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PREVIOUS YEAR PAPER · 2026

OLYMPIAD · STAGE I

NSEJS

National Standard Examination in Junior Science

2026

Question paper, answer key and Zigyan solutions

60	216	120 min	51
Questions	Maximum marks	Time	Paper code

Question paper and TENTATIVE answer key: Indian Association of Physics Teachers (IAPT), NSEJS 2026, paper code 51.
Solutions and notes: Zigyan. This booklet is not an IAPT publication.

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AIR 168	AIR 811
	99.95 percentile



Sulokya Bibhuty

3 YEARS CLASSROOM

JEE ADVANCED 2026	JEE MAIN 2026
AIR 1,315	AIR 1,095
	99.94 percentile

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- Sulokya Bibhuty — 3 Years Classroom
- Anay Gupta — 3 Years Classroom
- Akshat Khator — 3 Years Classroom
- Harshit Goyal — 4 Years Classroom
- Hardik Sharma — 3 Years Classroom
- Aarush Kumar — 1 Year Classroom

PHYSICS

- Sulokya Bibhuty — 3 Years Classroom
- Saksham Bishnoi — 4 Years Classroom

ASTRONOMY

- Sulokya Bibhuty — 3 Years Classroom

MATHEMATICS (IOQM)

- Priyanshi — 4 Years Classroom

Saksham Bishnoi qualified the Chemistry Olympiad twice and was selected for the Orientation-cum-Selection Camp at HBCSE, Mumbai.

16 selections	16 of 35	AIR 168
in JEE Advanced 2026	students of the batch selected	best JEE Advanced rank

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Given in the question paper

Physical constants you may need….

Mass of electron $m_e = 9.11\times10^{-31}\,kg = 0.511 MeV$	Magnitude of charge on electron $e = 1.60\times10^{-19}\,C$
Mass of proton $m_p = 1.67\times10^{-27}\,kg$	Planck's constant $h = 6.625\times10^{-34}\,Js$
Acceleration due to gravity $g = 9.80\ ms^{-2}$	Density of water is $\rho = 1.0\times10^{3}\,kg\,m^{-3}$
Universal gravitational constant $G = 6.67\times10^{-11}\,Nm^2\,kg^{-2}$	$(1+x)^n \approx 1+nx$, if $\lvert x\rvert \ll 1$
Universal gas constant $R = 8.31\ J\,mol^{-1}\,K^{-1}$	$1\ eV = 1.6\times10^{-19}\ J$
Boltzmann constant $k = 1.38\times10^{-23}\,JK^{-1}$	$\sin(A\pm B) = \sin A\cos B \pm \cos A\sin B$
Avogadro's constant $A = 6.02\times10^{23}\ mol^{-1}$	$E = mc^2$ gives mass and energy equivalence.
Atmospheric pressure (at STP) = $1.013\times10^{5}\ Nm^{-2}$	One amu = 1 u = 931.5 MeV
Speed of light in free space $c = 3.0\times10^{8}\ ms^{-1}$	One unit of electric power = 1kWh

PART A-1 · ONE CORRECT OPTION

Q. 1 – 48 · +3 for a correct answer, –1 for a wrong one

1. 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) $\frac{1}{N}\times\frac{\Delta N}{\Delta t}$

Solution · Q1 **Answer: (B)**

Absolute growth rate is the change in population per unit time.

For a change ΔN in a time Δt, it is given by

$$\frac{\Delta N}{\Delta t}$$

IAPT tentative answer: (B) | **Zigyan answer:** (B)

2. 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

Solution · Q2 **Answer: (B)**

Mast cells release histamine; it is also present in tissues such as lung, liver and muscle.

Histamine widens the blood vessels, so it is a vasodilator.

IAPT tentative answer: (B) | **Zigyan answer:** (B)

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

(A) Bile duct (B) Ureter (C) Intestine (D) Bronchii

Solution · Q3 **Answer: (C)**

Folds of Kerckring are the plicae circulares, ring-like ridges on the inner wall of the small intestine.

Along with the villi, they give a much larger area for absorbing food.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

4. 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

Solution · Q4 **Answer: (C)**

The resting potential across the nerve fibre membrane is about −70 mV, so A is true.

Outside the cell, the levels of Na^+, $C\ell^-$ and HCO_3^- are high.

Inside the cell, K^+ and negatively charged proteins are high.

R states the reverse for K^+ and Na^+, so R is false.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

5. 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)

Solution · Q5 **Answer: (B)**

RLM-514, Kranti and Pusa Bold are mustard varieties: 2-(iv).

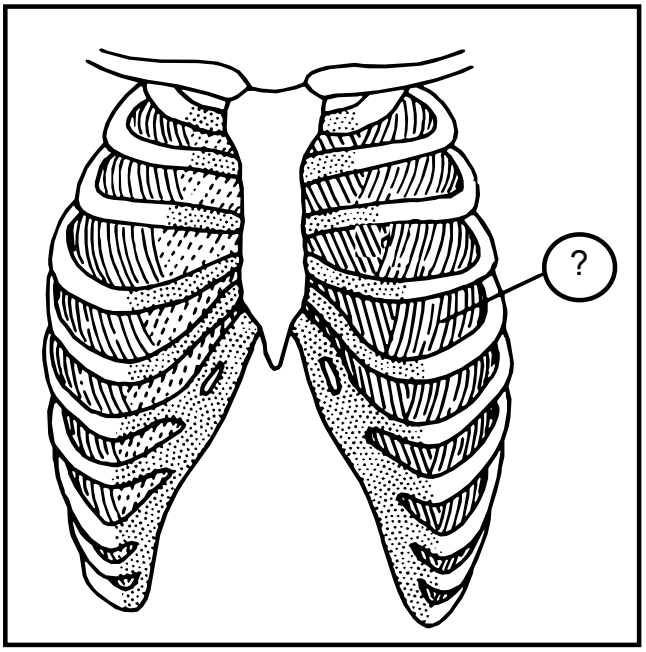
K-850, ICC-34 and BE-244 are gram varieties: 3-(i).

Ganga-5, Navjot and Vikram are maize varieties: 4-(ii).

Hence Heera, Jawahar and PNR-591 are rice varieties: 1-(iii).

IAPT tentative answer: (B) | **Zigyan answer:** (B)

6. 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.

Solution · Q6 **Answer: (D)**

The marked part is an external intercostal muscle, lying between two neighbouring ribs.

Its fibres run downwards and forwards from the upper rib to the lower rib.

On contraction, it raises the ribs upwards and outwards.

The chest cavity enlarges, which helps in breathing in.

IAPT tentative answer: (D) | **Zigyan answer:** (D)

7. 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 photosynthesis

Solution · Q7 **Answer: (C)**

Scotoactive means active in the dark: these stomata open at night and remain shut by day.

This lets the plant collect CO_2 at night while losing little water.

