

PART A : CLASS XII

PHYSICS

Q1

One deuteron and alpha particle are in the air at a separation of 1 \AA . The magnitude of electric field intensity on the alpha – article due to the deuteron is:

- (a) $576 \times 10^{11} \text{ N- C}^{-1}$
- (b) $1.44 \times 10^{11} \text{ N- C}^{-1}$
- (c) $20828 \times 10^{11} \text{ N- C}^{-1}$
- (d) Zero

[VMC 2005]

Q2

The electric field required for keeping a water drop of mass m just to remain suspended, when changed with one electron, is:

- (a) mg
- (b) $\frac{mg}{e}$
- (c) emg
- (d) $\frac{em}{g}$

[DPMT 1999, 2001]

Q3

Gauss's law is valid for:

- (a) Any close surface
- (b) Only regular closed surfaces
- (c) Any open surface
- (d) Only irregular open surfaces

[DPMT 1998]

Q4

The electric potential V at any point x, y, z (all the coordinates are in meters) in space is given by $V = 4x^2$ volts. The electric field at the point $(1\text{m}, 0\text{m}, 2\text{m})$ is:

- (a) 8 volt – meter⁻¹ along the negative X – axis
- (b) 8 volt – meter⁻¹ along the positive X – axis
- (c) 16 volt – meter⁻¹ along the negative X – axis
- (d) 16 volt – meter¹ along the positive X – axis

Q5

An ellipsoidal cavity has been carved within a perfect conductor as shown in Fig. 2.1. A positive charge q has been placed at the centre of the cavity. The points A and B are on the cavity. The points A and B are on the cavity surface. Then, the following is true:

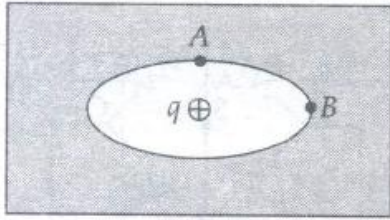


Fig. 2.1

- (a) Electric field near A in the cavity = electric field near B in the cavity
- (b) Charge at A = potential at B
- (c) Potential at A = potential at B
- (d) Total electric field flux through the surface of cavity is q/ϵ_0

[IIT 1999]

Q6

A parallel – plate capacitor is charged and then, the charging battery is disconnected. If the plates of the capacitor are moved farther apart by means of insulating handles, the following is true:

- (a) The charge on the capacitor increases
- (b) The voltage across the plates increase
- (c) The capacitance increases
- (d) The electrostatic energy stored in the capacitor increases

Q7

A dielectric slab of thickness d is inserted in a parallel plate capacitor, whose negative plate is at $x = 0$ and positive plate is at $x = 3d$. The slab is equidistant from the plates. The capacitor is given some charge. As x goes from 0 to $3d$:

- (a) The magnitude of the electric field remains the same
- (b) The direction of the electric field remains the same
- (c) The electric potential increases continuously
- (d) The electric potential increases at first, then decreases and again, it increases [IIT 1998]

Q8

A capacitor is charged by connecting a battery across its plates. It stores energy u . Now, the battery is disconnected and another identical capacitor is connected across it. Then, the energy stored by both capacitors of the system will be:

- (a) u
- (b) $\frac{u}{2}$
- (c) $\frac{3u}{2}$
- (d) $\frac{u}{4}$

[CBSE 2004]

Q9

The electric potential at a point (x, y, z) is given by $V = -x^2 y - xz^3 + 4$. The electric field \vec{E} at that point is:

- (a) $\vec{E} = \hat{i} 2xy + \hat{j} (x^2 + y^2) + \hat{k} (3xz - y^2)$
- (b) $\vec{E} = [(2xy + z^3) \hat{i} + x^2 \hat{j} + 3xz^2 \hat{k}]$
- (c) $\vec{E} = \hat{i} (2xy - z^3) \hat{j} xu^2 + \hat{k} 3z^2 x$
- (d) $\vec{E} = \hat{i} (2xy + z^3) + \hat{j} x^2 + \hat{k} 3xz^2$

[CBSE PMT 2009]

Q10

Three concentric spherical shells have radii a, b and c ($a < b < c$) and have surface charge densities $\sigma, -\sigma$ and σ , respectively. If V_A, V_B and V_C denote the potentials of the three shells, then $c = a + b$, we have

- (a) $V_C = V_B \neq V_A$
- (b) $V_C = V_B \neq V_A$
- (c) $V_C = V_B = V_A$
- (d) $V_C = V_A \neq V_B$

[CBSE 2009]

Q11

Three capacitors each of capacitance C and of breakdown voltage V have been joined in series. The capacitance and breakdown voltage of the combination will be:

- (a) $3C, \frac{V}{3}$
- (b) $\frac{C}{3}, 3V$
- (c) $3C, 3V$
- (d) $\frac{C}{3}, \frac{V}{3}$

[CBSE PMT 2009]

Q12

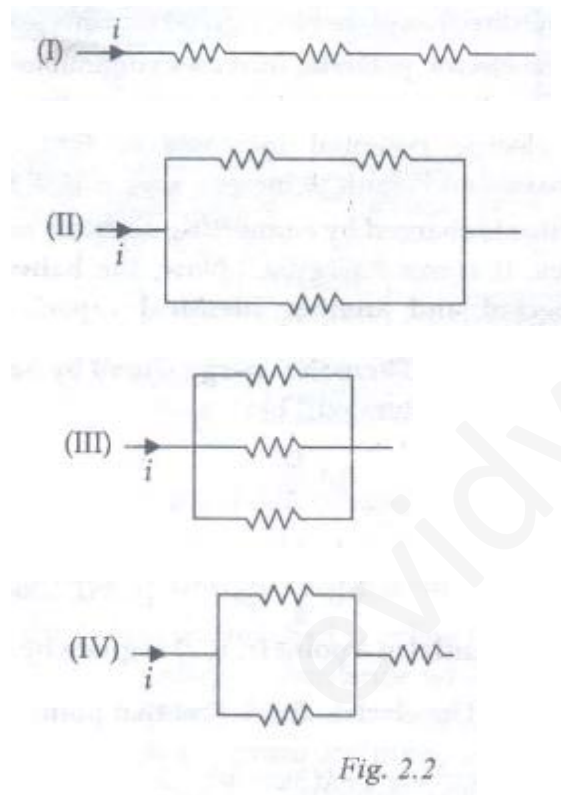
The potential difference applied to an X – ray tube is 5 k V and the current passing through it is 3.2 m A. Then, the number of electrons striking the target per second is:

- (a) 2×10^{16}
- (b) 5×10^{16}
- (c) 1×10^{17}
- (d) 4×10^{15}

[IIT 2002]

Q13

Refer Fig. 2.2. Three resistances of equal value have been arranged in the different combinations shown here. Arrange them in the increasing order of power dissipation:



- (a) III < II < IV < I
- (b) II < III < IV < I
- (c) I < IV < III < II
- (d) I < III < II < IV

Q14

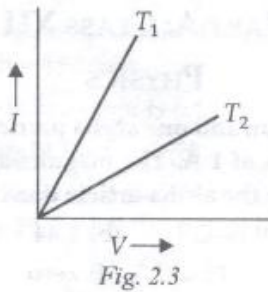
A piece of copper and another of germanium have been cooled from room temperature to 80 K. The resistance of:

- (a) Copper increases and of germanium decreases
- (b) Copper decreases and of germanium increase
- (c) Each one of them increases
- (d) Each one of then decreases

Q15

The current (I) and voltage (V) curves for a given metallic wire at two different temperatures T_1 and T_2 are shown in the Fig. 2.3. Then:

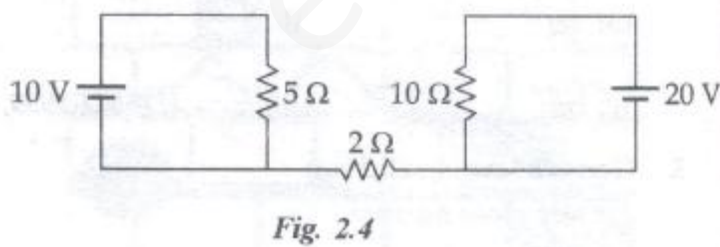
- (a) $T_1 > T_2$
- (b) $T_2 < T_2$
- (c) $T_1 = T_2$
- (d) $T_1 = 2T_2$



[IIT 1989]

Q16

Calculate the value of current through the 2 – watt resistance for the circuit shown in Fig. 2.4.



- (a) 0
- (b) 2 A
- (c) 5 A
- (d) 4 A

[IIT 2005]

Q17

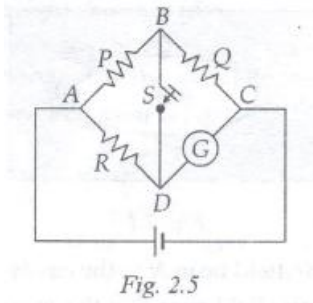
A wire of length L and three identical cells of negligible internal resistances have been connected in series. Due to the current, the temperature of the wire is raised by ΔT in time t . Now, N similar cells are connected in series with a wire of the same material and cross – section but of length $2L$. The temperature of the wire is raised by the same amount ΔT in the same time. The value of N is:

- (a) 4
- (b) 6
- (c) 8
- (d) 9

[IIT 2000]

Q18

In the circuit shown in the Fig. 2.5, $P \neq R$. Then reading of the galvanometer is same with switch S open or closed. Then:

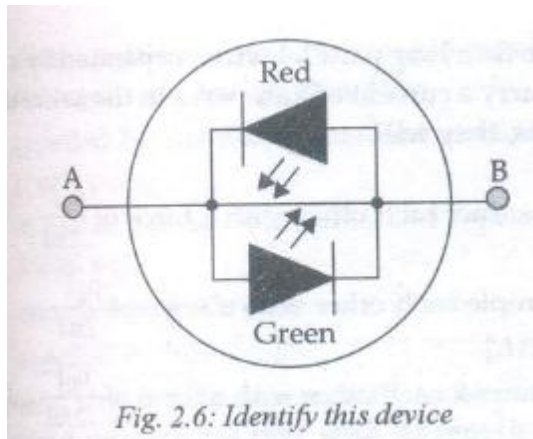


- (a) $I_R = I_G$
- (b) $I_P = I_G$
- (c) $I_Q = I_G$
- (d) $I_Q = I_R$

[DCE 2000]

Q19

Refer Fig. 2.6. Identify this device. What is its possible application in the field of electronics?



- (a) SCR; power rectifier
- (b) LED; polarity indicator
- (c) Solar cell; DC current generator
- (d) Photodiode; lighting at traffic light signals

Q20

In the given circuit shown in Fig. 2.7, it is observed that the current I is independent of the value of the resistance R_6 . So, the resistance vales must satisfy:

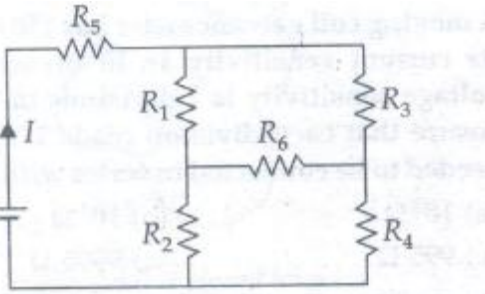


Fig. 2.7

- (a) $R_1 R_2 R_3 = R_4 R_5 R_6$
- (b) $\frac{1}{R_5} + \frac{1}{R_6} = \frac{1}{R_1 + R_2} + \frac{1}{R_3 + R_4}$
- (c) $R_1 R_4 = R_2 R_3$
- (d) $R_1 R_3 = R_2 R_4 = R_5 R_6$

Q21

In the circuit shown in the Fig. 2.8, the current through the:

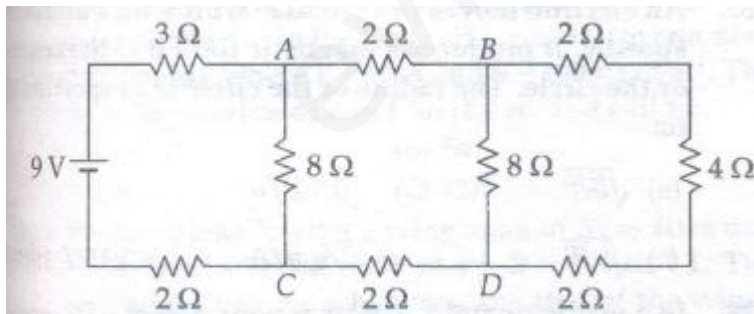


Fig. 2.8

- (a) 3 – Ω resistor is 0.50 A
- (b) 3 – Ω resistor is 0.25 A
- (c) 4 – Ω resistor is 0.50 A
- (d) 4 – Ω resistor is 0.25 A

[IIT 1998]

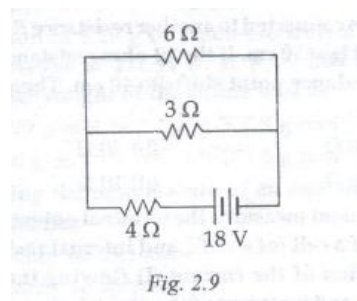
Q22

A battery is charged at a potential of 15 V for 8 hours when the current flowing is 10 A for 15 hours. The mean terminal voltage during discharge is 14 V. The watt – hour efficiency of the battery is:

- (a) 82.5%
- (b) 80%
- (c) 90%
- (d) 87.5%

Q23

Refer Fig. 2.9. The total power dissipated in watts in the circuit is:



- (a) 24 W
- (b) 54 W
- (c) 48 W
- (d) 36 W

Q24

Kirchhoff's First and Second laws of electrical circuits are the consequences of the law (s) of:

- (a) Conservation of energy and electric charge, respectively
- (b) Conservation of energy
- (c) Conservation of electric charge and energy, respectively
- (d) Conservation of electric charge

Q25

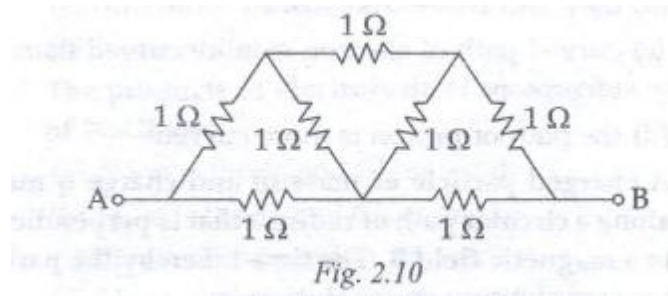
The resistance of each arm of a Wheatstone bridge is 10 Ω. Now, a resistance of 10 Ω is connected in series with the galvanometer. Then, the equivalent resistance of the resistance of the bridge across the battery will be:

- (a) 10 Ω
- (b) 15 Ω
- (c) 20 Ω
- (d) 40 Ω

[CBSE 2001]

Q26

In the network shown in Fig. 2.10, each resistance is 1Ω . The effective resistance between the point A and B is:



- (a) $\frac{4}{3} \Omega$
- (b) $\frac{3}{2} \Omega$
- (c) 7Ω
- (d) $\frac{8}{7} \Omega$

[CBSE 2005]

Q27

In a meter bridge, the balancing length from the left end (standard resistance of 1Ω is in the right gap) is 20 cm. The value of the unknown resistance is:

- (a) 0.8Ω
- (b) 0.5Ω
- (c) 1.4Ω
- (d) 0.25Ω

[CBSE 1999]

Q28

An unknown resistance R_1 has been connected in series with a resistance of 10Ω . This combination is connected to one gap of a meter bridge. The other gap of a meter bridge is connected to another resistance R_2 . The balance point is at 50 cm. If the 10Ω resistance is removed, the balance point shifts to 40 cm. Then, the value of R_1 is:

- (a) 60Ω
- (b) 40Ω
- (c) 20Ω
- (d) 10Ω

[CBSE 2009]

Q29

A student measures the terminal potential difference (V) of a cell (of e. m. f ξ and internal resistance x) as a function of the current (I) flowing through it. The slope and intercept of the graph between V and I are, respectively, equal to:

- (a) $-r$ and ξ
- (b) r and $-\xi$
- (c) $-\xi$ and r
- (d) ξ and $-r$

[CBSE PMT 09]

Q30

A charged particle moves through a magnetic field perpendicular to its direction. Then:

- (a) kinetic energy changes but the momentum remains constant
- (b) the momentum changes but the kinetic energy remains constant
- (c) both momentum and kinetic energy of the particle are not constant
- (d) both momentum and kinetic energy of the particle are constant

Q31

If an electron and a proton having same momenta enter a magnetic field perpendicularly, this:

- (a) curved path of electron and proton will be same (ignoring the sense of revolution)
- (b) they will move undeflected
- (c) curved path of electron is more curved than that of proton
- (d) the path of proton is more curved

Q32

A charged particle of mass m and charge q moves along a circular path of radius r that is perpendicular to a magnetic field B . The time taken by the particle for completing one revolution is:

- (a) $\frac{2\pi m q}{B}$
- (b) $\frac{2\pi q^2 B}{m}$
- (c) $\frac{2\pi q B}{m}$
- (d) $\frac{2\pi m}{q B}$

Q33

Two thin long parallel wires, separated by a distance d , carry a current of I amperes in the same direction. Thus, they will:

- (a) Attract each other with a force of $\frac{\mu_0 I^2}{2\pi d}$
- (b) Repel each other with a force of $\frac{\mu_0 I^2}{2\pi d}$
- (c) Attract each other with a force of $\frac{\mu_0 I^2}{2\pi d}$ (attractive)
- (d) Repel each other with a force of $\frac{\mu_0 I^2}{2\pi d^2}$

Q34

The magnitude of the magnetic field (B) due to loop ABCD at the origin (O) is:

- (a) 0
- (b) 1
- (c) $\frac{\mu_0 I}{24ab} (b - a)$
- (d) $\frac{\mu_0 I}{4\pi} [2(b - a)\frac{\pi}{3} (a + b)]$

[AIEEE 2009]

Q35

A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10 divisions $m - A^{-1}$ and voltage sensitivity is 2 divisions $m - V^{-1}$. In order to ensure that each division reads 1 V, the resistance needed to be connected in series with the coil will be:

- (a) $10^3 \Omega$
- (b) $10^5 \Omega$
- (c) 995Ω
- (d) 9995Ω

[AIEEE 2005]

Q36

Due to the presence of the current I_1 at the origin, the:

- (a) Forces on AB and DC are zero
- (b) Forces on AD and BC are zero
- (c) Magnitude of the net force on the loop $\frac{\mu_0 I I_1}{4\pi} \left[2(b - a) + \frac{\pi}{3}(a + b) \right]$
- (d) Magnitude of the net force on the loop is given by $\frac{\mu_0 I I_1}{24ab} (b - a)$

[AIEEE 2009]

Q37

An electron moves in a circular orbit with a uniform speed v . It produces a magnetic field B at the center of the circle. The radius of the circle is proportional to:

- (a) $\sqrt{B/v}$
- (b) B/v
- (c) $\sqrt{v/B}$
- (d) v/B

[IIT 1986]**Q38**

In a magnetic field, a diamagnetic object will move:

- (a) perpendicular to the field
- (b) from weaker to stronger parts
- (c) from stronger to weaker parts
- (d) in none of the after mentioned directions

[IIT 1991]**Q39**

If a diamagnetic substance is brought near the north or south pole of a bar magnet, it is:

- (a) repelled by the north pole and attracted by the south pole
- (b) attracted by the north pole and repelled by the south pole
- (c) attracted by both poles
- (d) repelled by both poles

[AIEEE 2007]**Q40**

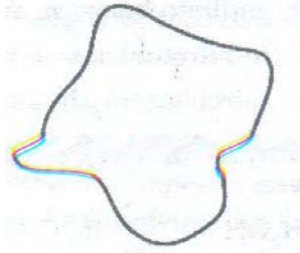
A metal ring is held horizontally and bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet is

- (a) equal to g
- (b) less than g
- (c) more than g
- (d) either (a) or (c)

[CBSE PMT 2005]

Q41

As a result of change in the magnetic flux linked with the closed loop shown in Fig. 2.11, and e. m. f of



V volts is induced in the loop. The work done (in joule) in taking a charge Q coulomb once along the loop is:

- (a) QV
- (b) $2QV$
- (c) $QV/2$
- (d) Zero

[CBSE PMT 2005]

Q42

If N is the number of turns in a coil, the value of self-inductance varies as:

- (a) N^0
- (b) N
- (c) N^2
- (d) N^{-2}

[CBSE PMT 1993; DCE 2002]

Q43

Two coils have mutual inductance 0.005 H. The current changes in the first coil according to equation $I = I_0 \sin \omega t$, where $I_0 = 10$ A and $\omega = 100 \pi \text{ rad } s^{-1}$. The maximum value of e. m. f. in the second coil is:

- (a) 2π
- (b) 5π
- (c) 6π
- (d) 12π

Q44

An aero plane having a wing span of 35 m flies due north with a speed of $90 \text{ m } s^{-1}$. $B = 4 \times 10^{-5}$ T. The potential difference between the tips of the wings will be:

- (a) 0.126 V
- (b) 1.26 V
- (c) 12.6 V
- (d) 0.031 V

Q45

What is the coefficient of mutual inductance if the magnetic flux changes by 2×10^{-2} weber and the change in current is 0.01 A?

- (a) 2 H
- (b) 4 H
- (c) 3 H
- (d) 8 H

PART B: CLASS XII

CHEMISTRY

Q46

Find the odd man out from among the following:

- (a) Al
- (b) Cu
- (c) Wood
- (d) Au

Q47

A solution of 1.25 g of a non – electrolyte in 20 g of water freezes at 271.94 K. If $K_f = 1.86 \text{ K} - \text{m}^{-1}$, the molecular weight of the solute will be:

- (a) $179.79 \text{ g} - \text{mol}^{-1}$
- (b) $207.8 \text{ g} - \text{mol}^{-1}$
- (c) $209.6 \text{ g} - \text{mol}^{-1}$
- (d) $109.6 \text{ g} - \text{mol}^{-1}$

Q48

Increasing the temperature of an aqueous solution will cause the:

- (a) Molality to increase
- (b) Molarity to increase
- (c) Mole fraction to decrease
- (d) Percentage by weight to increase

[I. S. M. Dhanbad 1994]

Q49

The molar freezing point constant of water is $1.86^{\circ}\text{C} \cdot \text{M}^{-1}$. Therefore, the freezing point of 0.1 M Na solution in water is:

- (a) -1.86°C
- (b) -0.186°C
- (c) -0.372°C
- (d) $+0.372^{\circ}\text{C}$

Q50

The effect of temperature rise on concentration is as follows:

- (a) Metallic conduction increases, electrolytic conduction decreases
- (b) Electrolytic conduction increases, metallic conduction decreases
- (c) Both metallic and electrolytic conduction decrease
- (d) Both metallic and electrolytic conduction increase

Q51

The EMF of a cell is the:

- (a) Sum of two oxidation potentials
- (b) Sum of two reduction potentials
- (c) Difference of two electrode potentials
- (d) None of these

Q52

The products of electrolysis of an aqueous solution of NaCl are:

- (a) Na at cathode and Cl_2 at anode
- (b) H_2 at cathode and Cl_2 at anode
- (c) H_2 at cathode and O_2 at anode
- (d) Na at cathode and O_2 at anode

Q53

Four alkali metals A, B, C and D are having respectively standard electrode potentials as -3.05 , -1.66 , -0.40 and 0.80 V. Which one will be most reducing?

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

Q54

The conductivity of a saturated solution of BaSO_4 is $3.06 \times 10^{-6} \text{ ohm}^{-1}$ and its equivalent conductance is 1.53 ohm^{-1} . The value of K_{sp} for BaSO_4 will be:

- (a) 4×10^{-12}
- (b) 2.5×10^{-9}
- (c) 2.5×10^{-13}
- (d) 4×10^{-6}

Q55

The role of catalyst in a chemical reaction is to change the:

- (a) Heat of reaction
- (b) Products of reaction
- (c) Activation energy
- (d) Equilibrium constant

Q56

The decomposition of NH_3 on the surface of tungsten is a reaction of:

- (a) Zero order
- (b) First order
- (c) Second order
- (d) Fractional order

Q57

In the presence of a catalyst, the heat evolved or absorbed during a reaction:

- (a) Decreases
- (b) Increases
- (c) Remains unaffected
- (d) None of these

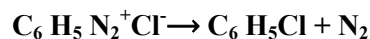
Q58

The quantum yield of photosynthesis of:

- (a) HCl is greater than that of HBr
- (b) HCl is less than that of HBr
- (c) HCl is equal to that HBr
- (d) None of these

Q59

Diazonium salt decomposes as follows:



At 0 °C, the evolution of N_2 becomes two times faster when the initial concentration of the salt is doubled. Hence it is a/an:

- (a) First order reaction
- (b) Second order reaction
- (c) Independent of the initial concentration of the salt
- (d) Zero order reaction

Q60

The rate constant, activation energy and Arrhenius parameter of a chemical reaction at 25 °C are $3.0 \times 10^{-4} \text{ s}^{-1}$, $104.4 \text{ kJ} - \text{mol}^{-1}$ and $6.0 \times 10^{14} \text{ s}^{-1}$, respectively. The value of the rate constant as $T \rightarrow \infty$ is:

- (a) $2.0 \times 10^{18} \text{ s}^{-1}$
- (b) $6.0 \times 10^{14} \text{ s}^{-1}$
- (c) Infinity
- (d) $3.6 \times 10^{30} \text{ s}^{-1}$

Q61

The molecular formula of ethers is:

- (a) $\text{C}_n\text{H}_{2n}\text{O}$
- (b) $\text{C}_n\text{H}_{2n+1}\text{O}$
- (c) $\text{C}_n\text{H}_{2n+2}\text{O}$
- (d) $\text{C}_n\text{H}_{2n}\text{OC}_n\text{H}_{2n}$

Q62

Dehydration of alcohol into ethers is catalyzed by:

- (a) Hot Concentrated H_2SO_4 at 413 K
- (b) Hot NaOH
- (c) Hot HBr
- (d) HNO_3

Q63

Diethyl ether on heating with concentrated HI gives two moles of:

- (a) Ethanol
- (b) Iodoform
- (c) Ethyl iodide
- (d) Methyl iodide

Q64

Which one of the following compounds will show metamerism?

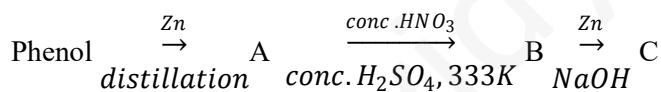
- (a) $\text{CH}_3\text{COC}_2\text{H}_5$
- (b) $\text{C}_2\text{H}_5\text{SC}_2\text{H}_5$
- (c) CH_3OCH_3
- (d) $\text{CH}_3\text{OC}_2\text{H}_5$

Q65

Which one of the following reduces Tollen's Reagent?

- (a) $\text{C}_6\text{H}_5\text{NO}_2$
- (b) $\text{C}_6\text{H}_5\text{NO}$
- (c) $\text{C}_6\text{H}_5\text{NH}_2$
- (d) $\text{C}_6\text{H}_5\text{NHOH}$

Q66



In this reaction sequence, A, B, and C are:

- (a) Benzene, nitrobenzene, aniline
- (b) Benzene, m-dinitrobenzene, m-nitro aniline
- (c) Toluene, m-nitro aniline, m-toluene
- (d) Benzene, nitrobenzene, hydrazobenzene

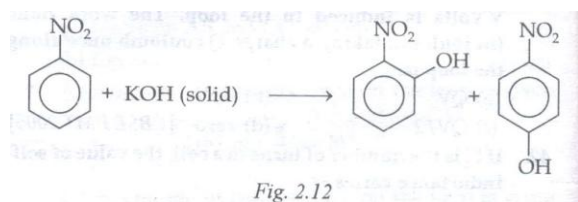
Q67

The hydrolysis of $\text{CH}_3\text{CH}_2\text{NO}_2$ with 85 percent H_2SO_4 gives:

- (a) $\text{CH}_3\text{CH}_2\text{OH}$
- (b) C_2H_6
- (c) $\text{CH}_3\text{CH}=\text{NOH}$
- (d) CH_3COOH

Q68

Refer fig. 2.12. The following reaction is a/an



- (a) Nucleophilic substitution
- (b) Electrophilic substitution
- (c) Free radical substitution
- (d) Electrophilic addition

Q69

Which drug is recommended for regular use by heart patients?

- (a) Vasograin
- (b) Norfloxacin TZ
- (c) Aspirin
- (d) Ciplar 40

Q70

Which one of the following is not a complex compound?

- (a) Potassium ferrocyanide
- (b) Potassium ferrioxalate
- (c) Ferrous ammonium sulphate
- (d) Cuprammonium sulphate

Q71

The molecular formula of glyceraldehyde is:

- (a) C₂ H₅ O₂
- (b) C₃ H₆ O₃
- (c) C₂ H₄ O₂
- (d) None of these

Q72

During the adsorption of oxalic acid on activated charcoal, the activated charcoal is known as:

- (a) Adsorbent
- (b) Adsorbate
- (c) Adsorber
- (d) Absorber

Q73

The presence of colloidal particles of dust in air imparts blue color to sky. This is due to the:

- (a) Absorption of the light
- (b) Scattering of the light
- (c) Reflection of the light
- (d) None of these

Q74

When the dispersion medium in a colloidal system is a gas, it is referred to as:

- (a) Hydrosol
- (b) Aquasol
- (c) Aerosol
- (d) Benzosol

Q75

Fog is an example of colloidal system of:

- (a) Liquid dispersed in gas
- (b) Gas dispersed in gas
- (c) Solid dispersed in gas
- (d) Solid dispersed in liquid

Q76

Which one of the following is a false statement?

- (a) Colloidal sols are homogeneous
- (b) Colloids carry positive or negative charge
- (c) Colloid sols show Tyndall Effect
- (d) The size range of colloidal particles is $10 - 2000 \text{ \AA}$

Q77

An emulsion is a colloidal solution in which both the dispersed phase and dispersion medium are:

- (a) Solids
- (b) Gases
- (c) Liquids
- (d) Suspensions

Q78

Which one of the following is a branched polymer?

- (a) Low Density Polythene (LDP)
- (b) Polyester
- (c) Nylon
- (d) Poly Vinyl Chloride (PVC)

Q79

Terylene is a polyester of:

- (a) Hexamethylenediamine and adipic acid
- (b) Vinyl chloride and formaldehyde
- (c) Melamine and Formaldehyde
- (d) Ethylene glycol and Terephthalic acid

[H. S. B. 1988]

Q80

Chloroprene is the repeating unit in:

- (a) Polystyrene
- (b) Neoprene
- (c) PVC
- (d) Polythene

Q81

A synthetic polymer prepared by using Caprolactam is known as:

- (a) Terylene
- (b) Teflon
- (c) Nylon
- (d) Neoprene

Q82

The carbohydrate which cannot be hydrolyzed by the human digestive system is:

- (a) Starch
- (b) Glycogen
- (c) Cellulose
- (d) All of these

Q83

Proteins are the polyimides of:

- (a) β – Amino acids
- (b) α – Amino
- (c) α – Hydroxy acids
- (d) β – Hydroxy acids

Q84

Which one of the following is a protein?

- (a) Lecithin
- (b) Glycogen
- (c) Keratin
- (d) Nucleic acid

Q85

Which ones of the following constitutes the genetic material of the cell?

- (a) Nucleic acids
- (b) Proteins
- (c) Lipids
- (d) Carbohydrates

Q86

Mutation in DNA occurs due to changes in the sequence of:

- (a) Nitrogenous bases
- (b) Ribose units
- (c) Phosphate units
- (d) None of these

Q87

Which one of the following has a branched chain structure?

- (a) Amylopectin
- (b) Amylose
- (c) Cellulose
- (d) Nylon

Q88

The main structural feature of proteins is:

- (a) Ether linkage
- (b) Ester linkage
- (c) Peptide linkage
- (d) All of these

Q89

Which one of the following is not a protein?

- (a) Wool
- (b) Nail
- (c) Hair
- (d) DNA

Q90

The helical structure of protein is stabilized by:

- (a) Peptide bonds
- (b) Di – peptide bonds
- (c) Hydrogen bonds
- (d) None of these

PART C: CLASS XII
BOTANY

Q91

Vegetative propagation plays a vital role in:

- (a) Sericulture
- (b) Apiculture
- (c) Sylriculture
- (d) Horticulture

Q92

A clone is a group of:

- (a) Genetically similar organisms produced through asexual reproduction
- (b) Genetically similar organisms produced through sexual reproduction
- (c) Genetically dissimilar organisms produced as a result of asexual reproduction
- (d) Genetically dissimilar organisms produced as a result of sexual reproduction

Q93

The technique of obtaining large number of plantlets through the tissue culture method is called:

- (a) Plantlet Culture
- (b) Organ Culture
- (c) Micro Propagation
- (d) Macro Propagation

Q94

In which plant, is bud grafting practiced?

- (a) Apple
- (b) Peach
- (c) Rose
- (d) All of these

Q95

What involves the fusion of gametes which differ in terms of size or motility?

- (a) An isogamy
- (b) Heterogamy
- (c) Oogamy
- (d) Both (a) and (b)

Q96

Which one of the following is not an item of bio piracy?

- (a) Micro organisms
- (b) Plants
- (c) Animals
- (d) Abiotic chemicals

Q97

Which one of the following is a transgenic plant?

- (a) Flavrsarv
- (b) Ashbyagossypii
- (c) Meloidogyne incognita
- (d) Gluconobacteroxidans

Q98

This kind of interferon is produced when leucocytes and lymphocytes are exposed to virus:

- (a) Interferon – a
- (b) Interferon – b
- (c) Interferon – g
- (d) None of these

Q99

A parasite can be defined as an organism which depends on others for:

- (a) Food
- (b) Shelter
- (c) Both food and shelter
- (d) Reproduction

Q100

A tropical rainforest is:

- (a) Single – storeyed
- (b) Double – storeyed
- (c) Multi storeyed
- (d) None of these

Q101

A tropical rainforest is:

- (a) Littoral zone
- (b) Limnetic zone
- (c) Disphotic zone
- (d) Benthic zone

Q102

Which horizon in soil profile is the area of illuviation?

- (a) A – Horizon
- (b) B – Horizon
- (c) C – Horizon
- (d) Bedrock horizon

Q103

Which type of water is absorbed or imbibed by the soil colloids?

