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NSEJS 2026 DETAILED SOLUTION

INDIAN ASSOCIATION OF PHYSICS TEACHERS

NATIONAL STANDARD EXAMINATION IN JUNIOR SCIENCE (NSEJS) 2026

(QUESTION PAPER CODE 52)

Date : 23/11/2025 **Time : 2 : 30 PM to 4 : 30 PM** **Maximum Marks: 216**

Write the question paper code (mentioned above) on YOUR OMR Answer Sheet (in the space provided), otherwise your Answer Sheet will NOT be evaluated, Note that the same Question paper code appears on each page of the question paper.

INSTRUCTIONS

1. Use of mobile phone, smart watches, and iPad during examination is STRICTLY **PROHIBITED.**
2. In addition to this question paper, you are given OMR Answer Sheet along with candidate's copy.
3. 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.
4. On the OMR Answer sheet, use only **BLUE or BLACK BALL POINT PEN** for making entries and filling bubbles
5. Your **10-digit roll number and date of birth** entered in the OMR Answer sheet shall remain your login credentials means login id and password respectively for accessing your performance result in National Standard Examination in Junior Science 2023.
6. Question paper has two parts. In part **A1 (Q. No.1 to 48)** each question has four alternatives, out of which **only one** is correct. Choose the correct alternative (s) and fill the appropriate bubbles(s), as shown.

   Q.No.12 

   In part **A2** (**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 bubbles(s), as shown

   Q.No.52 

7. For **Part A1,** each correct answer carries 3 marks whereas 1 mark will be deducted for each wrong answer. In **Part A2,** you get 6 marks. If all the correct alternative are marked. No negative marks in this part.
8. Rough work should be done only in the space provided. There are __ printed pages in this paper.
9. Calculator is **not** allowed.
10. No candidate should leave the examination hall before the completion of the examination.
11. After submitting answer paper, take away the question paper & candidate's copy of OMR for your reference
    Please DO NOT make any mark other than filling the appropriate bubbles properly in the space provided on the OMR answer sheet.
    OMR answer sheets are evaluated using machine, hence CHANGE OF ENTRY IS NOT ALLOWED, Scratching or overwriting may result in wrong score.
    DO NOT WRITE ON THE BACK SIDE OF THE OMR ANSWER SHEET.

Name of Student :.....

Batch : .....

Enrolment No. | | | | | | | | | | | | | | | | |

INDIAN ASSOCIATION OF PHYSICS TEACHERS

NATIONAL STANDARD EXAMINATION IN JUNIOR SCIENCE (NSEJS) 2026

PAPER CODE-52

Date of Examination – 22th November, 2026

SOLUTIONS

Attempt All Sixty Questions

(NSEJS) PART : A–1

ONLY ONE OUT OF FOUR OPTIONS IS CORRECT, BUBLE THE CORRECT OPTION.

[Q.1] 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

Ans. **(b)**

Sol. **Alkene** $\rightarrow$ Reacts with Br_2/H_2O

(Test for Unsaturation).

$$CH_2 = CH_2 + Na \rightarrow CH_2 = CH^{-}Na^{+} + \frac{1}{2}H_2$$

[Q.2] Which of the following represents an anhydride for two acids?

(a) N_2O (b) NO_2 (c) SO_2 (d) SO_3

Ans. **(b)**

Sol. $NO_2 \rightarrow NO_2 + H_2O \rightarrow HNO_2 + HNO_3$

[Q.3] 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

Ans. **(c)**

Sol. 6.023×10^6 Notes/day $\quad n_0 = \frac{24.8g}{248} \times = 8 = 0.8$ mol

$$\text{No. of dyas} = \frac{0.8 \times 6 \times 023 \quad 10^{23}}{6.023 \times 10^6} = 8 \times 10^{16}$$

[Q.4] 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

Ans. **(c)**

Sol.

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

32g $\quad \downarrow$

$n = 2$ mol. $\quad 8$ mol.