It is the feature of Crassulacean Acid Metabolism (CAM) plants.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

8. 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)

Solution · Q8 **Answer: (C)**

Obturator foramen belongs to the hip bone, a part of the pelvic girdle: 1-(ii).

Mental foramen is in the mandible: 2-(iii).

Foramen ovale (of the sphenoid bone) is in the skull: 3-(iv).

Foramina of Luschka are side openings in the brain, leading out of its fourth ventricle: 4-(i).

IAPT tentative answer: (C) | **Zigyan answer:** (C)

9. 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.

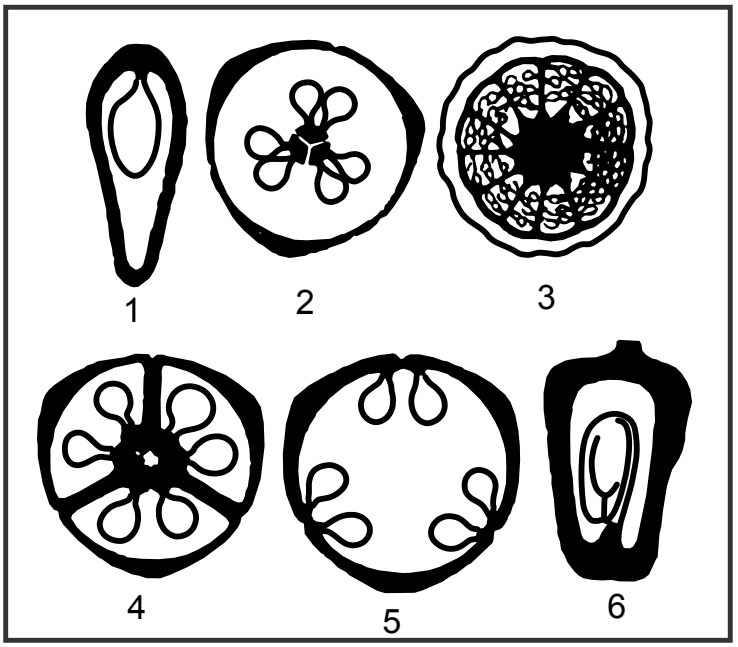
Solution · Q9 **Answer: (B)**

An antiseptic is mild enough to be put on skin, cuts and wounds to stop germs.

A disinfectant is harsher, so it is kept for lifeless things such as floors, toilets and drains.

IAPT tentative answer: (B) | **Zigyan answer:** (B)

10. 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

Solution · Q10 **Answer: (B)**

From the position of the ovules:

1 is marginal placentation: Lathyrus.

2 is free central placentation: Dianthus.

3 is superficial placentation (ovules spread over the septa): Nymphaea.

4 is axile placentation: Solanum.

5 is parietal placentation: Cucurbita.

6 is basal placentation (single ovule at the base): Tagetes.

In the order asked, the numbers are 6, 5, 4, 3, 2 and 1.

IAPT tentative answer: (B) | **Zigyan answer:** (B)

11. 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)

Solution · Q11 **Answer: (C)**

End bulbs of Krause sense cold (frigidoreceptors): 1-(iv).

End organs of Ruffini sense warmth (caloreceptors): 2-(iii).

Pacinian corpuscles sense pressure: 3-(ii).

Algesireceptors sense pain: 4-(i).

IAPT tentative answer: (C) | **Zigyan answer:** (C)

12. 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.

Solution · Q12 **Answer: (C)**

Photoautotrophs remove CO_2 from the air by photosynthesis.

All organisms, including plants, animals and decomposers, return it by cellular respiration.

Over the whole Earth these two rates are about equal, so the CO_2 level stays nearly constant.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

13. 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

Solution · Q13 **Answer: (B)**

Permanent lower canines usually erupt at about 9–10 years and upper canines at about 11–12 years.

∴ Among the given ranges, 9 to 14 years fits.

IAPT tentative answer: (B) | **Zigyan answer:** (B)

14. 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

Solution · Q14 **Answer: (A)**

In eukaryotic plants, the 60S subunit of cytoplasmic ribosomes contains 25S, 5S and 5.8S rRNA.

IAPT tentative answer: (A) | **Zigyan answer:** (A)

15. 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

Solution · Q15 **Answer: (C)**

At delivery, the baby's Rh positive red cells can enter the Rh negative mother's blood.

Injected anti-Rh antibodies destroy these cells before her immune system gets sensitised.

This protects the next Rh positive baby.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

16. 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.

Solution · Q16 **Answer: (B)**

Lenticels are pores with loosely packed cells in the periderm (bark) of woody plants.

Through them, O_2 and CO_2 are exchanged between the inner living tissues and the atmosphere.

IAPT tentative answer: (B) | **Zigyan answer:** (B)

17. 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

Solution · Q17 **Answer: (C)**

Decolourisation of bromine water indicates a C=C bond.

H_2 released with sodium indicates an –OH group:

$2R{-}OH + 2Na \rightarrow 2R{-}ONa + H_2$

$-COOH$ also gives H_2, but an ordinary carboxylic acid does not decolourise bromine water.

$\therefore$ X has both C=C and $-OH$ groups.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

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

(A) N_2O (B) NO_2 (C) SO_2 (D) SO_3

Solution · Q18 **Answer: (B)**

NO_2 reacts with water to form two acids:

$2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$

$\therefore$ NO_2 is a mixed anhydride.

IAPT tentative answer: (B) | **Zigyan answer:** (B)

19. 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

Solution · Q19 **Answer: (C)**

For $Na_2S_2O_3 \cdot 5H_2O$,

$$M = 248 \text{ g mol}^{-1}$$

$$n = \frac{24.8}{248} = 0.1 \text{ mol}$$

Oxygen atoms in one formula unit:

$$3 + 5 = 8$$

Total number of oxygen atoms:

$$N = 0.1 \times 8 \times 6.023 \times 10^{23}$$

Number of days:

$$t = \frac{0.8 \times 6.023 \times 10^{23}}{6.023 \times 10^{6}}$$

$$\Rightarrow t = 8 \times 10^{16}$$

IAPT tentative answer: (C) | **Zigyan answer:** (C)

20. 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

Solution · Q20 **Answer: (C)**

With excess chlorine, all four H atoms of methane get replaced:

$CH_4 + 4C\ell_2 \rightarrow CC\ell_4 + 4HC\ell$

$$n(CH_4) = \frac{32}{16} = 2 \text{ mol}$$

$$\Rightarrow n(HC\ell) = 4 \times 2 = 8 \text{ mol}$$

No conditions are printed, so the volume is taken at STP:

$$V = 8 \times 22.4 = 179.2 \text{ L}$$

IAPT tentative answer: (C) | **Zigyan answer:** (C)

21. 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

Solution · Q21 **Answer: (C)**

Oxidation of ethanol to acetic acid:

$C_2H_5OH + 2[O] \rightarrow CH_3COOH + H_2O$

$$n(\text{ethanol}) = \frac{92}{46} = 2 \text{ mol}$$

1 mol of ethanol gives 1 mol of acetic acid, so the theoretical mass is

$$m = 2 \times 60 = 120 \text{ g}$$

For 80% yield:

$$m = 0.80 \times 120 = 96 \text{ g}$$

IAPT tentative answer: (C) | **Zigyan answer:** (C)

22. 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

Solution · Q22 **Answer: (C)**

Taking 50% as mole per cent:

$$M(H_2O) = 18 \text{ g mol}^{-1}, M(D_2O) = 20 \text{ g mol}^{-1}$$

Average molar mass:

$$M = 0.5 \times 18 + 0.5 \times 20$$

$$\Rightarrow M = 19 \text{ g mol}^{-1}$$

IAPT tentative answer: (C) | **Zigyan answer:** (C)

23. 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) $Zn(OH)_2$

Solution · Q23 **Answer: (C)**

Zinc is amphoteric and dissolves in concentrated NaOH:

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

$\therefore$ In solution, zinc is present as sodium tetrahydroxozincate(II).

IAPT tentative answer: (C) | **Zigyan answer:** (C)

24. 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

Solution · Q24 **Answer: (C)**

A, B and C are correct matches.

D is wrong, as rusting is oxidation of iron (a combination reaction):

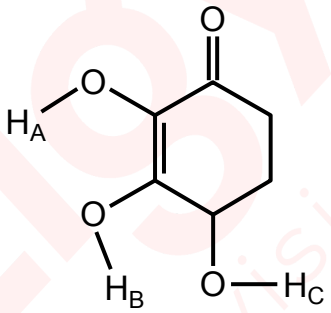
$4Fe + 3O_2 + 2xH_2O \rightarrow 2Fe_2O_3 \cdot xH_2O$

E is wrong, as formation of compost releases heat (exothermic).

∴ The incorrect matches are D and E.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

25. 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

Solution · Q25 **As per Zigyan: (B)**

Every option is written with ">" signs and is read as printed, from the strongest acid to the weakest.

A more stable anion means a more acidic hydrogen.

H_B: its anion is conjugated with C=O through C=C, so the charge reaches the carbonyl oxygen.

H_A: enolic O–H; the charge of its anion cannot reach that oxygen, though C=C and the –I effect of C=O still help.

H_C: alcoholic O–H, and its anion has no resonance.

∴ order of acidic strength:

$$H_B > H_A > H_C$$

Reference: PubChem (NIH), 'Ascorbate' (ChEBI note) and 'Ascorbic acid' (dissociation constants): in vitamin C, with a similar enediol beside a carbonyl group, the 3-OH proton leaves first (pK 4.17; next 11.57).

Check: The anion from H_C has no resonance, unlike the other two, so H_C is least acidic.

IAPT tentative answer: (B) | **Zigyan answer:** (B)

26. 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

Solution · Q26 **Answer: (C)**

The CO_2 gas puts out the flame.

I: $2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2$

(H_2 burns with a pop sound.)

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

III: $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$

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

V: $CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$

$\therefore$ CO_2 is formed only in II and IV.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

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

(A) $+2 \rightarrow +1$ (B) $+2 \rightarrow +3$ (C) $+2 \rightarrow 0$ (D) +2 only

Solution · Q27 **Answer: (D)**

Strong heating only removes the water of crystallisation.

$CuSO_4 \cdot 5H_2O \rightarrow CuSO_4 + 5H_2O$

The blue hydrated salt becomes the white anhydrous salt. No oxidation or reduction occurs.

$\therefore$ copper remains in the +2 state.

IAPT tentative answer: (D) | **Zigyan answer:** (D)

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

(A) Zn^{2+} (B) Ti^{3+} (C) Sc^{3+} (D) Ti^{4+}

Solution · Q28 **Answer: (B)**

A coloured ion needs a partly filled d subshell for a d-d transition.

Zn^{2+}: $3d^{10}$

Ti^{3+}: $3d^{1}$

Sc^{3+}: $3d^{0}$

Ti^{4+}: $3d^{0}$

$\therefore$ Ti^{3+} is coloured.

IAPT tentative answer: (B) | **Zigyan answer:** (B)

29. 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

Solution · Q29 **Answer: (B)**

Li^{+} and H^{-} are isoelectronic ($1s^2$).

The nuclear charge is +3 in Li^{+} but only +1 in H^{-}, so H^{-} holds its electrons loosely.

$\therefore$ H^{-} has the larger radius.

IAPT tentative answer: (B) | **Zigyan answer:** (B)

30. 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) $[Fe(H_2O)_6]^{2+}$

Solution · Q30 **Answer: (D)**

Spin-only magnetic moment:

$$\sqrt{n(n+2)} = 4.90$$

$$\Rightarrow n = 4$$

Unpaired electrons in each complex:

$[Cr(NH_3)_6]^{3+}$ (d^3): 3

$[Fe(CN)_6]^{4-}$ (low spin d^6): 0

$[Ni(CN)_4]^{2-}$ (square planar d^8): 0

$[Fe(H_2O)_6]^{2+}$ (high spin d^6): 4

$\therefore$ the ion is $[Fe(H_2O)_6]^{2+}$.

IAPT tentative answer: (D) | **Zigyan answer:** (D)

31. 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.

Solution · Q31 **Answer: (D)**

$Ag[AgO_2]$ contains Ag^{+} and Ag^{3+}.

Ag^{3+} is $4d^8$. In a tetrahedral arrangement it would have two unpaired electrons.

As the compound is diamagnetic, all eight electrons are paired, so Ag^{3+} is square planar (dsp^2).

Each Ag^{+} in AgO has only two O^{2-} neighbours, in a straight line.

IAPT tentative answer: (D) | **Zigyan answer:** (D)

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

(A) Cl_2 (B) CaH_2 (C) F_2 (D) None of these

Solution · Q32 **As per Zigyan: (C)**

Direct release of O_2 from water is meant.

F_2, a very strong oxidising agent, readily oxidises water to O_2.

$2F_2 + 2H_2O \rightarrow 4HF + O_2$

CaH_2 liberates hydrogen instead.

$CaH_2 + 2H_2O \rightarrow Ca(OH)_2 + 2H_2$

$C\ell_2$ reacts with water to give $HC\ell$ and $HOC\ell$, not O_2 directly.

Reference: NCERT Class XI Chemistry (Part II), Unit 7 'Redox Reactions', section 7.3.1: fluorine is so reactive that it attacks water and displaces its oxygen.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

33. 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

Solution · Q33 **Answer: (A)**

The cup is held up by the difference between the outside and inside air pressures.

Maximum weight supported:

$$W = (P_{out} - P_{in}) \times A$$

It depends on the contact area A (I) and the outside air pressure (II).

Air pressure hardly changes over the height of a room, and the roof thickness plays no part.