- (a) Hygroscopic water
- (b) Water vapour
- (c) Combined water
- (d) Capillary water

Q104

Which type of age pyramid is made for stable population?

- (a) Triangular Age pyramid
- (b) Bell – shaped Age pyramid
- (c) Urn shaped pyramid
- (d) Inverted triangular age pyramid

Q105

The breakdown of detritus into small particles by bacteria is a process called:

- (a) Mineralisation
- (b) Catabolism
- (c) Humification
- (d) Fragmentation

Q106

Carnivores represent:

- (a) Primary consumers
- (b) Secondary consumers
- (c) Secondary and tertiary consumers
- (d) Reducers

Q107

The tip of an ecological pyramids occupied by:

- (a) Producers
- (b) Herbivores
- (c) Carnivores
- (d) None of these

Q108

The percentage of energy converted into biomass by a higher trophic level over the energy of food resources available at the lower trophic level is called:

- (a) Photosynthetic efficiency
- (b) Net production efficiency
- (c) Assimilation efficiency
- (d) Ecological efficiency

Q109

The management of forests or woodlands for the production of timber and other wood products is called:

- (a) Apiculture
- (b) Sericulture
- (c) Silviculture
- (d) Forestry

Q110

When was the first Earth Day celebrated?

- (a) 1950
- (b) 1970
- (c) 1980
- (d) 1955

Q111

Refer Fig. 2.13. Name the unlabeled area 'a' to 'e' of the pie chart representing biodiversity of vertebrates showing the proportionate number of species of major taxa:

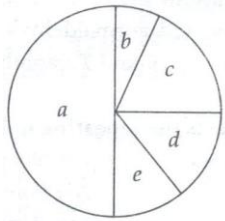


Fig. 2.13

- (a) a – Fish, b – Mammals, c – Birds, d – Reptiles, e – Amphibians
- (b) a – Mammals, b – Amphibians, c – Reptiles, d – Birds, e – Fish
- (c) a – Birds, b – Amphibians, c – Fish, d – Mammals, e – Reptiles
- (d) a – Fish, b – Reptiles, c – Amphibians, d – Birds, e – Mammals

Q112

The species listed in Red Data book are:

- (a) vulnerable
- (b) threatened
- (c) endangered
- (d) all of these

Q113

Which one is non - biodegradable?

- (a) Sewage
- (b) Market garbage
- (c) Liver stock waste
- (d) DDT

Q114

Which particulate size is biodegradable?

- (a) 1.0 μm or less
- (b) 1.5 μm or less
- (c) 2.5 μm or less
- (d) 5.2 μm - 2.5 μm

Q115

Shifting cultivation is:

- (a) Agroforestry
- (b) Social forestry
- (c) Conservation forestry
- (d) Industrial forestry

Q116

The global agreement for reducing the release of CFCs is:

- (a) Vienna Convention
- (b) Rio de Janeiro Conference
- (c) Kyoto Protocol
- (d) Montreal Protocol

Q117

Match the following:

A	Virus Free	1	Intact root
B	Root cutting	2	In vitro
C	Delbergia	3	Black berry
D	Mound layering	4	Jasmine

- (a) A – 1, B – 3, C – 2, D – 4
- (b) A – 2, B – 3, C – 1, D – 4
- (c) A – 2, B – 1, C – 3, D – 4
- (d) A – 2, B – 3, C – 4, D – 1

Q118

Which one of the following is a seasonal breeder?

- (a) Mice
- (b) Deer
- (c) Poultry
- (d) Rabbit

Q119

In vegetative propagation, when a branch is injured, defoliated and pegged down in the ground, this process is known as:

- (a) Layering
- (b) Grafting
- (c) Cutting
- (d) Bud Grafting

Q120

Bird pollination is:

- (a) Chiropterophily
- (b) Ornithophily
- (c) Malacophily
- (d) Myrmecophily

Q121

Ciesitogamous flowers are:

- (a) Self – pollinated
- (b) Insect – pollinated
- (c) Bird – pollinated
- (d) Wind – pollinated

Q122

Which one of the following is not an application of Lactic acid?

- (a) Food preservative
- (b) Manufacture of cheese and yoghurt
- (c) Fabric treatment in textile industry
- (d) All of these

Q123

Double fertilization involves the fertilization of:

- (a) An egg by two male gametes
- (b) Egg and central cell by two sperms brought by two sperms brought by two sperms brought by two different pollen tubes
- (c) Two eggs in the same embryo sac by two sperms brought by one pollen tube
- (d) Egg and central cell by two sperms brought by same pollen tube

Q124

Which one is a dominant trait out of the characters chosen by Mendel?

- (a) Pod color – Yellow
- (b) Seed Color – White
- (c) Flower position – Axillary
- (d) Plant height Dwarf

Q125

Heterozygous tall (Tt) is crossed with homozygous tall (TT). Percentage of heterozygous tall in the progeny would be:

- (a) 25%
- (b) 50%
- (c) 75%
- (d) 100%

Q126

The 9 : 3 : 3 : 1 ratio is due to:

- (a) Segregation
- (b) Independent assortment
- (c) Crossing over
- (d) Homologous pairing

Q127

Variations observed during tissue culture of some plants are known as:

- (a) Clonal variations
- (b) Soma clonal variations
- (c) Somatic variations
- (d) Tissue culture variations

Q128

India's wheat yield revolution in the 1960s was possible primarily due to:

- (a) Hybrid seeds
- (b) The development of sem – dwarf variety of wheat
- (c) Mutations resulting in plant height reduction
- (d) Quantitative trait mutations

Q129

Which ones of the following have been included in the genre of bio – pesticides?

- (a) Viruses and bacteria
- (b) Viruses, bacteria and fungi
- (c) Viruses, bacteria, fungi, protozoa and mites
- (d) Viruses, bacteria, fungi and protozoa

Q130

Mycorrhiza promotes plant growth by:

- (a) Absorbing inorganic ions from soil
- (b) Helping the plant in utilizing atmospheric nitrogen
- (c) Protecting the plant from infection
- (d) Serving as plant growth regulator

Q131

Agarose extracted from seaweeds is used in:

- (a) Spectrophotometry
- (b) Tissue culture
- (c) PCR
- (d) Gel electrophoresis

Q132

The main objective of production/ use of herbicide – resistant GM crops is the:

- (a) Elimination weeds from the field without the use of herbicides
- (b) Promotion of eco – friendly herbicides
- (c) Reduction of herbicide accumulation in food articles for health safety
- (d) Elimination of weeds from the field without the use of manual labor

Q133

Which one of the following combinations is incorrect?

- (a) Bean Seed: Endospermic and Monocotyledonous
- (b) Maize Grain: Endospermic and Monocotyledonous
- (c) Castor Seed: Endospermic and Dicotyledonous
- (d) Bean Seed: Non – endospermic and Dicotyledonous

Q134

Xerophytes possess:

- (a) Sunken stomata
- (b) Deep roots
- (c) Thick cuticles
- (d) All of these

Q135

Green muffler is related to the pollution of:

- (a) Soil
- (b) Air
- (c) Noise
- (d) Water

PART D: CLASS XII

ZOOLOGY

Q136

Which extra embryonic membrane in humans prevents desiccation of the embryo inside the uterus?

- (a) Allantois
- (b) Yolk sac
- (c) Amnion
- (d) Chorion

Q137

Cryptorchidism is a condition in which:

- (a) Testis does not descend into scrotal sac
- (b) Sperm is not found
- (c) Male hormones are not reactive
- (d) Ovaries are removed

Q138

Human egg is:

- (a) Centrolecithal
- (b) Alecithal
- (c) Teloecithal
- (d) Megalecithal

Q139

Saheli is:

- (a) An oral contraceptive for females
- (b) A surgical sterilization method for females
- (c) A diaphragm for females
- (d) A surgical method of sterilization in males

Q140

Chancroid is a sexually transmitted disease caused by:

- (a) Treponema
- (b) Haemophilus
- (c) Neisseria
- (d) Chlamydiae

Q141

What is correct about the test tube baby?

- (a) Fertilization inside female genital tract and growth in test tube
- (b) Rearing of prematurely born baby in an incubator
- (c) Fertilization outside and gestation inside the womb of mother
- (d) Both fertilization and development are effected outside the female genital tract

Q142

Which one is related to males?

- (a) Oral pills
- (b) Tubectomy
- (c) Vasectomy
- (d) None of these

Q143

A test cross is:

- (a) Tt x tt
- (b) TT x tt
- (c) Tt x Tt
- (d) Tt x tt

Q144

Pleiotropic effect is found in:

- (a) Human skin color
- (b) Night blindness
- (c) Hemophilia
- (d) Sickle cell anemia

Q145

The exon part of m – RNA has a code for:

- (a) Polypeptides
- (b) Carbohydrates
- (c) Lipids
- (d) Phospholipids

Q146

Which one of the following carries genetic messages to ribosomes?

- (a) tRNA
- (b) rRNA
- (c) mRNA
- (d) HnRNA

Q147

Refer Fig. 2.14. What do parts, a, b and c represent?

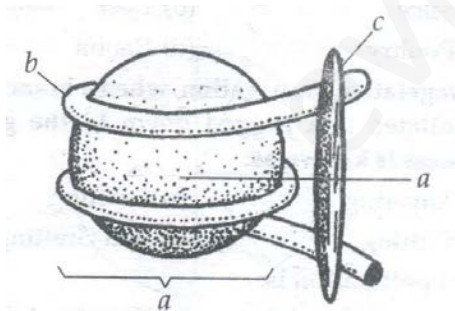


Fig. 2.14

- (a) DNA, H1 Histone, core to histone molecule
- (b) Core of Histone molecule, DNA, H1 Histone
- (c) H1 Histone, core of Histone molecule, DNA
- (d) H1 Histone, DNA, core of Histone molecule

Q148

Which one of the following is the correct sequence in the evolution of the horse?

- (a) Mesohippus → Pliohippus → Merychippus → Equus
- (b) Mesohippus → Eohippus → Merychippus → Equus
- (c) Eohippus → Mesohippus → Merychippus → Pliohippus
- (d) Eohippus → Merychippus → Mesohippus → Pliohippus

Q149

Palaentological evidence in favor of organic evolution can best be illustrated by:

- (a) Duck – billed platypus
- (b) Archaeopteryx
- (c) Darwin’s finches
- (d) Bistonbetalaria

Q150

‘Dexterity’ in man means that:

- (a) He has an erect posture
- (b) He has binocular vision
- (c) His brain volume is more
- (d) His thumb is opposite to his fingers

Q151

In the immune system, interferon’s are part of:

- (a) Physiological barriers
- (b) Cellular barriers
- (c) Physical barriers
- (d) Cytokine barriers

Q152

Emphysema is:

- (a) A type of depression
- (b) Insanity due to psychosis
- (c) The tendency to take much water
- (d) A respiratory disease

Q153

Macrophages are also known as:

- (a) Tumor cells
- (b) Natural killer cells
- (c) Phagocytes
- (d) B – cells

Q154

Which one is a Neem product and used as an insect repellent?

- (a) Azadirachtin
- (b) Rotenone
- (c) Parathione
- (d) Endrin

Q155

The sewage treatment process in which a part of decomposer microbes is recycled into the starting process is:

- (a) Primary treatment
- (b) Activated sludge treatment
- (c) Catalytic treatment
- (d) Tertiary treatment

Q156

The vector for t – DNA is:

- (a) *Thermos aquaticus*
- (b) *Salmonella typhimurium*
- (c) *Agrobacterium tumefaciens*
- (d) *Escherichia coli*

Q157

In which method, is foreign DNA directly injected into nucleus of animal cells or plant cell?

- (a) Microinjection
- (b) Electroporation
- (c) Chemical Mediated Gene Transfer
- (d) Gene Gun Method

Q158

The enzyme that degrades starches is:

- (a) Lipase
- (b) Amylase
- (c) Lactase
- (d) Protease

Q159

A patient is suspected to be suffering from Acquired Immuno Deficiency Syndrome (AIDS). Which diagnostic technique will you recommend for its detection?

- (a) ELISA
- (b) MRI
- (c) Ultrasound
- (d) WIDAL

Q160

Which one of the following are hermaphrodites?

- (a) Earthworm, Hydra and Leech
- (b) Cockroach, Ascaris and Hydra
- (c) Earthworm, Ascaris and Leech
- (d) Ascaris, Cockroach and Hydra

Q161

Which cell organelle is absent in the human sperm:

- (a) Endoplasmic Reticulum
- (b) Mitochondria
- (c) Nucleus
- (d) Centrioles

Q162

The part of Fallopian tube closest to the ovary is:

- (a) Isthmus
- (b) Infundibulum
- (c) Cervix
- (d) Ampulla

Q163

Sertoli cells are found in testis. These cells are:

- (a) Nurse cells
- (b) Reproductive cells
- (c) Receptor cells
- (d) None of these

Q164

Column I contains terms and Column II contains definitions. Match them correctly and choose the right answer:

Column I	Column II
A. Parturition	1. Attachment of zygote to endometrium
B. Gestation	2. Release of egg from Graafian follicle
C. Ovulation	3. Delivery of baby from uterus
D. Implantation	4. Duration between pregnancy and birth
E. Conception	5. Formation of zygote by fusion of egg and sperm
	6. Stoppage of ovulation and menstruation

(a) A – 2, B – 4, C – 1, D – 5, E – 3
(b) A – 4, B – 3, C – 1, D – 5, E – 2
(c) A – 5, B – 1, C – 2, D – 3, E – 4
(d) A – 3, B – 4, C – 2, D – 1, E – 5

Q 165

What is correct about amniocentesis?

- (a) Intrauterine diagnosis
- (b) Withdrawal of allantoic fluid from pregnant woman
- (c) Chemical analysis of fluids of pregnant woman
- (d) Culturing of amniotic cells and the study of metaphysics chromosomes for identifying chromosomal abnormality

Q166

Tubectomy, a method of population control, is performed on:

- (a) Both males and females
- (b) Males only
- (c) Females only
- (d) Only pregnant females

Q167

Medical termination of Pregnancy (MTP) is considered safe up to how many weeks of pregnancy?

- (a) Eight weeks
- (b) Twelve weeks
- (c) Eighteen weeks
- (d) Six weeks

Q168

Cri du chat is due to chromosomal aberration, called:

- (a) Duplication
- (b) Inversion
- (c) Deletion
- (d) Translocation

Q169

A sex – linked disorder is:

- (a) Albinism
- (b) Phenylketonuria
- (c) Hemophilia
- (d) Sickle Cell Anemia

Q170

Which one of the following Igs is nearly 0.2 percent of all antibodies in the human blood?

- (a) IgD
- (b) IgE
- (c) IgM
- (d) IgA

Q171

Hybrid cells proliferate into cells which are known as:

- (a) Monoclonal antibodies
- (b) Hybridisms
- (c) Hybrid Structures
- (d) None of these

Q172

Match the causative organisms with their diseases:

A.	Haemophilus influenza	1.	Malignant malaria
B.	Endameba histolytic a	2.	Elephantiasis
C.	Plasmodium falciparum	3.	Pneumonia
D.	Wuchereriabanacrofti	4.	Typhoid
E.	Salmonella typhi	5.	Amoebiasis

- (a) A – 1, B – 5, C – 3, D – 2, E – 4
- (b) A – 3, B – 5, C – 1, D – 2, E – 4
- (c) A – 5, B – 1, C – 3, D – 4, E – 2
- (d) A – 1, B – 3, C – 2, D – 5, E – 4
- (e) A – 1, B – 3, C – 5, D – 2, E – 4

Q173

The most abundant immunoglobulin is:

- (a) IgA
- (b) IgE
- (c) IgG
- (d) IgD

Q174

Asthma is characterized by:

- (a) Spasm in the bronchial muscle
- (b) Alveolar wall degradation
- (c) Pain in lungs
- (d) Damage to diaphragm

Q175

Mule is produced by:

- (a) Selection
- (b) In – breeding
- (c) Inter – specific hybridization
- (d) Cross – breeding

Q176

The fish reared in culture fishery in India are:

- (a) Salmon and Rohu
- (b) Salmon and Catla
- (c) Catla and Magur
- (d) Rohu and Catla

Q177

The first ever hormone prepared by genetic engineering was:

- (a) Oxytocin
- (b) Somato – tropin
- (c) Adrenalin
- (d) Insulin

Q178

The reagent used in ELISA test is:

- (a) Endonuclease
- (b) Polymerase
- (c) Ligase
- (d) Peroxidase

Q179

Female mosquitoes sucking human blood at intervals are:

- (a) Permanent parasites
- (b) Endoparasites
- (c) Hemi parasites
- (d) Intermittent parasites

Q180

A food chain can have the following trophic level (s).

- (a) Three or four
- (b) Three
- (c) Two
- (d) One

evidyarthi.in

Answers and Explanations

PART A : CLASS XII

PHYSICS

Sol 1.

(b) charge on deuteron = $+e = 1.6 \times 10^{-19}$ C.

$$E = \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{r^2} = 9 \times 10^9 \times \frac{1.6 \times 10^{-19}}{(1 \times 10^{-10})^2}$$
$$= 1.44 \times 10^{11} \text{ NC}^{-1}$$

The right choice is (b).

Sol 2.

(b) Force exerted by electric field. = Weight of water drop

$$eE = mg$$

$$\text{or } E = \frac{mg}{e}$$

The right choice is (b)

Sol 3.