$\therefore 22.4 \times 8 = 179.2$ L

[Q.5] 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

Ans. **(c)**

Sol. $C_2H_5OH + O_2 \longrightarrow CH_3\text{-}\overset{\overset{O}{\|}}{C}\text{-}O\text{-}H.$

$$C_2H_5OH + O_2 \rightarrow C_2H_4O_2 + H_2O$$

$$\downarrow \qquad \downarrow$$

$$\frac{92g}{46g/mol} = 2mol \rightarrow \quad 2mol \quad \text{Theoretical}$$

$$\text{Actual Yield} = 0.8 \times 2 = 1.6mol$$

$\therefore$ ₩ 96g

[Q.6] 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

Ans. **(c)**

Sol. $D_2O_2 \rightarrow 20, H\ O \quad 18$

$$\therefore \frac{20 \times 50 + 18 \times 50}{100} = \frac{20 + 18}{2} = 19$$

[Q.7] 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 $Na_2[Zn(OH)_2]$ (d) $Zn(OH)_2$

Ans. **(c)**

Sol.

$$Zn + NaOH \rightarrow Na_2ZnO_2 + H_2(g)$$

$$\downarrow$$

$$Na_2\left[Zn(OH)_4\right]$$

[Q.8] 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

Ans. **(c)**

Sol. (A) Burning of LPG $\rightarrow$ Exothermic √ (B) Photosynthesis $\rightarrow$ endo √

(C) Zn + HCl $\rightarrow$ Displacement √ (D) Rusting of Iron $\rightarrow$ Decompos^n ×

(E) Decompos^n of vegetable matter $\rightarrow$ endo

[Q.9] Between Li^+ and tH^- which is assumed to have larger ionic radius:

(a) Li^+

(b) H^-

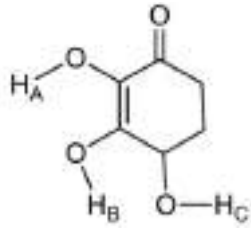
(c) Both contain two electrons and are of same size

(d) Depends upon the counter ion

Ans. **(b)**

Sol. $Li^+ < H^-$ (large ionic radius)

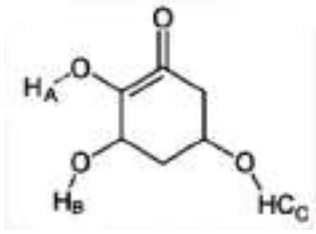
[Q.10] Arrange the hydrogens in increasing order of their acidic strength



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

Ans. **(b)**

Sol.



$H_B > H_A > H_C$

[Q.11] 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 hydroxid

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

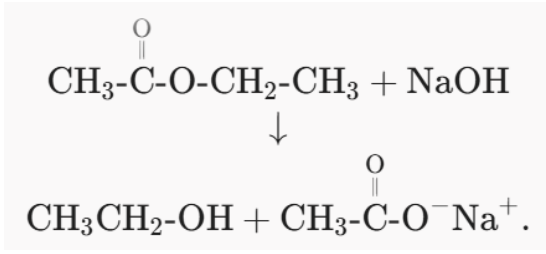
Ans. **(c)**

Sol. $C_2H_5OH + Na \rightarrow C_2H_5O^-\overset{+}{N}a \;\; \frac{1}{2}H_2\uparrow$

$CH_3COOH + Na_2CO_3 \rightarrow CH_3COO^-\overset{+}{N}a \;\; + H_2O + CO_2\uparrow$

$CH_3COOH + NaOH \rightarrow CH_3COO^-\overset{+}{N}a \;\; + H_2O$

$CH_3COOH + NaHCO_3 \rightarrow CH_3COO^-\overset{+}{N}a \;\; + H_2O + CO_2\uparrow$



[Q.12] 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

Ans. **(d)**

Sol. $CuSO_4$ Ans: +2 only

[Q.13] Which of the following metal ions is expected to be coloured?

(a) Zn^{2+} (b) Ti^{3+} (c) Sc^{2+} (d) Ti^{4+}

Ans. **(d)**

Sol. colourless $\rightarrow d^0$ / d^{10}

coloured $\rightarrow$ incomplete d subshell

$d^{10} \leftarrow Zn^{+2}$ colourless

$d^0 \xleftarrow{3} Sc^{+}$ colourless

$d^0 \xleftarrow{4} Ti^{+}$ colourless

$d^1 \xleftarrow{3} Ti^{+}$ colourrd

[Q.14] 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) $[Fe(H_2O)_6]^{2+}$

Ans. **(a)**

Sol. $\mu = \sqrt{n(n+2)}B.M$

4.9 $\therefore$ n = 3

(a)$Cr^{+3} \rightarrow 4s^0 3d^3$ | 1 | 1 | 1 |

[Q.15] 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.

(a) (b) (c) (d)

Ans. **(d)**

Sol.

$$Ag[AgO_2] \rightarrow {}_2Ag^+ + [AgO]^-$$

$$\downarrow$$

$$Ag^{+3}$$

$Ag \rightarrow 5s^1 4d^{10}$

$AG^{+3} \rightarrow 5s^0 4d^8$

Ans : Option (D) Square planar.

