cold
(iv) Malaria

61. Typhoid fever is caused by
(i) Giardia
(ii) Salmonella
(iii) Shigella
(iv) Escherichia

62. If a person shows production of interferons in his body, the chances are that he got an infection of
(i) typhoid
(ii) measles
(iii) tetanus
(iv) malaria

63. Which of the following disease is now consider hearly eradicated from India?
(i) Smallpox
(ii) Polia myelitis
(iii) Plasue
(iv) Kal-azar

64. Passive immunity was discovered by
(i) Edward Jenner
(ii) Emil von Behring
(iii) Robert Koch
(iv) Louis Pasteur

65. In which one of the following pairs of diseases both are caused by viruses?
(i) Tetanus & typhoid
(ii) Whooping cough and sleeping sickness
(iii) Syphills and AIDS
(iv) Measles and rabies

66. Which of the following diseases is due to an allergic reaction?
(i) Goitre
(ii) Skin cancer

(iii) Hay fever
(iv) Enteric fever

67. Botulism caused by clostriadium botulinum affects the
(i) Spleen
(ii) intestine
(iii) lymphgland
(iv) neuromuscular junction

68. Cercbral malaria is caused by plasmodium
(i) Vivax
(ii) Ovale
(iii) Falciparum
(iv) All of the above

69. Anthrax is caused by
(i) Vibrio
(ii) Bacillus
(iii) Salmonella
(iv) Virus

70. Entamoeba histolytica infection occurs through
(i) Mosquito bite
(ii) Bird droppings
(iii) Sweat
(iv) Contaminated food and water

71. Which masquito species are primarily responsible for dengue fever?
(i) Aedes albopictus
(ii) Anopheles gambiae
(iii) Aedes aegypti
(iv) Culiseta annulata

72. Which of the following are the diagnostics methods for dengue?
(i) RT – PCR
(ii) Nucleic acid amplification tests (NAATS)
(iii) Enzyme – linked immunosorbent assays (ELISA)
(iv) All of the above

73. What is the cansative agent of Chikungunya fever?
(i) virus
(ii) bacteria
(iii) fungus
(iv) parasite

74. What is the inlubation period for Chickungunya virus?
(i) 1 – 2 days
(ii) 3 – 7 days
(iii) 1 – 2 weeks
(iv) 2 – 3 weeks

75. Diptheria is caused by
(i) Poisons realesed dead bacterial cells into the host tissue
(ii) Poisons released by living bacterial cells into the host tissue.
(iii) Poisonss released by virus into the host tissues
(iv) Excessive immune response by the host's body.

76. Which vector can clone only a small fragment of DNA?
(i) Bacterial artificial chromosome
(ii) Yeast artificial chromosome

(iii) Plasmid
(iv) Cosmid

77. A single strand of nucleic acid tagged with a radioactive molecule is called
(i) vector
(ii) plasmid
(iii) selectable marker
(iv) probe

78. Which one of the following is used as vector for cloning genes into higher organisms?
(i) Baculovirus
(ii) Salmonella typhimurium
(iii) Rhizopus nigricans
(iv) Retrovirus

79. Manipulation of DNA in genetic engineering became possible due to the discovery of
(i) restriction endonuclease
(ii) DNA ligase
(iii) transcriptase
(iv) primase

80. The process of replication in plasmid DNA, other than initiation, is controlled by
(i)mitochondrial gene
(ii) bacterial gene
(iii) plasmid gene
(iv) none of the above

81. Two bacteria found to be very useful in genetic engineering experiments are
(i) Nitrosomonas and Klebsiella
(ii) Escherichia and Agrobacterium
(iii) Nitrobacter and Azotobacter
(iv) Rhizobium and Diplococcus

82. Which of the following is related to genetic engineering?
(i) mutation
(ii) plasmid
(iii) plastid
(iv) heterosis

83. Nandankanan Zoo is famous for
(i) White tiger
(ii) Whale
(iii) Hippopotamus
(iv) Nilgiri tahr

84. The organization which publishes the Red List of species is
(i) ICFRE
(ii) IUCN
(iii) UNED
(iv) WWF

85. An ex-situ method of conservation of endangered species is:
(i) Biosphere reserve
(ii) Wildlife sanctuary
(iii) National park
(iv) Cryopreservation