(a) Gauss's law is valid for any closed surface.

The right choice is (a).

Sol 4.

(a) Given $V = 4x^2$ volt

i. e., electric potential changes only along the X – axis.

$$\therefore E_x = \frac{dV}{dx} = -\frac{d}{dx}(4x^2) = -8x$$

Electric field at point (1m, 0, 2 m) is

$$E_x = -8 \times 1 = -8 \text{ V – m}^{-1} \text{ [put } x = 1 \text{ m]}$$

The right choice is (a).

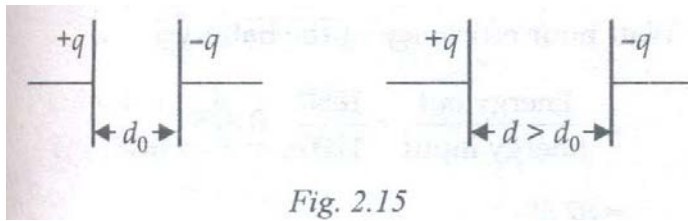
Sol 5.

(c) and (d) Under electrostatic condition, all points lying on the conductor are at the same potential. Therefore, potential at A = potential at B. Hence option (c) is correct. From Gauss's theorem, total flux through the surface of cavity = $\frac{q}{\epsilon_0}$

The right choices are (c) and (d).

Sol 6.

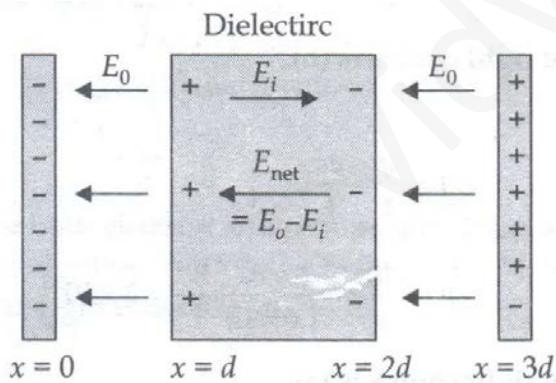
(b) and (c). Refer Fig. 2.15; options (b) and (c) are true.



The right choices are (b) and (c)

Sol 7.

(b) and (c) The section has been shown in Fig. 2.16. Options (b) and (c) are true. Due to polarization of the dielectric, a field E_i is induced in the opposite direction of original field \vec{E}_0 . But the field $\vec{E}_{net} = \vec{E}_0 - \vec{E}_i$ is the direction of \vec{E}_0 .



The right choice is (b) and (c)

Sol 8.

(b) Initial energy stored in the capacitor,

$$U = \frac{1}{2} CV^2 = \frac{q^2}{2C}$$

When the battery is disconnected, charge $q = \text{constant}$. Another capacitor connected across the first capacitor in parallel with it. So, the final energy stored by the system of two capacitors is:

$$U' = \frac{q^2}{2C_{eq}} = \frac{q^2}{2 \times 2C} = \frac{1}{2} U$$

The right choice is (b).

Sol 9.

$$(b) \vec{E} = -\frac{\partial V}{\partial r} = \left[-\frac{\partial V}{\partial x} \hat{i} - \frac{\partial V}{\partial y} \hat{j} - \frac{\partial V}{\partial z} \hat{k} \right]$$

$$= [(2xy + z^3) \hat{i} + x^2 \hat{j} + 3xz^2 \hat{k}]$$

The right choice is (b).

Sol 10.

$$(d) V_A = \frac{\sigma}{\epsilon_0} (a - b + c)$$

$$V_B = \frac{\sigma}{\epsilon_0} \left(\frac{a^2}{b} - b + c \right)$$

$$V_C = \frac{\sigma}{\epsilon_0} \left(\frac{a^2 - b^2}{c} + c \right)$$

$$= \frac{\sigma}{\epsilon_0} \left[\frac{(a-b)(a+b)}{c} + c \right]$$

$$= \frac{\sigma}{\epsilon_0} (a - b + c) \quad [\because a + b = c]$$

$$\therefore V_A = V_C \neq V_B$$

The right choice is (d)

Sol 11.

$$(b) V_{\text{eff}} = V + V + V = 3V$$

$$\frac{1}{C_{\text{eff}}} = \frac{1}{C} + \frac{1}{C} + \frac{1}{C} = C_{\text{eff}} = \frac{C}{3}$$

The right choice is (b)

Sol 12.

$$(a) I = \frac{q}{t} = \frac{ne}{t}$$

$$\therefore n = \frac{It}{e} = \frac{3.2 \times 10^{-3} \times 1}{1.6 \times 10^{-19}} = 2 \times 10^{16}$$

The right choice is (a).

Sol 13.

$$(a) I R_{\text{eq}} = R + R + R = 3R, P_I = I^2 (3R)$$

$$\text{II } R_{\text{eq}} = \frac{2R \times R}{2R+R} = \frac{2R}{3}, P_{\text{II}} = I^2 \left(\frac{2R}{3} \right)$$

$$\text{III } R_{\text{eq}} = \frac{1}{\frac{1}{R} + \frac{1}{R} + \frac{1}{R}} = \frac{2R}{3}, P_{\text{III}} = I^2 \left(\frac{R}{3} \right)$$

$$\text{IV } R_{\text{eq}} = \frac{R \times R}{R+R} + R = \frac{3}{2}R, P_{\text{IV}} = I^2 \left(\frac{3}{2}R \right)$$

Clearly, $P_{\text{III}} < P_{\text{II}} < P_{\text{IV}} < P_I$

The right choice is (a).

Sol 14.

(b) The resistance of the metallic conductor copper decreases of the semiconductor germanium increases with the decrease in temperature.

The right choice is (b).

Sol 15.

(a) For the same potential V_0

$$\text{At temperature } T_1, R_1 = \frac{V_0}{I_1}$$

$$\text{At temperature } T_2, R_2 = \frac{V_0}{I_2}$$

$$\text{As } I_2 < I_1 \therefore R_2 > R_1$$

Since resistance of a metal increase with temperature so $T_2 > T_1$ or $T_1 < T_2$.

The right choice is (a)

Sol 16.

(a) The current through 2Ω resistance will be zero because it is not a party of any closed loop.

The right choice is (a).

Sol 17.

(b) Let R and m be the resistance and mass of the first wire. Then the resistance of second wire would be $2R$ and mass is $2m$.

Let $\xi = \text{emf each cell}$

And $c = \text{specific heat capacity of the material of the wire.}$

For the first wire, current $I_1 = \frac{3\xi}{R}$

And heat produced, $I_1^2 (2R)t = mc \Delta T$

For the second wire, current $I_2 = \frac{N\xi}{2R}$

And heat produced, $I_2^2 (2R)t = 2mc \Delta T$

Clearly, $I_1 = I_2$. Hence, $N = 6$

The right choice is (b)

Sol 18.

(a) whether the switch S is open or closed, the reading of the galvanometer G is not affected. This indicates that no current flows through switch S . Therefore, $V_B = V_D$ and the Wheatstone bridge is balanced.

Hence, $I_P = I_Q$ and $I_R = I_G$

Only option (a) is correct

The right choice is (a).

Sol 19.

(b) This is the photograph of an LED. It is a bicolour LED. It is used as a polarity indicator.

The right choice is (b).

Sol 20.

(c) As I is independent of R_6 , no current flows through R_6 . Thus, the junction of R_1 and R_2 is at the same potential as the junction of R_3 and R_4 . Hence, for a balanced Wheatstone bridge, we have:

$$\frac{R_1}{R_2} = \frac{R_3}{R_4}$$

Or, $R_1 R_4 = R_2 R_3$

The right choice is (c).

Sol 21.

(d) The right option is (d)

Sol 22.

(d) Input energy when the battery is charged

$$= VIt$$

$$= 15 \text{ V} \times 10 \text{ A} \times 8 \text{ h} = 1200 \text{ Wh}$$

Energy released when the battery is discharged

$$= 14 \text{ V} \times 5 \text{ A} \times 15 \text{ h} = 1050 \text{ Wh}$$

Watt hour efficiency of the battery

$$= \frac{\text{Energy out}}{\text{Energy input}} = \frac{1050}{1200} = 0.875 = 87.5\%$$

The right choice is (d).

Sol 23.

The parallel combination of 6 Ω and 3 Ω resistances in series with the 4 Ω resistance. The equivalent resistance is

$$R = \frac{6 \times 3}{6+3} + 4 \Omega$$

$$\therefore P = \frac{V^2}{R} = \frac{18 \times 18}{6} = 54 \text{ W}$$

The right choice is (b).

Sol 24.

(c) Kirchhoff's first and second laws of electrical circuits are the consequences of the laws of conservation of electric charge and energy, respectively.

The right choice is (c).

Sol 25.

(a) Connecting a resistance in series with the galvanometer does not affect the balanced condition of the bridge. We just have (have 10 Ω + 10 Ω) and (10 Ω + 10 Ω) resistances in parallel.

$$\therefore R_{\text{eq}} = \frac{20 \times 20}{20+20} = 10 \Omega$$

The right choice is (a).

Sol 26.

(d) Putting $r = 1 \Omega$, we get:

$$R_{AB} = \frac{8r}{7} = \frac{8 \times 1}{7} = \frac{8}{7} \Omega$$

The right choice is (d).

Sol 27.

$$(d) \frac{R}{S} = \frac{1}{100-1}$$

$$\text{Or } \frac{R}{1\Omega} = \frac{20cm}{100cm - 20cm}$$

$$\text{Or } R = \frac{20}{80} \times 1 \Omega = 0.25 \Omega$$

The right choice is (d).

Sol 28.

(c) Case I:

$$\frac{R_1 + 10}{R_2} = \frac{50}{100 - 50}$$

$$\text{Or, } R_1 + 10 = R_2$$

Case II:

$$\frac{R_1}{R_2} = \frac{10}{100 - 60} = \frac{2}{3}$$

$$\text{On solving, } R_1 = 20 \Omega$$

The right choice is (c)

Sol 29.

$$(a) V = \xi - Ir \text{ Or } V = -rI + \xi$$

On comparing with $y = mx - c$, we get: slope = $-r$ and intercept = ξ

The right choice is (a).

Sol 30.

(b) The magnetic field exerts a force perpendicular at the direction of motion of the charged particle. It continuously deflects the particle from its path but does no work on it. Hence, the momentum of the particle changes but its kinetic energy remains same.

The right choice is (b)

Sol 31.

(a) Radius of the circular path of a charged particle in a perpendicular magnetic field.

$$r = \frac{mv}{qB}$$

For both electron and proton, quantities mv , q and B are all same. Hence, the radius r will be same.

The right choice is (a)

Sol 32.

(d) $r = \frac{mv}{qB}$

$$\therefore T = \frac{2\pi r}{v} = \frac{2\pi}{v} \cdot \frac{mv}{qB} = \frac{2\pi m}{qB}$$

The right choice is (d)

Sol 33.

(c) The force between two parallel wires carrying currents I_1 and I_2 in the same direction is

$$F = \frac{\mu_0}{2\pi} \frac{I_1 I_2}{d} \text{ (attractive)}$$

But $I_1 = I_2 = I$

$$\therefore F = \frac{\mu_0 I^2}{2\pi l} \text{ (attractive)}$$

The right choice is (c).

Sol 34.

(c) Refer Fig. 2.17. Net magnetic field due to loop ABCD at O is

$$B = B_{AB} + B_{BC} + B_{CD} + B_{DA} = 0 + \frac{\mu_0 I}{4\pi a} \times \frac{\pi}{6} + 0 - \frac{\mu_0 I}{4\pi b} \times \frac{\pi}{6} = \frac{\mu_0 I}{24a} - \frac{\mu_0 I}{24b} = \frac{\mu_0 I}{24ab} (b - a)$$

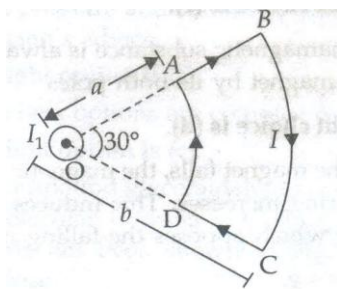


Fig. 2.17

The right choice is (c).

Sol 35.

(d) Resistance of the galvanometer.

$$G = \frac{\text{Current sensitivity}}{\text{Voltage sensitivity}} = \frac{10}{2} = 5 \Omega$$

Number of division on the galvanometer scale, $n = 150$

Current required for full scale deflection,

$$I_g = \frac{n}{\text{Current sensitivity}} = \frac{150}{10}$$

$$= 15 \text{ mA} = 15 \times 10^{-3} \text{ A}$$

Required range of voltmeter = $150 \times 1 = 150 \text{ V}$ Required series resistance,

$$R = \frac{V}{I_g} - G = \frac{150}{15 \times 10^{-3}} - 5 = 9995 \Omega$$

The right choice is (d).

Sol 36.

(b) The forces on AD and BC are zero because magnetic field due to a straight wire on AD and BC is parallel to elementary length of the loop.

The right choice is (b).

Sol 37.

$$T = \frac{2\pi R}{v}$$

$$\therefore I = \frac{q}{T} = \frac{qv}{2\pi R}$$

$$B = \frac{\mu_0 I}{2R} = \frac{\mu_0}{2R} \cdot \frac{qv}{2\pi R} = \frac{\mu_0 qv}{4\pi R^2}$$

$$\text{Or } R^2 = \frac{\mu_0 qv}{4\pi B}$$

$$\therefore R \propto \sqrt{\frac{v}{B}}$$

The right choice is (c).

Sol 38.

(c) A diamagnetic material moves slowly from stronger to weaker parts in a magnetic field.

The right choice is (c).

Sol 39.

(d) A diamagnetic substance is always repelled by a bar magnet by its both poles

The right choice is (d).

Sol 40.

(b) As the magnet falls, the magnetic flux linked with the ring increases. This induces an e. m. f. in the ring which opposes the falling magnet.

Hence, $a < g$.

The right choice is (b).

Sol 41.

(a) Induced e. m. f.,

$$V = \frac{\text{Work done in taking charge } Q \text{ once along the loop}}{\text{Charge } Q}$$

$$\text{Or } V = \frac{W}{Q}$$

$$\therefore W = QV$$

The right choice is (a).

Sol 42.

(b) self – inductance,

$$L = \frac{\mu_0 N^2 A}{l}$$

$$\text{i.e., } L \propto N^2$$

The right choice is (c).

Sol 43.

$$(b) x = M \frac{dI}{dt}$$

$$= M \frac{d}{dt} (I_0 \sin \omega t)$$

$$= MI_0 \omega \cos \omega t$$

$$\xi_{\max} = MI_0 \omega [\text{Max. value of } \cos \omega t = 1] = 0.005 \times 10 \times 100 \pi = 5 \pi \text{ V}$$

The right choice is (b).

Sol 44.

$$(a) \xi = Blv$$

$$= 4 \times 10^{-5} \times 35 \times 90$$

$$= 126 \times 10^{-3} \text{ V}$$

$$= 0.126 \text{ V}$$

The right choice is (a).

Sol 45.

$$(a) \phi = MI, \text{ so } \Delta\phi = M\Delta I$$

$$\text{Or } M = \frac{\Delta\phi}{\Delta I} = \frac{21 \times 10^{-2}}{0.01} = 2\text{H}$$

The right choice is (a).

PART B

CHEMISTRY

Sol 46.

(c) All others are good conductors of electricity. Wood is an insulator, so it is the odd man out.

The right option is (c).

Sol 47.

(d) The right option is (d).

Sol 48.

(b) Molarity will increase if the temperature of an aqueous solution is raised.

The right option is (b)

Sol 49.

(c) The right option is (c).

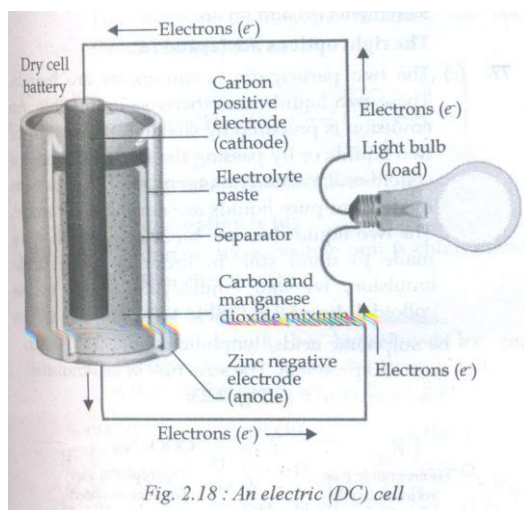
Sol 50.

(b) When temperature rises, electrolytic conduction rises and metallic conduction comes down.

The right choice is (b)

Sol 51.

(c) The right option is (c). Refer Fig. 2.18.



Sol 52.

(b) Hydrogen will be collected at cathode. Chlorine will be collected at anode.

The right choice is (b)

Sol 53.

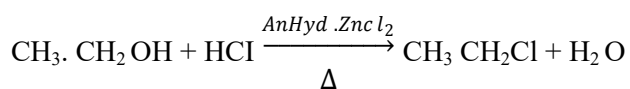
(a) The right option is (a).

Sol 54.

(d) The right option is (d).

Sol 55.

(c) Catalyst enhances the activation energy of reactants. So, they react quickly to form products. Let us take an example, as follows.