[Q.16] Which of the following may liberate O_2 from water?

(a) Cl_2 (b) CaH_2 (c) F_2 (d) None of these

Ans. **(c)**

Sol. $H_2O + F_2 \rightarrow HF + \frac{1}{2}O_2$

[Q.17] 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

Ans. **(a)**

Sol. The maximum weight supported by a suction cup depends on the pressure difference between atmospheric pressure and the pressure inside the cup.

The force due to pressure difference is: $F = (P_{\text{outside}} - P_{\text{inside}})A$

[Q.18] 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 9.75 $6ms^{-1}$

(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

Ans. **(b)**

Sol. Given:

Total distance = 100 m Acceleration = 2 m/s²

Initial velocity = 0 Accelerated distance = 64 m

Using the equation: $v^2 = u^2 + 2as$ $v^2 = 0 + 2(2)(64)$ $v = 16$ m/s

Time taken to cover the first 64 m: $v = u + at$ $16 = 0 + 2t$ $t = 8$ s

Remaining distance: $100 - 64 = 36$ m

Time taken for the remaining distance: $t = \frac{36}{16} = 2.25$ s Total time: $T = 8 + 2.25 = 10.25$ s

Average speed: $v_{avg} = \frac{\text{Total distance}}{\text{Total time}} = \frac{100}{10.25}$ $\boxed{v_{avg} = 9.756 \text{ m/s}}$

[Q.19] 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

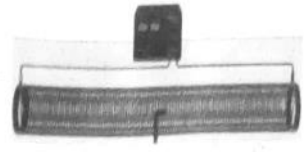


Figure (b)

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

Ans. **(a)**

Sol. When electric current passes through the insulated coils of a slinky, each adjacent turn behaves like a current-carrying conductor.

The currents in adjacent turns flow in the same direction.

According to the magnetic force between parallel current-carrying conductors:

- Currents in the same direction attract each other.

Therefore, adjacent turns attract each other and the slinky compresses.

[Q.20] 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

Ans. **(d)**

Sol. According to Newton's law of gravitation: $F_0 = \frac{GM^2}{r^2}$

The mass remains unchanged, while the distance between the centres is doubled.

Therefore, $F' = \frac{GM^2}{(2r)^2}$ $F' = \frac{GM^2}{4r^2}$ $\boxed{F' = \frac{F_0}{4} = 0.25F_0}$

The change in diameter does not affect gravitational force because the mass remains the same and the spheres are homogeneous.

[Q.21] 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

Ans. **(c)**

Sol. Let the dimensions of book A be: l, b, h

The dimensions of book B are twice those of book A: $2l, 2b, 2h$

Volume of book A: $V_A = lbh$ Volume of book B: $V_B = (2l)(2b)(2h)$ $V_B = 8lbh = 8V_A$

Since both books are made from the same paper, their density is equal.

Weight is proportional to volume: $W_B = 8W_A$

Area of the largest flat surface: $A_B = 4A_A$ Pressure is: $P = \frac{W}{A}$

Therefore, $\frac{P_B}{P_A} = \frac{8}{4} = 2$ $\boxed{P_B = 2P_A}$

[Q.22] 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

Ans. **(d)**

Sol. Given:

- Focal length = f

- Real image is doubly magnified.

For a real image: $m = -2$

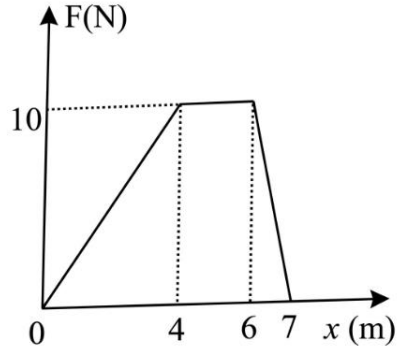
Using the magnification formula: $m = -\frac{v}{u}$ $\quad -2 = -\frac{v}{u}$ $\quad v = 2u$

Using the mirror formula: $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

Using distances as positive magnitudes: $\frac{1}{f} = \frac{1}{u} + \frac{1}{2u}$ $\quad \frac{1}{f} = \frac{3}{2u}$ $\quad u = \frac{3f}{2}$ & $v = 2u = 3f$

Separation between object and image: $d = v - u$ $\quad d = 3f - 1.5f$ $\quad \boxed{d = 1.5f}$

[Q.23] 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

Ans. **(b)**

Sol. According to the work-energy theorem: $W = \Delta K$

Work done is equal to the area under the force-displacement graph.

