Date: 22/11/2026

Question Paper Code: 53

Max. Marks: 216

Time: 120 Minutes

Aakash
Medical | IIT-JEE | Foundations

Corporate Office **:** AESL, 3rd Floor, Incuspaze Campus-2, Plot-13, Sector-18, Udyog Vihar, Gurugram, Haryana-122015

Answers & Solutions

For

Indian Association of Physics Teachers
National Standard Examination in Junior Science
(NSEJS-2026)

INSTRUCTIONS TO CANDIDATES

1. Use of mobile phone, smart watch, and iPad during examination is STRICTLY **PROHIBITED**.
2. On the OMR Sheet, make all the entries carefully in the space provided **ONLY** in **BLOCK CAPITALS** as well as by properly darkening the appropriate bubbles.
   Incomplete/ incorrect/ carelessly filled information may disqualify your candidature.
3. On the OMR Answer Sheet, use only **BLUE** or **BLACK BALL POINT PEN** for making entries and filling the bubbles.
4. There are 60 questions in the paper. Attempt All the 60 Questions.
5. Question paper has two parts. In part A-1 (Q. No. 1 to 48) each question has four alternatives, out of which **only one** is correct. Choose the correct alternative and fill the appropriate bubble, as shown.

   Q. No. 12 (a) ● (c) (d)

   In part A-2 (Q. No. 49 to 60) each question has four alternatives out of which any number of alternative(s) (1, 2, 3 or 4) may be correct. You have to choose **all** correct alternative(s) and fill the appropriate bubble(s), as shown

   Q. No. 52 (a) ● (c) ●
6. Attempt all sixty questions. For **Part A-1**, each correct answer carries 3 marks whereas 1 mark will be deducted for each wrong answer. In **Part A-2**, you get 6 marks if all the correct alternatives are marked and no incorrect. No negative marks in this part.
7. Calculator is **not** allowed.
8. No candidate should leave the examination hall before the completion of the examination.
9. After submitting answer paper, take away the question paper & candidate's copy of the OMR for your future reference.

Olympiads Results

777 Classroom Students Aakashians Qualified	134 Classroom Students Aakashians Qualified	378 Classroom Students Aakashians Qualified	26 Classroom Students Aakashians Qualified	2072 Classroom Students Aakashians Qualified
in IOQM 2025	in RMO 2025-26	in NSEs 2025-26	for OCSCs/IMOTC /APMO 2025-26	in NSO (Level-1) 2025-26

Attempt All Sixty Questions

A-1

OUT OF THE FOUR OPTIONS ONLY ONE IS CORRECT. BUBBLE THE CORRECT OPTION.

1. A suction cup is attached to the smooth ceiling in a room. The maximum weight that can be supported by the suction cup depends on

   (I) its area of contact with the ceiling

   (II) the air pressure outside the suction cup

   (III) height of the room up to the ceiling

   (IV) thickness of the roof above the ceiling

   The correct options are

   (a) I and II (b) I, II and III

   (c) I, III and IV (d) I and IV

Answer (a)

Sol. When the suction cup is pressed against the ceiling, air is expelled from inside it, so the pressure inside (P_{in}) becomes much less than the atmospheric pressure outside (P_0). The cup is held up by the net force due to this pressure difference.

Maximum force that can hold the cup = $(P_0 - P_{in}) \times A \approx P_0 \times A$ (when the inside is nearly evacuated)

$\therefore$ Maximum weight supported, $W_{max} = (P_0 - P_{in})A$, which depends on (I) the area of contact A and (II) the outside air pressure P_0.

The height of the room (the change in atmospheric pressure over a few metres is negligible) and the thickness of the roof do not affect the pressure difference across the cup. Hence statements I and II are correct.

2. A 100 m sprinter increases her speed uniformly from rest, at a rate of 2.0 ms^{-2} up to 64.0 m and covers the remaining track (distance) with a uniform speed. The correct statement is

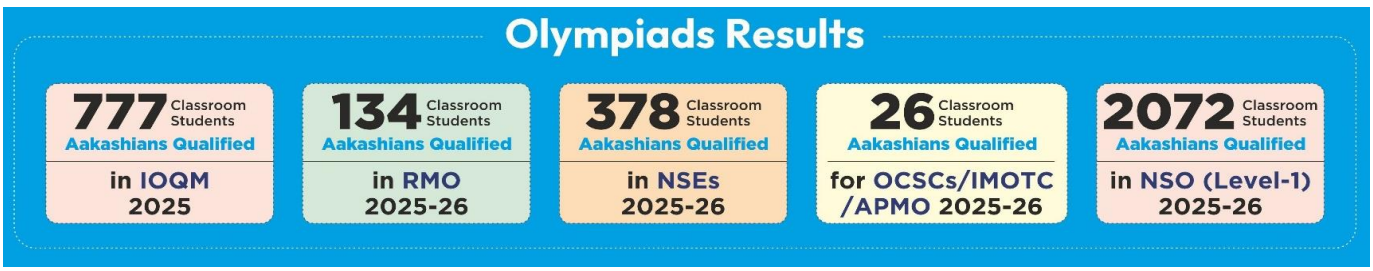
   (a) The sprinter covers the last half of the track (distance) in 3.35 sec

   (b) The average speed of the sprinter during the entire sprint (race) is close to 9.756 ms^{-1}

   (c) The slope of the velocity time graph during the last 36 meter of race is 2 (SI unit)

   (d) There is no force of friction between sprinter and the ground during the last 30 meters of the race

Answer (b)



Sol. Accelerated part (0 to 64 m): $u = 0$, $a = 2.0\ m\ s^{-2}$, $s_1 = 64\ m$

$v^2 = u^2 + 2as_1 = 2 \times 2 \times 64 = 256 \Rightarrow v = 16\ m\ s^{-1}$; $t_1 = v/a = 16/2 = 8\ s$

Uniform part (remaining 36 m): $t_2 = 36/16 = 2.25\ s$

Total time $T = 8 + 2.25 = 10.25\ s$

Average speed = total distance/total time $= 100/10.25 = 9.756\ m\ s^{-1} \Rightarrow$ statement (b) is correct.

Check of other options:

(a) Last 50 m: speed at the 50 m mark, $v_{50} = \sqrt{(2 \times 2 \times 50)} = \sqrt{200} = 14.14\ m\ s^{-1}$. Time from 50 m to 64 m $= (16 - 14.14)/2 = 0.93\ s$. Time for last 50 m $= 0.93 + 2.25 = 3.18\ s \neq 3.35\ s$. Incorrect.

(c) In the last 36 m the speed is constant, so the slope of the v–t graph (acceleration) is zero, not 2. Incorrect.

(d) The sprinter pushes the ground backward with her feet; the forward static friction from the ground is what balances air resistance and keeps her moving. Friction is not zero. Incorrect.

3. Mechanical engineer Richard James invented a metal slinky in 1943 as an iconic toy consisting of a tightly coiled metal wire (Fig a). Students use it to mimic and to understand the magnetic field produced by a current carrying solenoid.



Figure (a) Metal Slinky

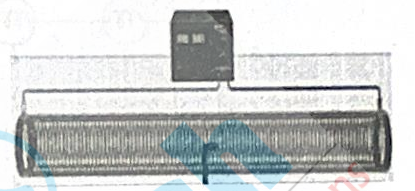


Figure (b)

In an experiment, a metal slinky consisting of insulated wires is stretched slightly and a direct current is passed through it (Fig b). The resulting magnetic field causes

(a) the slinky to compress in length

(b) the slinky to stretch out further to increase its length

(c) no effect on the length of the slinky

(d) stretching or compressing the slinky depending upon the direction of current passed

Answer (a)

Sol. The stretched slinky behaves like a solenoid. In adjacent turns of a solenoid the current flows in the same direction.

Two parallel conductors carrying currents in the same direction attract each other. (Equivalently, each turn behaves like a small bar magnet and the N-pole of one turn faces the S-pole of the next turn.)

Hence the turns attract one another and the slinky compresses in length.

If the direction of the current is reversed, the current in every turn is reversed, so adjacent currents are still parallel and the turns still attract. The effect does not depend on the direction of the current.

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

4. The magnitude of the force of gravitation between two homogeneous identical solid spheres is F_0. If each sphere shrinks to new homogeneous sphere of same mass and 80% diameter and the distance between the centers of the new spheres is doubled then the force of gravitation between the two spheres would be

(a) 0.64 F_0 (b) 0.50 F_0

(c) 0.36 F_0 (d) 0.25 F_0

Answer (d)

Sol. For homogeneous spheres, the gravitational force is the same as if the whole mass were concentrated at the centre (Newton's law of gravitation, $F = Gm_1m_2/r^2$, r = distance between centres).

Initially: $F_0 = Gm^2/r^2$

Finally: mass of each sphere is unchanged (m) and the distance between the centres = 2r. The change in diameter does not matter.