IAPT tentative answer: (A) | **Zigyan answer:** (A)

34. 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

Solution · Q34 **Answer: (B)**

For the first 64 m:

$$v^2 = 2 \times 2.0 \times 64$$

$$\Rightarrow v = 16 \text{ m s}^{-1}$$

$$t_1 = 16/2.0 = 8 \text{ s}$$

For the last 36 m:

$$t_2 = 36/16 = 2.25 \text{ s}$$

Average speed:

$$v_{av} = 100/(8 + 2.25) = 9.756 \text{ m s}^{-1}$$

$\therefore$ (B) is correct.

Time to reach the 50 m mark:

$$50 = (1/2) \times 2.0 \times t^2$$

$$\Rightarrow t = \sqrt{50} \approx 7.07 \text{ s}$$

Time for the last half:

$$10.25 - 7.07 = 3.18 \text{ s}$$

∴ (A) is false.

(C) is false, as the slope is zero at uniform speed.

(D) is false, as she still needs friction from the ground to keep running.

IAPT tentative answer: (B) | **Zigyan answer:** (B)

35. 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.

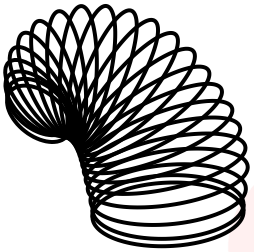


Figure (a) Metal Slinky

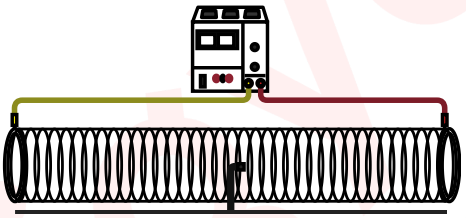


Figure (b)

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

Solution · Q35 **Answer: (A)**

Neighbouring turns of the slinky carry current in the same direction.

Parallel currents in the same direction attract each other.

∴ the turns pull together and the slinky compresses in length.

Reversing the current reverses it in every turn, so the turns still attract.

IAPT tentative answer: (A) | **Zigyan answer:** (A)

36. 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

Solution · Q36 **Answer: (D)**

A homogeneous sphere attracts as if its whole mass were at its centre, so the new diameter does not matter.

Initially:

$$F_0 = \frac{Gm^2}{r^2}$$

With the distance doubled:

$$F = \frac{Gm^2}{(2r)^2}$$

$$\Rightarrow F = 0.25\ F_0$$

IAPT tentative answer: (D) | **Zigyan answer:** (D)

37. 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

Solution · Q37 **Answer: (C)**

All three dimensions of B are double those of A.

$$\Rightarrow V_B = 8V_A$$

Same paper, so same density.

$$\Rightarrow W_B = 8W_A$$

For the largest face,

$$S_B = 4S_A$$

Pressure on the table:

$$P_B = \frac{8W_A}{4S_A} = 2P_A$$

IAPT tentative answer: (C) | **Zigyan answer:** (C)

38. 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

Solution · Q38 **Answer: (D)**

The image is real and doubly magnified.

$$m = -v/u = -2$$

$$\Rightarrow v = 2u$$

With the Cartesian sign convention,

$$u = -x,\ v = -2x$$

By the mirror formula,

$$\frac{1}{-2x} + \frac{1}{-x} = \frac{1}{-f}$$

$$\Rightarrow x = 1.5f$$

Object and image are on the same side of the mirror.

$$d = 2x - x = x$$

$$\therefore d = 1.5f$$

IAPT tentative answer: (D) | **Zigyan answer:** (D)

39. 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

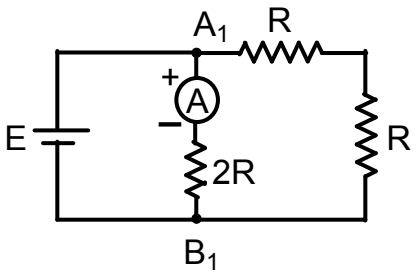


Fig (1)

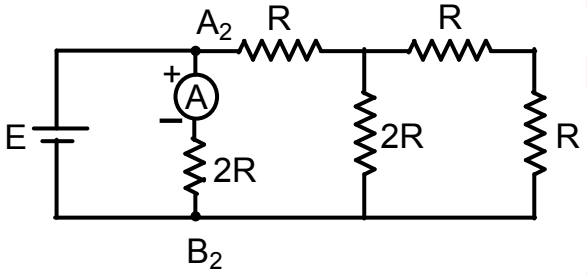


Fig (2)

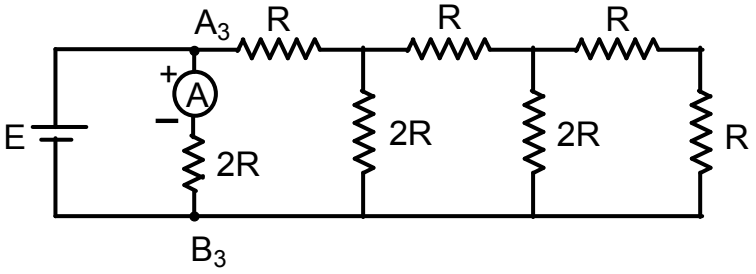


Fig (3)

(A) $I_1 > I_2 > I_3$ (B) $I_1 < I_2 < I_3$ (C) $I_1 = I_2 = I_3$ (D) $I_1 = I_2 + I_3$

Solution · Q39 **Answer: (C)**

In each circuit, branch AB is joined straight across the battery by wires of negligible resistance.

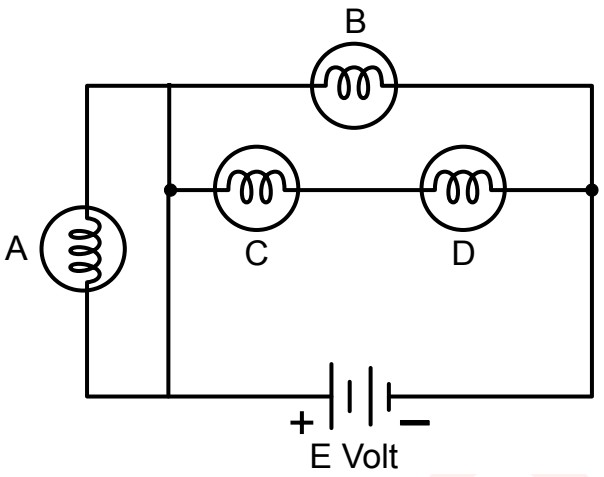
Taking the batteries as ideal, the potential difference across AB is E each time.

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

The other resistors form a separate parallel path and do not change this current.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

40. 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

Solution · Q40 **Answer: (C)**

A plain wire joins the two ends of bulb A, so A is short-circuited and never glows.

B is directly across the supply.

C and D are in series, and this pair is also across the supply.

(A) If C breaks, D also goes off. ∴ false.

(B) If D breaks, B still glows and A stays off. ∴ false.

(C) A carries no current, so breaking it changes nothing. ∴ true.