[Q.24] Three different circuits (1, 2 and 3) are designed using three identical batteries of equal emf E and the resistors of 2Ω and $2R\Omega$ 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_2 between A_3B_3 such that

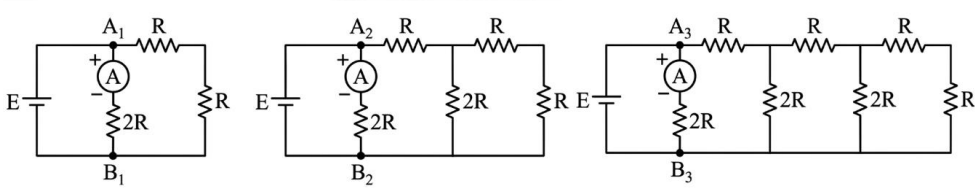


Fig (1) Fig (2) Fig (3)

(a) $I_1 > I_2 > I_3$ (b) $I_1 < I_2 < I_3$ (c) $I_1 = I_2 = I_3$ (d) $I_1 = I_2 \neq I_3$

Ans. **(c)**

Sol. In all three circuits, the ammeter is connected in series with a resistance of 2R.

The battery voltage is E, and the resistance of this branch is 2R.

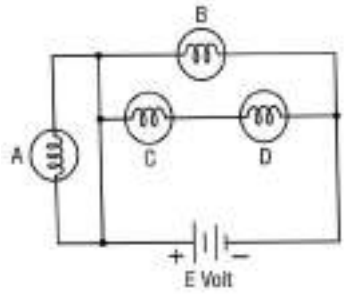
According to Ohm's law: $I = \frac{V}{R}$

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

The other resistor combinations do not change the voltage across the ammeter branch because the battery is identical.

Thus, $\boxed{I_1 = I_2 = I_3}$

[Q.25] 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

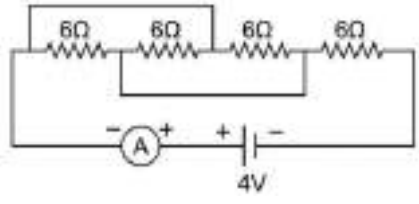
(d) If the filament of bulb B is broken, both the bulbs C and D will go off

Ans. **(c)**

Sol. Conceptual. (From broken filament, current won't pass)

[Q.26] In an experiment, four resistances of 6.0Ω 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



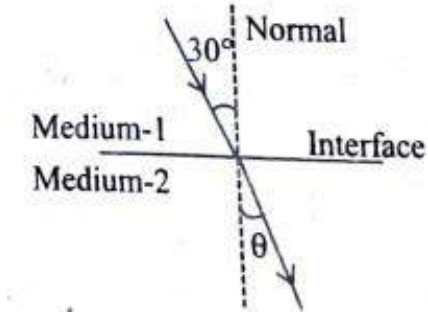
(a) $\frac{1}{6}$ amp (b) $\frac{1}{2}$ amp (c) $\frac{2}{3}$ amp (d) 2 amp

Ans. **(b)**

Sol. From potential concept, 1st three 6.0Ω resistors are in parallel. So they are 2Ω

Hence, Net equivalent is 8Ω. So $i = \frac{4}{8} = \frac{1}{2}$ amp

[Q.27] 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 $\theta = \frac{2}{5}$. 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}

Ans. **(b)**

Sol. Given: $i = 30°$ $\sin r = \frac{25}{5}$ $n_1 = \frac{4}{3}$ $c = 3 \times 10^8$ m/s

According to Snell's law: $n_1 \sin i = n_2 \sin r$

Substituting the values: $\frac{4}{3} \times \frac{1}{2} = n_2 \times \frac{2}{5}$ $\frac{2}{3} = \frac{2}{5} n_2$ Now $n_2 = \frac{c}{v}$

Therefore, $v = \frac{c}{n_2}$ $v = \frac{3 \times 10^8}{5/3}$ $v = 1.80 \times 10^8$ m/s