$F = Gm^2/(2r)^2 = \frac{1}{4} \times Gm^2/r^2 = 0.25\ F_0$

5. A concave mirror of focal length f produces a doubly magnified real image of an object placed on the principal axis at distance *x* from the pole. In terms of the focal length f, the separation between the object and its image, along the principal axis, is

(a) 4.5 f (b) 4.0 f

(c) 2.5 f (d) 1.5 f

Answer (d)

Sol. Using the New Cartesian sign convention: focal length of the concave mirror = −f, object distance u = −x.

Real image ⇒ inverted, so magnification $m = -v/u = -2 \Rightarrow v = 2u = -2x$

Mirror formula: $\frac{1}{v} + \frac{1}{u} = \frac{1}{f} \Rightarrow -\frac{1}{2x} - \frac{1}{x} = -\frac{1}{f} \Rightarrow \frac{3}{2x} = \frac{1}{f} \Rightarrow x = 1.5\ f$

Image distance |v| = 2x = 3f (both object and image are in front of the mirror).

Separation between object and image = 3f − 1.5f = 1.5 f

6. Two books A and B are made of paper from the same roll. The dimensions of the book B are twice of those of book A. Both the books are kept with their largest flat area on a horizontal table. The correct statement is

(a) The weight of book B is 6 times that of book A

(b) The volume of book B is 6 times that of book A

(c) The pressure exerted by book B on the table is twice to that exerted by book A

(d) The density of book A is less than that of book B

Answer (c)

Sol. Let the dimensions of A be l × b × h. Then B has dimensions 2l × 2b × 2h.

Volume: $V_B = 8lbh = 8V_A$; same material (same density) ⇒ $W_B = 8W_A$. So (a) and (b) are wrong, and (d) is wrong because density is the same.

Area of largest face: $A_B = (2l)(2b) = 4A_A$

Pressure $P = W/A \Rightarrow P_B/P_A = (8W_A/4A_A)/(W_A/A_A) = 2$

Hence the pressure exerted by book B is twice that exerted by book A.

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

7. Three different circuits (1, 2 and 3) are designed using three identical batteries of equal emf E and the resistors of R Ω and 2R Ω with the help of connecting wires of negligible resistance as shown. In the laboratory the current is measured as I_1 between A_1B_1, I_2 between A_2B_2 and I_3 between A_3B_3 such that

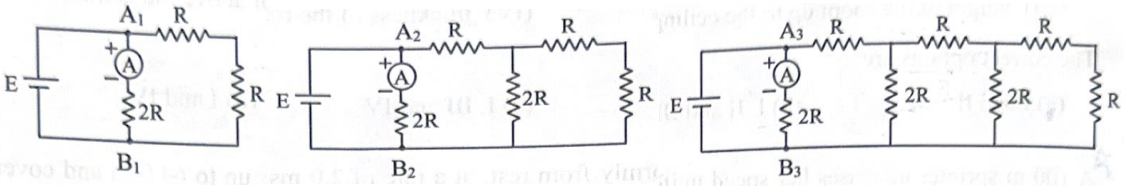


Fig. (1) Fig. (2) Fig. (3)

(a) $I_1 > I_2 > I_3$ (b) $I_1 < I_2 < I_3$

(c) $I_1 = I_2 = I_3$ (d) $I_1 = I_2 + I_3$

Answer (c)

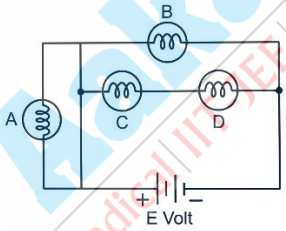
Sol. In each circuit, the branch A–B (ammeter in series with 2R) is connected directly between the two terminals of the battery through wires of negligible resistance. The battery has negligible internal resistance (ideal cell), so the potential difference across every branch connected across it is E.

Current through branch AB: $I = \frac{E}{2R}$ (the ammeter is ideal)

The remaining resistors only form other parallel branches across the same battery; they change the total current drawn from the battery but not the current in branch AB.

$\therefore \quad I_1 = I_2 = I_3 = \frac{E}{2R}$

8. Four identical bulbs A, B, C and D are connected to a supply of E volt as shown in figure. The correct statement is



(a) If the filament inside bulb C is broken, both the bulbs B and D continue to glow brightly

(b) If the filament inside bulb D is broken, bulb B goes off and bulb A glows

(c) If the filament of bulb A is broken, the event is unnoticeable; bulbs B, C, D remain glowing

(d) If the filament of bulb B is broken, both the bulbs C and D will go off

Answer (c)

Sol. Analysis of the circuit: Bulb A is connected between the top and bottom wires on the left, and a plain connecting wire is joined in parallel with it. This wire short-circuits bulb A, so the potential difference across A is zero and A never glows.

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Bulb B is connected directly across the supply. Bulbs C and D are in series with each other, and this series combination is also connected directly across the supply (in parallel with B).

(a) If C breaks, the C–D branch is open, so D goes off. Incorrect.

(b) If D breaks, C goes off; B still glows (it is directly across the supply) and A still does not glow (shorted). Incorrect.

(c) A carries no current at any time, so breaking its filament changes nothing; B, C and D continue to glow (C and D more dimly than B). **Correct.**

(d) If B breaks, the C–D branch is still connected across the supply, so C and D keep glowing. Incorrect.

9. The acceleration (a) – time (t) graph of a particle, moving in a straight line parallel to *x* axis, is shown in the figure (1). The correct velocity (v) – time (t) graph corresponding to the given acceleration-time graph for the motion of the particle is

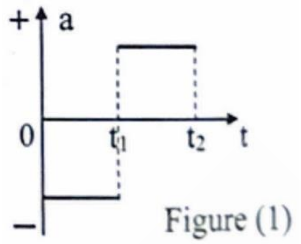
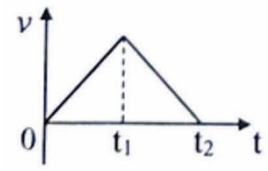
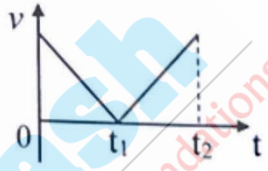
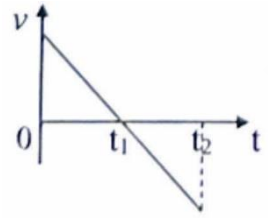
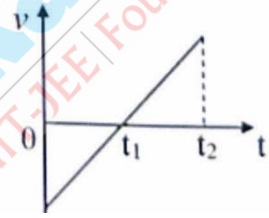


Figure (1)

(a) 

(b) 

(c) 

(d) 

Answer (b)

Sol. Acceleration is the slope of the v–t graph (a = dv/dt).

From 0 to t_1: a is constant and negative ⇒ v decreases linearly with time (straight line of negative slope).

From t_1 to t_2: a is constant and positive, of the same magnitude ⇒ v increases linearly with a positive slope of the same magnitude.

Thus the v–t graph consists of two straight lines of equal and opposite slopes meeting at t_1 (a 'V' shape). Only graph (b) shows this.

Graph (a) is an inverted V (a positive first, then negative); graphs (c) and (d) are single straight lines, which represent constant acceleration throughout.

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

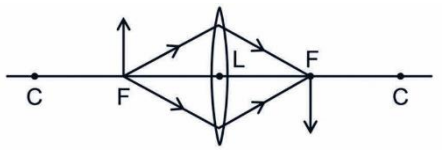
134 Classroom Students Aakashians Qualified in RMO 2025-26

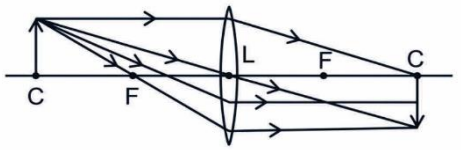
378 Classroom Students Aakashians Qualified in NSEs 2025-26

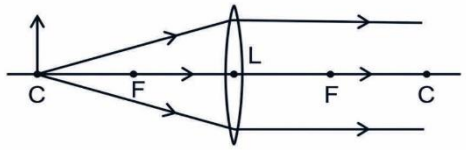
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

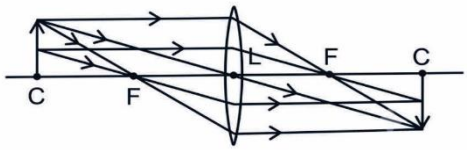
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

10. In the ray diagrams shown below, the points L, F and C respectively represent the positions of lens, the focus and the centre of curvature on the principal axis of a convex lens. The correct pictorial representation (ray diagram) of the image formation by the convex lens for the given positions of the object and image is (The system is in air. The figures may not be scaled.)

(a) 

(b) 

(c) 

(d) 

Answer (d)

Sol. For a convex lens, the standard rules of refraction are:

(i) A ray parallel to the principal axis passes through the second focus F after refraction.

(ii) A ray passing through the first focus F emerges parallel to the principal axis.

(iii) A ray through the optical centre L goes undeviated.

For an object at C (= 2F), the image is formed at C (2F) on the other side; it is real, inverted and of the same size.

