CMC Vellore
Sample Paper 2011

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Medical Entrance Exam
Solved Paper 2011

Physics

1. A ray of light is incident at an angle of incidence 60° from air to liquid. What is the ratio of width from air to liquid if angle of refraction is 45°?

   (a) $\dfrac{\sqrt{2}}{3}$

   (b) $\sqrt{\dfrac{3}{2}}$

   (c) $\sqrt{\dfrac{2}{3}}$

   (d) $\dfrac{1}{\sqrt{2}}$

   (e) $\dfrac{\sqrt{3}}{2}$

2. The nature of path of an electron when its moves in transverse electric field is
   (a) circle
   (b) ellipse
   (c) parabola
   (d) hyperbola
   (e) straight line

3. In photoelectric emission, one photon is capable of emitting
   (a) one electron
   (b) two electrons
   (c) more electrons
   (d) Both (a) and (b)
   (e) None of the above

4. Identify the incorrect relation.

   (a) $\alpha = \dfrac{\beta}{1-\beta}$

   (b) $\beta = \dfrac{\alpha}{1-\alpha}$

   (c) $\alpha = \dfrac{\beta}{1+\beta}$

   (d) $1 - \alpha = \dfrac{1}{1+\beta}$

   (e) $\beta = \alpha(1+\beta)$

5. The depletion layer in p-n junction region is caused by
   (a) drift of electrons
   (b) migration of impurity ions
   (c) drift of holes
   (d) diffusion of charge carriers
   (e) None of the above

6. Dimensional formula for entropy is identical to that of
   (a) universal gas constant
   (b) specific heat
   (c) Boltzmann constant
   (d) gravitational potential
   (e) None of the above

7. If the velocity of projection is increased by 1% (other things remaining constant), the horizontal range will increase by
   (a) 1%
   (b) 2%
   (c) 4%
   (d) 8%
   (e) 10%

8. A mass m is placed on an inclined plane. If the mass is in equilibrium, the maximum inclination of the plane with the horizontal would be : (where μ is the coefficient of friction between the mass and surface)

   (a) $\tan^{-1}(\mu)$

   (b) $\tan^{-1}\left(\dfrac{\mu}{2}\right)$

   (c) $\tan^{-1}\left(\dfrac{\mu}{m}\right)$

   (d) $\cos^{-1}(\mu)$

   (e) $\tan^{-1}\left(\dfrac{m}{\mu}\right)$

9. Light of two different frequencies whose photons have energies 1 eV and 2.5 eV successively illuminate a metal of work function 0.5 eV. The ratio of the maximum speeds of the emitted electrons will be

(a) $1:5$ (b) $1:4$

(c) $1:2$ (d) $1:1$

(e) $2:1$

10. The half-life of a radioactive element depends upon
    (a) temperature
    (b) pressure
    (c) nature of element
    (d) amount of radioactive element
    (e) None of the above

11. The gravitational field in a region is given by $I=(4\hat{i}+\hat{j})$ N/kg. The work done by this field is zero when a particle is moved along the line
    (a) $x+y=6$ (b) $x+4y=6$
    (c) $y+4x=6$ (d) $x-y=6$
    (e) $x+y=8$

12. A satellite with kinetic energy E revolving round the earth in a circular orbit. The minimum additional KE required for it to escape into outer space is
    (a) $\sqrt{2E}$ (b) $2E$
    (c) $E/\sqrt{2}$ (d) E
    (e) $\dfrac{E}{2}$

13. The magnitude of the force developed by raising the temperature from $0°C$ to $100°C$ of the iron bar 1.0 m long and 1 cm² cross-section, when it is held so that it is not permitted to expand or bend is $(\alpha=10^{-5}/°C, Y=10^{11}$ N/m²$)$
    (a) 10^3 N   (b) 10^4 N
    (c) 10^5 N   (d) 10^9 N
    (e) 10^2 N

14. The alpha and beta particles cause ionisation because of
    (a) photoelectric emission
    (b) compton collision
    (c) pair production
    (d) the electrostatic force
    (e) None of the above

15. Which one of the following is the weakest kind of bonding in solids?
    (a) Ionic   (b) Metallic
    (c) van der Waal's   (d) Covalent
    (e) None of these

16. A wave travelling along a stretched string is represented by $y=3\cos\pi(100t-x)$. Its wavelength is
    (a) 3 cm   (b) 100 cm
    (c) 2 cm   (d) 5 cm
    (e) 8 cm

17. A disc of mass 10 g is kept horizontally in air by firing bullets of mass 5 g each at the rate of 10 per second. If the bullets rebound with the same speed, what is the velocity with which the bullets are fired?
    (a) 49 cm/s   (b) 98 cm/s
    (c) 147 cm/s   (d) 196 cm/s
    (e) 208 cm/s

18. Frequency of the series limit of Balmer series of hydrogen atom in term of Rydberg constant R and velocity of light c is
    (a) $\dfrac{4}{Rc}$ (b) $4Rc$
    (c) $\dfrac{Rc}{4}$ (d) Rc
    (e) $\dfrac{Rc}{2}$

19. The inductive reactance X_L of induction coil is
    (a) always constant in AC circuit
    (b) directly proportional to frequency of AC
    (c) inversely proportional to frequency of AC
    (d) directly proportional to time period
    (e) None of the above

20. A 100 mH coil carries 1 A current. Energy stored in its magnetic field is
    (a) 0.1 J   (b) 0.05 J
    (c) 0.5 J   (d) 1 J
    (e) None of these

21. Liquids and gases never show
    (a) diamagnetic properties
    (b) paramagnetic properties
    (c) ferromagnetic properties
    (d) Both (a) and (b)
    (e) None of the above

22. The deflection of tangent galvanometer is governed
    (a) by a horse shoe magnet
    (b) by current in a circular coil
    (c) by current in a rectangular coil placed between the pole pieces of a magnet

(d) by pole pieces of an external bar magnet

(e) None of the above

23. Two small magnets each of magnetic moment $10\,Am^2$ are placed in end on position 0.1 m apart from their centres. The force acting between them is

(a) $0.6 \times 10^7\,N$

(b) $0.06 \times 10^{-7}\,N$

(c) 0.6 N

(d) 0.06 N

(e) $0.06 \times 10^{-10}\,N$

24. A coil of cross-sectional area 400 cm² having 30 turns is making 180 rev/min in a magnetic field of 1 T. The peak value of the induced emf is

(a) 0.4 V

(b) 0.6 V

(c) 226 V

(d) 2.26 V

(e) 22.6 V

25. For a thermocouple, the temperature of cold junction (T_c), the neutral temperature (T_n) and the temperature of inversion (T_i) are 0°C, 285°C, 570°C respectively. If the temperature of cold junction (T_c) is raised to 10°C, then

(a) $T_n = 275°C$ and $T_i = 570°C$

(b) $T_n = 275°C$ and $T_i = 560°C$

(c) $T_n = 285°C$ and $T_i = 560°C$

(d) $T_n = 295°C$ and $T_i = 580°C$

(e) $T_n = 560°C$ and $T_i = 285°C$

26. The wires A and B are of same material and same length but their radii are in the ratio 1 : 2. They are stretched by the same force. Strain produced in two wires is

(a) 2 : 1

(b) 1 : 2

(c) 1 : 4

(d) 4 : 1

(e) 1 : 8

27. Heat is transmitted from higher to lower temperature due to the molecular collision in

(a) conduction

(b) radiation

(c) convection

(d) convection and radiation

(e) None of the above

28. A wire of length 10 cm is placed horizontal on the surface of water and is gently pulled up with a force of $1.8 \times 10^{-2}\,N$ to keep the wire in equilibrium. The surface tension of water will be

(a) 0.99 N/m

(b) 0.09 N/m

(c) 0.59 m

(d) 59 N/m

(e) None of these

29. A solid sphere rolls down without slipping from rest on a 30° incline. Its linear acceleration is

(a) $\dfrac{5g}{7}$

(b) $\dfrac{5g}{14}$

(c) $\dfrac{2g}{3}$

(d) $\dfrac{g}{3}$

(e) $\dfrac{5g}{17}$

30. The time period of simple pendulum in a satellite is

(a) 4 s

(b) zero

(c) cannot be calculated

(d) infinite

(e) $\dfrac{3}{2}$ s

31. An electric bulb has power rating of 60 W, 220 V. If it is connected to a source of rms voltage 110 V, the power consumed is

(a) 125 W

(b) 15 W

(c) 30 W

(d) 60 W

(e) 40 W

32. In an AC circuit, $E = 220\sin 100\pi t$. If the impedance is $110\,\Omega$ and phase angle $\phi = 60°$, the power consumption is

(a) 440 W

(b) 220 W

(c) 110 W

(d) 55 W

(e) 1000 W

33. The Lyman series of hydrogen lies in the region

(a) microwave

(b) infrared

(c) visible

(d) ultraviolet

(e) None of the above

34. A radioactive element disintegrates 2 h and its 1/16th part remain undisintegrated. Half life of the element will be

(a) 0.5 h

(b) 1 h

(c) 8 h

(d) 4 h

(e) 2 h

35. Ozone layer blocks the radiation of wavelength
    (a) more than 3×10^{-7} m
    (b) less than 3×10^{-7} m
    (c) equal to 3×10^{-7} m
    (d) equal to 10^{-7} m
    (e) more than 10^{6} m

36. The resistance of discharge tube is
    (a) non-ohmic   (b) zero
    (c) ohmic   (d) one
    (e) None of these

37. A bulb has specifications of 1 kW and 250 V, the resistance of bulb is
    (a) 625Ω (b) 0.25Ω
    (c) 6.25Ω (d) 62.5Ω
    (e) 2.5Ω

38. The internal energy of the working substance in any cyclic process
    (a) increases   (b) decreases
    (c) remain constant   (d) becomes zero
    (e) None of these

39. Out of the following electromagnetic radiations which has the shortest wavelength?
    (a) Radiowaves   (b) Infrared
    (c) Ultraviolet   (d) Visible light
    (e) X-rays

40. The modulus of elasticity is dimensionally equivalent to
    (a) strain
    (b) force
    (c) stress
    (d) coefficient of viscosity
    (e) Work

41. A tiger chases a deer 30 m ahead of it and gains 3 m in 5 s after the chase began. The distance gained by the tiger in 10 s is
    (a) 6 m   (b) 12 m
    (c) 18 m   (d) 20 m
    (e) 16 m

42. The speed of projection of a projectile is increased by 10% without changing the angle of projection. The percentage increase in the range will be
    (a) 10%   (b) 20%
    (c) 15%   (d) 5%
    (e) 25%

43. A sphere is suspended by a thread of length l. The minimum horizontal velocity which has to be imparted to the sphere for it to reach the height of suspension is
    (a) $2\sqrt{gR}$ (b) $\sqrt{2gl}$
    (c) $2gl$ (d) gl
    (e) $\sqrt{gl/2}$

44. A vehicle of mass 120 kg is moving with a uniform velocity of 108 km/h. The force required to step the vehicle in 10 s is
    (a) 90 N   (b) 180 N
    (c) 360 N   (d) 720 N
    (e) 810 N

45. The change in potential energy when a body of mass m is raised to a height nR from the centre of earth (R = radius of earth)
    (a) $mgR \dfrac{(n-1)}{n}$ (b) $nmgR$
    (c) $mgR\left(\dfrac{n^2}{n^2+1}\right)$ (d) $mgR\left(\dfrac{n}{n+1}\right)$
    (e) mgR

46. A particle of mass 1 kg is moving in SHM with an amplitude 0.02 m and a frequency of 60 Hz. The maximum force in newton acting on the particle is
    (a) $188\pi^2$ (b) $144\pi^2$
    (c) $288\pi^2$ (d) $12\pi^2$
    (e) None of these

47. The equation of a spherical progressive wave is
    (a) $y = a \sin \omega t$
    (b) $y = a \sin(\omega t - kr)$
    (c) $y = \dfrac{a}{\sqrt{r}} \sin(\omega t - kr)$
    (d) $y = \dfrac{a}{r} \sin(\omega t - kr)$
    (e) None of the above

48. The moment of inertia of a rod (length l, mass m) about an axis perpendicular to the length of the rod and passing through a point equidistant from its mid-point and one end, is
    (a) $\dfrac{ml^2}{12}$ (b) $\dfrac{7}{48} ml^2$
    (c) $\dfrac{13}{48} ml^2$ (d) $\dfrac{19}{48} ml^2$
    (e) $\dfrac{14}{48} ml^2$

49. At constant volume, temperature is increased, then
    (a) collision on walls will be less
    (b) number of collisions per unit time will increase
    (c) collisions will be in straight lines
    (d) collisions will not change
    (e) None of the above

50. A rain drop of radius 0.3 mm has a terminal velocity 1 m/s in the air. The viscosity of air is 18×10^{-5} P. The viscous force on it is
    (a) 101.73×10^{-4} dyne
    (b) 101.73×10^{-5} dyne
    (c) 16.95×10^{-5} dyne
    (d) 16.95×10^{-4} dyne
    (e) 1.6×10^{-4} dyne

51. Magnetic field intensity due to a dipole varies as d^n; d = distance of observation point from dipole, where n is equal to
    (a) 2   (b) –2
    (c) 3   (d) –3
    (e) None of these