[Q.28] 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

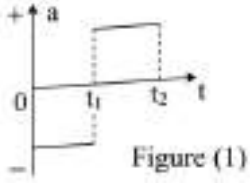
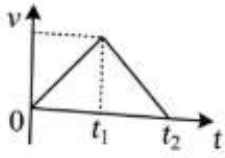
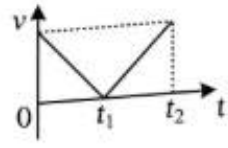
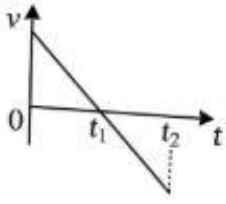
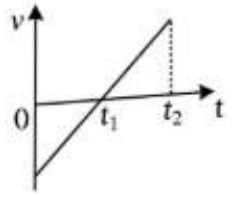


Figure (1)

(a)


(b)


(c)


(d)


Ans. **(b)**

Sol. From the acceleration-time graph on page 4:

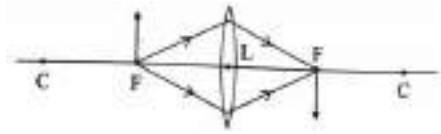
- From 0 to t_1, acceleration is negative.
- From t_1 to t_2, acceleration is positive.

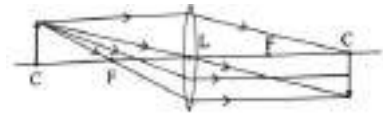
We know that: $a = \frac{dv}{dt}$

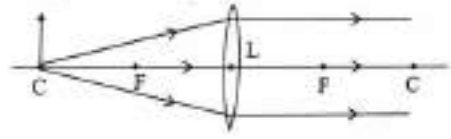
Acceleration represents the slope of the velocity-time graph.

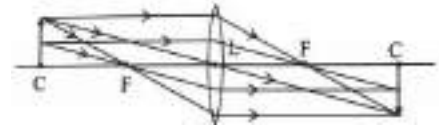
The graph that first decreases and then increases is option (b).

[Q.29] 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) 

Ans. **(d)**

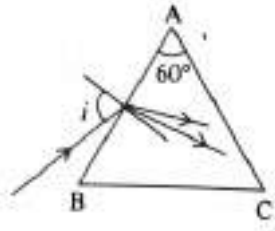
Sol. For a convex lens, when the object is placed at the centre of curvature (2F), the image is formed at the centre of curvature (2F) on the opposite side.

The characteristics of the image are:

- Position: At 2F on the opposite side.
- Nature: Real.
- Orientation: Inverted.
- Size: Same as the object.

The ray diagram in option (d) correctly represents these characteristics.

[Q.30] 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

Ans. **(a)**

Sol. Statement 1: Inside the prism, blue light bends more than red light.

This is true because the refractive index of glass is greater for blue light than for red light.

$$n_{\text{blue}} > n_{\text{red}}$$

Statement 2: Inside the prism, blue light slows down more than red light.

We know: $v = \frac{c}{n}$

Since the refractive index of blue light is greater: $v_{\text{blue}} < v_{\text{red}}$

Thus, blue light travels more slowly than red light inside the prism.

Both statements are correct.

Hence, option (a) is correct.

[Q.31] 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

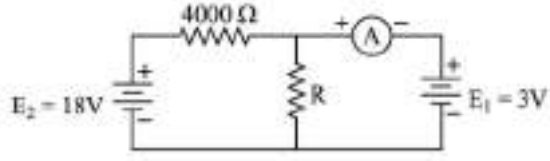
(a) 1176.4 N (b) 294.0 N (c) 235.2 N (d) 36.0 N

Ans. **(b)**

Sol. $1200 \times 0.3 = F \times (1.5 - 0.3)$

$F = 300$ N (For g = 9.8 it will be 294)

[Q.32] 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

Ans. **(b)**

Given: $E_1 = 3$ V $E_2 = 18$ V Resistance = 4000 Ω Ammeter reading = 0 A

Since the ammeter reads zero current, there is no potential difference across the ammeter.

Therefore, the potential at the junction connected to the positive terminal of the 3 V battery is 3 V relative to the common bottom wire.

Voltage across the 4000 Ω resistor: $V = 18 - 3 = 15$ V

Using Ohm's law: $I = \frac{V}{R}$ $I = \frac{15}{4000}$ $I = 0.00375$ A

The same current flows through resistance \(R\).

Voltage across R : $V_R = 3$ V

Therefor, $R = \frac{V_R}{I}$ $R = \frac{3}{0.00375}$ $\boxed{R = 800\ \Omega}$

[Q.33] 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) $\frac{\Delta t}{\Delta N}$ (d) $\frac{1}{N}\times\frac{\Delta N}{\Delta t}$

Ans. **(b)**

[Q.34] 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

Ans. **(b)**

[Q.35] Folds of Kerckring are anatomical characteristics to which of the following?