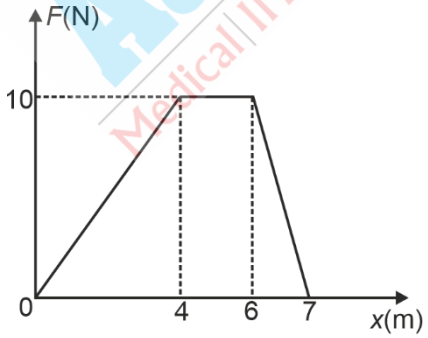
(a) Object at F: refracted rays become parallel and the image is formed at infinity, not at F. Incorrect.

(b) The ray incident parallel to the principal axis is drawn after refraction towards the foot of the image on the axis, not through F to the tip of the image. Incorrect.

(c) Object at C, but refracted rays are drawn parallel (this happens only for an object at F). Incorrect.

(d) All rays obey the rules above and meet at the tip of the real, inverted, same-size image at C. **Correct.**

11. A variable force *F* (in newton) acting on a body of mass m displaces it through displacement *x* (in meter) along a straight line in the direction of the force. The (*F*) vs displacement (*x*) graph is shown in figure. Change in the kinetic energy of the body, under the action of this force is



(a) 70 J

(b) 45 J

(c) 35 J

(d) Zero

Answer (b)

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

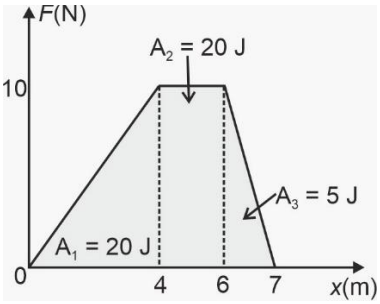
134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. Work–energy theorem: change in kinetic energy = work done by the net force = area under the $F - x$ graph.



A_1 (0 to 4 m, triangle) = $\frac{1}{2} \times 4 \times 10 = 20$ J

A_2 (4 to 6 m, rectangle) = $2 \times 10 = 20$ J

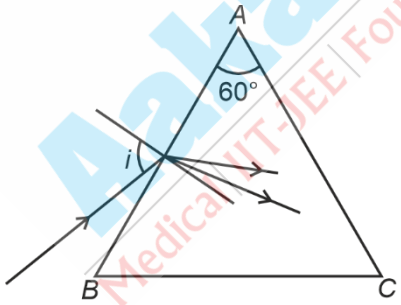
A_3 (6 to 7 m, triangle) = $\frac{1}{2} \times 1 \times 10 = 5$ J

$\Delta K = W = 20 + 20 + 5 = 45$ J

12. A fine ray of white light is incident on the refracting surface of a transparent prism of angle A = 60° such that the angle of incidence (i) is $0 < i < 90$. As a result of refraction, the light splits into its constituent colours. Hence the two statements

Statement-1, inside the prism, the blue light bends more than the red light

Statement-2, inside the prism, the blue light slows down more than red light



You may claim that the

(a) statement-1 and statement-2, are both true

(b) statement-1 is true but statement-2 is false

(c) statement-1 is false but the statement-2 is true

(d) statement-1 and statement-2, are both false

Answer (a)

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. The refractive index of glass is greater for blue light than for red light ($n_{blue} > n_{red}$). This is the cause of dispersion.

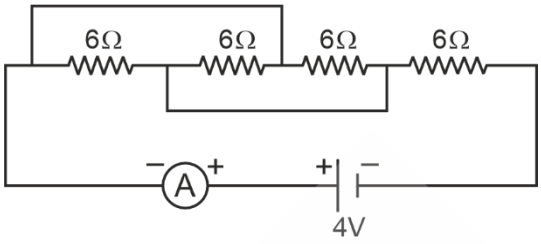
Statement-2: Speed in the medium $v = \frac{c}{n}$. Since $n_{blue} > n_{red}$, $v_{blue} < v_{red}$, *i.e.*, blue light slows down more. True.

Statement-1: By Snell's law, $\sin r = \frac{\sin i}{n}$. For the same angle of incidence, larger n gives a smaller angle of refraction, so blue light bends more towards the normal (deviates more) than red light. True.

Hence both statements are true.

13. In an experiment, four resistances of 6.0 Ω each are arranged in the circuit as shown below with a 4.0 V battery and an ammeter. The resistance of the ammeter and all connecting wires is negligible.

The current recorded by the ammeter is



(a) $\frac{1}{6}$ amp

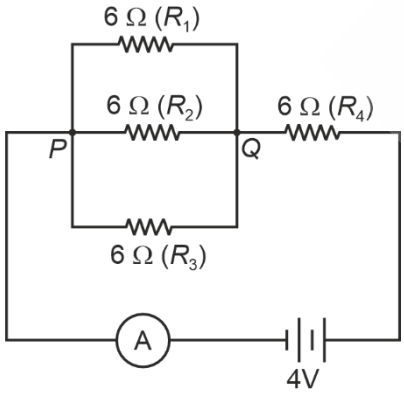
(b) $\frac{1}{2}$ amp

(c) $\frac{2}{3}$ amp

(d) 2 amp

Answer (b)

Sol.



$R_{PQ} = \frac{6}{3} = 2\Omega;\ R_{eq} = 2 + 6 = 8\Omega$

$I = \frac{V}{R_{eq}} = \frac{4}{8} = \frac{1}{2}\text{A}$

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

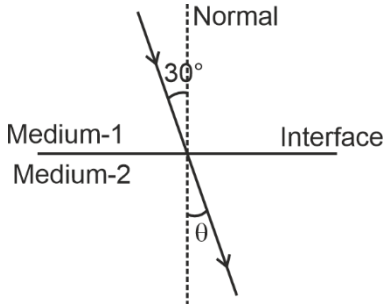
134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

14. In adjacent figure, a ray of light is incident on plane interface between medium-1 and medium-2 at an angle of incidence $i = 30°$. As a result of refraction, it travels in medium-2. The angle of refraction is θ, where $\sin\theta = \frac{2}{5}$. Absolute refractive index of medium-1 is $\frac{4}{3}$. Speed of light in vacuum is 3×10^8 ms^{-1}.



The speed of light in medium-2 is

(a) 2.25×10^8 ms^{-1}

(b) 1.80×10^8 ms^{-1}

(c) 1.40×10^8 ms^{-1}

(d) 1.25×10^8 ms^{-1}

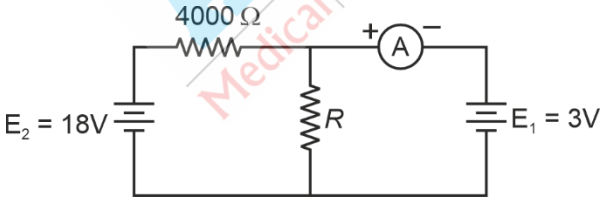
Answer (b)

Sol. Snell's law: $n_1 \sin i = n_2 \sin\theta$

$$\frac{4}{3}\times\sin 30° = n_2 \times \frac{2}{5} \Rightarrow \frac{4}{3}\times\frac{1}{2} = \frac{2}{5}n_2 \Rightarrow n_2 = \frac{2}{3}\times\frac{5}{2} = \frac{5}{3}$$

Speed of light in medium-2: $v_2 = \frac{c}{n_2} = \frac{3\times10^8}{\frac{5}{3}} = 1.80\times10^8$ ms^{-1}

15. In the following circuit A is an ideal ammeter. The internal resistance of both the battery E_1 and E_2 is negligible. If the ammeter A reads zero current, the value of the resistance R must be



(a) 1000 Ω

(b) 800 Ω

(c) 500 Ω

(d) 2000 Ω

Answer (b)

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. Since the ammeter reads zero, no current flows in the branch containing E_1. Hence there is no potential drop in that branch and the potential difference across R equals E_1 = 3 V.

The same current I flows through the 4000 Ω resistor and R (loop containing E_2): $I = \frac{E_2}{4000 + R} = \frac{18}{4000 + R}$

Potential difference across R: $IR = 3 \Rightarrow \frac{18R}{4000 + R} = 3 \Rightarrow 18R = 12000 + 3R \Rightarrow R = 800\ \Omega$

Check: $I = \frac{18}{4800}$ = 3.75 mA; drop across 4000 Ω = 15 V and across R = 3 V = E_1.

16. During restoration of an archaeological site, workers use a 1.5 m long lever to lift a big stone of mass 120 kg. The load is positioned 0.30 m from the fulcrum. The minimum effort required to lift the stone is

(a) 1176.4 N (b) 294.0 N

(c) 235.2 N (d) 36.0 N

Answer (c)

Sol. Load W = mg = 120 × 9.8 = 1176 N; load arm = 0.30 m

By the principle of moments (law of lever): Effort × effort arm = Load × load arm

The effort is minimum when the effort arm is maximum, i.e., when the effort is applied at the free end of the lever, at 1.5 m from the fulcrum (fulcrum at one end and the load between the fulcrum and the effort).

$E_{min} = \frac{1176 \times 0.30}{1.5} = 235.2$ N

(If the fulcrum were placed between the load and the effort, the effort arm would be only 1.5 − 0.3 = 1.2 m, giving 294 N, which is not the minimum.)

17. If N is the population of a country at a certain time t then which of the following refers to the absolute growth rate of a population?