Here, anhydrous zinc chloride has been used as a catalyst. It converts reactants in products when heat is given to them. The activation energy is enhanced in this reaction by ZnCl_2 .

The right option is (c),

Sol 56.

(a) The right option is (a).

Sol 57.

(c) The heat evolved or absorbed in a reaction is not affected by the catalyst in a reaction.

The right option is (c).

Sol 58.

(a) The right option is (a).

Sol 59.

(a) The right option is (a).

Sol 60.

(b) The right option is (b)

Sol 61.

(c) The general formula of ethers is as follow:



If the two alkyl groups attached to the oxygen atom are the same, then the ether is called Symmetrical Ether. If the alkyl groups attached to the oxygen atom are different, the ether is called Unsymmetrical Ether. Refer Fig. 2.19 which shows a symmetrical ether.

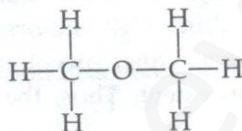


Fig. 2.19 Methoxy methane (Symmetrical ether)

Refer Fig. 2.20 which shows an unsymmetrical ether.

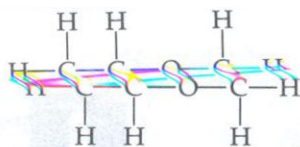


Fig. 2.20 Methoxy ethane (Unsymmetrical ether)

The right choice is (c).

Sol 62.

(a) The right option is (a).

Sol 63.

(c) The right option is (c).

Sol 64.

(b) $C_2H_5SC_2H_5$ will show metamerism.

The right option is (b).

Sol 65.

(d) The right option is (d).

Sol 66.

(d) The right option is (d).

Sol 67.

(d) When $CH_3CH_2NO_2$ is hydrolyzed with 85 percent sulphuric acid, CH_3COOH is produced.

The right choice is (d).

Sol 68.

(a) This is a Nucleophilic reaction

The right option is (a).

Sol 69.

(c) Aspirin must be taken by patient as per doctor's advice. It is recommended by doctors as it keeps human heart comfortable. So, aspirin is a good doing for heart patients. Vasograin is used for treating migraine. Nor TZ is an antibiotic that kills stomach infection. Ciplar 40 controls high blood pressure and cannot be taken without the physician's advice.

The right option is (c).

Sol 70.

(c) The others options are complex compounds.

The right choice is (c).

Sol 71.

The compound glyceraldehyde is a biomolecule. Its molecular formula is $C_3H_6O_3$. Its structural formula has been shown in Fig. 2.20. It is an aldriose. (Image) page no. 51

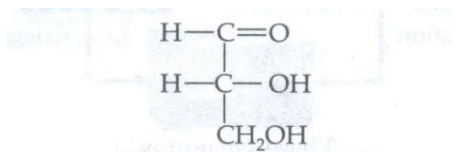


Fig. 2.20: D(+)-Glyceraldehyde

The right option is (b).

Sol 72.

(a) Activated charcoal acts as an adsorbent.

The right option is (a)

Sol 73.

(b) The white light is scattered and the violet color (out of 7 VIBGYOR) colors is scattered by the highest angle. Other six colors are not scattered to such an extent. Thus, sky appears to be blue.

The right option is (b).

Sol 74.

(c) When the dispersion medium in a colloid is a gas, the medium is called Aerosol. Refer Fig. 2.21.

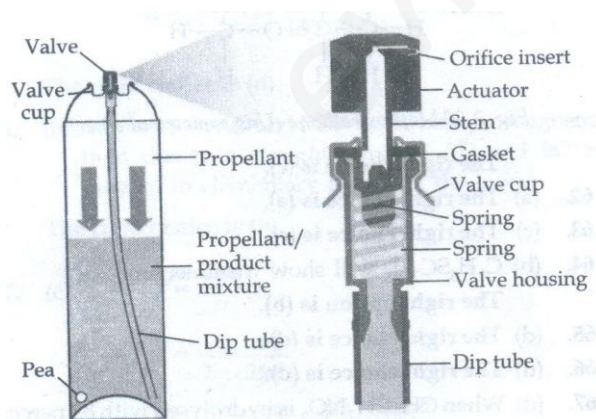
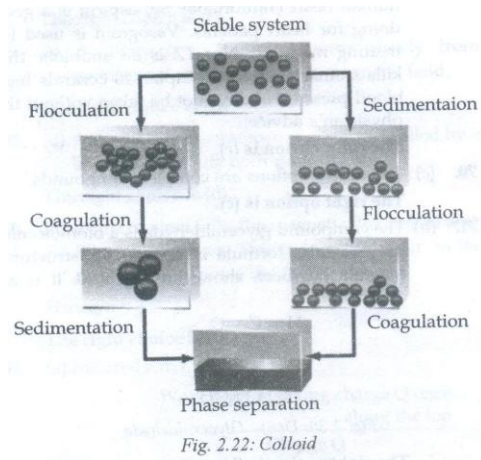


Fig. 2.21: Aerosol

Sol 75.

(a) Fog is a colloid. It is a liquid dispersed in a gas Refer the Fig. 2.22.

The right option is (a).



Sol 76.

(a) and (d). Both (a) and (d) are incorrect statement statements. Statements (b) and (c) are correct.

The right options are (a) and (d).

Sol 77.

(c) The two participating components are liquids. These two liquids are otherwise immiscible. An emulsion is prepared by shaking the mixture of two liquids or by passing the mixture through a colloid mill, called Homogenizer. The emulsions made from pure liquids are normally not stable. The two liquids become separate when they are emulsion, we add emulsifying agents to the colloidal dispersion. These stabilizing agents to the colloidal dispersion, These stabilizing agents can be sulphonic acids, lyophilic colloids of an emulsifier has been shown in Fig. 2.23

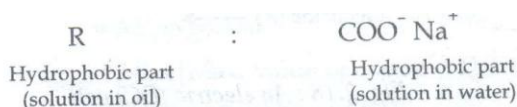


Fig. 2.23: Emulsifier structure

The soaps are potassium and sodium salts of higher fatty acids. Sodium palmitate ($\text{C}_{15} \text{H}_{31} \text{COONa}$) and Sodium stearate ($\text{C}_{17} \text{H}_{35} \text{COONa}$) are two examples in this context. The hydrocarbon part of the soap molecule (like $\text{C}_{15} \text{H}_{31}$ or $\text{C}_{17} \text{H}_{35}$) is soluble in oil. The polar group ($\text{COO}^- \text{Na}^+$) of the soap is soluble in water. So, the R – part of the soap remains in the oil and the $\text{COO}^- \text{Na}^+$ part remains in water. The soap molecules oil. Due to this, the interfacial tension between oil and water reduces. Thus, they mix up to yield an emulsion. Fig. 2.24 will make the concept clear.

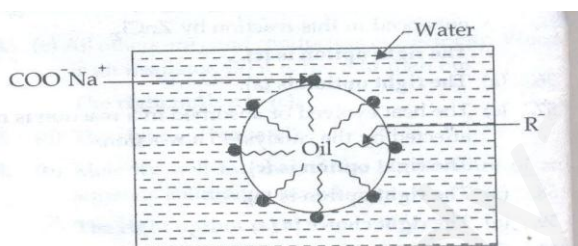


Fig. 2.24 Soap as an emulsifier in an oil- plus-water emulsion

The right option is (c).

Sol 78.

(a) Low Density Polythene (LDP) is a branched polymer,

The right option is (a)

Sol 79.

(d) Terylene is a polyester prepared from Ethylene glycol and terephthalic acid. The structure of Terylene (Dacron) has been shown in Fig. 2.25.

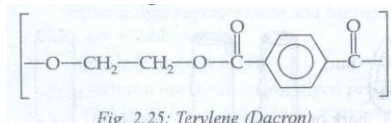


Fig. 2.25: Terylene (Dacron)

The right option is (d).

Sol 80.

(b) In neoprene, the repetitive unit is chloroprene.

The right choice is (b).

Sol 81.

(c) The right option is (c).

Sol 82.

(c) Cellulose cannot be hydrolyzed by man's digestive organs. It will be thrown out of the system without any action. Refer Fig. 2.26.

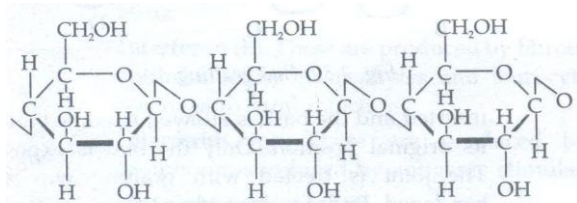


Fig. 2.26: Cellulose

The right option is (c).

Sol 83.

(b) The right option is (b).

Sol 84.

(c) Keratin is a protein. It is a type of fibrous protein. These proteins are the major structural material of animal tissue. Examples: Keratin (skin), Collagen (tendons), Fibroin (silk) and Myosin (muscles). The intermolecular forces of attraction are strong in such proteins. They are not soluble in water. They can withstand moderate changes in temperature and pH value. Refer Fig. 2.27.

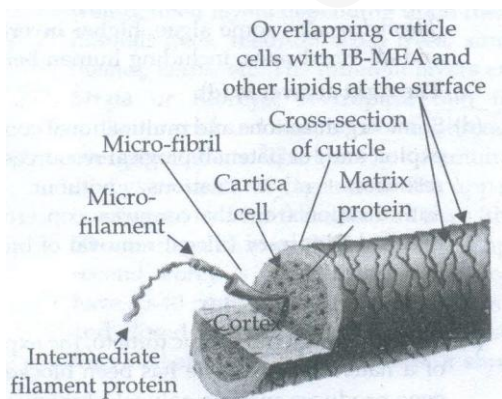


Fig. 2.27: Keratin

The right option is (c).

Sol 85.

(a) The right option is (a).

Sol 86.

(a) The right option is (a).

Sol 87.

(a) The right option is (a).

Sol 88.

(c) Peptide linkage is the chief structural feature of proteins. Refer Fig. 2.28.

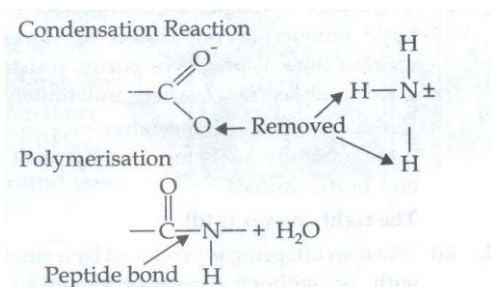


Fig. 2.28: Peptide linkage in proteins

The right option is (c).

Sol 89.

(d) DNA is the basic molecule of life. It is not a protein. Refer Fig. 2.29.

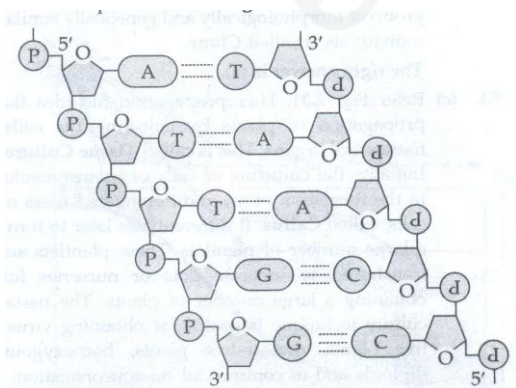
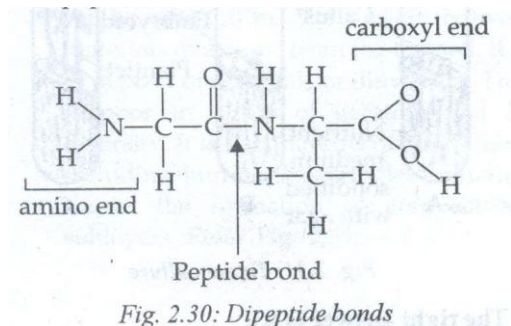


Fig. 2.29 DNA structure

The right option is (d).

Sol 90.

(b) The helical structure of protein is stabilized by dipeptide bonds. Refer Fig. 2.30. It shows dipeptide bonds.



The right option is (b).

PART C

BOTANY

Sol 91.

(d) Vegetative propagation is the formation of new plants from vegetative units such as buds, tubers, rhizomes etc. These vegetative units are called Vegetative Propagules. This method produces a large number of populations of clones in the shortest time. It preserves purity, resistance and good qualities race/variety indefinitely. Various methods of vegetative propagation that grow naturally are being used by plant growers and horticulturists.

The right answer is (d).

Sol 92.

(a) When an offspring is produced by a single parent with or without the involvement of gamete formation, the reproduction is called Asexual Reproduction. As a result, the offspring that are produced are not only similar to one another but are also the exact copies of their parents. Such a group of morphologically and genetically similar individuals is called Clone.

The right answer is (a).

Sol 93.

(c) Refer Fig. 2.31. Micropropagation includes the propagation of plants by culturing the cells, tissues and organs. This is called Tissue Culture. Initially, the culturing of cells or tissues results in the formation of an undifferentiated mass of cells, called Callus. It differentiates later to form a large number of plantlets. These plantlets are transferred to separate pots or nurseries for obtaining a large number of plants. The tissue culture technique is useful for obtaining virus- free plants, disease-free plants, homozygous diploids and in commercial micropropagation.

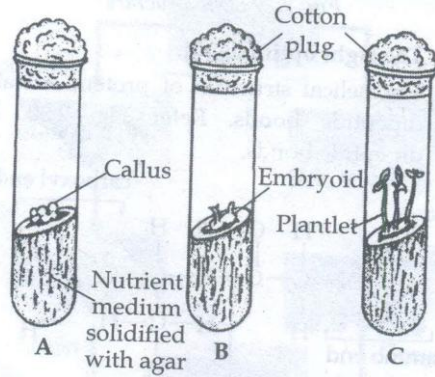


Fig. 2.31: Tissue culture

The right answer is (c).

Sol 94.

(d) Refer Fig. 2.32. Scion is a bud with a small piece of bark and cambium. The stock is given a T-shaped cut. Bark is lifted for exposing cambium

Bud is (image) page no. 54 inserted and the bark is allowed to come back to its original position. Only the bud is exposed. The joint is treated with grafting wax bandaged. Bud develops after 3-5 weeks. Leave and buds of the stock are removed. The stock cut above the graft. Bud grafting is practised Apple, Peach and Rose.

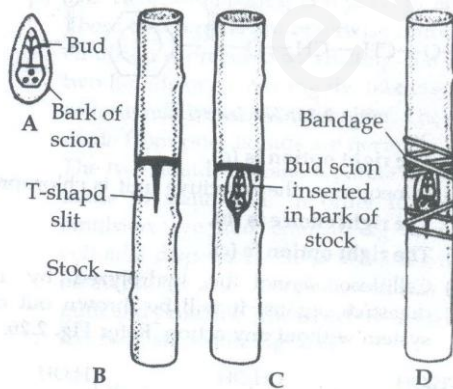


Fig. 2.32: Bud grafting

The right answer is (d).

Sol 95.

An isogamy (Heterogamy) involves the fusion of gametes which differ in size or motility. Such gametes are called an isogametes or heterogametes (e.g. microgametes or male gametes and macrogametes or female gametes, An isogamy(G. K. an = without, iso = equal, gamos = marriage) or heterogamy (G. K. hetero = different, gamos = marriage) occurs in (hlamydomonas, some algade, higher invertebrates and all vertebrates, including human beings).

The right answer is (d).

Sol 96.

(d) Some organizations and multinational companies exploit and/ or patent biological resources or bio-resources other nations without proper authorization from the countries concerned this is called Bio-piracy (illegal removal of biologic materials).

The right answer is (d).

Sol 97.

(a) In FlavrSarv, a transgenic tomato, the expression of a native tomato gene has been blocked. This gene produces enzyme polygalacturonase which promotes the softening of fruit. The production of this enzyme was reduced in the Flavrsarv transgenic tomato. The non-availability of this enzyme prevents over-ripening because the enzyme is essential for the degradation of cell walls. Thus fruit remains fresh for a longer period than the fruit of normal tomato variety. It retains flavor, has superior taste and higher quantity of total soluble solids.

The right answer is (a).

Sol 98.

(a) Interferon are the antiviral glycol proteins (called Lytokines) functioning as immune regulators as lymphokines produced by the infected cells in response to viral infections (discovered in 1957 by Alec Issacs and Jean Lindenmann). These proteins are produced by most body cells on exposure to viruses. There are three major classes of interferon, as follows:

(i) Interferon (a): This kind of interferon is produced when leucocytes and lymphocytes are exposed to virus. (ii) Interferon (b): These are produced by fibroblasts, epithelial cells, macrophytes and leucocytes in response to viral infection. (iii) Interferon (g): These are produced by T- lymphocytes induced by antigenic stimulation.

The right answer is (a).

Sol 99.

(c) Parasitism is a relationship between two living organisms of different species in which one organism, called Parasite, obtains its food directly from another living organism, called Host. The parasite is smaller as compared to its host. It spends a part whole of its life on or in the body of the host.

The right answer is (c).

Sol 100.

(c) In a tropical rain forest, the vegetation shows stratification. Note that stratification is the grouping of plants in a forest into two or more well-defined layers depending upon their height like tall trees, medium sized trees, small trees, bushes, herbs, etc. The different layers are called Strata or Storeys. A tropical rain forest is multistoreyed and mainly contains broad-leaved evergreen plants. There are a minimum of five storeys or strata of vegetation. The upper storey is occupied by very tall emergent trees (they have 50 m or more of height). The canopy is open. The second storey is constituted by tall trees (they have 35-40 metres of height) which form a dense and closed canopy. There is an understorey or intermediate layer of small trees, a shrub layer and a ground layer of ferns, mosses and herbs. Refer Fig. 2.33.