ANSWER

Q. No.	Key	Q. No.	Key	Q. No.	Key	Q. No.	Key
1	ii	23	ii	45	ii	67	iv
2	i	24	iii	46	ii	68	iii
3	ii	25	iv	47	i	69	ii
4	ii	26	ii	48	iv	70	iv
5	iii	27	ii	49	i	71	i
6	iii	28	iv	50	i	72	iii
7	iii	29	i	51	iii	73	i
8	iv	30	i	52	i	74	ii
9	iv	31	iv	53	ii	75	ii
10	i	32	iv	54	iv	76	iii
11	i	33	iv	55	ii	77	iv
12	i	34	i	56	ii	78	iv
13	iii	35	ii	57	i	79	i
14	i	36	i	58	iv	80	ii
15	i	37	iii	59	iii	81	ii
16	i	38	ii	60	i	82	ii
17	iii	39	i	61	ii	83	i
18	iii	40	iii	62	ii	84	ii
19	i	41	iii	63	i	85	iv
20	iii	42	iv	64	i		
21	iv	43	iii	65	iv		
22	ii	44	iii	66	iii		

Fill in the blanks with correct answer. (1 mark Questions)

1. The degenerated corpus luteum is called _____.
2. The test is of man are connected with the scrotal sac by _____.
3. Sacs in which tests are lodged are called _____.
4. The _____ is the cavity of gastrula.
5. Failure of descending testis into the scrotum is called _____.
6. The mature follicles are termed as _____.
7. External genitalia of female is _____.
8. Human seminal fluid is _____ in nature.
9. Embryonic membranes are formed from _____ of blastula.
10. Gestation period of human female is _____ days.
11. During maturation the sperms get nourishment from _____.
12. Acrosome of sperm is formed from _____.
13. Development of fertilized ovum starts with _____.
14. The process which transforms zygote to morula is called _____.

15. Vasectomy is the surgical cutting of _____.
16. Immediately after parturition, women experience _____ amenorrhoea.
17. A state of healthy reproductive organs with normal function is _____.
18. Genital warts are caused by _____.
19. Trichomonas vaginalis lives in _____ of female.
20. Methods of preserving sperm in frozen condition is called _____.
21. Fertility treatment with donor eggs is usually done using _____.
22. The mutation theory was proposed by _____.
23. Theory of recapitulation was postulated by _____.
24. …….. in support of evolution is in form of _____.
25. Natural selection operates only in _____ troints.
26. Abiogenesis of simple organic molecules was experimentally supported by _____.
27. A reducing atmosphere lacks free _____.
28. Origin of life occurred in _____ period.
29. Life originated in _____.
30. The raw material for evolutionary change is _____.
31. The sum total of all the genes in a population is _____.
32. Ultimate source of variation is _____.
33. Concept of genetic drift was introduced by _____.
34. Different species occurring in different geographical areas are known as _____.
35. Mutation theory cannot explain _____.
36. Sedimentary rock is the richest source of _____.
37. _____ parasite causes Malaria.
38. Vaccine was first disovered by _____.
39. _____ transmit filarial worm.
40. _____ antibody is the largest antibody.
41. Father of immunology is _____.
42. HIV virus causes _____ disease.
43. Red date book was complied by _____.
44. Dolphins are found in _____ sanctuary of Odisha.
45. Wild life week is observed in _____ month of every year.
46. _____ is a bird sanctuary in Odisha.
47. The concept of "Biosphere reserve" was suggested by _____.
48. World Environment day is observed on _____.
49. World biodiversity day is observed on _____.
50. Project tiger was lunched by the Central Government in the year _____.
51. MAB stands for _____.
52. Dengue is transmitted by _____.
53. Typhoid fever could be confirmed by _____.
54. _____ responsible for disease pneumonia.
55. Malignant malaria is caused by _____.
56. The causative agent of Chikungunya is _____.
57. Filaria is caused by _____.
58. Cells involved in immune mechanism are _____.
59. The term antibiotic was coined by _____.
60. Interferons are _____.

Answers of fill in the blanks.