(a) $\frac{\Delta N}{N}\Delta t$ (b) $\frac{\Delta N}{\Delta t}$

(c) $\frac{\Delta t}{N}$ (d) $\frac{1}{N} \times \frac{\Delta N}{\Delta t}$

Answer (b)

Sol. The absolute growth rate of a population is represented by $\frac{\Delta N}{\Delta t}$.

It gives the raw rate at which the population is increasing or decreasing over a specific time interval.

18. One of the following is a vasodilator, produced by the mast cells and many other tissues like liver, lung muscles etc. Choose the correct option:

(a) Serotonin (b) Histamine

(c) Prostacyclin (d) Bradykinin

Answer (b)

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. Histamine is a chemical mediator synthesized and stored primarily in mast cells and basophils, as well as in tissues like the liver, lungs, and skin. It acts as a potent vasodilator.

19. Folds of Kerckring are anatomical characteristics to which of the following?

(a) Bile duct (b) Ureter

(c) Intestine (d) Bronchii

Answer (c)

Sol. The folds of Kerckring are large, circular folds of the mucous membrane found in the small intestine. They increase the surface area available for nutrient absorption.

20. Given below are two statements, one labeled as **Assertion A** and other labeled as **Reason R**.

Assertion (A): The difference in electric potential on the two sides of the nerve fibre membrane is termed the membrane potential which is about –0.07 volt or –70 mV.

Reason (R): The extracellular fluid (ECF) has a high concentration of K^+ and Cl^- and the intracellular fluid has a high concentration of Na^+ and HCO_3^-.

Select the correct answer from the codes given below:

CODES:

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is not the correct explanation of A

(c) A is true but R is false

(d) R is true but A is false

Answer (c)

Sol. The extracellular fluid (ECF) has a high concentration of Na^+ and Cl^-, whereas the intracellular fluid (ICF) has a high concentration of K^+ and negatively charged proteins.

21. Keeping in mind climatic factors, disease and pest resistance, quality, yield and adaptability etc, a large number of varieties of crops have been developed in India. Make the correct matches of the following. Items under Column I are various varieties and Column II indicates the related crops.

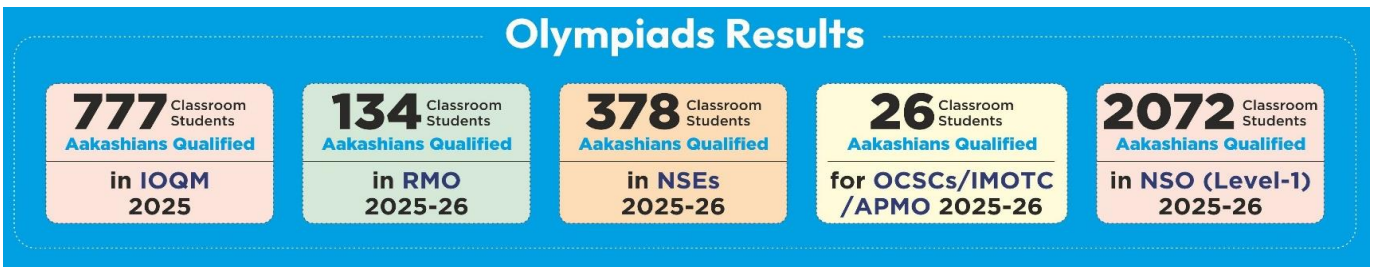
Column I	Column II
1. Heera, Jawahar, PNR-591	(i) Gram
2. RLM-514, Kranti, Pusa Bold	(ii) Maize
3. K-850, ICC-34, BE-244	(iii) Rice
4. Ganga-5, Navjot, Vikram	(iv) Mustard

Choose the correct option:

(a) 1-(ii), 2-(i), 3-(iv), 4(iii) (b) 1-(iii), 2-(iv), 3-(i), 4-(ii)

(c) 1-(i), 2-(ii), 3-(iii), 4-(iv) (d) 1-(iv), 2-(iii), 3-(i), 4-(ii)

Answer (b)



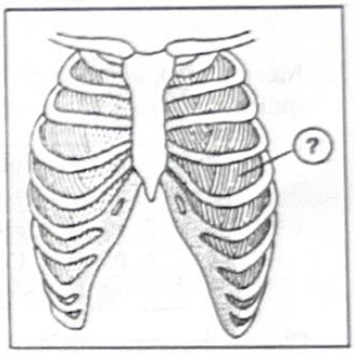
Sol. Correct matching with explanation:

Variety	Crop	Identification
1. Heera, Jawahar, PNR-591	Rice	(iii)
2. RLM-514, Kranti, Pusa Bold	Mustard	(iv)
3. K-850, ICC-34, BE-244	Gram	(i)
4. Ganga-5, Navjot, Vikram	Maize	(ii)

Therefore, the correct sequence is:

1-(iii), 2-(iv), 3-(i), 4-(ii)

22. Study the following diagram and its functional antomical details. One important part of its structual constituent is labeled with **'question (?) mark'**, playing an important role in the physiology of mammals. What function can be correlated with the **'question (?) marked'** part. Choose the correct option:



(a) Their action draws the ribs downwards.

(b) Their action draws the ribs both downwards and outwards.

(c) Their action raises the ribs upwards and inwards.

(d) Their action raises the ribs upwards and outwards.

Answer (d)

Sol. Here, the question mark(?) represents external intercostal muscles. The primary function of the external intercostal muscles is to elevate the ribs and sternum upwards and outwards during inhalation.

23. Some plants have scotoactive stomata. Such plants have:

(a) C_3 pathway of photosynthesis

(b) Photosynthesize by Calvin-Benson pathways

(c) Crassulacean Acid Metabolism pathways of photosynthesis

(d) C_4 pathways of photosynthesiss

Answer (c)

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. Scotoactive stomata are specialized stomata that remain closed during the day to prevent water loss through transpiration and open at night to take in carbon dioxide.

Succulent and desert plants (such as cacti, Opuntia, and pineapple) possess scotoactive stomata and perform Crassulacean Acid Metabolism (CAM).

24. Make the correct matches of the following. Items under Column I are various foramina found in human body and Column II indicates their precise location.

Column I	Column II
1. Obturator Foramen	(i) Brain
2. Mental Foramen	(ii) Pelvic Girdle
3. Foramen Ovale	(iii) Mandible
4. Foramina of Luschka	(iv) Skull

Choose the correct option:

(a) 1-(iv), 2-(i), 3-(iii), 4-(ii)
(b) 1-(ii), 2-(iv), 3-(i), 4-(iii)
(c) 1-(ii), 2-(iii), 3-(iv), 4-(i)
(d) 1-(iii), 2-(ii), 3-(i), 4-(iv)

Answer (c)

Sol. 1. Obturator Foramen: A large opening in the hip bone of the Pelvic Girdle (ii).

2. Mental Foramen: An opening on the anterior surface of the Mandible (iii) (lower jaw).

3. Foramen Ovale: An opening in the sphenoid bone at the base of the Skull (iv).

4. Foramina of Luschka: Lateral openings in the fourth ventricle of the Brain (i) that allow cerebrospinal fluid to flow into the subarachnoid space.

25. What is the difference between a disinfectant and an antiseptic?

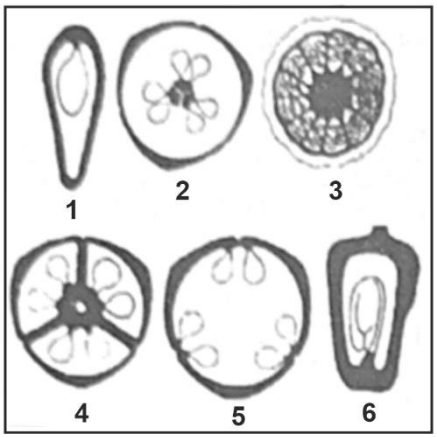
(a) A disinfectant kills bacterial spores, while an antiseptic does not.
(b) A disinfectant is used on lifeless objects only, while an antiseptic is used on the skin surface.
(c) A disinfectant does not get sterilized, while an antiseptic does.
(d) Disinfectants are chemical substances, while antiseptics are not.

Answer (b)

Sol. Antiseptics are antimicrobial agents safe to apply to living tissues (such as skin, cuts, and wounds), whereas disinfectants are stronger formulations meant strictly for inanimate (lifeless) objects like floors, instruments, and drainage systems because they can harm living tissue.

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

26. Study the following diagrams labeled 1 to 6.



Which of the following options shows the correct sequence of labeled numbers related with the plants, namely- *Tagetes, Cucurbita, Solanum, Nymphaea, Dianthus and Lathyrus*?

(a) 1, 3, 4, 2, 5 and 6
(b) 6, 5, 4, 3, 2 and 1
(c) 5, 6, 3, 1, 2 and 4
(d) 2, 4, 5, 3, 1 and 2

Answer (b)

Sol.

Diagram	Type of Placentation	Examples
1	**Marginal**	***Lathyrus***
2	**Free-central**	***Dianthus***
3	**Superficial**	***Nymphaea*** (Water lily)
4	**Axile**	***Solanum***
5	**Parietal**	***Cucurbita***
6	**Basal**	***Tagetus***

27. Make the correct matches of the following. Items under Column I are various receptors and Column II indicates the related types or functions.