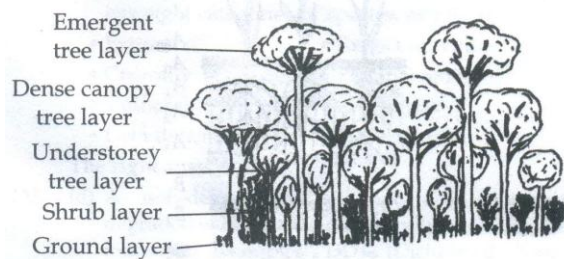


Fig. 2.33

The right answer is (c).

Sol 101.

(d) The Benthic zone is the bottom zone. In deep lakes and seas, the bottom is also in perpetual darkness. However, in shallow waters, light does penetrate. Refer Fig. 2.34.

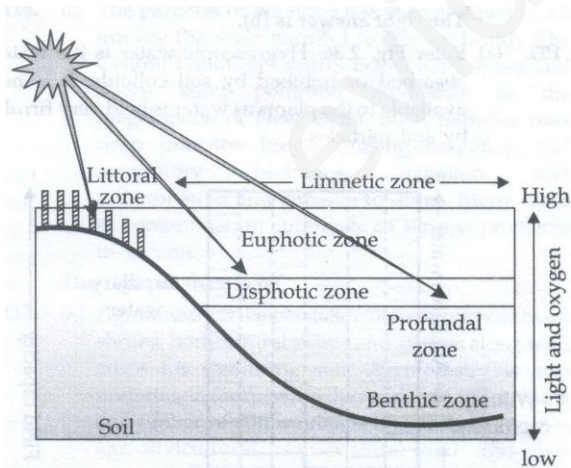
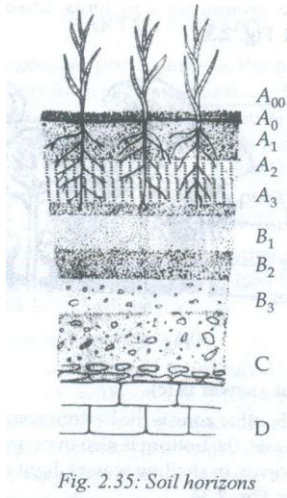


Fig. 2.34: Benthic zone is low-lying

The right answer is (d).

Sol 102.

(b) The B-horizon is also called Subsoil. Its thickness can be up to 1.0 m. The subsoil receives various materials that come from the top soil. It is an area of deposit of materials or illuviation. The horizon is poor in terms of aeration and biological diversity. It is rich in terms of plant nutrients and including humus. Nevertheless, illuviation also causes the formation of compact and hard sub layers. Refer Fig. 2.35.



The right answer is (b).

Sol 103.

(a) Refer Fig. 2.36. Hygroscopic water is the water absorbed or imbibed by soil colloids. It is not available to the plants as water is held very firmly by soil particles.

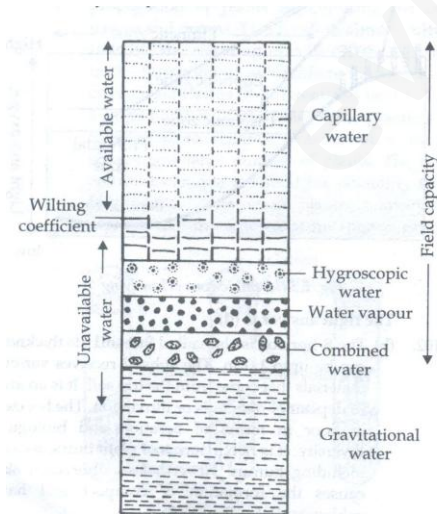
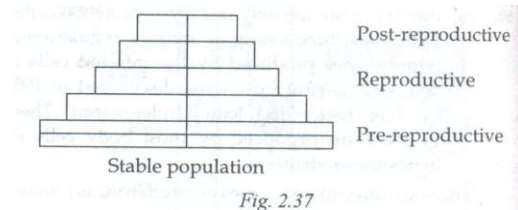


Fig. 2.36: Hygroscopic water

The right answer is (a).

Sol 104.

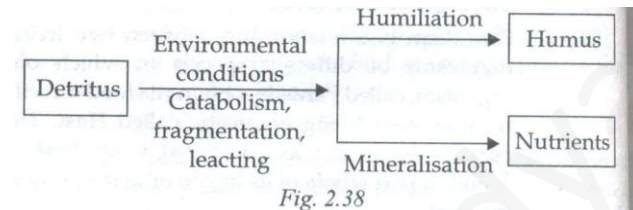
(b) Refer Fig. 2.37. For a stable population, the bell - shaped age pyramid is made. The number of pre-reproductive and reproductive individuals are almost equal. Post-reproductive individuals are comparatively fewer in terms of number. The population size remains stable; it neither grows nor diminishes.



The right answer is (b).

Sol 105.

(b) Refer Fig. 2.38. In catabolism, the decomposers (like bacteria and fungi) excrete digestive enzymes over the detritus. It changes soluble complex organic substances into simple and soluble organic compounds and inorganic mass. A part of the broken down food is taken up by decomposers and immobilized. Refer Fig. 2.38.



The right answer is (b).

Sol 106.

(c) Refer Fig. 2.39.

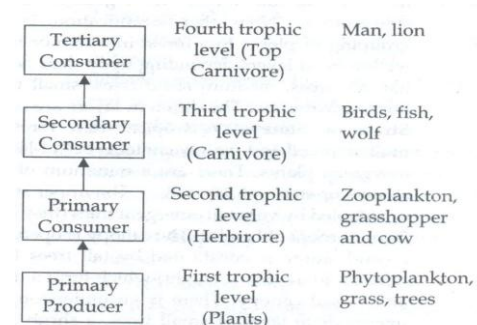
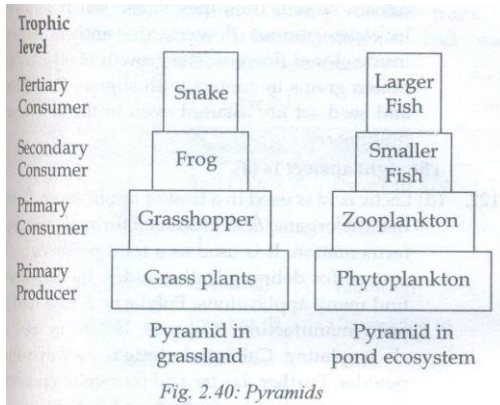


Fig. 2.39: Actors in a food chain

The right answer is (c).

Sol 107.

(c) Refer Fig. 2.40.



The right answer is (c).

Sol 108.

(d) Ecological Efficiency

$$= \frac{\text{Energy Converted into Biomass at a Trophic level}}{\text{Energy Present in Biomass at Lower Trophic Level}} \times 100$$

The right answer is (d)

Sol 109.

(c) The management of forests or woodlands for the production of timber and other wood products is called Silviculture.

The right choice is (b).

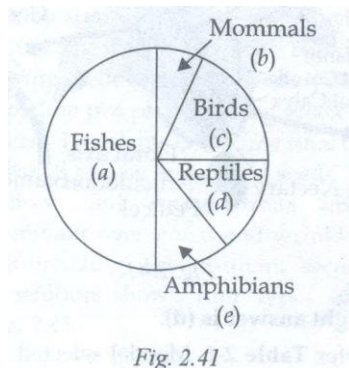
Sol 110.

(b) The first Earth Day was celebrated in 1970 by a group of people of America to draw attention towards the increasing environmental problems caused by humans on the mother earth.

The right answer is (b).

Sol 111.

(a) Refer Fig. 2.41.



The right answer is (a).

Sol 112.

(d) The Red Data Book or Red List is a catalogue of taxa that face the risk of extinction. The Red List has eight categories of species, as follows:

- Extinct
- Critically endangered
- Vulnerable
- Data deficiency
- Extinct in wild
- Endangered
- Lower risk
- Not evaluated

The right answer is (d).

Sol 113.

(d) A non-degradable pollutant does not get degraded or broken down naturally into harmless materials. Examples: DDT (Dichloro - diphenyltrichloro-ethane), BHC (Benzene hexachloride), empty cans, polythene bags, waste plastics, etc. No degradable pollutants are also called Persistent Pollutants. They are difficult to manage, for a natural method for degrading them is absent.

The right answer is (d).

Sol 114.

(c) The particles of diameter less than or equal to 2.5 μm are the most harmful to human health. The Central Pollution Control Board (CPCB) has laid down strict pollution guidelines in the megalopolis of New Delhi. Such particles pass deep into the lungs, causing breathing and respiratory problems, irritation and inflammation and damage to lungs. Many cases of contamination culminate in serious problems in victims.

The right answer is (c).

Sol 115.

(a) Agroforestry is the plantation of multipurpose trees, shrubs, horticultural plants and grasses along with crops for stabilizing soil. Agroforestry is also undertaken for meeting the needs of fodder, fruits and timber of communities. It is of three types- agri - Silviculture, agri - pastoral and agri – silvi -pastoral. In the Tanugya system, agricultural crops are grown in between the rows of planted trees like Sal and Teak. Jhum or Shifting Cultivation is also a traditional system of agroforestry; it allows the re-growth of forests after clearing and cultivating an area for a few years.

The right answer is (a).

Sol 116.

(d) Under the Montreal Protocol (September 16, 1987) 27 industrialized countries agreed to limit the production of ChloroFluoro Carbons (CFCs) to one half of the level present at that time.

The right answer is (d).

Sol 117.

(b) The right answer is (b).

Sol 118.

(b) Deer is a seasonal breeder. That is because it reproduces only at a particular period of the year. The other examples of tills genre are birds (most of them), lizard, frog, etc. Other animals reproduce throughout the year during the course of their sexual maturity. The other examples of tills genre are cattle, mice, rabbit, honey bee queen, poultry, etc.

The right answer is (b).

Sol 119.

(a) Layering is a type of root cutting technique in which adventitious roots are induced for developing on a soft stem while it is still attached to the plant. The process of layering is carried on one – year - old basal shoot branches generally during the early spring or early rainy season. A soft basal branch is defoliated in its middle where a small injury or cut is given. The cuts are of many types- Tonguing (oblique cut), Notching (V- shaped cut) and Ringing (removal of the ring of bark). The injured defoliated part is pegged in the soil so that an adventitious root is developed. The pegged down branch of the plant is called Layer. Later, as roots develop, tills layer is separated and planted.

The right answer is (a).

Sol 120.

(b) Refer Fig. 2.42. Ornithophily is the mode of allogamy performed by birds. Only a few types of bird are specialized for tills. They usually have small size and long beaks. Two common types of tropical pollinating birds are sun birds (Afro-Asia) and humming birds (America). Humming birds performs pollination while hovering over the flowers. Sun birds alight over the shoots supporting flowers or occasionally rest over flowers. Some other pollinating birds are - Crow, Bulbil, Parrot and Maynah.



Fig. 2.42: Ornithophily

The right answer is (b).

Sol 121.

(a) Cleistogamous flowers are intersexual. They remain closed, thus they cause self-pollination. In Cleistogamous flowers, the anthers dehisce inside closed flowers. The growth of style brings pollen grains in contact with stigma. Pollination and seed set are assured even in the absence of pollinators.

The right answer is (a).

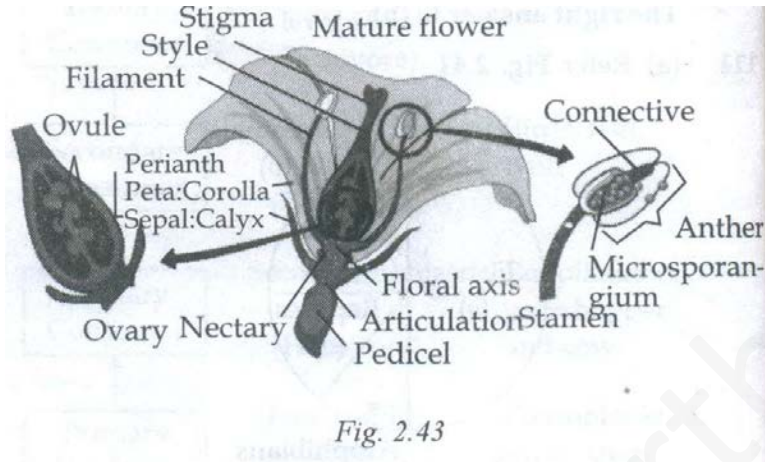
Sol 122.

(d) Lactic acid is used in a host of applications. It was the first organic acid produced through microbial fermentation. It is used as a food preservative. It is used for de lining leather hides. Its derivatives find many applications. Polylactic acid is used in resin manufacture. Coppere lactate is used in electroplating. Calcium lactate is used as baking powder. Further, Lactic acid fermentation is used in for making cheese, yoghurt and butter.

The right answer is (d).

Sol 123.

(d) Refer Fig. 2.43. Double fertilization is the fusion of two male gametes brought by a pollen tube to two different cells of the same female gametophyte for producing two different structures. It is found only in angiosperms where it was first discovered by Nawaschch in 1898 in *Fritillaria* and *Lilium*. In angiosperms, the pollen tube bursts open in one of the two synergids for releasing two male gametes. One male gamete fuses with the egg or oosphere to form a diploid zygote or oospore. It is called Generative Fertilization. The second male gamete descends down and fuses with the diploid secondary nucleus of the central cell to form a triploid primary endosperm cell. It is known as Vegetative Fertilization.



The right answer is (d).

Sol 124.

(c) Refer Table 2-1. Mendel selected 7 pairs of pure or true breeding varieties of pea as the starting material for his experiments. Upon self-pollination or self-breeding, a pure variety gave rise to offspring having similar traits. All characters of selected varieties had easily distinguishable alternate traits.

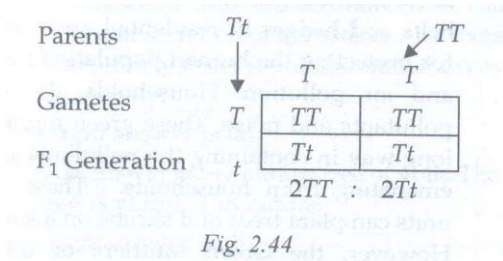
Table 2-1

	Character	Dominant	Recessive
1	Plant Height	Tall (T) 6' - 7'	Dwarf (t) 3/4 -
2	Flower/pod position	Axial (A)	Terminal (a)
3	Pod color	Green (G)	Yellow (g)
4	Pod Shape	Inflated (I)	Constricted (i)
5	Flower color / Seed coat	Violet/red (V or R)/Grey	White (v or r)
6	Seed shape	Smooth/Round (R)	Wrinkled (r)
7	Seed color	Yellow	Green (y)

The right answer is (c).

Sol 125.

(b) Refer Fig. 2.44.

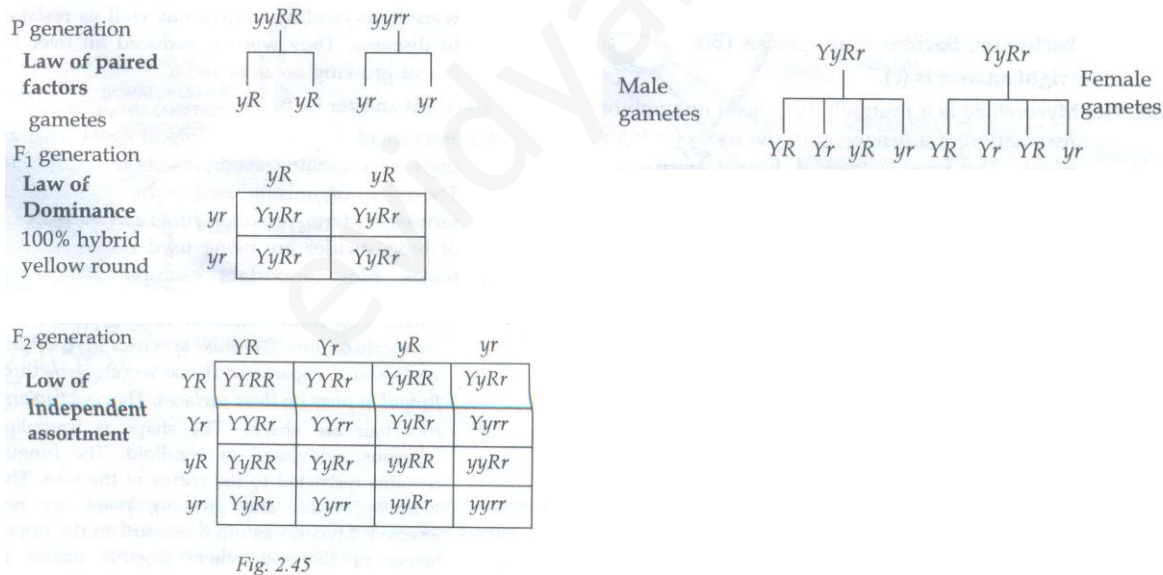


Hence, percentage of heterozygous tall in the progeny would be 50 percent

The right answer is (b).

Sol 126.