(D) If B breaks, C and D keep glowing. ∴ false.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

41. 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

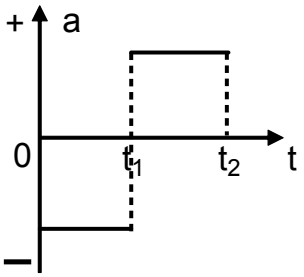
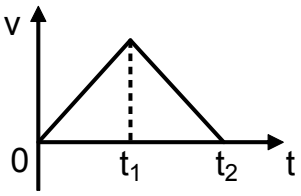
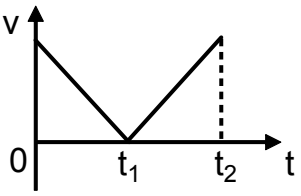


Figure (1)

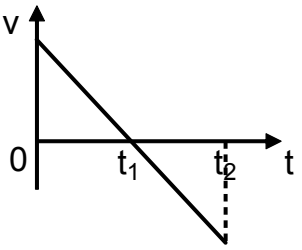
(A)



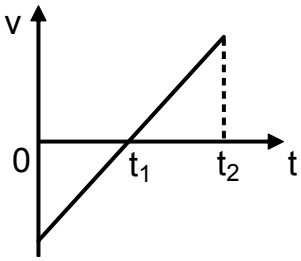
(B)



(C)



(D)



Solution · Q41 **Answer: (B)**

The slope of a v – t graph gives the acceleration.

From 0 to t_1, a is constant and negative, so v falls along a straight line.

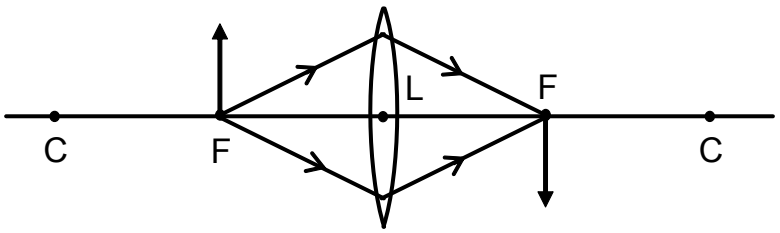
From t_1 to t_2, a is constant and positive, so v rises along a straight line.

Only graph (B) falls first and then rises.

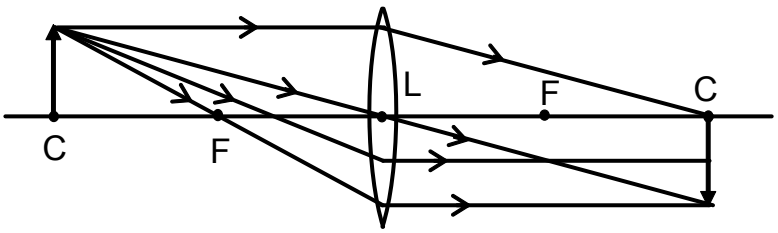
IAPT tentative answer: (B) | **Zigyan answer:** (B)

42. 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.)

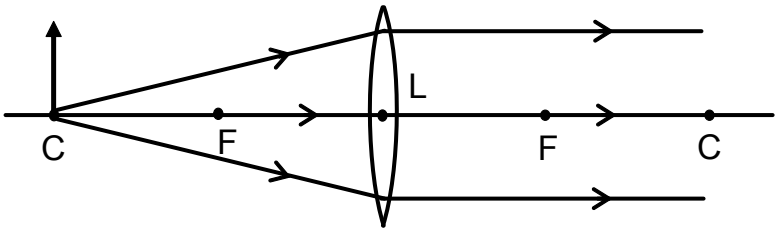
(A)



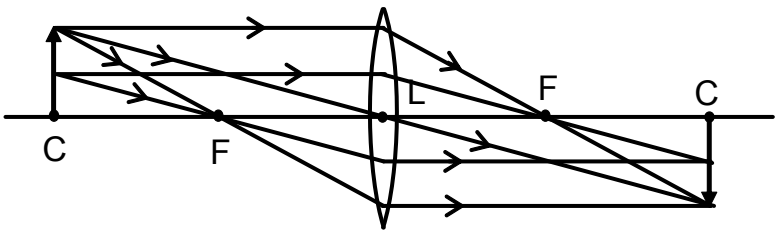
(B)



(C)



(D)



Solution · Q42 **Answer: (D)**

A ray parallel to the axis refracts through F, a ray through F emerges parallel, and a ray through L goes straight.

C is drawn at twice the distance LF, so an object at C has a real, inverted, same-size image at C.

(A) An object at F forms its image at infinity. ∴ false.

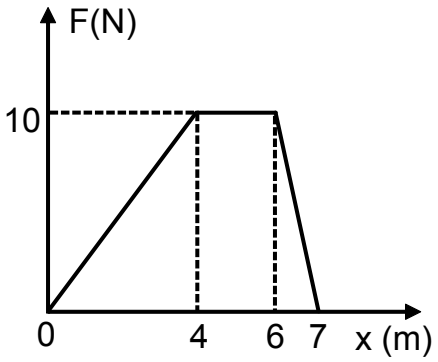
(B) The parallel ray goes to C instead of passing through F. ∴ false.

(C) Rays from an axial point leave parallel only if it is at F. ∴ false.

(D) All rays obey the rules and the image is at C. ∴ true.

IAPT tentative answer: (D) | **Zigyan answer:** (D)

43. 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 force (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

Solution · Q43 **Answer: (B)**

By the work-energy theorem, the change in kinetic energy equals the area under the F – x graph.

$$\Delta K = \frac{1}{2}\times 4\times 10 + 2\times 10 + \frac{1}{2}\times 1\times 10$$

$$\Rightarrow \Delta K = 20 + 20 + 5$$

$$\therefore \Delta K = 45\ \text{J}$$

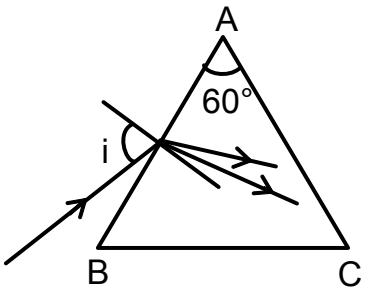
IAPT tentative answer: (B) | **Zigyan answer:** (B)

44. 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

Solution · Q44 **Answer: (A)**

The refractive index of the prism is larger for blue light than for red light.

$$n_{blue} > n_{red}$$

By Snell's law, for the same i,

$$\sin r = \frac{\sin i}{n}$$

$$\Rightarrow r_{blue} < r_{red}$$

So blue light bends more. Statement 1 is true.