	Column I		Column II
1.	End Bulbs of Krause	(i)	Pain Receptors
2.	End Organs of Ruffini	(ii)	Pressure Receptors
3.	Pacinian Corpuscles	(iii)	Caloreceptors
4.	Algesireceptors	(iv)	Frigidoreceptors

Choose the correct option:

(a) 1-(i), 2-(iii), 3-(ii), 4-(iv)
(b) 1-(iii), 2-(i), 3-(iv), 4-(ii)
(c) 1-(iv), 2-(iii), 3-(ii), 4-(i)
(d) 1-(iv), 2-(ii), 3-(i), 4-(iii)

Answer (c)

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. 1. End Bulbs of Krause → (iv) Frigidoreceptors.

Thermoreceptors in the dermis and mucous membranes that detect cold.

2. End Organs of Ruffini → (iii) Caloreceptors.

Thermoreceptors located deep in the dermis that detect warmth/heat (as well as skin stretch).

3. Pacinian Corpuscles → (ii) Pressure Receptors.

Mechanoreceptors sensitive to deep pressure and high-frequency vibration.

4. Algesireceptors (Nociceptors) → (i) Pain Receptors.

Sensory nerve endings that respond to tissue damage and pain.

28. Suppose there is no anthropogenic pollution, the concentration of CO_2 in the atmosphere would remain relatively constant, because:

(a) In photoautotrophs, the rate of photosynthesis is equal to the rate of their cellular respiration.

(b) During photosynthesis, CO_2 is consumed and O_2 is released.

(c) The rate of photosynthesis by photoautotrophs is about equal to the rate of cellular respiration by all organisms.

(d) In plants, photosynthesis occurs during the day and cellular respiration at night.

Answer (c)

Sol. Without human-caused (anthropogenic) emissions, atmospheric CO_2 stays steady because the amount of CO_2 absorbed from the atmosphere by **photoautotrophs** during photosynthesis roughly equals the total amount of CO_2 released back into the atmosphere through **cellular respiration**.

29. Deciduous teeth in human beings fall out generally between the age of 6 and 13 years. What is the approximate age at which permanent Canines erupt?

(a) 5 to 8 years (b) 9 to 14 years

(c) 7 to 24 years (d) 8 to 10 years

Answer (b)

Sol. Permanent canines are the pointed teeth situated next to the lateral incisors. They replace the deciduous canines during the process of permanent dentition. In humans, permanent lower canines generally erupt around 9–10 years of age, whereas permanent upper canines generally erupt around 11–12 years of age. Thus, the approximate eruption period of permanent canines falls within the range of 9–14 years among the given options. Therefore, option (b) is correct.

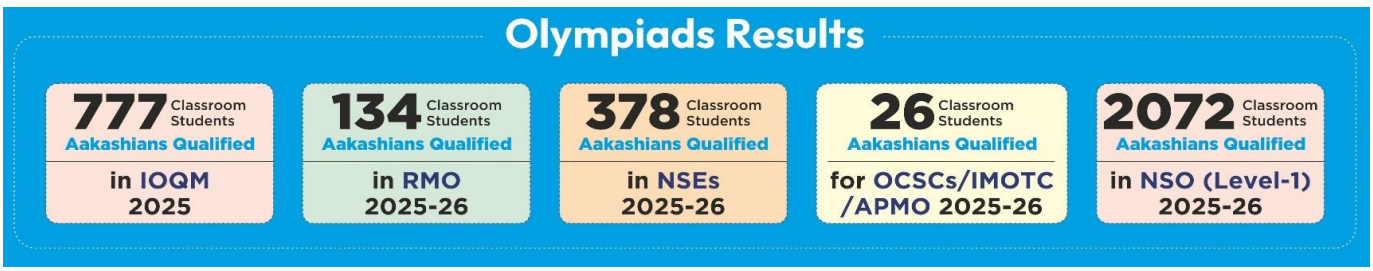
30. Larger subunit of ribosomes (60^S) in eukaryotic plants involves which of the following RNA composition?

(a) 25S + 5S + 5.8S (b) 28-29S + 5S + 5.8S

(c) 23S + 5.8S (d) 28S + 16-17S + 5S

Answer (a)

Sol. In eukaryotic plants, the larger subunit of ribosome (60S) consists of 25S, 5S and 5.8S subunits.



31. Which of the following statements best describes the primary function of lenticels in woody plants?
    (a) To facilitate the process of guttation during periods of high humidity.
    (b) To allow for gaseous exchange between the internal tissues of the stem and the atmosphere.
    (c) To provide structural support to the secondary xylem in aging trees.
    (d) To facilitate the formation of phellogen.

Answer (b)

Sol. Lenticels are lens-shaped, porous openings in the periderm (bark) of woody stems and roots filled with loosely arranged complementary cells. They allow oxygen and carbon dioxide to diffuse between the atmosphere and living internal stem tissues.

32. To prevent hemolytic disease of the newborn from occurring in a successive pregnancy, *Rh* negative woman giving birth to *Rh* positive child will receive shortly after birth an injection of
    (a) A & B factors
    (b) Type O blood
    (c) Rh antibodies
    (d) *Rh* antigens

Answer (c)

Sol. During delivery of an Rh^+ baby, small amounts of fetal blood can enter the Rh- mother's bloodstream. To prevent her immune system from becoming sensitized and making permanent memory cells, she is given an injection of anti-Rh antibodies within 72 hours of birth. These injected antibodies bind to and destroy the fetal Rh^+ red blood cells before the mother's own immune system can react to them.

33. A compound X is observed to decolourise bromine water and reacts with sodium metal to release hydrogen gas. Which functional group(s) is/are present in that compound?
    (a) Aldehyde (–CHO) only
    (b) Alkene (C=C) only
    (c) Both an alkene (C=C) and a hydroxyl (–OH) group
    (d) Carboxylic acid (–COOH) only

Answer (c)

Sol. Decolourisation of bromine water is the test for unsaturation (C=C): bromine adds across the double bond, e.g. $CH_2 = CH - CH_2OH + Br_2 \rightarrow CH_2Br - CHBr - CH_2OH$ (reddish-brown colour disappears)

Liberation of H_2 with sodium shows an acidic hydrogen, i.e., an –OH group:

$2CH_2 = CH - CH_2OH + 2Na \rightarrow 2CH_2 = CH - CH_2ONa + H_2\uparrow$

An alkene alone does not react with Na; an aldehyde alone does not liberate H_2 with Na; a carboxylic acid alone does not decolourise bromine water. Hence X contains both C=C and –OH (e.g., allyl alcohol).

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

34. Which of the following represents an anhydride for two acids?

(a) N_2O (b) NO_2

(c) SO_2 (d) SO_3

Answer (b)

Sol. NO_2 is a mixed anhydride: on dissolving in water, it gives two acids, nitrous acid and nitric acid.

$2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$

N_2O is a neutral oxide; SO_2 gives only H_2SO_3 ($SO_2 + H_2O \rightarrow H_2SO_3$); SO_3 gives only H_2SO_4 ($SO_3 + H_2O \rightarrow H_2SO_4$).

35. A currency counting machine counts 6.023 million notes per day. A bank has as many notes as number of oxygen atoms in 24.8 g of $Na_2S_2O_3 \cdot 5H_2O$. How many days would be required to count these notes?

(a) 10^6 (b) 15×10^{15}

(c) 8×10^{16} (d) None of these

Answer (c)

Sol. Molar mass of $Na_2S_2O_3 \cdot 5H_2O = 2(23) + 2(32) + 3(16) + 5(18) = 46 + 64 + 48 + 90 = 248$ g mol^{-1}

Moles in 24.8 g = 24.8/248 = 0.1 mol

Oxygen atoms per formula unit = 3 (in $S_2O_3^{2-}$) + 5 (in $5H_2O$) = 8

Number of O atoms = $0.1 \times 8 \times 6.023 \times 10^{23} = 0.8 \times 6.023 \times 10^{23}$

Number of days = $\frac{0.8 \times 6.023 \times 10^{23}}{6.023 \times 10^{6}} = 0.8 \times 10^{17} = 8 \times 10^{16}$ days

36. The volume of HCl produced, when 32 g of CH_4 is allowed to react with excess chlorine is

(a) 8.96 L (b) 89.6 L

(c) 179.2 L (d) 22.4 L

Answer (c)

Sol. With excess chlorine (in diffused sunlight), substitution continues until all four hydrogen atoms of methane are replaced:

$CH_4 + 4Cl_2 \rightarrow CCl_4 + 4HCl$

Moles of CH_4 = 32/16 = 2 mol $\Rightarrow$ moles of HCl = $4 \times 2 = 8$ mol

Volume of HCl at STP = 8×22.4 L = 179.2 L

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

37. How many grams of acetic acid will be produced when 92 g of ethanol is completely oxidized, if the reaction has 80% yields?