52. If the photon of energy 12.1 eV is incident on hydrogen gas, the gas will emit per second
    (a) few lines in Balmer and Lymen series
    (b) all the lines in Balmer series
    (c) few lines in Balmer series
    (d) Balmer series only
    (e) None of the above

53. A body is moving in circular motion of constant radius, then
    (a) the net acceleration of the body may be towards the centre of the circle
    (b) the net acceleration of the body may not be towards the centre of the circle
    (c) the velocity of the body must change
    (d) All of the above
    (e) None of the above

54. For a constant hydraulic stress on an object, the fractional change in the object's volume $\left(\dfrac{\Delta V}{V}\right)$ and its bulk modulus (B) are related as

(a) $\dfrac{\Delta V}{V} \propto B$ (b) $\dfrac{\Delta V}{V} \propto \dfrac{1}{B}$

(c) $\dfrac{\Delta V}{V} \propto B^2$ (d) $\dfrac{\Delta V}{V} \propto B^{-2}$

(e) $\dfrac{\Delta V}{V} \propto B^{3/2}$

55. A person cannot see the object beyond 100 cm. The power of a lens to correct his vision will be
    (a) +2D   (b) –1D
    (c) +5D   (d) 0.5D
    (e) +6D

56. The moment of inertia of a body about a given axis is 1.2 kg m^2. Initially the body is at rest. In order to produce a rotational kinetic energy of 1500 J, an angular acceleration of 25 rad/s^2 must be applied about that axis for a duration of
    (a) 4 s   (b) 2 s
    (c) 8 s   (d) 10 s
    (e) 3 s

57. The following equation represents induced transmutation
    $$_4Be^9 + {}_2He^4 \longrightarrow {}_6C^{12} + X$$
    In this equation, X represents
    (a) one negative β-particle
    (b) α-particle
    (c) a positron
    (d) a neutron
    (e) γ-particle

58. Cyclotron is a device which is used to
    (a) measure the charge
    (b) measure the voltage
    (c) accelerate protons
    (d) accelerate electrons
    (e) None of the above

59. If boiling point of water is 95 F, what will be the reduction at celsius scale?
    (a) 7°C   (b) 65°C
    (c) 63°C   (d) 35°C
    (e) 70 C

60. The refractive indices of violet and red light are 1.54 and 1.52 respectively. If the angle of prism is 10°, the angular dispersion (in degree) is
    (a) 0.02   (b) 0.20
    (c) 3.06   (d) 30.6
    (e) 306

Chemistry

1. Which of the following reacts fastest with a mixture of anhydrous $ZnCl_2$ and conc. HCl ?
   (a) Trimethyl carbinol
   (b) Ethanol
   (c) Propanol
   (d) Methanol
   (e) Iso-propanol

2. The reagent with which both acetaldehyde and acetophenone reacts easily are
   (a) Fehling's solution
   (b) Schiff's reagent
   (c) Tollen's reagent
   (d) sodium bisulphite
   (e) 2, 4-dinitrophenylhydrazine

3. The main component of glass which gives heat resistance to laboratory glassware is
   (a) PbO   (b) MgO
   (c) B_2O_3 (d) Al_2O_3
   (e) P_2O_5

4. Thomas slag is referred to as
   (a) calcium silicate
   (b) calcium phosphate
   (c) barium phosphate
   (d) strontium silicate
   (e) barium silicate

5. Each B—H—B bridge in B_2H_6 is formed by the sharing of
   (a) 2 electrons   (b) 4 electrons
   (c) 1 electron   (d) 3 electrons
   (e) 8 electrons

6. The one electron species having ionisation energy of 54.4 eV is
   (a) H   (b) He^-
   (c) B^{4+} (d) Li^{2+}
   (e) Be^{2+}

7. Density of a crystal remains unchanged as a result of
   (a) ionic defect
   (b) Schottky defect
   (c) Frenkel defect
   (d) crystal defect
   (e) point defect

8. The mass of 11.2 L of ammonia gas at STP is
   (a) 8.5 g   (b) 85 g
   (c) 17 g   (d) 1.7 g
   (e) 4.25 g

9. Identify the correct statement from below, concerning the structure of $CH_2=C=CH_2$.
   (a) The molecule is planar
   (b) One of the three carbon atoms is in sp^3 hybridized state
   (c) The molecule is non-planar with the two —CH_2 groups being in planes perpendicular to each other
   (d) All the carbon atoms are sp-hybridized
   (e) The molecule is bent with the —C—C—C— angle being 120 degrees

10. The enthalpy of a monoatomic gas at T Kelvin is
    (a) $\frac{7}{2}RT$ (b) $\frac{3}{2}RT$
    (c) $\frac{1}{2}RT$ (d) $\frac{1}{2}mv^2$
    (e) $\frac{5}{2}RT$

11. The dissociation constant of acetic acid K_a is 1.74×10^{-5} at 298 K. The pH of a solution of 0.1 M acetic acid is
    (a) 2.88   (b) 3.6
    (c) 4.0   (d) 1.0
    (e) 2.0

12. In the given reaction,
    $$2X(g) + Y(g) \longrightarrow 2Z(g) + 80 \text{ kcal,}$$
    Which combination of pressure and temperature will give the highest yield of Z at equilibrium?
    (a) 1000 atm and 200°C
    (b) 500 atm and 500°C
    (c) 1000 atm and 100°C
    (d) 500 atm and 100°C
    (e) 1000 atm and 500°C

13. $E^\circ_{Cu^{2+}/Cu} = 0.34 \text{ V}, E^\circ_{Zn^{2+}/Zn} = -0.76 \text{ V}.$
    A Daniell cell contains 0.1 M $ZnSO_4$ solution and 0.01 M $CuSO_4$ solution at its electrodes. EMF of the cell is
    (a) 1.10 V
    (b) 1.04 V
    (c) 1.16 V
    (d) 1.07 V
    (e) 1.00 V

14. A radioactive isotope has a half-life of 8 days. If today 125 mg is left over, what was its original weight 32 days earlier ?
    (a) 6 g   (b) 5 g
    (c) 4 g   (d) 2 g
    (e) 1 g

15. On addition of 1 mL solution of 10% NaCl to 10 mL gold solution in the presence of 0.025 g of starch, the coagulation is prevented because starch has the following gold number
    (a) 25   (b) 0.025
    (c) 0.25   (d) 2.5
    (e) 0.0025

16. IUPAC name of acraldehyde is
    (a) but-3-en-1-al
    (b) propenyl aldehyde
    (c) but-2-ene-1-al
    (d) propanal
    (e) prop-2-ene-1-al

17. A molecule of urea can show
    (a) chain isomerism
    (b) position isomerism
    (c) geometrical isomerism
    (d) tautomerism
    (e) None of the above

18. The presence of Ag⁺ ion increases the solubility of alkenes due to the formation of
    (a) $d\pi$-$d\sigma$ bonding   (b) $p\sigma$-$p\pi$ bonding
    (c) $p\pi$-$d\pi$ bonding   (d) $p\pi$-$p\pi$ bonding
    (e) None of these

19. Glycerine contains
    (a) 1° carbon
    (b) 2° carbon
    (c) 3° carbon
    (d) both 1° and 2° carbon
    (e) both 2° and 3° carbon

20. α and β-glucose differ in the orientation of —OH group around
    (a) C_1 (b) C_2
    (c) C_3 (d) C_4
    (e) C_5

21. Which one of the following has the highest molar conductivity ?
    (a) Diamminedichloroplatinum (II)
    (b) Tetramminedichlorocobalt (III) chloride

(c) Potassium hexacyanoferrate (II)
(d) Hexaaquochromium (III) bromide
(e) Pentacarbonyl iron (0)

22. The first law of thermodynamic is expressed as
    (a) $Q - W = \Delta E$ (b) $\Delta E = Q - p\Delta V$
    (c) $Q = \Delta E - W$ (d) $W = Q + \Delta E$
    (e) None of these

23. The Markownikoff's rule is the best applicable to the reaction between
    (a) $C_2H_4 + HCl$
    (b) $C_3H_6 + Br_2$
    (c) $C_3H_6 + HBr$
    (d) $C_3H_8 + Cl_2$
    (e) $C_2H_4 + I_2$

24. Phenol can be distinguished from ethanol by the following reagents except
    (a) sodium
    (b) $NaOH/I_2$
    (c) neutral $FeCl_3$
    (d) Br_2/H_2O
    (e) phthalic anhydride/conc. H_2SO_4 and NaOH

25. The enol form of acetone after treatment with D_2O, gives
    (a) $H_3C—C=CH_2$
                $|$
                OD

    (b) $H_3C—C—CD_3$
                $|$
                O

    (c) $H_2C=C—CH_2D$
                $|$
                OH

    (d) $H_2C=C—CHD_2$
                $|$
                OH

    (e) $D_2C=C—CD_3$
                $|$
                OD

26. An alkene on reductive ozonolysis gives 2-molecules of $CH_2(CHO)_2$. The alkene is
    (a) 2, 4-hexadiene
    (b) 1, 3-cyclohexadiene
    (c) 1, 4-cyclohexadiene
    (d) 1-methyl-1, 3-cyclopentadiene
    (e) 1, 2-dimethylcyclopropene

27. Identify the compound Z in this reaction sequence.

$$CH_3CH_2COOH \xrightarrow[\Delta]{NH_3} X \xrightarrow{Br_2 + KOH}$$

$$Y \xrightarrow{HNO_2} Z$$
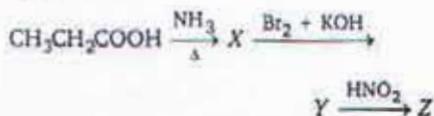
   (a) CH_3OH
   (b) $CH_3CH_2NH_2$
   (c) CH_3CH_2OH
   (d) $CH_3CH_2CH_2OH$
   (e) CH_3NH_2

28. The following homogeneous gaseous reactions were experimentally found to be second order overall.

   I. $2NO \longrightarrow N_2 + O_2$
   II. $3O_2 \longrightarrow 2O_3$
   III. $N_2O_3 \longrightarrow NO + NO_2$
   IV. $H_2 + I_2 \longrightarrow 2HI$
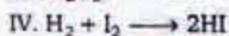
   Which of these are most likely to be elementary reactions that occur in one step ?
   (a) III only
   (b) I and III
   (c) I and IV
   (d) III and IV
   (e) I, II and III

29. On a humid day in summer, the mole fraction of gaseous H_2O (water vapour) in the air at 25°C can be as high as 0.0287. Assuming a total pressure of 0.977 atm, what is the partial pressure of dry air ?
   (a) 94.9 atm
   (b) 0.949 atm
   (c) 949 atm
   (d) 0.648 atm
   (e) 1.248 atm

30. For which of the following sparingly soluble salt, the solubility (s) and solubility product (K_{sp}) are related by the expression $s = (K_{sp} / 4)^{1/3}$?
   (a) $BaSO_4$
   (b) $Ca_3(PO_4)_2$
   (c) Hg_2Cl_2
   (d) Ag_3PO_4
   (e) CuS

31. At certain temperature, a 5.12% solution of cane sugar is isotonic with a 0.9% solution of an unknown solute. The molar mass of solute is
   (a) 60
   (b) 46.17
   (c) 120
   (d) 90
   (e) 92.34

32. Which of the following is true in respect of adsorption ?
   (a) $\Delta G < 0$; $\Delta S > 0$; $\Delta H < 0$
   (b) $\Delta G < 0$; $\Delta S < 0$; $\Delta H < 0$
   (c) $\Delta G > 0$; $\Delta S > 0$; $\Delta H < 0$
   (d) $\Delta G < 0$; $\Delta S < 0$; $\Delta H > 0$
   (e) $\Delta G > 0$; $\Delta S > 0$; $\Delta H > 0$

33. The amine which will not liberate nitrogen on reaction with nitrous acid is
   (a) trimethyl amine
   (b) ethyl amine
   (c) sec-butyl amine
   (d) t-butyl amine
   (e) iso-propyl amine

34. One mole of acidified $K_2Cr_2O_7$ on reaction with excess KI will liberate ... mole(s) of I_2.
   (a) 6
   (b) 1
   (c) 7
   (d) 2
   (e) 3

35. Which of the following exists as Zwitter ion ?
   (a) p-aminophenol
   (b) Salicylic acid
   (c) Sulphanilic acid
   (d) Ethanolamine
   (e) p-aminoacetophenone

36. Consider the following halogen containing compounds

   I. $CHCl_3$
   II. CCl_4
   III. CH_2Cl_2
   IV. CH_3Cl
   V. Cl—⬡—Cl
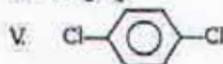
   The compounds with a net zero dipole moment are
   (a) II and V only
   (b) III only
   (c) III and IV only
   (d) I and IV only
   (e) II only

37. Which of the following is bacteriostatic ?
   (a) Penicillin
   (b) Erythromycin
   (c) Amino glycodine
   (d) Ofloxacin
   (e) Bithional

38. Which one of the following set of quantum numbers is not possible for electron in the ground state of an atom with atomic number 19?
   (a) $n = 2, l = 0, m = 0$
   (b) $n = 2, l = 1, m = 0$
   (c) $n = 3, l = 1, m = -1$
   (d) $n = 3, l = 2, m = +2$
   (e) $n = 4, l = 0, m = 0$