(b) The principle or law of independent assortment can be studied by means of dihybrid cross. We can study it between pure breeding pea plants having yellow round seeds ($YYRR$) and pure breeding pea plants having green wrinkled seeds ($yyrr$). The plants of the first filial or F₁ generation have all yellow and round seeds ($YyRr$) because yellow and round traits are respectively dominant over green and wrinkled traits. Upon self-breeding, the resultant second filial or F₂ generation shows four types of plants. Refer Fig. 2.45.



(i) 9 Y-R (Yellow Round) (ii) 3yR (Green round) (iii) 3Yr (Yellow wrinkled) (iv) 1yr (Green wrinkled)

(v) Phenotypic Dihybrid Ratio = 9 : 3 : 3 : 1.

The right answer is (b).

Sol 127.

(b) Genetic variation present among plant cells of a culture is called Soma clonal Variation. The term soma clonal variation is also used for the genetic variation present in plant regenerated from a single culture. This variation has been used for developing several useful varieties.

The right answer is (b).

Sol 128.

(b) In 1960 to 2000 wheat production increased from 11 million tones to 75 million tones. It was due to the development of semi-dwarf varieties of wheat. Nobel prize winner Norman E. Borlaug of International Centre for Wheat and Maize Improvement (based in Mexico) developed semi - dwarf wheat. In 1963, many lines like Sonalika and KalyanSona were selected from these. They were high-yielding varieties as well as resistant to diseases. They were introduced all over the wheat-growing areas of India.

The right answer is (b).

Sol 129.

(c) Bio pesticides are those biological agents that are used for controlling weeds, insects and pathogens. The micro-organisms used as bio pesticides are viruses, bacteria, protozoa, fungi and mites. Some of bio pesticides are being used on commercial scales. Most important example is the soil bacterium, *Bacillus thuringiensis* (Bt).

The right answer is (c).

Sol 130.

(c) Mycorrhiza is a mutually beneficial or symbiotic association of a fungus with the root of a higher plant. The most common fungal partners of mycorrhiza are *Glomus* species. Mycorrhizal roots show a sparse or dense woolly growth of fungal hyphae on their surfaces. The root cap and root hair are absent. The shape is irregular, tuberous, nodulated or coralloid. The fungus remains restricted to the cortex of the root. The vascular strand and growing point are not affected Mycorrhiza often remains in the upper layers of the soil where organic matter is abundant.

The right answer is (c).

Sol 131.

(d) Electrophoresis is a technique of separation of molecules such as DNA, RNA or protein under the influence of an electrical field so that they migrate in the direction of electrode bearing the opposite charge. Positively charged molecules move towards cathode (negative electrode) and negatively charged molecules travel towards anode (positive electrode) through a medium or matrix. Nowadays, the most commonly used matrix is agarose which is a polysaccharide extracted from sea weeds.

The right answer is (d).

Sol 132.

(c) The right answer is (c).

Sol 133.

(a) The option (a) gives wrong set of information about the bean seed. All other options are correct. Option (d) gives correct data about the bean seed.

The right answer is (a).

Sol 134.

(a) Xerophytes are plants of dry habitats where the environment favors higher rate of transpiration than the rate of absorption. In xerophytes, leaves may possess prickles and spines. Cuticle is thick Wax occurs stomata are sunken and restricted to lower surface of the leaves. Barks is thick and develop very early. The root system is very extensive. It may spread along the soil surface in order to absorb every drop of rain as well as dew.

The right answer is (a).

Sol 135.

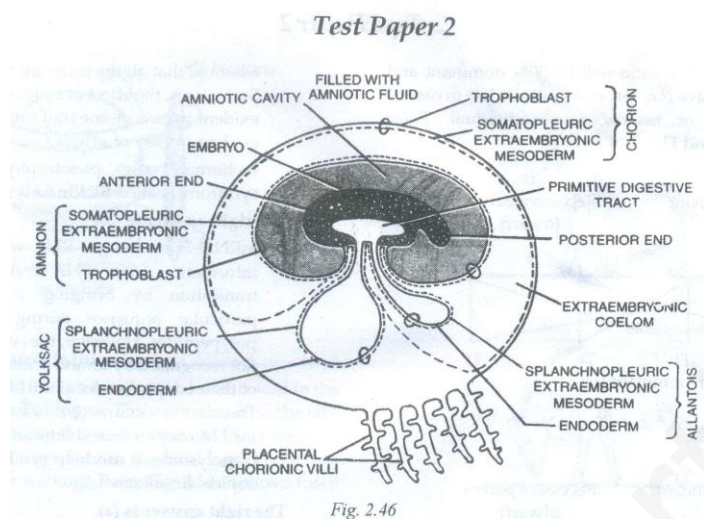
(b) And (c) Green Muffler or Green belt vegetation refers to the long rows of green trees or shrubs that are grown and maintained for reducing noise pollution. These green trees and shrubs act as noise absorbers. They also reduce air pollution because trees and shrubs absorb polluting gases (emanated by vehicles and factories) and settle suspended particulate Matter (SPM). Green Muffler is created especially along highways and rails so that noise could be absorbed by green vegetation. Pollutants and gases are also absorbed by this long row of vegetation. It is also grown around industrial units and commercial enclaves. The green belts can be made much wider in such areas. These green belts protect residents from SPM, harmful gases, dust and sound. The green belts and hedges in residential areas are meant for protecting the human population from noise and air pollution. Households also generate pollutants and noise. These green mufflers go a long way in containing the pollutants and noise emanating from households. These dwelling units can plant trees and shrubs on a small scale. However, the Green Mufflers of urban and industrial areas are to be developed by forest authorities or other officials who look after this affair.

The right answers are (b) and (c).

PART D: ZOOLOGY

Sol 136.

(c) Amnion is composed of trophoblast inside and somatopleuric extraembryonic mesoderm outside. The space between embryo and amnion is called Amniotic Cavity which is filled with a clear, watery fluid secreted by embryo and membranes. The amniotic fluid prevents the desiccation of the embryo and acts as a protective cushion that absorbs shocks. Refer Fig. 2.46.



The right answer is (c)

Sol 137.

(a) In cryptorchidism, crypto means hidden, orchid means testis. It is a condition in which testes do not descend into the scrotum. It is caused by deficient secretion of testosterone by foetal testes. Retention of testes in the abdominal cavity results in sterility.

The right answer is (a).

Sol 138.

(b) Alecithal eggs are almost free of yolk. The human egg is Alecithal in nature.

The right answer is (b).

Sol 139.

(a) Mini pills contain progestin only (with no oestrogen). **Saheli** contains a Mon steroidal preparation, called **Centchroman** which is taken once a week after an initial intake of twice-a-week dose for 3 months (by females). It has high contraceptive value with very little side effects. The **Saheli** contraceptive has been developed at Central Drug Research Institute (CDRI), Lucknow.

The right answer is (a).

Sol 140.

(b) *Haemophilus ducreyi* is a pathogen that causes chancroid.

Symptoms of Chancroid: Ulcer appears at the site of infection generally over external genitalia. It is painful and bleeds easily. The lymph nodes near it swell up and become tender.

The right answer is (b)

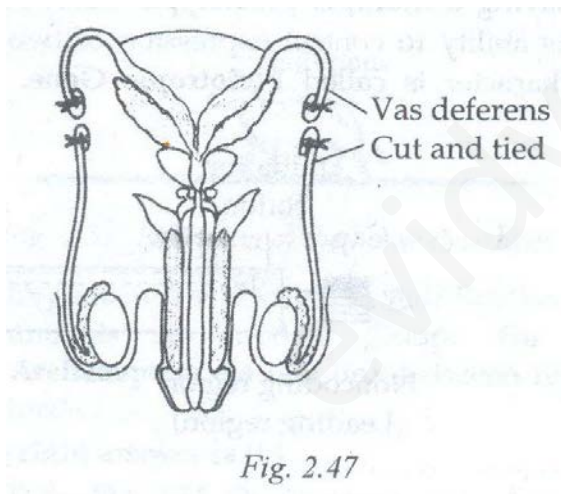
Sol 141.

(c) In a test tube baby, the fusion of ovum and sperm is done outside the body of woman for forming a zygote which is allowed to divide to form embryo. This embryo is then implanted in uterus where it develops into a foetus. The foetus, in turn, develops into a child.

The right answer is (c).

Sol 142.

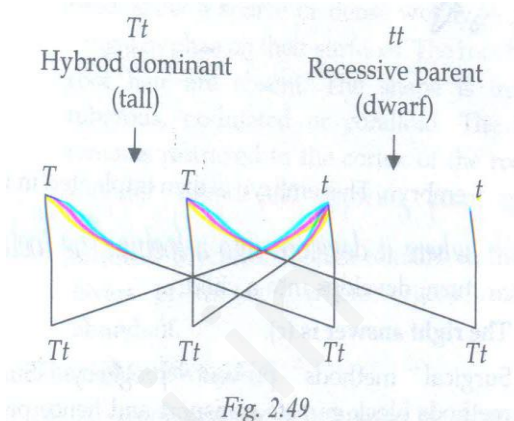
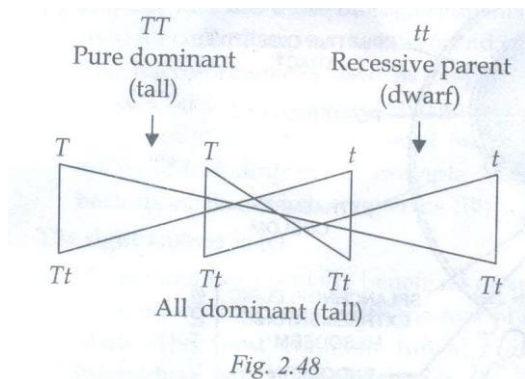
Surgical methods prevent pregnancy. Surgical methods block gamete transport and hence prevent fertilization. The sterilization procedure for males is termed **Vasectomy** and that for females is termed **Tubectomy** (tubal ligation). In vasectomy, a small part of the Vas deferens is removed or tied up through a small cut on the scrotum. Refer Fig. 2.47.



The right answer is (c).

Sol 143.

(a) Test cross is a type of cross for knowing whether an individual is homozygous or heterozygous for the dominant character. The individual is crossed with a recessive parent. The offspring will be 100% dominant if the individual was homozygous dominant. The ratio will be 50% dominant and 50% recessive (*i.e.*, test cross ratio of 1: 1) in case of a hybrid or heterozygous individual. Refer Fig. 2.48 and Fig. 2.49.



Sol 144.

(d) The ability of a gene to have multiple phenotypic effect because it influences a number of characters simultaneously is known as **Pleiotropy**. The gene having a multiple phenotypic effect because of its ability to control expression of two or more characters is called **Pleiotropic Gene**. It is not essential that all the traits are equally influenced. Sometimes, the effect of a pleiotropic gene is more evident in case of one (major effect) and less evident in case of others (secondary effect). In human beings, Pleiotropy is exhibited by a syndrome, called **Sickle Cell Anemia**.

The right answer is (d).

Sol 145.

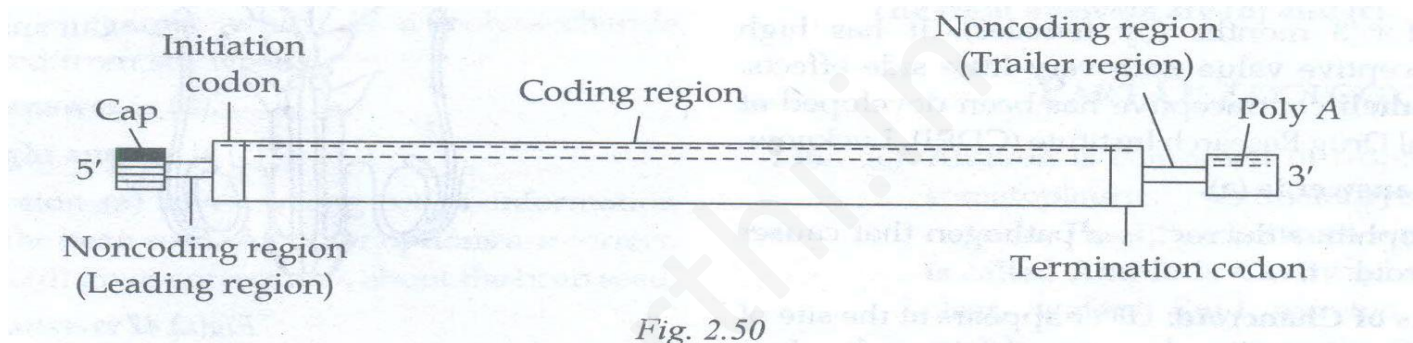
(a) mRNA is messenger RNA which brings coded information from DNA and takes part in its translation by bringing amino acids in a particular sequence during the synthesis of polypeptides. However, the codons of mRNA are not recognized by amino acids but by anticodons of their adaptor molecules (tRNAs \rightarrow aa - t RNAs). Translation occurs over ribosomes. The same mRNA may be reused time and again. In the form of polysome, it can help synthesize a number of copies simultaneously.

The right answer is (a).

Sol 146.

(c) The functions of mRNA are as follows: (Refer Fig. 2.50):

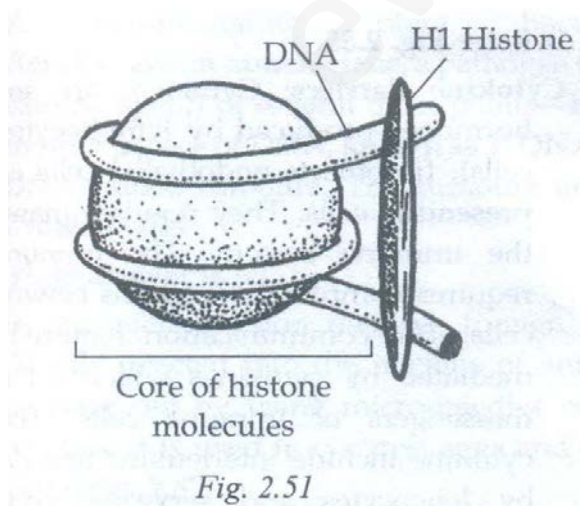
- (i) MRNA carries coded information for translation into polypeptide formation.
- (ii) Through reverse transcription it can form compact genes which are used in genetic engineering. The phenomenon also occurs in nature and has added certain genes to the genomes.
- (iii) It has a cap region for attachment to ribosome.
- (iv) Cap protects the nRNA from degradation by enzymes.
- (v) mRNA has a tail region for protection from cellular enzymes and detachment from ribosome.



The right answer is (c).

Sol 147.

(b) The diagram given below represents the nucleosome. Nucleosomes are spherical bodies formed by the coils of chromatin. The nucleosomes are coiled to form the fibres that make up chromosomes. Refer Fig. 2.51.



The right answer is (b).

Sol 148.

(c) The earliest known fossil of the horse traced in the Eocene Era is **Eohippus**. This animal was of the size of the present – day dog and possessed four toes in its fore – legs and three toes in the hind legs. These toes were used for walking. Refer Fig. 2.52; it shows a fossil of horse.

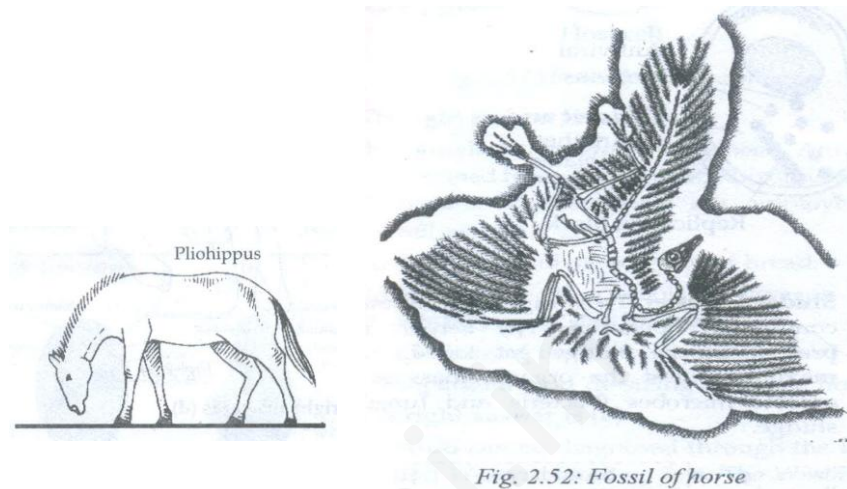


Fig. 2.52: Fossil of horse

Refer Fig. 2.53. It shows the evolution of the horse over Eras. The next horse to evolve from **Eohippus** was **Mesohippus** in the Oligocene Era. This animal was of the height of present – day sheep and possessed three toes in both fore – legs. **Mesohippus** gave rise to **Merychippus** of the Miocene Era. From it, **Pliohippus** of the Pliocene Era and **Pleistocene** Era evolved. This horse had all the usual characters similar to the modern horse, **Equus**.