(a) 120 g (b) 60 g

(c) 96 g (d) 80 g

Answer (c)

Sol. Oxidation of ethanol by alkaline $KMnO_4$ or acidified $K_2Cr_2O_7$:

$CH_3CH_2OH + 2[O] \rightarrow CH_3COOH + H_2O$

Moles of ethanol = 92/46 = 2 mol $\Rightarrow$ theoretical acetic acid = 2 mol = 2 × 60 = 120 g

Actual yield = 80% of 120 g = 96 g

38. What is the molar mass of water if it contains 50% heavy water (D_2O)?

(a) 9 g (b) 18 g

(c) 19 g (d) 10 g

Answer (c)

Sol. Molar mass of H_2O = 18 g mol^{-1}; molar mass of D_2O = 2(2) + 16 = 20 g mol^{-1}

Average molar mass of the 50 : 50 (mole) mixture = 0.5 × 18 + 0.5 × 20 = 19 g mol^{-1}

39. During the reaction of zinc with concentrated sodium hydroxide solution, hydrogen gas is evolved. This dissolved zinc is present in solution as

(a) ZnO (b) $Na_2[Zn(H_2O)_6]$

(c) $Na_2[Zn(OH)_4]$ (d) $Zn(OH)_2$

Answer (c)

Sol. Zinc is amphoteric and dissolves in concentrated alkali to form soluble sodium zincate, liberating hydrogen:

$Zn + 2NaOH + 2H_2O \rightarrow Na_2[Zn(OH)_4] + H_2\uparrow$

(Often written in simplified form as $Zn + 2NaOH \rightarrow Na_2ZnO_2 + H_2\uparrow$.) In solution the zinc is present as the tetrahydroxozincate (II) ion, $[Zn(OH)_4]^{2-}$.

40. Select the incorrect matches:

A. Burning of LPG — Exothermic reaction

B. Photosynthesis — Endothermic reaction

C. Reaction of Zinc with dilute HCl — Displacement reaction

D. Rusting of Iron — Decomposition reaction

E. Decomposition of vegetable matter into compost — Endothermic reaction

(a) A and C (b) B, C and E

(c) D and E (d) B, D and E

Answer (c)

Sol. Rusting: $4Fe + 3O_2 + 2xH_2O \rightarrow 2Fe_2O_3 \cdot xH_2O$; it is an oxidation (combination) reaction, not decomposition.

Decomposition of vegetable matter into compost releases heat – exothermic, not endothermic.

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

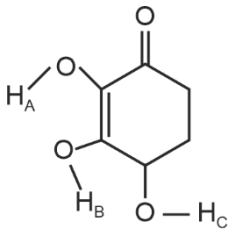
134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

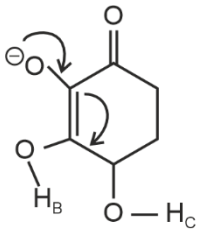
41. Arrange the hydrogens in increasing order of their acidic strength:



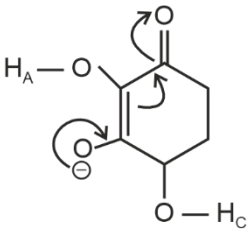
(a) A > B > C
(b) B > A > C
(c) C > B > A
(d) C > A > B

Answer (b)

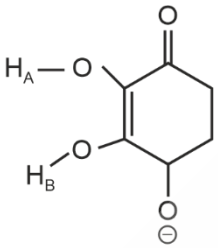
Sol. Acidic Strength ∝ Stability of their Conjugate base.



(A) Resonance Stabilised



(B) Extended resonance



(C) No Resonance

Conjugate Base of B is involved in extended conjugation hence most stable, so most acidic. Conjugate base of A is involved in single resonance whereas conjugate base of C not involved in resonance.

So order will be B > A > C

42. Five test tubes (I–V) contain the following reacting substances

Test tube	Reactants
I	Ethanol + Sodium metal
II	Ethanoic acid + Sodium carbonate
III	Ethanoic acid + Sodium hydroxide
IV	Ethanoic acid + Sodium hydrogen carbonate
V	Ethyl ethanoate + Sodium hydroxide

A burning matchstick is brought near the mouth of each test tube. In which of the test tubes will the flame be extinguished?

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

Answer (c)

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. The flame is extinguished only by carbon dioxide (it neither burns nor supports combustion).

I: $2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2\uparrow$ (H_2 burns with a pop sound; flame not extinguished)

II: $2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + H_2O + CO_2\uparrow$

III: $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$ (neutralisation; no gas)

IV: $CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2\uparrow$

V: $CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$ (saponification; no gas)

CO_2 is evolved only in II and IV.

43. A blue $CuSO_4$ solution is evaporated to dryness and heated strongly (≈230°) until it becomes white. The oxidation state of copper throughout the process is

(a) +2 ⟶ +1 (b) +2 ⟶ +3

(c) +2 ⟶ 0 (d) +2 only

Answer (d)

Sol. On evaporation, blue crystals of $CuSO_4 \cdot 5H_2O$ are obtained. Strong heating (≈230°C) removes the water of crystallisation:

$CuSO_4 \cdot 5H_2O$ (blue) → $CuSO_4$ (white, anhydrous) + $5H_2O$

This is only dehydration; no oxidation or reduction occurs. Copper remains in the +2 oxidation state throughout.

44. Which of the following metal ions is expected to be coloured?

(a) Zn^{2+} (b) Ti^{3+}

(c) Sc^{3+} (d) Ti^{4+}

Answer (b)

Sol. Colour of transition metal ions arises from d–d transitions, which require partly filled d-orbitals.

Zn^{2+}: $3d^{10}$; Sc^{3+}: $3d^0$; Ti^{4+}: $3d^0$ — no d–d transition possible, so colourless.

Ti^{3+}: $3d^1$ — one unpaired d electron; d–d transition absorbs visible light, so $[Ti(H_2O)_6]^{3+}$ is violet/purple.

45. Between Li^+ and H^- which is assumed to have larger ionic radius:

(a) Li^+

(b) H^-

(c) Both contain two electrons and are of same size

(d) Depends upon the counter ion

Answer (b)

Sol. Li^+ and H^- are isoelectronic (2 electrons each, $1s^2$).

For isoelectronic species, the size decreases as the nuclear charge increases. Li^+ has Z = 3, while H^- has Z = 1, so the two electrons of H^- are held much less tightly (and also repel each other more effectively).

Hence H^- is much larger than Li^+.

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

46. A complex ion has magnetic moment 4.90 BM. It is supposed to be:

(a) $[Cr(NH_3)_6]^{3+}$ (b) $[Fe(CN)_6]^{4-}$

(c) $[Ni(CN)_4]^{2-}$ (d) $[Fe(H_2O)_6]^{2+}$

Answer (d)

Sol. Spin-only magnetic moment $\mu = \sqrt{(n(n+2))}$ BM. $4.90 = \sqrt{24} \Rightarrow n(n+2) = 24 \Rightarrow n = 4$ unpaired electrons.

$[Cr(NH_3)_6]^{3+}$: Cr^{3+}, $3d^3$, $n = 3$, $\mu = 3.87$ BM

$[Fe(CN)_6]^{4-}$: Fe^{2+}, $3d^6$, CN^- is a strong field ligand $\rightarrow$ low spin t_{2g}^6, $n = 0$ (diamagnetic)

$[Ni(CN)_4]^{2-}$: Ni^{2+}, $3d^8$, square planar (dsp^2), $n = 0$ (diamagnetic)

$[Fe(H_2O)_6]^{2+}$: Fe^{2+}, $3d^6$, H_2O is a weak field ligand $n = 4$

47. AgO actually exists as $Ag[AgO_2]$, which is diamagnetic in nature. Then which of the following statements is correct regarding AgO?

(a) The arrangement of O^{2-} ions around Ag^+ ion is square planar.

(b) The arrangement of O^{2-} ions around Ag^{3+} ion is tetrahedral.

(c) The arrangement of O^{2-} ions around Ag^+ ion is tetrahedral.

(d) The arrangement of O^{2-} ions around Ag^{3+} ion is square planar.

Answer (d)

Sol. In $Ag[AgO_2]$ (i.e., $Ag^{I}Ag^{III}O_2$), the average oxidation state +2 is shared as one Ag^+ and one Ag^{3+}.

Ag^+: $4d^{10}$ — always diamagnetic; in AgO it is linearly coordinated by two O^{2-} ions.

Ag^{3+}: $4d^8$ — in a tetrahedral field a d^8 ion has two unpaired electrons (paramagnetic). For the compound to be diamagnetic, the eight d electrons must be paired, which happens in a square planar (dsp^2) arrangement.

Hence the O^{2-} ions are arranged in a square planar manner around Ag^{3+}.