39. The sequence that correctly describes the relative bond strength pertaining to oxygen molecule and its cation or anions is
    (a) $O_2^{2-} > O_2^- > O_2 > O_2^+$
    (b) $O_2 > O_2^+ > O_2^- > O_2^{2-}$
    (c) $O_2^+ > O_2 > O_2^{2-} > O_2^-$
    (d) $O_2^+ > O_2 > O_2^- > O_2^{2-}$
    (e) $O_2 > O_2^- > O_2^{2-} > O_2^+$

40. The hybrid rocket propellant consists of
    (a) acrylic rubber and liquid nitrogen tetraoxide
    (b) polyurethane and ammonium
    perchlorate
    (c) nitroglycerine and nitrocellulose
    (d) liquid hydrogen and liquid oxygen
    (e) hydrogen peroxide

41. Boric acid is used in carom boards for smooth gliding of pawns because
    (a) H_3BO_3 molecules are loosely chemically bonded and hence soft
    (b) its low density makes it fluffy
    (c) it can be powdered to a very small grain size
    (d) it is chemically inert with the plywood
    (e) H-bonding in H_3BO_3 gives it a layered structure

42. The pair of $[Co(SO_4)(NH_3)_5]Cl$ and $[CoCl(NH_3)_5]SO_4$ constitutes
    (a) optical isomers
    (b) linkage isomers
    (c) coordination isomers
    (d) hydrate isomers
    (e) ionisation isomers

43. Which one of the following pairs of elements is called 'chemical twins' because of their very similar chemical properties?
    (a) Mn and W   (b) Mo and Tc
    (c) Fe and Re   (d) Hf and Zr
    (e) Fe and Co

44. The IUPAC name of $[Co(NH_3)_5ONO]^{2+}$ ion is
    (a) pentammine nitrito cobalt (IV) ion
    (b) pentammine nitrito cobalt (III) ion
    (c) pentammine nitro cobalt (III) ion
    (d) pentammine nitro cobalt (IV) ion
    (e) None of the above

45. Hydration of different ions in aqueous solution is an example of
    (a) ion-induced dipole interaction
    (b) dipole-dipole interaction
    (c) dipole-induced dipole interaction
    (d) attractive dispersion forces between atoms
    (e) ion-dipole interaction

46. The vapour pressure of two liquids X and Y are 80 and 60 Torr respectively. The total vapour pressure of the ideal solution obtained by mixing 3 moles of X and 2 moles of Y would be
    (a) 68 Torr   (b) 140 Torr
    (c) 48 Torr   (d) 72 Torr
    (e) 54 Torr

47. The elements present in the core of earth are collectively known as
    (a) lithophiles   (b) nucleophiles
    (c) chalcophiles   (d) siderophiles
    (e) atmophiles

48. Concentrated sulphuric acid can be reduced by
    (a) NaCl   (b) NaF
    (c) NaOH   (d) $NaNO_3$
    (e) NaBr

49. Consider the ions : K^+, S^{2-}, Cl^- and Ca^{2+}. The radii of these ionic species follow the order
    (a) $Ca^{2+} > K^+ > Cl^- > S^{2-}$
    (b) $Cl^- > S^{2-} > K^+ > Ca^{2+}$
    (c) $Ca^{2+} > Cl^- > K^+ > S^{2-}$
    (d) $K^+ > S^{2-} > Cl^- > Ca^{2+}$
    (e) $S^{2-} > Cl^- > K^+ > Ca^{2+}$

50. A compound in which a metal ion $M^{x+}(Z = 25)$ has a spin only magnetic moment of $\sqrt{24}$ BM. The number of unpaired electrons in the compound and the oxidation state of the metal ion are respectively
    (a) 4 and 2
    (b) 5 and 3
    (c) 3 and 2
    (d) 4 and 3
    (e) 3 and 1

51. To an aqueous solution containing anions, a few drops of acidified $KMnO_4$ are added. Which one of the following anions, if present will not decolourise the $KMnO_4$ solution?
    (a) I^-
    (b) CO_3^{2-}
    (c) S^{2-}
    (d) NO_2^-
    (e) Cl^-

52. The ion that is more effective for the coagulation of As_2S_3 sol is
    (a) Ba^{2+}
    (b) Na^-
    (c) PO_4^{3-}
    (d) SO_4^{2-}
    (e) Al^{3+}

53. Lassaigne's test for the detection of nitrogen fails in
    (a) $H_2N—CO—NHNH_2 \cdot HCl$
    (b) $NH_2—NH_2 \cdot HCl$
    (c) $NH_2—CO—NH_2$
    (d) $C_6H_5—NH—NH_2 \cdot HCl$
    (e) $C_6H_5CONH_2$

54. The alkyl halide that undergoes $S_N 1$ reaction more readily is
    (a) ethyl bromide
    (b) iso-propyl bromide
    (c) vinyl bromide
    (d) n-propyl bromide
    (e) t-butyl bromide

55. Select R-isomers from the following

56. Which of the following is a better reducing agent for the following reduction ?

$$RCOOH \longrightarrow RCH_2OH$$

(a) $SnCl_2/HCl$
(b) $NaBH_4/ether$
(c) H_2/Pd
(d) N_2H_4/C_2H_5ONa
(e) B_2H_6/H_3O^+

(a) I and III
(b) II, IV and V
(c) I, II and III
(d) II and III
(e) I, III and V

57. The ore that is concentrated by froth floatation process is
    (a) zincite
    (b) cinnabar
    (c) bauxite
    (d) malachite
    (e) corundum

58. The oxide of an element whose electronic configuration is $1s^2, 2s^2, 2p^6, 3s^1$ is
    (a) neutral
    (b) amphoteric
    (c) basic
    (d) acidic
    (e) data insufficient

59. Among the following, the compound that contains ionic, covalent and coordinate linkage is
    (a) NH_3
    (b) NH_4Cl
    (c) $NaCl$
    (d) CaO
    (e) C_6H_5CHO

60. Which of the following is fully fluorinated polymer ?
    (a) PVC
    (b) Thiokol
    (c) Teflon
    (d) Neoprene
    (e) Saran

Biology

1. Plants restricted to certain localities are referred to as
   (a) exotic
   (b) endemic
   (c) introduced
   (d) natural

2. Some bacteria are not easily killed by antibiotics or heat treatment because of their
   (a) capsule
   (b) chitinous cell wall
   (c) mucopeptides in cell wall
   (d) mesosomes

3. Which type of ribosome is found in *Nostoc* cells?
   (a) 70 S
   (b) 80 S
   (c) 55 S
   (d) 30 S

4. Haploid cells can be obtained from
   (a) leaf
   (b) stem
   (c) seed
   (d) anther

5. Bromelain is an enzyme extracted from
   (a) yeast
   (b) *Ficus*
   (c) pineapple
   (d) papaya

6. Genes not located within the nucleus are almost always found in
   (a) cytosol
   (b) ribosome
   (c) cytoskeleton
   (d) cell membrane

7. Spine formation is found in
   (a) *Opuntia*
   (b) *Nepenthes*
   (c) *Asparagus*
   (d) *Drosera*

8. Which one reproduces vegetatively?
   (a) *Allium cepa*
   (b) *Allium sativum*
   (c) *Pisum sativum*
   (d) *Zea mays*

9. Gall flowers of figs are
   (a) staminate
   (b) pistillate
   (c) neutar
   (d) naked

10. Quiescent centre possesses
    (a) actively dividing cells
    (b) meristematic cells
    (c) passive cells
    (d) storage cells

11. Stomata are evenly distributed on upper and lower surfaces of leaf in
    (a) potato
    (b) mulberry
    (c) *Vallisneria*
    (d) *Eichhornia*

12. Cork cells are dead because they do not possess
    (a) cellulosic cell wall
    (b) permeable cell wall
    (c) protoplast
    (d) meristematic activities

13. Transfusion tissue is meant for translocation of
    (a) organic solutes
    (b) sap
    (b) food materials
    (d) All of these

14. An alcohol-dipped cell kept in hypertonic sucrose solution will
    (a) burst
    (b) plasmolysed
    (c) remain unchanged
    (d) become turgid

15. The plant ash is an indication of
    (a) mineral salts absorbed by the plant
    (b) organic matter of the plant
    (c) both mineral salts and organic matter
    (d) None of the above

16. The smallest known plant having the same pigments as grasses and trees, belongs to
    (a) Chlorophyceae
    (b) Schizomycetes
    (c) Bryophyta
    (d) Angiosperms

17. Synthesis of ATP in mitochondria requires
    (a) NADP
    (b) FMN
    (c) oxygen
    (d) pyruvic acid

18. *Polygonum* type 7-celled embryo sac closely resembles to
    (a) *Allium* type
    (b) *Drusa* type
    (c) *Adoxa* type
    (d) All of these

19. Fruit formation is directly associated with stimulus of
    (a) pollination
    (b) fertilization
    (c) endospore formation
    (d) None of the above

20. Hormone related to phototropism is
    (a) IAA
    (b) GA_3
    (c) kinetin
    (d) 2, 4-D

21. In mangrove forest, there occur
    (a) rich biodiversity
    (b) very severe interspecific competition
    (c) very severe intraspecific competition
    (d) no competition

22. Secondary growth is not seen in
    - (a) succulents
    - (b) xerophytes
    - (c) hydrophytes
    - (d) mangroves

23. Important Value Index (IVI) is determined using quantitative data of
    - (a) relative density
    - (b) relative frequency
    - (c) relative dominance
    - (d) All of the above

24. Maximum radiant energy is trapped by
    - (a) algae
    - (b) herbs
    - (c) shrubs
    - (d) trees

25. Which of the weed is most harmful?
    - (a) *Azolla*
    - (b) *Parthenium*
    - (c) *Salvinia*
    - (d) *Salicornia*

26. Early blight disease is related to
    - (a) sugarcane
    - (b) potato
    - (c) onion
    - (d) rose

27. Bioenergy is always
    - (a) ecofriendly
    - (b) cheap
    - (c) non-polluting
    - (d) Both (a) and (b)

28. Axenic culture means
    - (a) cell culture
    - (b) cell culture free from microorganisms
    - (c) cell culture free from plants
    - (d) None of the above

29. Nif genes are fixing genes for
    - (a) nitrogen
    - (b) oxygen
    - (c) carbon
    - (d) nitrate

30. A cell having genetically different DNA strands is called
    - (a) callus
    - (b) cybrid
    - (c) chimera
    - (d) plasmid

31. Glisson's capsule is related to
    - (a) intestine
    - (b) liver
    - (c) lung
    - (d) stomach

32. Crypts of Lieberkuhn have
    - (a) α-cells
    - (b) β-cells
    - (c) paneth cells
    - (d) Kupffer's cells

33. Circulation is closed type in
    - (a) frog
    - (b) human
    - (c) monkey
    - (d) earthworm

34. Frogs and toads belong to the order
    - (a) Caudata
    - (b) Apoda
    - (c) Anura
    - (d) Gymnophiona

35. The Vibrissae of a rat is arranged in
    - (a) 2 groups
    - (b) 3 groups
    - (c) 4 groups
    - (d) 5 groups

36. Kwashiorkor is a deficiency disease of
    - (a) protein
    - (b) fat
    - (c) carbohydrate
    - (d) minerals

37. Which refers to biocatalysts?
    - (a) Erepsin, amylase, rennin
    - (b) Rhodopsin, pepsin, steapsin
    - (c) Myosin, oxytocin, adrenaline
    - (d) Glucose, amino acids, fatty acids

38. Which of them possess non-elastic lungs with elastic air sacs connected to them?
    - (a) Birds
    - (b) Reptiles
    - (c) Mammals
    - (d) Amphibians

39. The yellow colour of urine is due to
    - (a) urea
    - (b) bilirubin
    - (c) uric acid
    - (d) urochrome

40. Retinal cells involved in colour vision are
    - (a) cones
    - (b) cornea
    - (c) neurons
    - (d) neuroglial cells

41. Pituitary lies in the sella turcica of
    - (a) nasal
    - (b) vomer
    - (c) ethmoid
    - (d) sphenoid

42. Glucagon characteristically increases all the following except
    - (a) ketogenesis in the liver
    - (b) glycogenolysis in muscle
    - (c) lipolysis in adipose tissue
    - (d) urea synthesis in liver

43. Membrane attack complex (Mac) is formed by
    - (a) B-lymphocytes
    - (b) macrophages
    - (c) T-lymphocytes
    - (d) complements

44. Which one is not related to hallucinogens?
    - (a) LSD
    - (b) Marijuana
    - (c) Psilocybin
    - (d) Heroin

45. Chromatoid bodies in *Entamoeba histolytica* are found in
    - (a) cyst
    - (b) minuta
    - (c) metacyst
    - (d) trophozoite

46. Animals which have well-marked digestive cavity are put under
    - (a) Metazoa
    - (b) Bryozoa
    - (c) Parazoa
    - (d) Enterozoa

47. Blood of earthworm is red because its haemoglobin is
    (a) reduced   (b) oxidised
    (c) intracellular   (d) intercellular

48. Larva of housefly lacks
    (a) eyes   (b) abdomen
    (c) fins   (d) spiracles

49. Which of the following stain is obtained from the female scale insect *Coccus cacti?*
    (a) Carmine   (b) Orcein
    (c) Haematoxylin   (d) Crystal violet