Speed inside the prism:

$$v = \frac{c}{n}$$

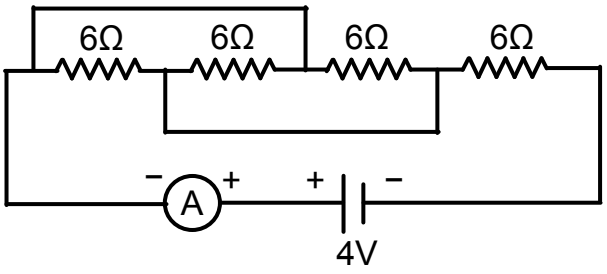
$$\Rightarrow v_{blue} < v_{red}$$

So blue light slows down more. Statement 2 is true.

IAPT tentative answer: (A) | **Zigyan answer:** (A)

45. 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

Solution · Q45 **Answer: (B)**

The top wire joins the left end of the first resistor to the point between the second and third.

The bottom wire joins the point between the first and second to the point between the third and fourth.

So the first three resistors are in parallel, and the fourth is in series with them.

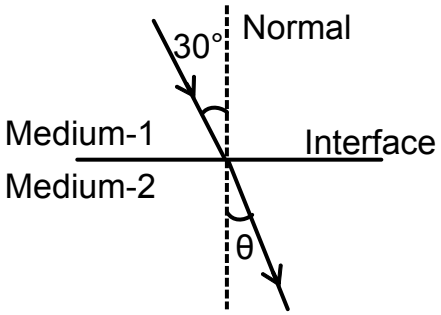
$$R = \frac{6}{3} + 6 = 8\ \Omega$$

By Ohm's law,

$$I = \frac{4}{8} = \frac{1}{2}\ A$$

IAPT tentative answer: (B) | **Zigyan answer:** (B)

46. 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}

Solution · Q46 **Answer: (B)**

By Snell's law,

$$n_1 \sin i = n_2 \sin\theta$$

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

$$\Rightarrow n_2 = \frac{5}{3}$$

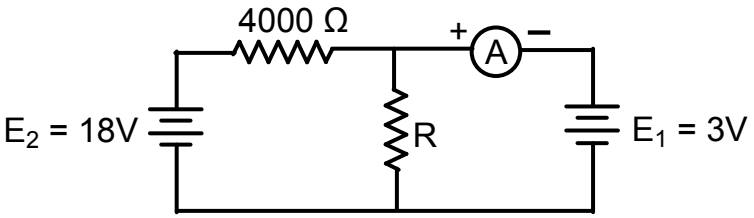
Speed in medium-2:

$$v_2 = \frac{c}{n_2} = 3 \times 10^8 \times \frac{3}{5}$$

$$\Rightarrow v_2 = 1.80 \times 10^8 \text{ m s}^{-1}$$

IAPT tentative answer: (B) | **Zigyan answer:** (B)

47. 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

Solution · Q47 **Answer: (B)**

The ammeter reads zero, so the same current flows through 4000 Ω and R.

The potential difference across R then equals E_1.

$$V_R = 3 \text{ V}$$

Current in the left loop:

$$I = \frac{18 - 3}{4000} = 3.75 \times 10^{-3}\ A$$

$$R = \frac{V_R}{I} = \frac{3}{3.75 \times 10^{-3}}$$

$$\therefore R = 800\ \Omega$$

IAPT tentative answer: (B) | **Zigyan answer:** (B)

48. 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

Solution · Q48 **As per Zigyan: (C)**

The effort is smallest when its arm is longest. With the fulcrum at one end, the stone 0.30 m from it and the effort at the other end:

Effort arm:

1.5 m

By the principle of moments,

$$F \times 1.5 = mg \times 0.30$$

$$g = 9.8\ m\ s^{-2}$$

$$\Rightarrow F \times 1.5 = 120 \times 9.8 \times 0.30$$

$$\therefore F = 235.2\ N$$

Reference: NCERT Class XI Physics (Part I), Chapter 6 'Systems of Particles and Rotational Motion', section 6.8.1: load times load arm equals effort times effort arm.

Check: The arms, 1.5 m and 0.30 m, give a mechanical advantage of 5, and 1176 N divided by 5 is 235.2 N.

IAPT tentative answer: (C) | **Zigyan answer:** (C)

PART A-2 · ONE OR MORE CORRECT OPTIONS

Q. 49 – 60 · 6 marks only if all correct options are marked · no negative marking

49. 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.

Solution · Q49 **As per Zigyan: (A), (C)**

(A) In liver cells of fasted animals, the leftover glycogen is seen along the smooth ER. ∴ true.

(B) The activating enzymes lie on the ER, outer mitochondrial membrane and peroxisomes, so mitochondria are not taken as the main site. ∴ false.

(C) In goblet cells, the Golgi complex sulphates glycoprotein to form mucigen. ∴ true.

(D) Proteins are made on free and ER-bound ribosomes, often in groups called polysomes. ∴ false.

Reference: Bronfman et al., Biochem J, 1984 (PubMed 6240978), human liver: palmitoyl-CoA synthetase activity was 60% microsomal, 21% mitochondrial and 16% peroxisomal.

Reference: Lane et al., J Cell Biol, 1964 (PubMed 14193835): in colonic goblet cells, the Golgi apparatus is where sulphation occurs. This supports (C).

Reference: NCERT Class XI Biology, Chapter 8 'Cell: The Unit of Life', section 8.4.2 (under prokaryotes): several ribosomes on one mRNA form a polysome that translates it. This is against (D).

IAPT tentative answer: (A), (C) | **Zigyan answer:** (A), (C)

50. 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.

Solution · Q50 **Answer: (B), (D)**

(A) Nokrek Biosphere Reserve (Meghalaya) lies in the Garo Hills. ∴ matches.

(B) Simlipal (Odisha) is an inland forest reserve. The largest contiguous mangrove area is the Sundarbans. ∴ does not match.

(C) Pachmarhi Biosphere Reserve (Madhya Pradesh) includes Satpura National Park. ∴ matches.

(D) Khangchendzonga lies in the Sikkim Himalaya, not in the hills south of the Brahmaputra valley. ∴ does not match.

IAPT tentative answer: (B), (D) | **Zigyan answer:** (B), (D)

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

(A) Phaeophyta (B) Pyrrophyta (C) Chlorophyta (D) Rhodophyta

Solution · Q51 **As per Zigyan: (B), (C)**

Reserve food of these algae:

(A) Phaeophyta: laminarin and mannitol. ∴ not starch.

(B) Pyrrophyta (dinoflagellates): starch and oils. ∴ correct.

(C) Chlorophyta: starch. ∴ correct.

(D) Rhodophyta: floridean starch, which is close to amylopectin and glycogen in structure and is listed apart from true starch. ∴ not counted.

Reference: NCERT Biology Class XI, Chapter 3 'Plant Kingdom', section 3.1: red algae store floridean starch, very similar to amylopectin and glycogen in structure.

IAPT tentative answer: (B), (C) | **Zigyan answer:** (B), (C)

52. 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.

Solution · Q52 **Answer: (A), (C), (D)**

(A) Drift changes allele frequencies purely by chance, in no fixed direction. ∴ true.