1. Corpus albican
2. Gubernaculum
3. Scrotal sac
4. Archenteron
5. Cryptorchidism
6. Graffian follicle
7. Vulva
8. Alkaline
9. Trophoblast
10. 280 days
11. Sertosi cells
12. Galgibody
13. Cleavage
14. Cleavage
15. Vas deferens
16. Lactational
17. reproductive health
18. HPV
19. vagina
20. crypreservation
21. IVF
22. Hugo de vries
23. Haeckel
24. Fossils
25. inherited
26. Stanley
27. oxygen
28. Pre-cambrian
29. Water
30. Variation
31. Gene pool
32. mutation
33. sewall wright
34. Allopatric
35. Mimicry
36. fossils
37. Plasmodium
38. Edward Jenner
39. Culex masquito
40. IgM
41. Sir Edward Jenner
42. AIDS
43. IUCN
44. Bhitarkanika
45. October
46. Nalabana
47. UNESCO
48. 5th June
49. 29th December

50. 1973
51. Man and Biosphere programme
52. Aedes Mosquito
53. Widal test
54. Streptococcus premoniae
55. Plasmodium falciparum
56. Chikngunya virus (CHIKV)
57. Wuchereria brancraffi
58. Lymphocytes
59. Selmen waksman
60.

Group – B

Write notes on the following (Restrict each answer within 2 to 3 important sentences) 2.5 marks

Human Reproduction

1. What is a Placenta?
2. What are the function of Placenta?
3. What is Puberty?
4. What are composition of Semen?
5. What is a Corpus luteum?
6. What is follicular atresia?
7. Explain "Placenta is an endocrine gland".
8. Explain LH surge.
9. Explain the role of LH in both male and female.
10. What is Menopause?
11. What is Luteal phase?
12. Define Lactation.
13. What is Graafian follicle?
14. What is amphimixis?
15. Explain the importance of fertilizin and anti-fertilizing.
16. What is implantation?
17. What is an umbilical cord?
18. What is amnion?

Reproductive Health

1. What is amino centesis?
2. What is tubectomy?
3. What are STDS? Give example.
4. What are the signivicances of IUDS?
5. Define MTP.
6.
7. Mention the different barrier methods of family planning.
8. Mention the different natural methods of birth control.
9. Explain chemical method of birth control.
10. What is IVF?

11. What is surrogate mother?
12. What is ZIFT?
13. What is GIFT?

Genetion

1. What is Criss-cross inheritance?
2. What is free martin?
3. Define Genic balance theory.
4. What is Thalassemia?
5. What is gynandromorphy?
6. What is Dowrin syndrome?
7. What is Turnerin syndrome?
8. What is Klinefelter's syndrome?
9. What do you mean by autosomes?
10. What is Holoandric gene?
11. What is Sex reversal?
12. What is barr body?

Evolution

1. Explain genetic drift.
2. What is bottleneck effect?
3. What is adaptive radiation?
4. What is founder effect?
5. What is gene flow?
6. What is Hardy Weinbergo principle?
7. What is speciation?
8. Explain the theory of recapitulation.
9. Write three Crdticism's of Darwinism.
10. Explain Vestigeal organs.
11. Define Homologous Organs.
12. Define analogous organs.
13. Define Atavism.
14. What are Coacervates?
15. What are fossils?
16. Explain Miller-urey experiment.
17. What do you mean by chemical evolution?

Human Health and Diseases

1. What is Immunity?
2. What is allergy?
3. What are the different types of cancer?
4. Give a note on antibody.
5. What are the Common problems of adolescence?
6. How can AIDS be prevented?
7. How one can prevent mosquito bite?
8. What are the effects of tobacco use in the body?
9. What are the effects of alcoholism in the body?

10. Write a short note on amoebiasis.
11. What are the different species of malarias parasite?
12. What are the reasons of drug abuse by the youth?
13. What kind of psychological changes characterize adolescence?

Bio-technology Principles and Processes

1. What are essential features of a vector?
2. What is gene cloning?
3. What is recombinant DNA?
4. What are Plasmids?
5. What is genetic engineering?
6. Explain PCR.
7. Define gel electro phoresis.
8. What is a Pallindrome?

Biodiversity and its Conservation

1. Define biodiversity.
2. What is Red data book?
3. Define bio sphere reserves.
4. Define sanctuaries.
5. What is Ramsar sites?
6. Define Sacred groves.
7. Write a note on biodiversity hot spot of Odisha.