48. Which of the following may liberate O_2 from water?

(a) Cl_2 (b) CaH_2

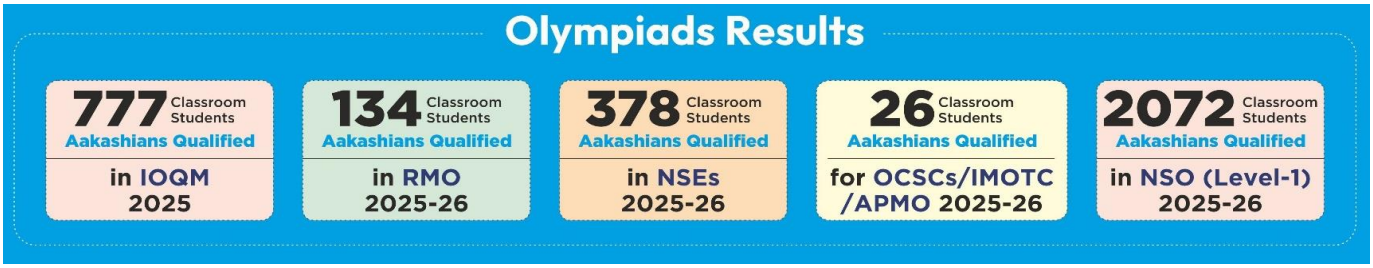
(c) F_2 (d) None of these

Answer (c)

Sol. Fluorine is the strongest oxidising agent; it oxidises water to oxygen:

$2F_2 + 2H_2O \rightarrow 4HF + O_2$ (some O_3 is also formed)

Chlorine reacts with water to give HCl and HOCl ($Cl_2 + H_2O \rightarrow HCl + HOCl$) and does not liberate O_2 directly; calcium hydride liberates hydrogen: $CaH_2 + 2H_2O \rightarrow Ca(OH)_2 + 2H_2\uparrow$.



A-2

ANY NUMBER OF OPTIONS (4, 3, 2 or 1) MAY BE CORRECT
MARKS WILL BE AWARDED ONLY IF ALL THE CORRECT OPTIONS ARE BUBBLED AND NO INCORRECT.

49. Brass is an alloy of Copper and Zinc containing Copper and Zinc in a specific ratio. A cube of brass weighs 516 gram-weight in air. When completely immersed in water, it weighs 452 gram-weight. Density of water = 1.0 g/cc, Relative density of Copper ρ_{Cu} = 8.9 Relative density of Zinc ρ_{Zn} = 7.1

The correct option(s) is/are

(a) The edge of the cube is 4.0 cm

(b) The mass of Copper contained in the cube is 304.58 gram

(c) The mass of Zinc contained in the cube is 206.40 gm

(d) The mass ratio of Copper and Zinc is in the cube is 60 : 40

Answer (a, b)

Sol. Volume: By Archimedes' principle, loss of weight = weight of water displaced = 516 − 452 = 64 g-wt

Volume of cube V = 64 g/(1.0 g cm^{-3}) = 64 cm^3 $\Rightarrow$ edge a = $\sqrt[3]{64}$ = 4.0 cm. Option (a) is correct.

Composition: Let mass of copper = x g; mass of zinc = (516 − x) g. Total volume = sum of volumes of the two metals:

$$\frac{x}{8.9}+\frac{516-x}{7.1}=64$$

Multiplying by 8.9 × 7.1 = 63.19: $7.1x + 8.9(516 - x) = 4044.16 \Rightarrow 4592.4 - 1.8x = 4044.16 \Rightarrow x = 304.58$ g

Mass of copper = 304.58 g (option (b) correct); mass of zinc = 516 − 304.58 = 211.42 g (so option (c), 206.40 g, is incorrect).

Mass ratio Cu : Zn = 304.58 : 211.42 ≈ 59 : 41, not 60 : 40. Option (d) is incorrect.

50. A driver starts a DTC bus in Delhi from sector-1, RK Puram bus stop and accelerates it at a constant rate a_1 for 10 second. During this time, the bus travels 100 meter. The bus continues to move at a constant velocity v for one minute. When the driver notices a red light 100 meter ahead and applies brake. The bus moves further with constant deceleration a_2 and finally comes to a stop just at the red light. If the bus travels in a straight line all the way, you may conclude that

(a) the velocity of the bus after first 10 seconds is 20 ms^{-1}

(b) the average speed of the bus, during the entire journey, is 17.5 ms^{-1}

(c) the driver continues to apply the brake for the last 10 seconds

(d) the acceleration a_1 = + 2 ms^{-2} and retardation a_2 = − 4 ms^{-2}

Answer (a, b, c)

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. Stage 1 (acceleration from rest): $s_1 = \frac{1}{2}a_1t^2 \Rightarrow 100 = \frac{1}{2}a_1(10)^2 \Rightarrow a_1 = 2\ ms^{-2}$

$v = a_1t = 2 \times 10 = 20\ m\ s^{-1}$. Option (a) is correct.

Stage 2 (uniform velocity for 60 s): $s_2 = 20 \times 60 = 1200$ m

Stage 3 (braking over 100 m): $0 = v^2 - 2a_2s_3 \Rightarrow a_2 = \frac{20^2}{2\times100} = 2\ ms^{-2}$ (retardation, i.e., $-2\ m\ s^{-2}$)

Time of braking $t_3 = \frac{v}{a_2} = \frac{20}{2} = 10$ s. Option (c) is correct; option (d) (retardation $-4\ m\ s^{-2}$) is incorrect.

Average speed = $\frac{100+1200+100}{10+60+10} = \frac{1400}{80} = 17.5\ m\ s^{-1}$. Option (b) is correct.

51. On a hot and dry summer day, a person standing between two vertical hills (considered plane & parallel), fires a gun. He hears first echo after 1.5 second of firing the gun and second echo after 1.0 second of hearing the first echo. Considering the speed of sound in air on that hot day to be 360 ms^{-1}, the person will

(a) hear the third echo after 1.5 second of hearing the second echo

(b) hear the third echo after 4.0 second of hearing the first echo

(c) hear the fourth echo after 5.5 second of firing the gun

(d) find the distance between the two hills to be 720 meter

Answer (a, c, d)

Sol. Let d_1 and d_2 be the distances of the person from the nearer and the farther hill. An echo is heard each time a reflected pulse returns to the person.

First echo (nearer hill): $2d_1 = 360 \times 1.5 \Rightarrow d_1 = 270$ m

Second echo (farther hill) at $t = 1.5 + 1.0 = 2.5$ s: $2d_2 = 360 \times 2.5 \Rightarrow d_2 = 450$ m

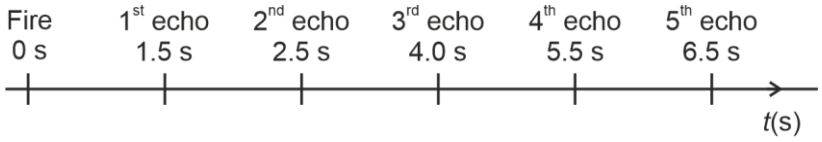
Distance between the hills = $d_1 + d_2 = 720$ m. Option (d) is correct.

Subsequent echoes: The pulse returning from one hill passes the person and is reflected by the other hill.

Third echo: path $2d_1 + 2d_2 = 1440$ m $\Rightarrow t = \frac{1440}{360} = 4.0$ s (both pulses arrive together). This is $4.0 - 2.5 = 1.5$ s after the second echo (option (a) correct) and $4.0 - 1.5 = 2.5$ s after the first echo (option (b) incorrect).

Fourth echo: path $4d_1 + 2d_2 = 1080 + 900 = 1980$ m $\Rightarrow t = 1980/360 = 5.5$ s after firing. Option (c) is correct.

(The next echo, path $2d_1 + 4d_2 = 2340$ m, arrives at 6.5 s.)



Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

52. As part of its mission to reduce air pollution and promote sustainable transportation in a smart city, the authorities have introduced a fleet of electric buses. At the central bus depot, a high-capacity fast-charging station supplies electricity to the buses between trips. For charging, an electric bus is connected to a charging point that operates at a potential difference of 600 volt and delivers a current of 50 ampere. The bus remains connected to the charger for 45 minutes before resuming service. Based on this information, we can predict that the

(a) electrical power supplied by the charging station to the bus is 30 kilo-watt.

(b) total electrical energy transferred to the bus battery during the charging period is 81 mega joule.

(c) cost incurred for one charging session at @ ₹9 per kWh (per unit) is Rs 202.50

(d) charge flowing through the charging cable during charging is 1×10^6 coulombs.

Answer (a, b, c)

Sol. V = 600 V, I = 50 A, t = 45 min = 2700 s = 0.75 h

(a) Power P = VI = 600 × 50 = 30000 W = 30 kW. Correct.

(b) Energy E = Pt = 30000 × 2700 = 8.1×10^7 J = 81 MJ. Correct (assuming the whole energy delivered is transferred to the battery).

(c) Energy in kWh = 30 kW × 0.75 h = 22.5 kWh; cost = 22.5 × ₹9 = ₹202.50. Correct.

(d) Charge Q = It = 50 × 2700 = 1.35×10^5 C, not 1×10^6 C. Incorrect.

53. Which of the following is/are the correct statement(s) related with the function of cellular organelles:

(a) In hepatocytes residual glycogen has been found with the endoplasmic reticulum of fasted animals.

(b) Conversion of fatty acids to Acyl Coenzyme A esters occurs mainly in mitochondria.