50. Creatinine is formed metabolically from
    (a) arginine   (b) histidine
    (c) tryptophan   (d) phenylalanine

51. Example of a phosphoprotein is
    (a) mucin   (b) casein
    (c) ferritin   (d) haemoglobin

52. Which of the following diseases is related to colour blindness?
    (a) Night blindness
    (b) Haemophilia
    (c) Cataract
    (d) Cancer

53. The category of molecules produced by Miller-Urey experiment was
    (a) organic polymers
    (b) inorganic polymers
    (c) organic monomers
    (d) inorganic monomers

54. Which of them are not homologous?
    (a) Insect legs
    (b) Insect mouth parts
    (c) Vertebrate forelimbs
    (d) Birds and insect wings

55. An example of vestigial organ is
    (a) hair of bear
    (b) ear of cow
    (c) tusk of elephant
    (d) nictitating membrane of man

56. The closest relative of modern man is considered to be
    (a) monkey   (b) chimpanzee
    (c) ape   (d) gorilla

57. Why pea plants were more suitable than dogs for Mendel's experiment?
    (a) Dogs have many genetic traits
    (b) Pea plants can be self fertilized
    (c) No pedigree records of dogs
    (d) Pea plants favour cross fertilization

58. Super position image formation takes place in cockroach during
    (a) dim light   (b) diffused light
    (c) bright light   (d) None of these

59. Scales are absent in
    (a) *Catla*   (b) *Wallago*
    (c) *Cirrhinus*   (d) *Scoliodon*

60. The mammals evolved from the reptile in the
    (a) Cretaceous   (b) Triassic
    (c) Devonian   (d) Carboniferous

English

1. The ICC Executive Board has declared that 14-team will be eligible for the 2015 World Cup, to be held in Australia and New Zealand. What number has been decided for 2019 World Cup?
    (a) 10   (b) 12
    (c) 14   (d) 16

2. In which of following States the Sick Newborn Care Units (SNCUs) are being set up in all district hospital with a view to minimizing the infant and child mortality rate?
    (a) Gujarat   (b) Punjab
    (c) Bihar   (d) Haryana

3. Which famous temple in Kerala sparked widespread interest when a treasure trove amounting to $ 22 was unearthed during a stock-taking exercise?
    (a) Sri Guruvayr Temple
    (b) Sri Padmanabhaswamy Temple
    (c) Sril Lakshman Temple
    (d) Puthukulangara Sree Bhadrakli Temple

4. Which of these is the capital of the newly constituted country South Sudan?
    (a) Aber
    (b) Juba
    (c) Jongli
    (d) Bahr al Ghazal

5. The 17th SAARC Summit will be held in the Republic of Maldives from Nov 10-11,2011. What will be the theme of this summit?

    (a) Investing for Future
    (b) Building Cross-Border Confidence
    (c) Respect for Elders and Love for Children
    (d) Building Bridges for Peace, Friendship And Security

6. The first UID number was issued on Sept 29, 2010, in a village of Nandurbar district of Maharashtra. Since then, one crore Indians have been issued their Unique Identification Numbers. The government targets of issuing 60 crore Aadhaar numbers by which year?

    (a) 2013   (b) 2014
    (c) 2015   (d) 2016

7. Which of the following biosphere reserves (NBR) is going to be showcased for the award instituted by the UNESCO to mark the 40th year of its theme "Man and Biosphere"?

    (a) Sunderban   (b) Nilgiris
    (c) Manas   (d) Nokrek

8. The World Chess Championship Title match in 2012 will be held in Chennai in April-May. The title clash will be between defending champion Viswanathan Anand of India and Boris Gelfand, who belongs to

    (a) Spain   (b) Belarus
    (c) Israel   (d) Russia

9. Basant Nayak, who passed away recently, was a film-maker of which among the following film industry?

    (a) Tamil   (b) Telugu
    (c) Oriya   (d) Bhojpuri

10. Which day is observed as the international day against drug abuse and illicit trafficking throughout the world?

    (a) June 23   (b) June 24
    (c) June 25   (d) June 26

11. Which of the following rivers is also called 'Ganga of the South?

    (a) Krishna   (b) Godavari
    (c) Cauveri   (d) Tapti

12. Maximum crude petroleum in India is produced in

    (a) Asom
    (b) Gujarat

    (c) Off-shor Bombay High
    (d) Coastal Tamil Nadu

13. Lines which join the places receiving equal amount of rainfall are called

    (a) Contours   (b) Isohyets
    (c) Isotherms   (d) Isobars

14. Which among the following rivers makes an estuary?

    (a) Cauveri   (b) Krishna
    (c) Narmada   (d) Ganga

15. Which State of India has the largest area under forests?

    (a) Arunachal Pradesh
    (b) Madhya Pradesh
    (c) Maharashtra
    (d) Nagaland

16. The highest peak of India is

    (a) Everest   (b) K2
    (c) Pokalde   (d) Nanda Devi

17. Oil reserves are found mainly in following rocks

    (a) Metamorphic (b) Sedimentary
    (c) Igneous   (d) None of these

18. Which State in India is famous for sandal wood?

    (a) Maharashtra (b) Karnataka
    (c) Kerala   (d) Andhra Pradesh

19. Indian Standard Time is calculated on the basis of that longitude, which is near

    (a) Allahabad   (b) Lucknow
    (c) Kanpur   (d) Varanasi

20. The shape of the earth is oblong spheroid due to

    (a) attraction of moon
    (b) internal structure
    (c) revolution around the sun
    (d) rotation about its axis

21. During which geological age did dinosaurs roam on the earth?

    (a) Jurrasic   (b) Tommotian
    (c) Cambrian   (d) Precambrian

22. The Southernmost point of mainland India is

    (a) Chennai
    (b) Kanyakumari
   (c) Thiruvananthpuram
    (d) Mangalore

23. Which of the following scales is used to measure earthquake intensity?
    (a) Mohr's scale   (b) Richter scale
    (c) Beaufort scale (d) None of these

24. Teen-Bigha Corridor links
    (a) Bangladesh and India
    (b) India and Nepal
    (c) Bangladesh and Nepal
    (d) India and Pakistan

25. A solar eclipse occurs when
    (a) the earth comes in between the sun and the moon
    (b) the sun comes in between the moon and the earth
    (c) the moon, the sun and the earth are in a straight line
    (d) the moon comes in between the sun and the earth

26. The Panama Canal connects
    (a) the Atlantic ocean and the mediterranean sea
    (b) the Atlantic ocean and the Indian ocean
    (c) the Pacific and the Atlantic oceans
    (d) None of the above

27. On which river is the highest waterfall in India located?
    (a) Krishna   (b) Godavari
    (c) Sharavati   (d) Tapti

28. The country with highest population density in the world is
    (a) England   (b) Nauru
    (c) Japan   (d) India

29. The 'Chipko Movement' was about
    (a) forest conservation
    (b) wildlife preservation
    (c) scientific agriculture
    (d) deforestation

30. Which is the longest National Highway in India?
    (a) NH 1   (b) NH 24
    (c) NH 7   (d) NH 6   -

31. The city known as the 'Pittsburg of India' is
    (a) Jamshedpur
    (b) Tatanagar
    (c) Hardwar
    (d) Bhilai

32. Which of the following is the best type of coal?
    (a) Anthracite   (b) Lignite
    (c) Peat   (d) Limonite

33. India's largest lake Chilka is situated in
    (a) Odisha   (b) Maharashtra
    (c) West Bengal (d) Karnataka

34. A storm is indicated if atomospheric pressure
    (a) falls suddenly
    (b) rises gradually
    (c) rises suddenly
    (d) falls gradually

35. Who is credited with the design of Taj Mahal?
    (a) Ustad Isa   (b) Mir Ali
    (c) Syed Hussain (d) Abdus Samad

36. The Qutub Minar at Delhi was built to commemorate honour
    (a) Qutubuddin Aibak
    (b) Iltutmish
    (c) Qutubuddin Bakhtiyar Kaki
    (d) Alauddin Khalji

37. Tripitakas are the sacred texts of which religion?
    (a) Jainism   (b) Buddhism
    (c) Pashupatas   (d) None of these

38. Which leader started the now hugely popular 'Ganapati Festival' in Maharashtra?
    (a) Dadabhai Nauroji
    (b) MG Ranade
    (c) Bal Gangadhar Tilak
    (d) None of the above

39. Bahadur Shah Zafar, the last Mughal, was exiled to
    (a) Maldives   (b) Kala Pani
    (c) Rangoon   (d) London

40. The Mughal Emperor who again imposed Jaziya on Hindus was
    (a) Aurangzeb   (b) Akbar
    (c) Shah Jahan (d) Humayun

41. The Bengal Partition was announced in
    (a) 1911   (b) 1901
    (c) 1905   (d) 1916

42. Who was called the 'Nightingale of India'?
    (a) Pandita Ramabai
    (b) Kalpana Dutt
    (c) Sucheta Kriplani
    (d) Sarojini Naidu

43. Where did in India Mahatma Gandhi first try his techniques of Satyagraha?
    (a) Poona   (b) Champaran
    (c) Delhi   (d) Sabarmati

44. 'Lilavati' an ancient work on Mathematics, was written by
    (a) Aryabhatta   (b) Varahmihira
    (c) Bhaskaracharya (d) Banabhatta

45. Which of the following was a famous physician?
    (a) Charvak   (b) Kamban
    (c) Charak   (d) Bhaskar

46. Which Gupta ruler has been depicted on his coins as playing veena?
    (a) Skandagupta   (b) Chandragupta
    (c) Samudragupta   (d) None of these

47. In which year was the battle of Plassy fought?
    (a) 1761   (b) 1757
    (c) 1857   (d) 1843

48. Alberuni has given the detailed account of his visit to India in
    (a) Kitab-ul-Hind
    (b) Tarikh-i-Yamini
    (c) Futuh-us-Alamgiri
    (d) Hamzanamah

49. Who was the British Prime Minister at the time of independence of India?
    (a) McDonald   (b) Atlee
    (c) Churchill   (d) Cripps

50. The ancient name of Bengal was
    (a) Gaud   (b) Sopara
    (c) Kamarupa   (d) Panchala

51. Name the founder of the Widow Remarriage Association in the 19th century.
    (a) Ishwar Chandra Vidyasagar
    (b) Vishnu Shastri Pandit
    (c) Raja Ram Mohan Roy
    (d) Gopal Hari Deshmukh

52. Which Mughal Emperor got constructed the Peacock throne?
    (a) Jahangir   (b) Aurangzeb
    (c) Shah Jahan   (d) Akbar

53. Who was the only Indian Governor-General of India?
    (a) Jawahar Lal Nehru
    (b) Narendra Kriplani
    (c) Rajendra Prasad
    (d) C Rajagopalachari

54. In which language was the Sangam literature composed?
    (a) Sanskrit   (b) Aramaic
    (c) Prakrit   (d) Tamil

55. Which of the following objects has been discovered at all the Harappan sites?
    (a) Seals   (b) Ploughshare
    (c) Gold ornaments (d) Spindles

56. The revenue system of Mughal Empire was revamped by
    (a) Raja Birbal   (b) Raja Man Singh
    (c) Todarmal   (d) Bairam Khan

57. At which session of the Congress it split due to the differences between the Extremists and the Moderates?
    (a) 1903   (b) 1904
    (c) 1906   (d) 1907

58. Who among the following was called 'The Grand Old Man of India'?
    (a) Mahatma Gandhi
    (b) Dadabhai Nauroji
    (c) AO Hume
    (d) Badruddin Tyabji

59. Which Mughal ruler got executed Teg Bahadur, the 9th Sikh Guru?
    (a) Jahangir   (b) Aurangzeb
    (c) Bahadur Shah I (d) Shah Jahan

60. 'Prithviraj Raso' was written by
    (a) Bilhan   (b) Amir Khusro
    (c) Chand Bardai   (d) Kalhana

61. Gandhiji withdrew the Non-Cooperation Movement due to
    (a) agreement with Lord Irwin
    (b) Jalianwala Bagh violence
    (c) Chauri Chaura incident
    (d) None of the above

62. Mahatma Gandhi was the President of the Congress in which session?
    (a) Bombay, 1942
    (b) Belgaum, 1924
    (c) Calcutta, 1920
    (d) None of the above

63. Which of the following bodies is not a constitutional body?
    (a) Planning Commission
    (b) Election Commission
    (c) Finance Commission
    (d) Union Public Service Commission

64. The Zero hour is set aside for
    (a) asking questions
    (b) rest break between two meetings of the House
    (c) discussing budget proposals
    (d) miscellaneous business

65. The Pro-tem Speaker
    (a) swears-in members and hold charge till a regular Speaker is elected
    (b) officiates as Speaker when the Speaker is unlikely to be elected
    (c) conducts the proceedings of Houses in absence of the Speaker and the Deputy Speaker
    (d) checks if the election certificates of the members are in order

66. Which among the following is referred to as the 'First Citizen of India'?
    (a) The Prime Minister
    (b) The Chief Justice of India
    (c) The Lok Sabha Speaker
    (d) The President

67. The ninth schedule of Indian Constitution deals with
    (a) anti-defection legislation
    (b) Panchayati Raj
    (c) land reforms
    (d) distribution of powers between the Union and States