(B) Chance effects are strongest in small populations, not in large panmictic ones. ∴ false.

(C) By chance, any allele may be lost or fixed, whether useful or harmful. ∴ true.

(D) Founder effect and bottleneck leave a very small population, so drift becomes strong. ∴ true.

IAPT tentative answer: (A), (C), (D) | **Zigyan answer:** (A), (C), (D)

53. 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 = 1.8×10^{-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

Solution · Q53 **Answer: (A), (B), (D)**

$$n(HC\ell) = 100 \times 0.2 = 20 \text{ mmol}$$

$$n(NaOH) = n(CH_3COOH) = 100 \times 0.1 = 10 \text{ mmol}$$

NaOH first neutralises the strong acid:

$HC\ell + NaOH \rightarrow NaC\ell + H_2O$

$HC\ell$ left over:

$$20 - 10 = 10 \text{ mmol}$$

CH_3COOH remains unreacted. ∴ (A) is true.

Total volume is 300 mL. Ionisation of CH_3COOH is suppressed by $HC\ell$.

$$[H^+] = \frac{10}{300} = \frac{1}{30} \text{ M}$$

$$\Rightarrow \text{pH} = \log 30 \approx 1.48$$

∴ (B) is true.

A strong acid is in excess, so the solution is not a buffer. (C) is false.

H^+ from $HC\ell$ is 20 mmol, while OH^- is only 10 mmol. (D) is true.

IAPT tentative answer: (A), (B), (D) | **Zigyan answer:** (A), (B), (D)

54. 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) 0.1mol 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 0.1mol compared to initial

Solution · Q54 **Answer: (A), (B), (C), (D)**

$$n(CO) = \frac{5.6}{28} = 0.2 \text{ mol}$$

$$n(O_2) = \frac{6.4}{32} = 0.2 \text{ mol}$$

0.2 mol of CO needs only 0.1 mol of O_2. So CO is the limiting reagent.

O_2 left over:

$$0.2 - 0.1 = 0.1 \text{ mol}$$

$$\Rightarrow n(CO_2) = 0.2 \text{ mol}$$

$$x(CO_2) = \frac{0.2}{0.2 + 0.1} = \frac{2}{3}$$

Fall in the total moles of gas:

$$(0.2 + 0.2) - (0.2 + 0.1) = 0.1 \text{ mol}$$

$\therefore$ all four statements are true.

IAPT tentative answer: (A), (B), (C), (D) | **Zigyan answer:** (A), (B), (C), (D)

55. Which of the following are isoelectronic and isostructural?

(A) NO_3^- (B) CO_3^{2-} (C) ClO_3^- (D) SO_3

Solution · Q55 **Answer: (A), (B)**

Total number of electrons:

NO_3^-: 7 + 24 + 1 = 32

CO_3^{2-}: 6 + 24 + 2 = 32

$C\ell O_3^-$: 17 + 24 + 1 = 42

SO_3: 16 + 24 = 40

NO_3^-, CO_3^{2-} and SO_3 are trigonal planar; $C\ell O_3^-$ is pyramidal.

$\therefore$ NO_3^- and CO_3^{2-} are isoelectronic and isostructural.

IAPT tentative answer: (A), (B) | **Zigyan answer:** (A), (B)

56. 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.

Solution · Q56 **Answer: (A), (C), (D)**

(A) Potential energy of the electron:

$$U = -\frac{kZe^2}{r}$$

Smaller r gives a lower U. ∴ true.

(B) An electron does not radiate energy while it stays in a stationary orbit. ∴ false.

(C) The model works only for one-electron species like H, He^+ and Li^{2+}. ∴ true.

(D) Bohr's was the first model of the atom with quantised energy levels. ∴ true.

IAPT tentative answer: (A), (C), (D) | **Zigyan answer:** (A), (C), (D)

57. 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

Solution · Q57 **Answer: (A), (B)**

Loss of weight in water:

$$516 - 452 = 64 \text{ gf}$$

$$\Rightarrow V = 64 \text{ cm}^3$$

$$a = \sqrt[3]{64} = 4.0 \text{ cm}$$

Let the mass of copper be x gram. Taking the two volumes as additive,

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

$$\Rightarrow x = 304.58 \text{ g}$$

Mass of zinc:

$$516 - 304.58 = 211.42 \text{ g}$$

$$\Rightarrow \text{Cu : Zn} = 304.58 : 211.42 \approx 59 : 41$$

∴ (A) and (B) are true.

IAPT tentative answer: (A), (B) | **Zigyan answer:** (A), (B)

58. 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 $a_2 = -4\ ms^{-2}$

Solution · Q58 **Answer: (A), (B), (C)**

For the first 10 s:

$$100 = \frac{1}{2}a_1(10)^2$$

$$\Rightarrow a_1 = 2\ m\ s^{-2}$$

$$\Rightarrow v = 2 \times 10 = 20\ m\ s^{-1}$$

Distance covered at constant velocity:

$$20 \times 60 = 1200\ m$$

While braking:

$$0 = 20^2 + 2a_2(100)$$

$$\Rightarrow a_2 = -2\ m\ s^{-2}$$

Braking time:

$$t = \frac{20}{2} = 10\ s$$

Average speed:

$$\frac{100 + 1200 + 100}{10 + 60 + 10} = 17.5\ m/s$$

$\therefore$ (A), (B) and (C) are true.

IAPT tentative answer: (A), (B), (C) | **Zigyan answer:** (A), (B), (C)

59. 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

Solution · Q59 **Answer: (A), (C), (D)**

First echo, from the nearer hill:

$$2d_1 = 360 \times 1.5$$

$$\Rightarrow d_1 = 270 \text{ m}$$

Second echo, from the farther hill:

$$2d_2 = 360 \times (1.5 + 1.0)$$

$$\Rightarrow d_2 = 450 \text{ m}$$

$$\Rightarrow d_1 + d_2 = 720 \text{ m}$$

Third echo, after reflection from both hills:

$$t_3 = \frac{2 \times 720}{360} = 4.0 \text{ s}$$

It comes 1.5 s after the second echo, but only 2.5 s after the first.

Fourth echo, via the nearer, farther and again the nearer hill:

$$t_4 = \frac{1440 + 540}{360} = 5.5 \text{ s}$$

$\therefore$ (A), (C) and (D) are true.

IAPT tentative answer: (A), (C), (D) | **Zigyan answer:** (A), (C), (D)

60. 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.

Solution · Q60 **Answer: (A), (B), (C)**

$$P = VI = 600 \times 50 = 30000 \text{ W}$$

$$\Rightarrow P = 30 \text{ kW}$$

$$t = 45 \text{ min} = 2700 \text{ s}$$

$$E = Pt = 30000 \times 2700 = 8.1 \times 10^7 \text{ J}$$

$$\Rightarrow E = 81 \text{ MJ}$$

This takes all the supplied energy as reaching the battery.