(c) Glycoprotein is sulphated in the Golgi complex to form Mucigen.

(d) Protein synthesis takes place exclusively on isolated individual ribosomes.

Answer (a, c)

Sol. Statements (b) & (d) are incorrect.

- The activation/conversion of fatty acids into fatty acyl-CoA esters by acyl-CoA synthetase occurs primarily in the cytosol (specifically on the outer mitochondrial membrane and endoplasmic reticulum), before the acyl group is transported into the mitochondrial matrix via the carnitine shuttle for beta-oxidation.
- Active protein synthesis (translation) typically occurs on polyribosomes (polysomes)—clusters of multiple ribosomes simultaneously translating a single mRNA strand—rather than exclusively on isolated individual ribosomes.

54. Following are the statements regarding important Biosphere Reserves of India. Choose the option(s) which do/does not correlate with their characteristic geography:

(a) Norek Biosphere Reserve covers parts of Garo Hill districts.

(b) Simlipal Biosphere Reserve is the largest contiguous mangrove area in the world.

(c) Satpura National Park comes under Panchmarhi Biosphere Reserve.

(d) Khangchendzonga Biosphere Reserve extends along the Himalayan forest hills to the south of Brahmaputra valley.

Answer (b, d)

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. (a) Nokrek Biosphere Reserve is located in the Garo Hills district of Meghalaya.

(b) Simlipal Biosphere Reserve (in Odisha) is known for tropical moist deciduous/sal forests and tigers, not mangroves. The Sundarbans is the largest contiguous mangrove forest in the world.

(c) Satpura National Park forms part of the Pachmarhi Biosphere Reserve in Madhya Pradesh.

(d) Khangchendzonga Biosphere Reserve is situated in Sikkim in the Eastern Himalayas (north/northwest of the Brahmaputra basin), whereas the hills lying to the south of the Brahmaputra valley belong to the Meghalaya Plateau and Purvanchal range.

55. Which of the following Phyla of algae have reserve food material as starch?

(a) Phaeophyta (b) Pyrrophyta

(c) Chlorophyta (d) Rhodophyta

Answer (b, c, d)

Sol.

	Classes of Algae	**Stored Reserve Food**
a.	Phaeophyta (brown algae)	Laminarin and mannintol
b.	Pyrrophyta (dinoflagellates)	Starch like alpha-1, 4 glucans
c.	Chlorophyta (green algae)	Starch
d.	Rhodophyta(red algae)	Floridean starch

56. Which of the following statements regarding **Genetic Drift** is/are correct?

(a) It is a non-directional process that leads to changes in allele frequencies due to random sampling error.

(b) Its effects are most pronounced and significant in large, panmictic populations.

(c) It can result in the complete loss of an allele or the fixation of another, regardless of whether the allele is beneficial or harmful.

(d) The founder effect and population bottleneck are specific scenarios where genetic drift is intensified.

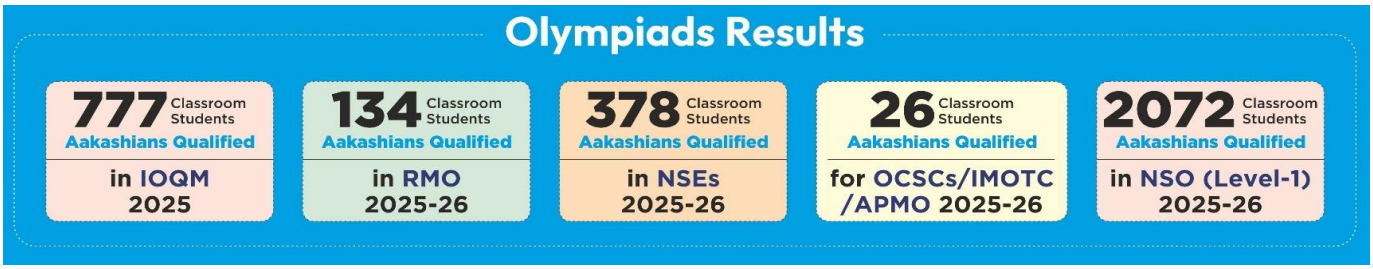
Answer (a, c, d)

Sol. (a) Correct. Genetic drift is a random, non-directional process that alters allele frequencies across generations due to random sampling error.

(b) Incorrect. Genetic drift is strongest in small populations; in large, panmictic (randomly mating) populations, random sampling fluctuations are negligible.

(c) Correct. Over time, random fluctuations can drive an allele to fixation (frequency = 1) or complete loss (frequency = 0), regardless of whether the allele is beneficial, neutral, or harmful.

(d) Correct. Both the founder effect and population bottlenecks sharply reduce effective population size, which intensifies genetic drift.



57. 100 mL of 0.2 M HCl is mixed with 100 mL of 0.1 M NaOH and 100 mL of 0.1 M CH_3COOH (dissociation constant $Ka = 1.8 \times 10^{-5}$. Which statements are correct?

(a) The final mixture contains excess HCl and CH_3COOH after neutralization

(b) The pH of the resulting solution is less than 3

(c) The resulting solution is a buffer solution

(d) Moles of H^+ from HCl alone exceed total moles of OH^- available

Answer (a, b, d)

Sol. Moles: HCl = 0.1 L × 0.2 = 0.02 mol; NaOH = 0.1 × 0.1 = 0.01 mol; CH_3COOH = 0.1 × 0.1 = 0.01 mol

NaOH neutralises the strong acid first: $HCl + NaOH \rightarrow NaCl + H_2O$.

HCl left = 0.02 − 0.01 = 0.01 mol; CH_3COOH (0.01 mol) remains unreacted.

(d) Moles of H^+ from HCl (0.02) > moles of OH^- (0.01).

(b) Total volume = 300 mL $[H^+]$ from excess HCl = 0.01/0.3 = 0.0333 M (dissociation of CH_3COOH is suppressed by the common ion H^+ and is negligible). pH = $-\log(0.0333) \approx 1.48 < 3$.

(c) No CH_3COO^- (conjugate base) is present and a strong acid is in excess, so the solution is not a buffer.

58. 5.6 g of CO and 6.4 g of O_2 are taken in a closed container. After the reaction $2CO + O_2 \rightarrow 2CO_2$ goes to completion, which statements are correct?

(Molar masses: C = 12, O = 16)

(a) CO is the limiting reagent

(b) 0.1 mol of O_2 remains unreacted

(c) The mole fraction of CO_2 in the final mixture is $\frac{2}{3}$

(d) The total moles of gas in the container decreases by 0.1 mol compared to initial

Answer (a, b, c, d)

Sol. Moles of CO = 5.6/28 = 0.2 mol; moles of O_2 = 6.4/32 = 0.2 mol

$2CO + O_2 \rightarrow 2CO_2$: 0.2 mol CO needs only 0.1 mol O_2.

So, CO is the limiting reagent and 0.2 − 0.1 = 0.1 mol O_2 remains

CO_2 formed = 0.2 mol. Final mixture: CO_2 = 0.2 mol, O_2 = 0.1 mol, total = 0.3 mol.

Mole fraction of CO_2 = 0.2/0.3 = $\frac{2}{3}$

Initial total moles = 0.4 mol; final = 0.3 mol; decrease = 0.1 mol

59. Which of the following are isoelectronic and isostructural?

(a) NO_3^- (b) CO_3^{2-}

(c) ClO_3^- (d) SO_3

Answer (a, b)

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. Total electrons: NO_3^- = 7 + 24 + 1 = 32; CO_3^{2-} = 6 + 24 + 2 = 32;

ClO_3^- = 17 + 24 + 1 = 42; SO_3 = 16 + 24 = 40

Shapes: NO_3^- – sp^2, trigonal planar; CO_3^{2-} – sp^2, trigonal planar; ClO_3^- –sp^3 with one lone pair, trigonal pyramidal; SO_3 – sp^2, trigonal planar.

NO_3^- and CO_3^{2-} are both isoelectronic (32 electrons) and isostructural (trigonal planar). SO_3 is trigonal planar but not isoelectronic with them.

60. Select the correct statement(s):

(a) An electron near the nucleus is attracted by the nucleus and has a low potential energy.

(b) According to Bohr's theory, electrons continuously radiate energy if it stays in one orbit.

(c) Bohr's model could not explain the spectra of multi-electron atoms.

(d) Bohr's model was the first atomic model based on quantisation of energy.

Answer (a, c, d)

Sol. (a) The potential energy of the electron, $U = -\frac{kZe^2}{r}$, becomes more negative (lower) as r decreases, *i.e.*, as the electron comes closer to the nucleus.

(b) Bohr postulated that an electron revolving in a stationary orbit does not radiate energy; energy is emitted or absorbed only when it jumps from one orbit to another.

(c) Bohr's model explains the spectra of hydrogen and hydrogen-like species (He^+, Li^{2+}) only; it fails for multi-electron atoms.

(d) Bohr's model (1913) was the first atomic model to incorporate the quantisation of energy (stationary states of definite energy) using Planck's quantum theory.

❑ ❑ ❑

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26