68. Which of the following UTs sends most MPs to the Lok Sabha?
    (a) Chhattisgarh
    (b) Delhi
    (c) Puducherry
    (d) Andaman

69. Indian Constitution heavily borrowed from
    (a) the erstwhile USSR Constitution
    (b) the British Constitution
    (c) the Govt of India Act, 1935
    (d) the US Constitution

70. Who officiates as the President when offices of both the President and the Vice-President are vacant?
    (a) The Lok Sabha Speaker
    (b) The Rajya Sabha Chairman
    (c) The Chief Justice
    (d) The Home Minster

71. Who was the first woman Governor of a State?
    (a) Indira Gandhi
    (b) Sarojini Naidu
    (c) Vijaya Lakshmi Pandit
    (d) Lakshmi Sehgal

72. The Constitution states that India shall be
    (a) a Union of States
    (b) Unitary State
    (c) a Federation
    (d) a Confederation

73. The number of Fundamental Duties mentioned in the Constitution is
    (a) 12   (b) 10
    (c) 11   (d) 13

74. The maximum permissible time-gap between two consecutive sessions of Parliament is
    (a) 3 months   (b) 2 months
    (c) 6 months   (d) 4 months

75. Right to education to all children of the age-group of 6 to 14 years is
    (a) a Directive Principle of State Policy
    (b) a Fundamental Right
    (c) a Statutory Right
    (d) None of the above

76. A joint sitting of the two Houses of Parliament is summoned by the
    (a) Prime Minister
    (b) President
    (c) Members of Lok Sabha
    (d) Members of Rajya Sabha

77. Who among the following is called the First Law Officer of India?
    (a) Attorney-General
    (b) Law Minister
    (c) Chief Justice
    (d) Law Secretary

78. The President can impose central rule on a State under
    (a) Article 356   (b) Article 256
    (c) Article 370   (d) Article 377

79. How many members can the President nominate to the Rajya Sabha?
    (a) 12 members   (b) 18 members
    (c) 6 members   (d) 15 members

80. 'World Bank' is also known as
    (a) International Bank for Research and Development
    (b) International Bank for Rehabilitation and Development
    (c) International Bank for Refinance and Development
    (d) International Bank for Reconstruction and Development

81. The headquarters of the Asian Development Bank is at
    (a) Manila   (b) Singapore
    (c) Delhi   (d) Bangkok

82. 'CAPART' is engaged primarily in
    (a) e-governance
    (b) share market
    (c) rural development
    (d) pollution control

83. The difference between the GNP and the NNP is equal to the
    (a) consumer expenditure on durable goods
    (b) indirect tax revenue
    (c) direct tax revenue
    (d) capital depreciation

84. Bank rate is the rate at which the RBI provides loans to
    (a) Public Sector Undertakings
    (b) Private Corporate Sector
    (c) Scheduled Commercial Banks
    (d) Non-Banking Financial Institutions

85. Which sector of India's economy employs the maximum number of people?
    (a) Primary sector
    (b) Secondary sector
    (c) Tertiary sector
    (d) None of the above

86. What does AGMARK signify?
    (a) A quality guarantee stamp for agricultural produce
    (b) Regulated agricultural produce markets
    (c) Farmer associations
    (d) A cooperative for agricultural produce

87. The term 'Green Revolution' indicates higher production through
    (a) enhanced agricultural productivity
    (b) planting more trees
    (c) creation of grasslands
    (d) creation of garden in urban areas

88. 'Wall Street' is
    (a) the financial centre of USA
    (b) the newspaper centre of Britain
    (c) the great wall of China
    (d) a renowned street in France

89. GDP is defined as the value of all
    (a) final value of goods and services produced in an economy in a year
    (b) goods and services produced in an economy in a year
    (c) final goods produced in an economy in a year
    (d) goods produced in an economy in a year

90. ATM stands for
    (a) Automatic Tally Machine
    (b) Automotive Teller Machine
    (c) Automatic Teller Machine
    (d) Automated Tally Mechanism

91. Which States of India benfited most from Green Revolution?
    (a) Punjab, Haryana and Western Uttar Pradesh
    (b) Rajasthan, Gujarat and Maharashtra
    (c) Bihar, Uttar Pradesh and Asom
    (d) Tamil Nadu, Andhra Pradesh and Karnataka

92. Who is the brand ambassador of Thums Up?
    (a) Salman Khan
    (b) Amir Khan
    (c) Akshay Kumar
    (d) Shahrukh Khan

93. When was the General Agreement on Tariff and Trade (GATT) absorbed into the World Trade Organization (WTO)?
    (a) 1991   (b) 2000
    (c) 1995   (d) 2005

94. The First Five Year Plan adopted
    (a) Harrod Domar model
    (b) Manalanobis model
    (c) Lewis Fei model
    (d) Stalin model

95. The Mid-day Meal Scheme was launched by the Union Ministry of
    (a) Home Affairs
    (b) Social Welfare
    (c) HRD
    (d) None of the above

96. Public Distribution System was launched to
    (a) prevent hoarding and black-marketing
    (b) provide food security to the poor
    (c) prevent overcharging by traders
    (d) All of the above

97. Which year is known as the Year of Great Divide with respect to population growth in India?
    (a) 1947
    (b) 1921
    (c) 1911
    (d) None of these

98. Which type of unemployment can occur even in a situation of full employment?
    (a) Structural unemployment
    (b) Functional unemployment
    (c) Cyclical unemployment
    (d) Disguised unemployment

99. The number of companies covered under the 'BSE Sensex' is
    (a) 20
    (b) 25
    (c) 30
    (d) 50

100. Nuclear fission is caused by the impact of
    (a) proton
    (b) electron
    (c) neutron
    (d) None of these

101. Which of the following has the least penetrating power?
    (a) Alpha particles
    (b) Beta particles
    (c) Gamma rays
    (d) All have the same penetrating power

102. Which of the following are the discoveries of Einstein?
    (a) Radioactivity and photoelectric effect
    (b) Radioactivity and theory of relativity
    (c) theory of relativity and photoelectric effect
    (d) X-rays and photoelectric effect

103. Cryogenic engines find applications in
    (a) rocket technology
    (b) frost-free refrigerators
    (c) submarine propulsion
    (c) researches in superconductivity

104. Optic fibres are mainly use for which of the following?
    (a) Communication
    (b) Weaving
    (c) Musical instruments
    (d) Food industry

105. Which of the following is used as a coolant in nuclear reactors?
    (a) Heavy water
    (b) Cadmium
    (c) Liquid sodium
    (d) Graphite

106. Which of the following is the lightest metal?
    (a) Mercury
    (b) Silver
    (c) Lithium
    (d) Lead

107. An alloy used in making heating elements for electric heating devices is
    (a) solder
    (b) alloy steel
    (c) nichrome
    (d) German silver

108. Carbon, diamond and graphite are together called
    (a) isomers
    (b) allotropes
    (c) isomorphs
    (d) isotopes

109. Which of the following is used in beauty parlours for hair setting?
    (a) Chlorine
    (b) Sulphur
    (c) Phosphorus
    (d) Silicon

110. Balloons are filled with
    (a) helium
    (b) oxygen
    (c) nitrogen
    (d) argon

111. Which of the following compounds are responsible for 'acid rain'?
    1. Nitrogen dioxide
    2. Silicon dioxide
    3. Sulphur dioxide
    4. Carbon monoxide
    Select the correct answer from the codes given below
    (a) 1 and 2
    (b) 1 and 3
    (c) 2 and 4
    (d) 3 and 4

112. Washing soda is the common name for
    (a) calcium carbonate
    (b) calcium bicarbonate
    (c) sodium carbonate
    (d) sodium bicarbonate

113. A person who lives exclusively on milk, egg and bread is likey to become a victim of
    (a) rickets
    (b) scurvy
    (c) xerophthalmia
    (d) None of the above

114. During sleep a man's blood pressure
    (a) increases
    (b) decreases
    (c) remains constant
    (d) fluctuates

115. Ready source of energy available for athletes is
    (a) carbohydrates
    (b) fats
    (c) proteins
    (d) vitamins

116. Alzheimer's disease in human beings is characterised by the degeneration of
    (a) kideny cells   (b) nerve cells
    (c) brain cells   (d) liver cells

117. The pH of human blood is between
    (a) 6.5 – 7   (b) 7.5 – 8
    (c) 8 – 9   (d) 4.5 – 5

118. Flower colours are due to
    (a) chlorophyll   (b) melanin
    (c) phytochromes   (d) anthocyanin

119. Which vitamin is provided by sunlight to the body?
    (a) Vitamin-A   (b) Vitamin-B
    (c) Vitamin-C   (d) Vitamin-D

120. Human body is
    (a) heart   (b) liver
    (c) kidney   (d) brain

Answers

Physics

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

Chemistry

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

Biology

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

English

1. (a)	2. (d)	3. (b)	4. (b)	5. (a)	6. (b)	7. (b)	8. (c)	9. (c)	10. (d)
11. (c)	12. (c)	13. (b)	14. (b)	15. (b)	16. (b)	17. (b)	18. (b)	19. (a)	20. (d)
21. (a)	22. (b)	23. (b)	24. (a)	25. (d)	26. (c)	27. (c)	28. (c)	29. (a)	30. (c)
31. (a)	32. (a)	33. (a)	34. (a)	35. (a)	36. (c)	37. (b)	38. (c)	39. (c)	40. (a)
41. (c)	42. (d)	43. (b)	44. (c)	45. (c)	46. (c)	47. (b)	48. (a)	49. (b)	50. (a)
51. (b)	52. (c)	53. (d)	54. (d)	55. (a)	56. (c)	57. (d)	58. (b)	59. (b)	60. (c)
61. (c)	62. (b)	63. (a)	64. (d)	65. (a)	66. (d)	67. (c)	68. (b)	69. (c)	70. (c)
71. (b)	72. (a)	73. (a)	74. (c)	75. (b)	76. (b)	77. (a)	78. (a)	79. (a)	80. (d)
81. (a)	82. (c)	83. (d)	84. (c)	85. (a)	86. (a)	87. (a)	88. (a)	89. (a)	90. (c)
91. (a)	92. (c)	93. (c)	94. (a)	95. (c)	96. (d)	97. (b)	98. (c)	99. (c)	100. (c)
101. (a)	102. (c)	103. (a)	104. (a)	105. (a)	106. (c)	107. (c)	108. (b)	109. (b)	110. (a)
111. (b)	112. (d)	113. (b)	114. (d)	115. (a)	116. (b)	117. (b)	118. (d)	119. (d)	120. (b)

Hints & Solutions

Physics

1. $\dfrac{\text{Width of incident wavefront}}{\text{Width of refracted wavefront}} = \dfrac{\cos i}{\cos r}$

$$= \dfrac{\cos 60°}{\cos 45°} = \dfrac{1/2}{1/\sqrt{2}}$$

$$= \dfrac{1}{\sqrt{2}}$$

2. When electron moves in transverse electric field, the nature of path is parabola.

3. According to Einstein's theory of photoelectric emission, one incident photon of light can eject one photoelectron from the surface of metal.

4. As $\beta = \dfrac{\alpha}{1-\alpha}$

$$\alpha = \dfrac{\beta}{1+\beta}$$

Also, $1 - \alpha = \dfrac{1}{1-\beta}$

5. The depletion layer is free from mobile charge carriers. There is diffusion of charge carriers to form depletion layer.

6. Entropy $= \dfrac{\text{Heat absorbed}}{\text{Temperature}}$

$$\Rightarrow \qquad S = \dfrac{Q}{T}$$

$$\Rightarrow \qquad [S] = [ML^2T^{-2}K^{-1}]$$

Also, $E = \dfrac{1}{2} k_B T$

where k_B is Boltzmann constant.

$$\Rightarrow \quad [k_B] = \dfrac{[E]}{[T]} = \dfrac{[ML^2T^{-2}]}{[K]} = [ML^2T^{-2}K^{-1}]$$

Hence, dimensional formula of entropy is same as that of Boltzmann constant.

7. Since, $R \propto u^2 \Rightarrow R = ku^2$

$$\Rightarrow \qquad \dfrac{dR}{R} = 2\dfrac{du}{u}$$

$$= 2 \times 1\% = 2\%$$

8. $\mu = \tan\theta$

where, θ = angle of repose

$$\Rightarrow \qquad \theta = \tan^{-1}(\mu)$$

9. $(E_k) = h\nu - \phi_0$

$(E_k)_1 = 1 - 0.5 = 0.5$ eV

Similarly $(E_k)_2 = 2.5 - 0.5 = 2$ eV

$$\dfrac{(E_k)_1}{(E_k)_2} = \dfrac{1}{4}$$

$$\Rightarrow \qquad \dfrac{\frac{1}{2}mv_1^2}{\frac{1}{2}mv_2^2} = \dfrac{1}{4} \Rightarrow \dfrac{v_1^2}{v_2^2} = \dfrac{1}{4}$$

$$\Rightarrow \qquad \dfrac{v_1}{v_2} = \dfrac{1}{2}$$

10. The half-life of a radioactive element depends upon the amount of radioactive element.

11. Work done by the gravitational field is zero, when displacement is perpendicular to gravitational field.

Here, gravitational field, $I = 4\hat{i} + \hat{j}$

If θ_1 is the angle which I makes with positive x-axis, then

$$\tan\theta_1 = \dfrac{1}{4}$$

or $\theta_1 = \tan^{-1}\left(\dfrac{1}{4}\right) = 14°6'$

If θ_2 is the angle which the line $y + 4x = 6$ makes with positive x-axis, then

$$\theta_2 = \tan^{-1}(-4) = 75°56'$$

So, $\theta_1 + \theta_2 = 90°$

ie. the line $y + 4x = 6$ is perpendicular to I.