Energy in units:

$$30 \times 0.75 = 22.5 \text{ kWh}$$

Cost of one session:

$$22.5 \times 9 = ₹202.50$$

Charge:

$$q = It = 50 \times 2700 = 1.35 \times 10^5 \text{ C}$$

∴ (A), (B) and (C) are true.

IAPT tentative answer: (A), (B), (C) | **Zigyan answer:** (A), (B), (C)

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ANSWER KEY

NSEJS 2026 · PAPER CODE 51 · IAPT TENTATIVE KEY

60
QUESTIONS · 216 MARKS

IAPT's TENTATIVE answer key for paper code 51; the final key may differ. ★ marks an answer given as per Zigyan.

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

★ Answers as per Zigyan

- **Q25** — As per Zigyan: (B); IAPT tentative key (B).
- **Q32** — As per Zigyan: (C); IAPT tentative key (C).
- **Q48** — As per Zigyan: (C); IAPT tentative key (C).
- **Q49** — As per Zigyan: (A), (C); IAPT tentative key (A), (C).
- **Q51** — As per Zigyan: (B), (C); IAPT tentative key (B), (C).

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OLYMPIADS · 2026

Olympiad results



TOP ACHIEVEMENT · CHEMISTRY

Qualified the Chemistry Olympiad twice, and selected for the HBCSE camp.

Saksham Bishnoi reached the national stage of the Chemistry Olympiad in two consecutive years and was selected for the Orientation-cum-Selection Camp at HBCSE, Mumbai. 4 Years Classroom - the same student who took AIR 168 in JEE Advanced 2026.

Qualified twice | HBCSE selection camp | Only student from Faridabad

Above MAS means above the **Minimum Admissible Score**: clearing it puts a student in the national band for their subject. It is a real threshold, not a participation marker.

CHEMISTRY · ABOVE MAS



Sulokya Bibhuty
Class XII
3 Years Classroom
Above MAS



Anay Gupta
Class XI
3 Years Classroom
Above MAS



Akshat Khator
Class XI
3 Years Classroom
Above MAS



Harshit Goyal
Class XII
4 Years Classroom
Above MAS



Hardik Sharma
Class XI
3 Years Classroom
Above MAS



Aarush Kumar
Class XII
1 Year Classroom
Above MAS

PHYSICS · ASTRONOMY · MATHEMATICS

PHYSICS



Sulokya Bibhuty
Class XII
3 Years Classroom
Above MAS

PHYSICS



Saksham Bishnoi
Class XII
4 Years Classroom
Above MAS

ASTRONOMY



Sulokya Bibhuty
Class XI
3 Years Classroom
Above MAS

MATHEMATICS · IOQM



Priyanshi
Class XI
4 Years Classroom
IOQM Qualifier

OLYMPIADS WE PREPARE STUDENTS FOR

NSEP	NSEC	NSEB	NSEA	IOQM	NSEJS
Physics	Chemistry	Biology	Astronomy	Mathematics	Class X and below

The olympiad pathway starts in Class 8.

NSEJS is open to Class 10 and below - the habit of staying with one hard problem is the one JEE Advanced rewards.

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RESULTS · 2021 – 2026

Our toppers, year by year

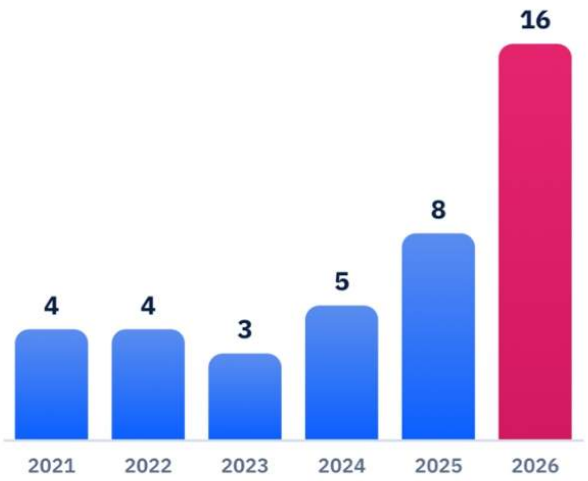
40
JEE Advanced selections in 6 years

AIR 168
best rank — Saksham Bishnoi, 2026

16 of 35
students selected, JEE Advanced 2026

14 of 35
above 98 percentile, JEE Main 2026

JEE ADVANCED SELECTIONS PER YEAR



BEST RANK EACH YEAR

YEAR	JEE ADVANCED	JEE MAIN
2026	**Saksham Bishnoi** AIR 168 · 4 Years Classroom	**Saksham Bishnoi** AIR 811 · 99.95 %ile
2025	**Chakshu** AIR 4,233 · 2 Years Classroom	**Chakshu** AIR 8,538 · 99.44 %ile
2024	**Harshit** AIR 777 · 2 Years Classroom	**Harshit** AIR 1,473 · 99.91 %ile
2023	**Aditya Jain** AIR 2,373 · 2 Years Classroom	**Aditya Jain** AIR 2,503 · 99.79 %ile
2022	**Rachit Sharma** AIR 698 · 1 Year Classroom	**Rachit Sharma** AIR 1,016 · 99.90 %ile
2021	**Sparsh Mittal** AIR 2,237 · 1 Year Classroom	**Sparsh Mittal** AIR 1,562

JEE ADVANCED 2026 — THIRTEEN NAMED SELECTIONS



Saksham Bishnoi
AIR 168
4 Years Classroom



Sulokya Bibhuty
AIR 1,315
3 Years Classroom



Aarush
AIR 2,699
1 Year Classroom



Manishka
AIR 2,869
4 Years Classroom



Oojit Kumar
AIR 5,765
4 Years Classroom



Harshit Goyal
AIR 6,407
4 Years Classroom



Pranab Sharma
AIR 6,750
3 Years Classroom



Aditya Dhar
AIR 15,183
3 Years Classroom



Arpit Anshuman
AIR 19,308
4 Years Classroom



Lokesh
AIR 22,857
3 Years Classroom



Arjun
AIR 24,674
3 Years Classroom



Sanyam Gulyani
AIR 25,123
1 Year Classroom



Saket
AIR 27,628
3 Years Classroom

Sixteen students of the 2026 batch were selected in JEE Advanced; the thirteen above are named with their All India Rank.

JEE MAIN 2026 — TOP SIX, WITH PERCENTILE



Saksham Bishnoi
AIR 811
99.95 %ile
4 Years Classroom



Sulokya Bibhuty
AIR 1,095
99.94 %ile
3 Years Classroom



Harshit Goyal
AIR 2,662
99.83 %ile
4 Years Classroom



Manishka
AIR 4,817
99.70 %ile
4 Years Classroom



Oojit Kumar
AIR 5,040
99.69 %ile
4 Years Classroom



Aarush
AIR 5,276
99.67 %ile
1 Year Classroom

14 of the 35 students in the 2026 batch scored above the 98th percentile in JEE Main.

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