Group – B

Differentiate between (3.5 marks)

Human Reproduction

1. Spermatogenesis and Spermiogenesis
2. Corpus Luteum and Corpus albicans
3. Sertoli Cell and Leydig Cell
4. Follicular phase and Luteal phase
5. Spermatogenesis and Oogenesis
6. Sperm and Ovum
7. Vas deferens and Vas efferentia
8. Testes and Ovary
9. Fertilizin and Antifertilizin

Reproductive Health

1. Tubectomy and Vasectomy
2. Safe Period and Unsafe Period
3. Chemical method and Natural method
4. Spacing method and Terminal method
5. ZIFT and GIFT

Genetics

1. Phenotype and Genotype
2. Autosome and Allosome
3. Super male and Super female
4. Gynandromorph and Free martin
5. Down Syndrome and Turner Syndrome
6. 'X' Chromosome and 'Y' Chromosome

Evolution

1. Convergent evolution and Divergent evolution
2. Somatic variation and Germinal variation
3. Abiogenesis and Biogenesis
4. Homologous organs and Analogous organs
5. Fossils and Living Fossils
6. Natural selection and Genetic drift
7. Chromosomal aberration and Gene mutation
8. Euploidy and Aneuploidy
9. Moulds and Costs

Human Health and Diseases

1. Vaccination and Immunization
2. Innate immunity and Acquired immunity
3. Cell mediated immunity and Humoral immunity
4. Benigm tumour and Malignant tumour
5. Carcinoma and Sarcoma
6. T-Lymphocytes and B-Lymphocytes
7. Antigen and Antibody
8. Active Immunity and Passive Immunity
9. Communicable and non – Communicable disease
10. Infection and Infestation

Biotechnology – Principles and Processes

1. DNA polymerase and DNA ligase
2. Plasmid and Cosmid

Biodiversity and Its Conservation

1. In situ and ex situ Conservation
2. National park and Sanctuary
3. Genetic diversity and Species diversity
4. National Park and biosphere reserves

Group – C

Long Answer type Questions (7 marks)

Human Reproduction

1. Describe the male Reproductive system in human.
2. Describe the female Reproductive system in human.
3. Describe the process of spermatogenesis.
4. Describe the process of oogenesis.
5. Describe the process of Fertilization.

Genetics

1. Discuss the chromosomal theory of sex determimation.
2. What is genic balance theory and explain its role in sex determination?
3. What is sex linked inheritance? Explain inheritance of haemophilia in man.
4. What is sex linked inheritance? Explain inheritance of colour blindness in man.
5. Explain chromosomal disorders in man.

Evolution

1. Discuss the evidences of organic evolution from comparative anatomy and morphology.
2. Give an account of the embryological evidences of organic evolution.
3. Describe palaeonoto logical evidences of organic evolution.
4. Describe Darwin's theory of natural selection and origin of species and discuss about the criticism.

Human Health and Diseases

1. Define Immunity? Explain Innate ima.
2. Define Immunity? Explain acquired Immunity.
3. What is adolescence? Discuss the common problems of adolescence.
4. Mention the factors causing cancer. Add a no on diagnosis and prevention of cancer.
5. What are pathogens? Classify diseases and give a note on this.
6. Describe the symptoms, diagnosis, treatment and control of malaria.
7. Give the symptoms, infection, prevention and control of typhoid.

Biotechnology – principles and Processes

1. Describe the mechanism of recombinant DNA technology.

Biodiversity and Its Conservation

1. What is biodiversity? Explain its importance and loss of biodiversity.
2. Define biodiversity and its types and add a notes on biodiversity conservation.

Short Notes (3.5 marks)

1. Implantation
2. Parturition
3. Menstrual Cycle
4. Birth Control
5. STD
6. Infertility

7. Free martin
8. Sex reversal
9. Genetic drift
10. Hardy – weinberg's principle
11. Variatio
12. Adaptive radiation
13. Origin of life
14. Vaccines
15. AIDS
16. Dengue
17. Antigen antibody interaction
18. Genetic engineering
19. Bt crops
20. Red data book
21. Ramsar sites
22. Sacred groves