12. When a satellite is orbiting close to earth, its orbital velocity, $v_o = \sqrt{\dfrac{GM}{R}}$

escape velocity, $v_e = \sqrt{\dfrac{2GM}{R}}$

Here, kinetic energy, $E = \frac{1}{2}mv^2 = \frac{1}{2}m\frac{GM}{R}$

KE required to escape,

$$E_1 = \frac{1}{2}mv_e^2 = \frac{1}{2}m\left[\frac{2GM}{R}\right] = 2E$$

∴ Additional KE required $= 2E - E = E$

13. $F = YA\frac{\Delta L}{L} = \frac{YA}{L} \times \alpha L \Delta\theta = YA\alpha\Delta\theta$

$$F = 10^{11} \times 10^{-6} \times 10^{-5} \times 100$$

$$= 10^4\,N$$

14. Ionisation caused is an account of energy produced by electrostatic force.

15. Weakest bond in solids are van der Waals bonds.

16. Compare with the standard from

$$y = r\cos\left[\frac{2\pi t}{T} - \frac{2\pi x}{\lambda}\right]$$

We have

$$\frac{2\pi}{\lambda} = \pi \text{ or } \lambda = 2\,cm$$

17. Rate of change of momentum of bullets = weight of disc

ie, $\qquad m\frac{di}{dt} = Mg$

$$5 \times 10^{-3} \times 10[v - (-v)] = 10 \times 10^{-3} \times 9.8$$

$$5(2v) = 9.8$$

$$v = \frac{9.8}{10}\,m\cdot s$$

$$= \frac{9.8}{10} \times 100\,cm/s$$

$$= 98\,cm/s$$

18. The frequency of Balmer series

$$v = R_c\left[\frac{1}{2^2} - \frac{1}{n^2}\right]$$

For series limit: $n = \infty$

$$v = \frac{R}{4}$$

19. Inductive reactance $X = \omega L$

$\qquad X = 2\pi f L$

$\qquad \lambda$

20. Energy stored $E = \frac{1}{2}Li^2$

$$= \frac{1}{2} \times 100 \times 10^{-3} \times (1)^2$$

$$= 0.05\,J$$

21. Liquids and gases never shows ferromagnetic properties.

22. The deflection of tangent galvanometer is governed by a current in a circular coil.

23. $F = \frac{\mu_0}{4\pi}\cdot\frac{6M_1M_2}{r^4}$

$$F = 10^{-7} \times \frac{6 \times 10 \times 10}{(0.1)^4}$$

$$F = \frac{600 \times 10^{-7}}{0.0001}$$

$$F = 0.6\,N$$

24. $e_{max} = NBA\omega$

$$e_{max} = 30 \times 1 \times \left(\frac{400}{10000}\right) \times \left(1800 \times \frac{2\pi}{10}\right)$$

$$e_{max} = 226\,V$$

25. Given, $T_H = 285°C, T = 10°C$

$$T_c = 2T_H - T$$

$$= 2 \times 285 - 10$$

$$= 560°C$$

26. $r_1 : r_2 = 1 : 2$

Ratio of strains $= \left(\frac{r_2}{r_1}\right)^2$

$$= \left(\frac{2}{1}\right)^2 = \frac{4}{1}$$

$$= 4 : 1$$

27. In conduction process, heat is transmitted from higher to lower temperature due to molecular collision.

28. $T = \frac{F}{2l}$

$$= \frac{1.8 \times 10^{-3}}{2 \times 10 \times 10^{-3}}$$

$$= 0.09\,N/m$$

29. Acceleration due to rolling of body on an inclined plane

$$a = \frac{g \sin \theta}{1 + \frac{K^2}{R^2}}$$

$$a = \frac{g \sin 30°}{1 + \frac{2}{5}} \qquad \left[\because \text{For sphere } \frac{K^2}{R^2} = \frac{2}{5} \right]$$

$$= \frac{g \times \frac{1}{2}}{\frac{5+2}{5}}$$

$$a = \frac{g/2}{7/5} = \frac{5g}{14}$$

30. In satellite, g is zero, so time period of simple pendulum is infinite.

31. Resistance $R = \frac{V^2}{W} = \frac{220 \times 220}{60}$

Now, power consumed is

$$W' = \frac{V'^2}{R} = \frac{110 \times 110}{\frac{220 \times 220}{60}}$$

$$= 15 \text{ W}$$

32. $E_0 = 220$ V

$$E_{rms} = \frac{220}{\sqrt{2}}$$

$$i_0 = \frac{E_0}{Z}$$

$$i_0 = \frac{220}{110} = 2 \text{ A}$$

$$\Rightarrow \quad i_{rms} = \frac{2}{\sqrt{2}}$$

Power $= E_{rms} \times i_{rms} \times \cos \phi$

$$= \frac{200}{\sqrt{2}} \times \frac{2}{\sqrt{2}} \times \cos 60°$$

$$= 220 \times \frac{1}{2} = 110 \text{ W}$$

34. Remaining quantity $N = N_0 \left(\frac{1}{2} \right)^n$

where N_0 = initial quantity

$$\frac{N_0}{16} = N_0 \left(\frac{1}{2} \right)^n$$

$$\left(\frac{1}{2} \right)^4 = \left(\frac{1}{2} \right)^n \Rightarrow n = 4$$

n = number of half-lives

$$\frac{t}{T_{1/2}} = 4$$

$$\frac{2}{T_{1/2}} = 4$$

$$T_{1/2} = \frac{2}{4}$$

$$T_{1/2} = 0.5 \text{ h}$$

37. $P = \frac{V^2}{R}$

$$R = \frac{V^2}{P}$$

$$R = \frac{250 \times 250}{1000} = 62.5 \, \Omega$$

38. Internal energy of a gas depends only upon the temperature. Hence, internal energy of the working substance in any cyclic process remain constant.

41. If a is the relative acceleration, then

$$3 = \frac{1}{2} a \times 5 \times 5$$

$$a = \frac{6}{25} \text{ m/s}^2$$

Again, $s = \frac{1}{2} \times \frac{6}{25} \times 10 \times 10$

$$= 12 \text{ m}$$

42. $H = \frac{u^2 \sin^2 \theta}{2g}$

$$dH = \frac{2u \sin^2 \theta}{2g} du$$

$$\frac{dH}{H} = \frac{2du}{u} = 2 \times \frac{1}{10}$$

$\therefore$ % increases in $H = \frac{dH}{H} \times 100$

$$= \frac{2}{10} \times 100 = 20\%$$

43. To reach the height of suspension, $h = l$

$$v = \sqrt{2gh} = \sqrt{2gl}$$

44. $v = 108 \times \dfrac{5}{18}$ m/s

$$= 30 \text{ m/s}$$

Momentum $= 120 \times 30$ kg-m/s (initial)

Final momentum $= 0$

$$\text{Force} = \frac{\text{change in momentum}}{\text{time}}$$

$$= \frac{120 \times 30}{20} = 180 \text{ N}$$

45. The change in potential energy in gravitational field is given by

$$\Delta E = GMm\left[\frac{1}{r_1} - \frac{1}{r_2}\right]$$

In this problem, $r_1 = R$ and $r_2 = nR$

$$\Delta E = GMm\left[\frac{1}{R} - \frac{1}{nR}\right]$$

$$= \frac{GMm}{R}\left(\frac{n-1}{n}\right)$$

$$= mgR\left(\frac{n-1}{n}\right) \qquad \left[\because g = \frac{GM}{R^2}\right]$$

46. Maximum force $= m\omega^2 a$

$$= m \times 4\pi^2 v^2 a$$

$$= 1 \times 4\pi^2 \times (60)^2 \times 0.02$$

$$= 288\pi^2$$

47. The amplitude of a plane progressive wave $= a$

that of a spherical progressive wave is $\dfrac{a}{r}$

48. Moment of inertia of thin rod

$$I = \frac{ml^2}{12}$$
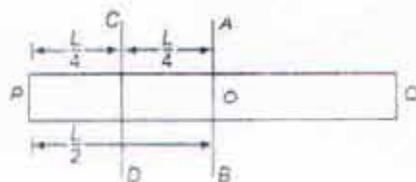
Distance of axis CD from $AB = \dfrac{L}{4}$

From theorem of parallel axis, we have

$$I_{CD} = I_{AB} + M\left(\frac{l}{4}\right)^2$$

$$= \frac{ml^2}{12} + \frac{ml^2}{16}$$

$$= \frac{7}{48}ml^2$$

49. As the temperature increases, the average velocity increases so, the collision are faster.

50. From Stoke's law

$$F = 6\pi\eta rv$$

$$F = 6\pi \times 18 \times 10^{-5} \times \left(\frac{0.3}{10}\right) \times 100 \text{ dyne}$$

$$F = 0.01073 \text{ dyne}$$

$$F = 101.73 \times 10^{-4} \text{ dyne}$$

51. Due to a magnetic dipole, $B \times \dfrac{1}{d^3}$

$$n = -3$$

52. We known that as the photon is to be observed completely. So, electron energy after collision will be

$$-13.6 \text{ eV} + 12.1 \text{ eV} = 1.5 \text{ eV}$$

This means electron can go to third orbit only. Therefore, transitions $3 \to 2, 2 \to 1$ and $3 \to 1$ are possible. So, few spectral lines in Balmer and Lyman series are possible.

53. In a uniform circular motion velocity changes with time and net acceleration may or may not be towards centre.

54. $B = \dfrac{p}{\dfrac{\Delta V}{V}}$

If p is constant, then $\dfrac{\Delta V}{V} \times \dfrac{1}{B}$

55. He is short sighted and he has to use a concave lens of $f = -100$ cm

$$P = \frac{100}{f} = \frac{100}{-100} = -1D$$

56. KE of rotation $= 1500$

$$\frac{1}{2} I \omega^2 = 1500$$

$$\frac{1}{2} \times 1.2 \omega^2 = 1500$$

$$\omega^2 = \frac{1500 \times 2}{1.2} = 2500$$

$$\omega = \sqrt{2500}$$

$$= 50 \text{ rad/s}$$

From equation of rotational motion

$$\omega = \omega_0 + \alpha t$$

$$50 = 0 + 25 \times t$$

$$t = \frac{50}{25} = 2 \text{ s}$$

57. $_4Be^9 + _2He^4 \longrightarrow _6C^{12} + X$

From conservation of mass number, mass number of $X = 9 + 4 - 12 = 1$

Similarly, atomic number of X

$$= 4 + 2 - 6 = 0$$

So, X is $_0X^1$, ie, neutron ($_0n^1$).

59.
$$T_C = \frac{5}{9}(T_f - 32)$$

$$T_C = \frac{5}{9}(95 - 32)$$

$$T_C = 35°C$$

60. $\delta_v - \delta_r = (\mu_v - \mu_r)A$

$$= (1.54 - 1.52) \times 10$$

$$= 0.02 \times 10 = 0.2°$$

Chemistry

1. Reactivity order of alcohols towards $ZnCl_2$ and conc. HCl (Lucas reagent) is

tertiary alcohol > sec alcohol > primary alcohol

Trimethyl carbinol is $CH_3 \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} OH$. It is a
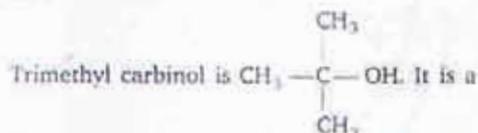
tertiary alcohol, so reacts readily with anhy. $ZnCl_2$ and concentrated HCl.

2. Aldehydes and aromatic ketones both can react with 2, 4-dinitrophenyl hydrazine as

$CH_3CH\boxed{O + H_2}N \cdot NHC_6H_3(NO_2)_2 \longrightarrow$

$\quad CH_3CH = N \cdot NHC_6H_3(NO_2)_2 + H_2$
$\quad$ acetaldehyde phenyl hydrazone derivative

$\underset{CH_3}{\overset{C_6H_5}{>}} C\boxed{O + H_2}N \cdot NHC_6H_3(NO_2)_2 \longrightarrow$

$\underset{CH_3}{\overset{C_6H_5}{>}} C = N \cdot NHC_6H_3(NO_2)_2 + H_2O$
$\quad$ acetophenone phenyl
$\quad$ hydrazone derivative
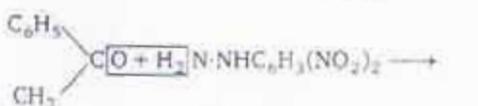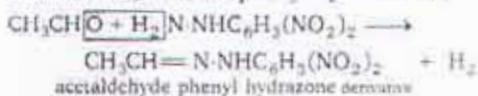
3. Boric anhydride or boron oxide, B_2O_3, if present, makes the glass heat resistant.

4. Calcium phosphate, $Ca_3(PO_4)_2$ is also called Thomas slag.

5. B_2H_6 has the following structure
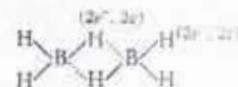
From the structure, it is clear that B—H—B bridge is formed by sharing of two electrons between three centres. This is called banana bond.