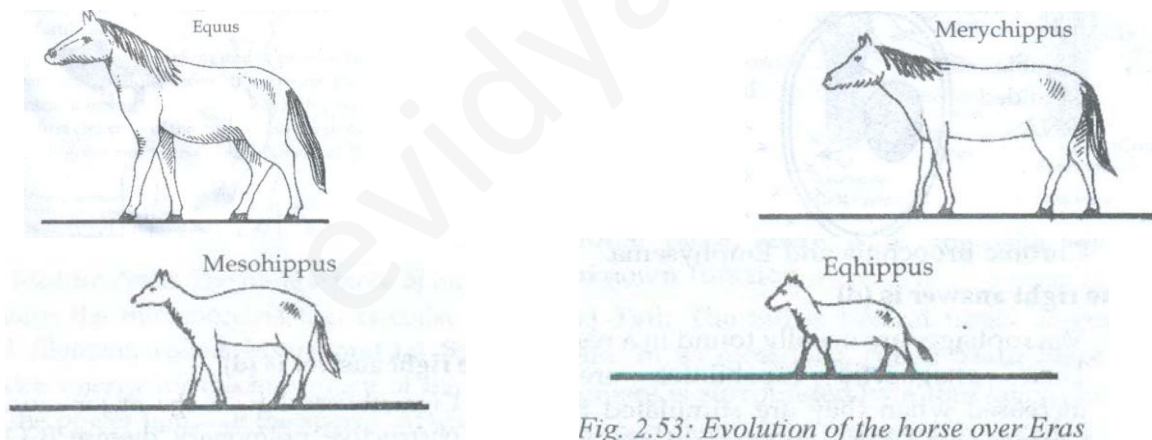


Fig. 2.53: Evolution of the horse over Eras

The right option is (c).

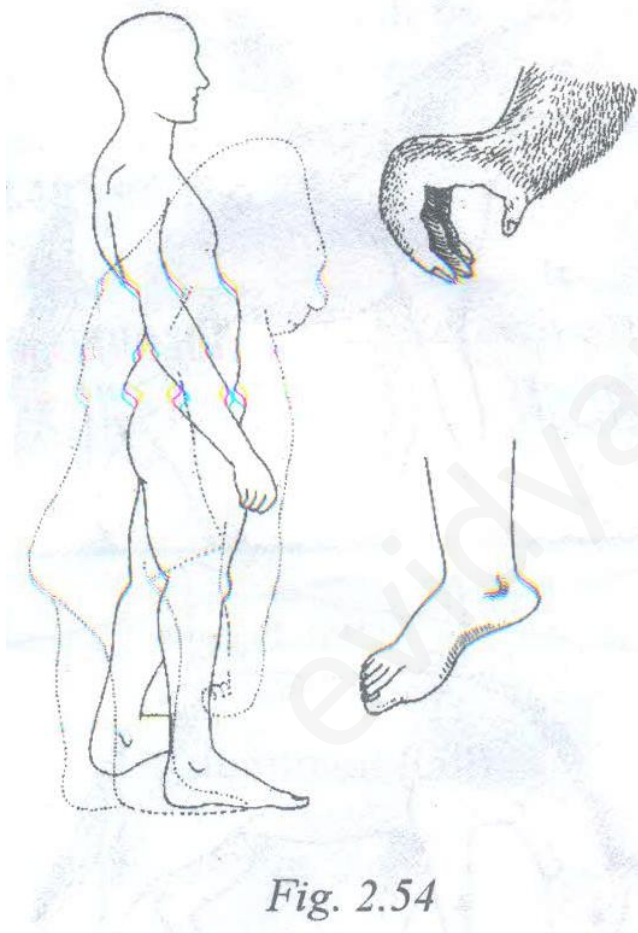
Sol 149.

(b) Organisms that existed in past link one group of animals to another group. For example, **Archaeopteryx** is a link between reptiles and birds

The right answer is (b)

Sol 150.

(d) Refer Fig. 2.54. During the course of evolution, of man thumb has been brought opposite to the fingers thus enabling the hand for better grasping power. This advantage of man is often called **Dexterity**.

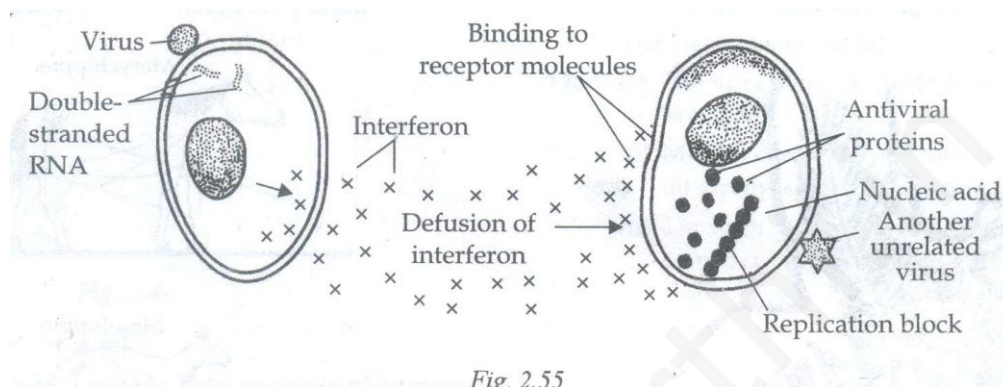


The right answer is (d).

Sol 151.

(d) Refer Fig. 2.55.

Cytokine Barriers: Cytokines are small protein hormones produced by lymphocytes (helper T – cells), fibroblasts endothelial cells and antigen - requires complex interactions between different cells. The communication required for this is mediated by cytokines which act as chemical messengers of immune cells. The kinds of cytokine include interleukins that are produced cytokine include interleukins that are produced by leucocytes and serve as communicators between leukocytes, lymphokines produced by lymphocytes, tumour necrosis factor interferon's (IFNs). Interferons protect against viral infection of cells.



The right answer is (d)

Sol 152.

(d) Cigarette smoking is the major cause of chronic obstructive pulmonary disease (COPD) that is Chronic bronchitis and Emphysema.

The right answer is (d).

Sol 153.

(c) Macrophages are usually found in a resting state. Their phagocytic capabilities are greatly increased when they are stimulated to become activated macrophages. Macrophages are present along with lymphocytes in almost all lymphoid tissues.

The right answer is (c).

Sol 154.

(a) Azadirachtin is extracted from Margosa or Neem (*Azadirachta indica*). It occurs in Margosa extract. The spray of Azadirachtin keeps away Japanese beetles and other leaf – eating pests because of its antifeedant property.

The right answer is (a).

Sol 155.

(b) Refer Fig. 2.56. The sediment of settling tank is called **Activated Sludge**. A part of it is used as inoculum in aeration tanks. The remaining part is passed into a large tank, called **Anaerobic Sludge Digester**. These digesters are designed for continuous operation. The aerobic microbes present in the sludge get killed. Anaerobic microbes digest the organic mass as well as aerobic microbes (bacteria and fungi) of the sludge. (image page no. 64)

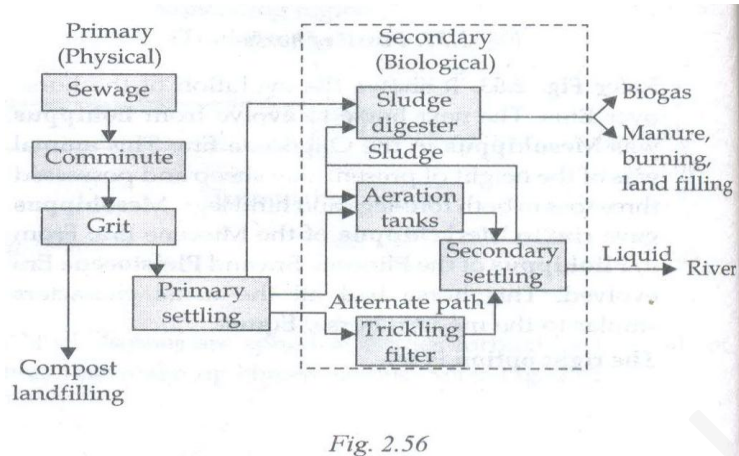


Fig. 2.56

The right answer is (b).

Sol 156.

(c) A soil – inhabiting plant bacterium – **Agrobacterium tumefaciens**, a pathogen (disease –causing agent) of several dicot plants – is able to DNA causes tumours. The tumours are called **Crown Galls**.

The right answer is (c).

Sol 157.

(a) In the microinjection method, foreign DNA is directly injected into the nucleus of animal cell or plant cell by using micro – needles or micropipettes. It is used in oocytes, eggs and embryo. Refer Fig. 2.57.

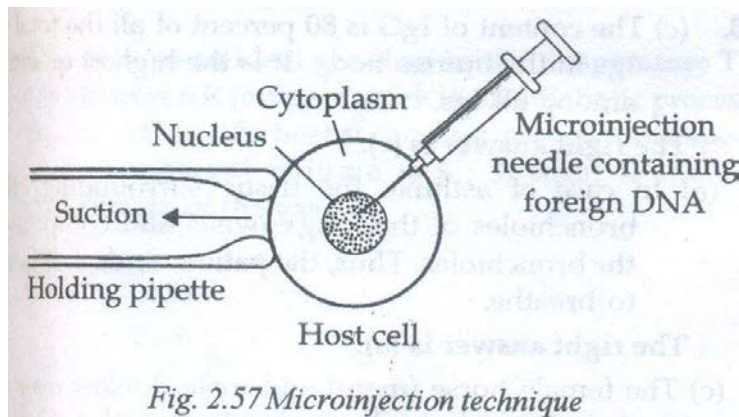


Fig. 2.57 Microinjection technique

The right answer is (a).

Sol 158.

(b) Amylases degrade starches. Amylases are obtained from *Aspergillus*, *Rhizopus* and *Bacillus* species. The enzymes are employed for the following:

- (i) Softening and sweetening of bread.
- (ii) Production of alcoholic beverages (*e.g.* beer, whisky) from starchy material.
- (iii) Clearing of turbidity in juices caused by starch
- (iv) Separation and de – sizing of textile fibres.

Sol 159.

(a) AIDS can be diagnosed through the ELISA Test and Western Blotting Test. The Western Blotting Test is employed for the confirmation of ELISA positive cases.

The right answer is (a).

Sol 160.

(a) In hermaphrodites, male and female gametes are formed in the same individual.

The right answer is (a).

Sol 161.

(a) A typical mammalian sperm consists of a head, neck, middle piece and tail. Refer Fig. 2.58.

(i) **Head:** It contains an anterior small acrosome and a posterior large nucleus. Acrosome is formed from the Golgi Body of the spermatid. Acrosome contains hyaluronidaseproteolytic enzymes which are popularly known as **Spermlysins** and are used for contacting and penetrating the egg (ovum) at the time of fertilization.

(ii) **Neck:** It is very short and is present between the head and middle piece. It contains the proximal centriole towards the nucleus which plays a role in the first cleavage of the zygote and the distal centriole which gives rise to the axial filament of the sperm. (image page no. 65

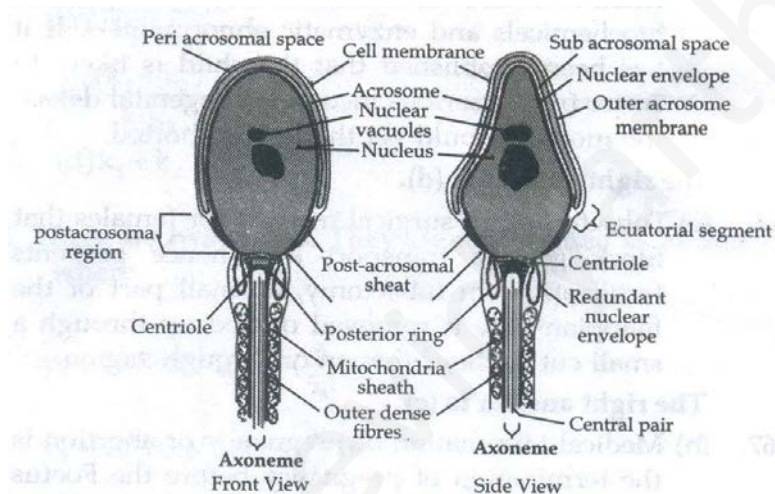
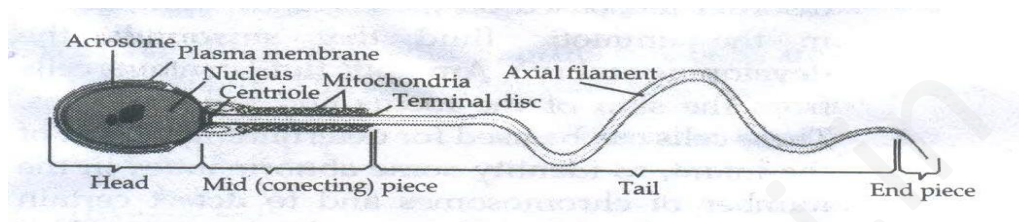


Fig. 2.58

(iii) **Middle Piece:** The middle piece of human sperm contains the mitochondria that is coiled round the axial filament, called **Mitochondrial Spiral**. They provide energy for the movement of the sperm. So, it is the power house of the sperm. At the end of the middle piece, there is a ring centriole with an unknown function.

(iv) **Tail:** The tail is several times longer than the head. In its most part, called **Main piece**, the axial filament is surrounded by a thin layer of cytoplasm. The part behind the main piece is called **End Piece** which consists of a naked filament alone. The sperm swims with the help of its tail in a fluid medium.

The right answer is (a).

Sol 162.

(b) Fallopian tube is about 10 -12 cm long and consists of the following parts – infundibulum, ampulla, isthmus and uterine part.

The infundibulum is a dilated trumpet – like portion that opens into the peritoneal cavity. The end of the tube has finger – like projections, called **Fimbriae** which help in collection of the ovum after ovulation.

The right answer is (b).

Sol 163.

(a) Sertoli cells support developing germ cells and provide them with nutrition, especially spermatids. Sertoli cells provide nutrition to the developing sperms. Thus, they are nurse cells.

The right answer is (a).

Sol 164.

(d) The right answer is (d).

Sol 165.

(d) Amniocentesis is a foetal sex determination and disorder test based on the chromosomal pattern in the amniotic fluid that surrounds the developing embryo. Amniotic fluid contains cells from the skin of the foetus and other sources. These cells can be used for determining the sex of the infant, to identify some abnormalities in the number of chromosomes and to detect certain biochemical and enzymatic abnormalities. If it has been established that the child is likely to suffer from a serious incurable congenital defect, the mother should get the foetus aborted.

The right answer is (d).

Sol 166.

(c) Tubectomy is a surgical method for females that block gamete transport and hence prevents fertilisation. In tubectomy, a small part of the fallopian tube is removed or tied up through a small cut in the abdomen or through vagina.

Sol 167.

(b) Medical termination of pregnancy or abortion is the termination of pregnancy before the Foetus becomes viable. Government of India legalized MTP in 1971. MTP is comparatively safe up to 12 weeks (the first trimester of pregnancy. It becomes more risky after the first trimester period of pregnancy as the foetus becomes intimately associated with maternal tissues.

The right answer is (b).

Sol 168.

(c) The newborn affected with *Cri du chat* syndrome cries like mewling of a cat. It was first described by Lejeune (1963) in France. Hence, it was named *cri du chat* (cat cry). This condition is due to a deletion of one half part in the short arm of chromosome number 5. It is very rare. The affected person has a small head, widely spaced eyes, moon – like face, receding chin and congenital heart disease.

The right answer is (c).

Sol 169.

(c) Some genetic disorders are produced by changes (substitution) in the genes lying in the sex chromosomes. These are called **Sex – linked Disorders**. The transmission of sex – linked characters (traits) from parents to offspring is called **Sex – linked Inheritance**. Haemophilia, color blindness, night blindness and Duchenne’s Muscular Dystrophy are the sex – linked disorders which are caused by recessive gene located in the X – chromosome. They affect males more than females.

The right answer is (c).

Sol 170.

(a) Among all Igs (antibodies), IgD is nearly 0.2 percent of all antibodies in the human blood. For other immunoglobins, the values are as follows: other IgE: less than 0.1 percent. IgM: 5 – 10 percent,; IgA: 10 – 15 percent.

The right answer is (a).

Sol 171.

(b) Hybrid cells proliferate into cells which are known as **Hybridomas**.

The right answer is (b).

Sol 172.

(b) The right answer is (b).

Sol 173.

(c) The content of IgG is 80 percent of all the total of Igs in the human body. It is the highest quantity among all Igs.

The right answer is (c).

Sol 174.

(a) In case of asthma, the tissue surrounding the bronchioles of the lungs swells and compresses the bronchioles. Thus, the patient finds it difficult to breathe.

The right answer is (a).

Sol 175.

The female horse (mare) and male donkey mate to produce the mule. Mules are harder than their parents and are well suited for hard work in mountainous regions. The name of the process is **Inter – specific Hybridization**.

The right answer is (c).

Sol 176.

(d) Rohu and Catla are being reared in India

The right answer is (d).

Sol 177.

The first ever hormone prepared by genetic engineering was insulin.

The right answer is (d).

Sol 178.

(d) ELISA is based on the principle of antigen – antibody interaction. It can detect very small amounts of protein (antibody or antigen) with the help of enzyme (like peroxidase or alkaline phosphatase). Infection by pathogen can be detected by the presence of antigens such as proteins, glycoproteins, etc., or by detecting the antibodies synthesized against the pathogen.

The right answer is (d).

Sol 179.

(d) Temporary parasites live in contact with host for only a part of their life or occasionally at the time of **Intermittent Parasites**. In fact, the female mosquito is not considered a parasite into human beings. So, it is a vector.

The right answer is (d).

Sol 180.

(a) A food chain can have three or four trophic levels.

The right answer is (a).