6.
$$E_n = \frac{-13.6 \times (Z)^2}{n^2} \text{ eV}$$

If $\quad n = 1$

$$E_n = -13.6 Z^2$$

$$Z^2 = \frac{-54.4}{-13.6}$$

$$Z^2 = 4$$

$$Z = 2$$

Thus, the species with atomic number 2 (i.e., He^+) has the ionisation energy 54.4 eV.

7. Since no cation or anion is missing from its lattice site in case of Frenkel defect, so density remains the same.

8. 22.4 L $NH_3 = 17$ g NH_3

$$\therefore 11.2 \text{ L } NH_3 = \frac{17}{22.4} \times 11.2 \text{ g } NH_3$$

$$= 8.5 \text{ g } NH_3$$

9. The structure $CH_2=C=CH_2$ is non-planar with the two $-CH_2$ groups being in planes perpendicular to each other.

10. Enthalpy of monoatomic gas at T Kelvin is
$$= \frac{5}{2} RT$$

11.
$$C = 0.1\ M$$
$$K_a = 1.74 \times 10^{-5}$$

According to Ostwald dilution formula,
$$[H^+] = \sqrt{K_a \times C}$$
$$= \sqrt{1.74 \times 10^{-5} \times 0.1}$$
$$= \sqrt{0.017 \times 10^{-4}}$$

$$pH = -\log_{10}[H^+]$$
$$= -\log_{10} \sqrt{0.017 \times 10^{-4}}$$

$$pH = 2.88$$

12. In this equation, volume is decreasing and the reaction is exothermic. So for the highest yield of Z, pressure should be high and temperature should be low.

13.
$$Cu^{2+} + 2e^- \longrightarrow Cu; \qquad E^\circ = 0.34$$
$$Zn^{2+} + 2e^- \longrightarrow Zn; \qquad E^\circ = -0.76$$

in the cell,
$$\underset{\text{anode}}{Zn|Zn^{2+}} \| \underset{\text{cathode}}{Cu|Cu^{2+}}$$
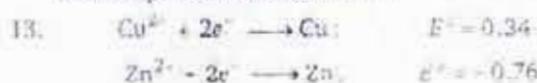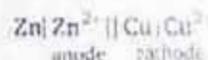
In the cell,
$$E_{cell}^\circ = E_{cathode}^\circ - E_{anode}^\circ$$
$$0.34 - (-0.76) = 1.1$$

$$E_{cell} = E_{cell}^\circ - \frac{0.0591}{2} \log \frac{[Zn^{2+}]}{[Cu^{2+}]}$$
$$= 1.1 - 0.02955 \log \frac{0.1}{0.01}$$
$$= 1.1 - 0.02955$$
$$= 1.07\ V$$

14.
$$T = n \times t_{1/2}$$
$$\Rightarrow 32 = n \times 8$$
$$\therefore n = 4$$
$$N = N_0 \left(\frac{1}{2}\right)^n$$
$$\Rightarrow 125 = N_0 \left(\frac{1}{2}\right)^4$$

$$125 = N_0 \times \frac{1}{16}$$
$$N = 125 \times 16 = 2000\ mg = 2\ g$$

15. Gold number of protective colloid is defined as the amount of "Colloid in milligrams which when added to 10 mL of gold solution just prevents its coagulation by 1 mL of 10% NaCl solution".

Protective power $\propto \dfrac{1}{\text{gold number}}$

$$0.025\ g = 25\ mg$$

Thus, the gold number of starch is 25.

16. The formula of the acraldehyde is
$$\overset{1}{OHC}-\overset{2}{CH}=\overset{3}{CH_2}$$
prop-2-ene-1-al
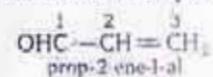
17. Urea shows tautomerism as

$$\underset{\text{keto form}}{NH_2-\overset{\overset{O}{\|}}{C}-NH_2} \rightleftharpoons \underset{\text{enolic form}}{NH=\overset{\overset{OH}{|}}{C}-NH_2}$$
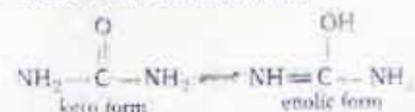
18. Ag^+ ion increases the solubility of alkenes due to the formation of $p\pi$-$d\pi$ bonding.

19. The formula of glycerine is
$$^1CH_2-OH \longleftarrow 1^\circ\ alcohol$$
$$^2CH-OH \longleftarrow 2^\circ\ alcohol$$
$$^3CH_2-OH \longleftarrow 1^\circ\ alcohol$$

Thus, it contains 1° and 2° carbon atoms.

20.

H—C—OH	HO—C—H
HCOH	HCOH
HOCH ⟩O	HOCH ⟩O
HCOH	HCOH
HC	HC
CH₂OH	CH₂OH
α-glucose	β-glucose
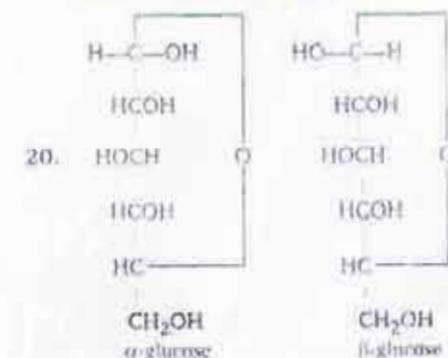
These both the forms of glucose differ in the orientation of $-OH$ group around C_1.

21. The molar conductivity of potassium hexacyanoferrate (II) i.e., $K_4[Fe(CN)_6]$ is highest because it gives maximum number of ions on ionisation.

$$K_4[Fe(CN)_6] \longrightarrow 4K^+ + [Fe(CN)_6]^{4-}$$

22. The first law of thermodynamic can be expressed as

$$\Delta E = Q - W$$
$$Q = \Delta E - W$$

23. According to Markownikoff's rule, the addition of a unsymmetrical reagent (HX) to an unsymmetric alkene takes place in such a way that the negative part of the reagent will be attached to the carbon atom which contains lesser number of H-atom. Hence, it is best applicable to the reaction between C_3H_6 and HBr.

$$\underset{\substack{\text{unsymmetric} \\ \text{alkene}}}{CH_3CH = CH_2} + HBr \longrightarrow CH_3 - \underset{\underset{Br}{|}}{CH} - CH_3$$
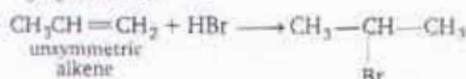
24. Phenol cannot be distinguished from ethanol by sodium because both evolve hydrogen with sodium.

$$2C_6H_5OH + 2Na \longrightarrow 2C_6H_5ONa + H_2 \uparrow$$
$$2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2 \uparrow$$

25. $CH_3 - \underset{\underset{OH}{|}}{C} = CH_2 + D_2O \rightarrow H_3C - \underset{\underset{OD}{|}}{C} = CH_2$

enol form of acetone

26. The alkene on reductive ozonolysis gives 2-molecules of $CH_2(CHO)_2$. Hence, the alkene is 1, 4-cyclohexadiene.
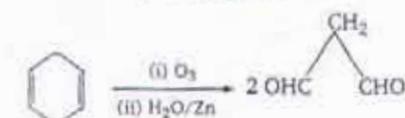
$$\underset{\substack{\text{1,4-cyclo} \\ \text{hexadiene}}}{\bigcirc} \xrightarrow[\text{(ii) } H_2O/Zn]{\text{(i) } O_3} 2 \; OHC \underset{CHO}{\overset{CH_2}{\bigwedge}}$$

27. $\underset{\substack{\text{propionic acid}}}{CH_3CH_2COOH} \xrightarrow{NH_3} \underset{\substack{\text{propionamide} \\ (X)}}{CH_3CH_2CONH_2}$

$$\xrightarrow[\substack{\text{(Hoffmann} \\ \text{bromamide} \\ \text{reaction)}}]{Br_2 + KOH} \underset{\substack{\text{ethyl amine} \\ (Y)}}{CH_3CH_2NH_2} \xrightarrow{HNO_2} \underset{\substack{\text{ethyl alcohol} \\ (Z)}}{CH_3CH_2OH}$$

28. $2NO \longrightarrow N_2 + O_2$

$$Rate = k[NO]^2$$

Hence, order of reaction is 2.

$$H_2 + I_2 \longrightarrow 2HI$$
$$Rate = k[H_2][I_2]$$

Hence, order of reaction is $(1 + 1) = 2$

Therefore, these reactions are most likely to be elementary reaction that occur in one step.

29. $$p_{H_2O} = X_{H_2O} p_{total}$$
$$= 0.0287 \times 0.977$$
$$= 0.028 \text{ atm}$$
$$p_{total} = p_{dry\ air} + p_{H_2O}$$
$$p_{dry\ air} = p_{total} - p_{H_2O}$$
$$= 0.977 - 0.028 = 0.949 \text{ atm}$$

30. $\underset{s}{Hg_2Cl_2} \rightleftharpoons \underset{s}{Hg_2^{2+}} + \underset{s}{2Cl^-}$

$$K_{sp} = [Hg_2^{2+}][Cl^-]^2$$
$$= (s)(2s)^2$$
$$K_{sp} = 4s^3$$
$$s = \left(\frac{K_{sp}}{4}\right)^{1/3}$$

31. Solutions having same osmotic pressure are called isotonic solutions. The osmotic pressure is given as

$$\pi = \frac{w_B RT}{VM_B}$$

π (cane sugar) $= \pi$ (unknown solute)

$$\frac{5.12}{342} = \frac{0.9}{M}$$
$$M = \frac{342 \times 0.9}{5.12}$$
$$= 60$$

32. Adsorption is an exothermic process and hence, ΔH is negative for adsorption. On the other hand, the molecules of the adsorbate are held on the surface of the adsorbent and hence, they have lesser tendency to move freely. In other words entropy decreases i.e.,

ΔS is negative. According to Gibbs-Helmholtz equation, $\Delta G = \Delta H - T \cdot \Delta S$

Thus, for the process of adsorption to occur ΔG must be negative. Hence, for adsorption

$$\Delta G < 0; \Delta S < 0; \Delta H < 0$$

33. Trimethyl amine is a tertiary amine. It dissolve in cold nitrous acid to form salts which decompose on warming to nitrosoamine and alcohol. It will not liberate nitrogen.

$$(CH_3)_3N + HNO_2 \longrightarrow$$
$$[(CH_3)_3NH]^+ NO_2^-$$
trimethyl ammonium nitrite

34. $Cr_2O_7^{2-} + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$

$(2I^- \longrightarrow I_2 + 2e^-) \times 3$

$\overline{Cr_2O_7^{2-} + 14H^+ + 6I^- \longrightarrow}$

$$2Cr^{3+} + 7H_2O + 3I_2$$
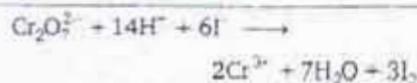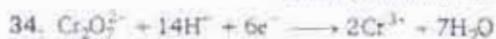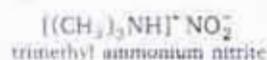
Hence, number of moles of I_2 produced = 3

35. Sulphanilic acid exists as Zwitter ion.

sulphanilic acid   Zwitter ion
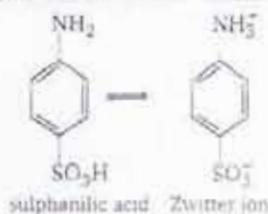
It exists as a dipolar ion, which has acidic and basic groups in the same molecule.

36. CCl_4 and compounds have

zero dipole moment due to their symmetrical structure.

37. Erythromycin is a bacteriostatic (inhibits the growth of micro organisms).

38. $K (Z = 19): 1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^1$

In the ground state, the value of l can be either zero or one. Hence, the set (d) of quantum numbers i.e., $(n = 3, l = 2, m = +2)$ cannot be possible in the ground state of the atom.

39. MO configuration of O_2 is

$O_2(8 + 8 = 16) = \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2,$
$\sigma 2p_z^2, \pi 2p_x^2 = \pi 2p_y^2 = \pi^* 2p_x, = \pi^* 2p_y$
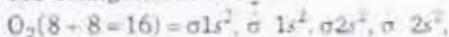
Bond order $= \dfrac{N_b - N_a}{2} = \dfrac{10 - 6}{2} = 2$

Similarly, bond order of oxygen molecule ion

$$(O_2^-) = 2.5$$

Bond order of superoxide ion $(O_2^-) = 1.5$

Bond order of peroxide ion $(O_2^{2-}) = 1$

Bond strength $\propto$ Bond order

Hence, the order of bond strength is as

$$O_2^+ > O_2 > O_2^- > O_2^{2-}$$

40. Hybrid propellants contain solid fuel (acrylic rubber) and liquid oxidiser (liquid nitrogen tetraoxide, N_2O_4).

41. Boric acid is used in carom boards for smooth gliding of pawns because H-bonding in H_3BO_3 gives it a layered structure.

42. $[Co(SO_4)(NH_3)_5]Cl \longleftrightarrow [Co(SO_4)(NH_3)_5]^+$
$$+ Cl^-$$

$[CoCl(NH_3)_5]SO_4 \longleftrightarrow [CoCl(NH_3)_5]^{2+}$
$$+ SO_4^{2-}$$
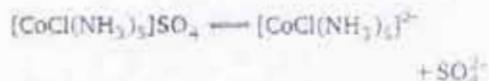
These complexes give different ions when subjected to ionisation. So, they exhibit ionisation isomerism.

43. Zr and Hf possesses similar atomic size and hence, have almost same chemical properties, so they are called twins of Periodic Table. It is due to lanthanide contraction.

44. The IUPAC name of $[Co(NH_3)_5ONO]^{2+}$ is pentamminenitrito cobalt (III) ion.

45. During hydration of ions in aqueous solution, there exists an attractive force between ions and water molecules, which are polar in nature and acts as dipole. So, hydration of ions in aqueous solution is an example of ion-dipole interaction.

46. Moles of X, $n_X = \dfrac{3}{3 + 2} = \dfrac{3}{5}$

Moles of Y, $n_Y = \dfrac{2}{3 + 2} = \dfrac{2}{5}$

$$P_T = p_X n_X + p_Y n_Y$$
$$= 80 \times \frac{3}{5} + 60 \times \frac{2}{5}$$
$$= 48 + 24 = 72 \text{ Torr}$$

47. The elements present in the earth's core are collectively called siderophiles. These are found in their native state. These elements generally have a low reactivity and exhibit an affinity to form metallic bonds. e.g., Pt, Ru, Pd, Ir, Os etc.

48. Concentrated sulphuric acid, being a strong acid, oxidises bromides and iodides but not chlorides and fluorides since, the later are more electronegative. Hence, it can be reduced by only NaBr among the given options.

$$\overset{+6}{H_2SO_4} + \overset{-1}{NaBr} \longrightarrow \overset{+6}{NaHSO_4} + \overset{-1}{HBr}$$

$$\overset{-1}{2HBr} + \overset{+6}{H_2SO_4} \longrightarrow 2H_2O + \overset{0}{Br_2} + \overset{+4}{SO_2}$$

Reduction
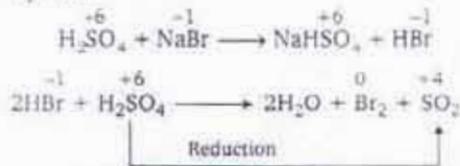
49. Ionic radii $\propto \dfrac{1}{Z_{eff}}$

$\propto$ negative charge $\times \dfrac{1}{\text{positive charge}}$

Thus, the correct order of ionic radii of these ions is

$$S^{2-} > Cl^- > K^+ > Ca^{2+}$$

50. Spin only magnetic moment,
$$\mu = \sqrt{n(n+2)} = \sqrt{24}$$
$$\Rightarrow \quad n^2 + 2n - 24 = 0$$
$$(n+6)(n-4) = 0$$
$$n = 4$$

$[\because n = -6 \text{ not possible}]$
Here, n is the number of unpaired electrons. The electronic configuration of the metal ion M^{x+} is

$$Z(25) = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^5$$
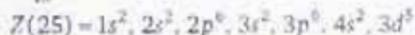
Since, four unpaired electrons are present, the oxidation state must be +3.

$$Z^{3+}(25) = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^0, 3d^4$$

| ↿ | ↿ | ↿ | ↿ | |

unpaired electrons
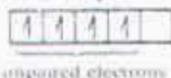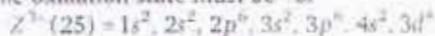
51. In CO_3^{2-}, C is present in its highest oxidation state, i.e., +4 state, so its further oxidation is not possible, it only undergoes reduction.

Acidified $KMnO_4$ is a strong oxidising agent, but it cannot oxidise CO_3^{2-}. Hence, it will not be decolourised by CO_3^{2-}.

52. Since, As_2S_3 is a negatively charged sol, the ion bearing the highest positive charge, is more effective for its coagulation. Al^{3+} has the highest positive charge, i.e., +3, so it is more effective for the coagulation of As_2S_3 sol.

53. Lassaigne's test is given by those nitrogenous compounds in which carbon is also present alongwith nitrogen.

In $NH_2 \cdot NH_2 \cdot HCl$, carbon is absent, so it does not give Lassaigne's test.

54. S_N1 mechanism involves formation of carbocation intermediate. Hence, the species which gives the most stable carbocation readily undergoes S_N1 mechanism. t-butyl bromide gives the most stable carbocation, i.e., 3° carbocation, so it readily undergoes S_N1 reaction.

55.
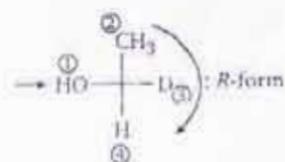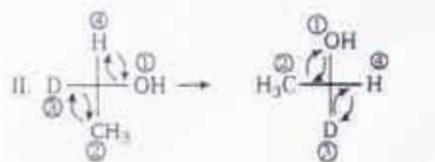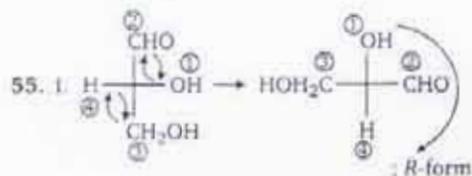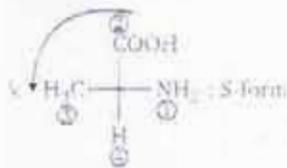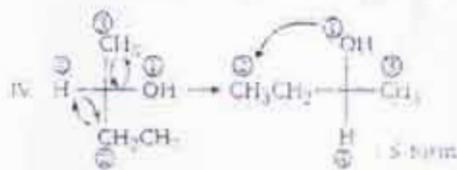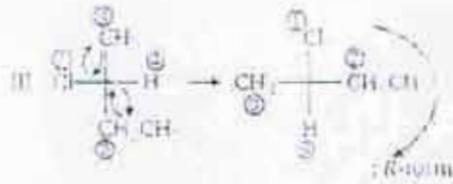
Hence, structures I, II and III are R-isomers.

56. Carboxylic acids when treated with either diborane or LAH, get reduced to primary alcohols. Diborane is a better reagent than LAH for such conversion, as it does not affect other functional groups such as ester, nitro, halo etc.

$$R-COOH + B_2H_6 \xrightarrow{H_3O^-} R-CH_2OH$$
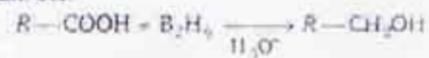
57. Cinnabar (HgS) is a sulphide ore, hence it is concentrated by froth floatation process.

58. Na(11) $1s^2, 2s^2 2p^6, 3s^1$

It is an alkali metal. Alkali metal oxides are basic in nature.

59. NH_4Cl contains ionic, covalent and coordinate linkage.
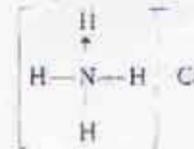
60. Teflon $-(CF_2-CF_2)_n-$ is a fully fluorinated polymer.

Biology

1. Plants confined to certain localities are called endemic plants, e.g., *Ginkgo biloba* or *Crocus sativus*. Most of the Indian Himalayan flora are endemic in nature due to geographical barriers.

2. Capsule or endospores of bacteria are highly resistant to heat and protect bacteria during extreme conditions. In boiling water, endospores survive and when water is cooled, they produce vegetative cells to grow and multiply.

3. *Nostoc* is a filamentous blue-green algae i.e. prokaryotic cell.

4. Meiosis occurs in the microspore mother cells within anther of angiosperms.

5. Pineapple belongs to the family–Bromelaceae.

6. Cytosol contains organelles like chloroplasts and mitochondria having DNA.

7. Spine formation occurs in *Opuntia* and other cacti to reduce transpiration.

8. Garlic (*Allium sativum*) reproduces vegetatively, whereas onion (*Allium cepa*) reproduces by seeds.

9. Gall flowers are neutar and they are used as food for gall wasps which are specific pollinators of hypanthodium inflorescence.

10. Quiescent centre is formed by a group of inactive meristematic cells which develop behind the root tip. They have low DNA, RNA and ribosome contents.

11. Stomata are evenly distributed on both upper and lower epidermal layers in isobilateral leaves. *Eichhornia crassipes* (water hyacinth) is free-floating hydrophyte producing isobilateral leaves having stomata distributed on both upper and lower surfaces evenly. Floating leaved hydrophytes have stomata on upper epidermis only.

12. Cork cells are dead cells as they lack protoplasm which is regarded as physical basis of life. These cells have only suberized cell wall which is impermeable for gases, solutes and solvents.

13. In gymnosperms, leaves are without vein and veinlets in most of the cases. They develop transfusion tissue for translocation

of sap in the region of wing and thus, absence of veinlets is compensated.

14. Alcohol treatment causes loss of selective permeability of membrane and hence there will be no change when this alcohol treated cell will be placed in hypertonic solution of sucrose.

15. Plant ash contains only inorganic substances or minerals.

16. Members of Chlorophyceae class (green algae) of algae will have some pigments as these of grasses and trees, i.e., chlorophyll-a, chlorophyll-b and carotenoids.

17. Synthesis of ATP in mitochondria occurs in presence of O_2.

18. 8-nucleate or 7-celled mature embryo sac is produced in *Polygonum* type monosporic embryo sac, *Allium* type bisporic embryo sac and *Adoxa* or *Drusa* type tetrasporic embryo sacs.

19. Fruit formation is related with stimulus of pollination but seed formation is related with stimulus of fertilization.

20. IAA is the hormone involved in phototropism according to Cholodny-Went theory.

21. In mangrove forests, vivipary causes dense aggregation of seedlings in closed vicinity of mother plants. It causes high intraspecific competition and results in heavy seedling mortality.

22. Hydrophytes do not produce mechanical tissues and vascular strands in large quantity, to maintain elasticity. Even the perennial forms are also incapable of showing secondary growth.

23. IVI is determined by taking the total sum of relative frequency, relative density and relative dominance.

24. About 74% of the earth's surface is covered by oceans and fresh water where algae grow in dominant primary producers. Diatom and dinoflagellates are the major primary producers on earth.

25. *Parthenium* is a most noxious terrestrial weed all over the world. Its seeds are very tiny and wind dispersed. It is commonly called congress grass or carrot grass. It competes with crop plants for space, water and nutrients and so should be irradicated properly before sowing the crop.

26. Early blight disease is caused by a saprophyte (a fungus) *Alternaria solani* in potato.

27. Bioenergy does not pollute environment much. It is ecofriendly and can be used better than conventional sources of energy available today.

28. Axenic culture means pure culture free from all types of microbial contaminations.

29. Nitrogen fixing genes (Nif-gene) represent a cluster of 17 genes and found in the cells of nitrogen fixing bacteria.

30. Chimera are developed by addition of foreign gene into plasmid DNA to construct recombinant DNA.

31. The functional unit of liver is called lobule. The thin layer of connective tissue separating the lobules is Glisson's capsule.

32. Paneth cells play important role in regulating the normal bacterial flora of small intestine.

33. Closed type circulation represent single circulation, which means that both the oxygenated and the deoxygenated blood enters the heart and get mixed in ventricles.

34. Anura is characterized by the absence of tail, also known as Salientia, the leaping animals.

35. Vibrissae, commonly called 'whiskers' are sensory hairs that provide a tactile sense to many mammals.

36. Kwashiorkor can be prevented by giving protein rich food. It is characterized by edema and fatty liver.

37. Biocatalyst refers to enzymes eg. erepsin, amylase, rennin.

38. Birds have non-distensible lungs continuous with thin walled air sacs.

39. The yellow colour of urine is due to urochrome, a pigment derived from the destruction of haemoglobin by reticulo-endothelial cells.

40. Cones are photoreceptor cells in the retina of eye that enables a person to visualize colours.

41. Sella turcica is a transverse depression on the superior surface of sphenoid bone lodging the pituitary gland.

42. Glucagon does not stimulate glycogenolysis in muscle. It does not stimulate the liver to make glucose from amino acids (gluconeogenesis) and increases lipolysis in adipose tissue.

43. Some complement proteins initiate a series of reactions that forms holes in the plasma membrane.

44. Heroin is an opioid rest of them are hallucinogens which have strong effect on cerebrum and sense organs.

45. The chromatid bodies, made of ribonucleoprotein are found in the early stages of cysts.

46. Enteron is the gut or alimentary canal enclosed within the endoderm.

47. Haemoglobin dissolved in plasma can be termed as intercellular.

48. Wings are present only in adult housefly but absent in the larva.

49. Carmine is produced from female cochineal insect after treatment with alum; it was introduced by Goppert and Cohn in 1849.

50. Creatinine found in muscles is synthesized from three amino acids viz; glycine, arginine and methionine.

51. Casein, the principal albuminous milk phosphoprotein, is found as calcium salt obtained by curdling.

52. Both haemophilia and colour blindness are sex linked disease.

53. The amino acids are organic monomers. Which are synthesized by Miller-Urey experiment.

54. Wings of birds and insects are analogous organs.

55. Nictitating membrane of man is a vestigial organ. It is known as plica semilunaris in man.

56. Human and chimpanzee DNA differs in only 1.27% of their nucleotide sequence.

57. Dogs are dioecious, so cannot be self-fertilized.

58. There are two types of vision in insects mosaic vision or apposition image during day time and superposition or dull image in dim light.

59. Wallago is a catfish without scales.

60. Mammals evolved from reptiles in the Triassic period of the Mesozoic era.