(a) Bile duct (b) Ureter (c) Intestine (d) Bronchii

Ans. **(c)**

[Q.36] 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

Ans. **(a)**

[Q.37] 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

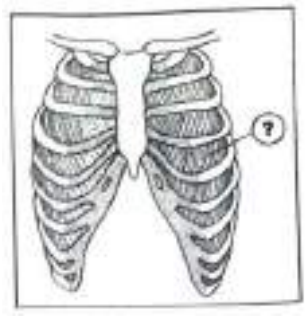
Choose the correct option:

(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)

Ans. **(b)**

[Q.38] 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.

Ans. **(d)**

[Q.39] 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

Ans. **(c)**

[Q.40] 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)

Ans. **(c)**

[Q.41] What is the difference between a disinfectant and an antiseptic?

(a) A disinfectant kills bacterial spores, while an antiseptic does not.

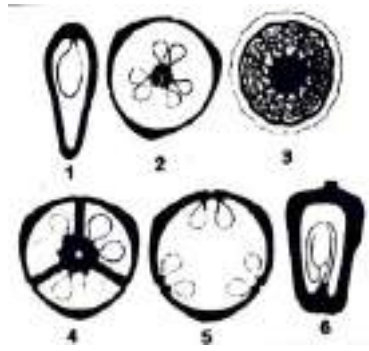
(b) A disinfectant is used on lifeless objects only, while an antiseptic is used on the skin surface.

(c) A disinfectant does not get sterilized, while an antiseptic does.

(d) Disinfectants are chemical substances, while antiseptics are not.

Ans. **(b)**

[Q.42] 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

Ans. **(b)**

[Q.43] 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)

Ans. **(c)**

[Q.44] 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.

Ans. (c)

[Q.45] 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

Ans. (b)

[Q.46] 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

Ans. (a)

[Q.47] 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

Ans. (c)

[Q.48] 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.

Ans. (b)

(NSEJS) PART : 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.

[Q.49] 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 K_a = 1.8 X 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

Ans. **(a,b,d)**

Sol.

100 ml, 0.2 M HCl

+

100 ml, 0.1 M NaOH

+

100 ml, 0.1 M $CH_3COOH\left(1.8\times10^{-5}\right)$

Ans $\rightarrow$ Option (A) Correct. HCl and CH_3COOH will be left

HCl	+	NaOH	$\rightarrow$	NaCl	+	H_2O
0.02 mol		0.01 mol		0		0
$\frac{0.01\text{ mol}}{\text{left}}$		0 mol		0.01 mol		

$V_{net} = 300$ ml 0.31

$$\therefore [HCl] = \frac{0.01}{03} = \left[\frac{1}{30}\right. = \frac{1}{3}\times10^{-1}$$

$$\therefore pH_{nearly} = 1-\log\frac{1}{3} = 1+0.48$$

$pH = 1.48$

Ans : Option (B) correct

Option (C) incorrect

Option (D) Correct

[Q.50] 50.5.6 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

Ans. **(a,b,c,d)**

Sol. $5.6\text{ g CO} + 6.4\text{ g}O_2$

	CO	+ $\frac{1}{2}O_2$	$_2\rightarrow$ CO
$t = 0$	0.2 mol	0.2 mol	0
$t = t$	0	0.1 mol	0.2 mol

$\therefore$ L.R CO, Option (A) Correct

(B) Correct

(C) $X_{CO_2} = \frac{0.2}{0.3} = \frac{2}{3}$ $\therefore$ Correct

(D) $n_{\text{Total initial}} = 0.4$ mol

$n_{\text{Total final}} = 0.3$ mol

$\therefore \Delta n = 0.1$ mol

Option (D) Correct

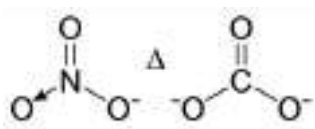
[Q.51] Which of the following are isoelectronic and isostructural?

(a) NO_3^- (b) CO_3^{2-} (c) ClO_3^- (d) SO_3

Ans. **(a,b)**

Sol.

NO_3^-	CO_3^{2-}	ClO_3^-	SO_3
$7 + 24 + 1 = 32e^-$	$^-6 + 24 + 2 = 32e$	$17 + 24 + 1(\times)$	$16 + 24 = 40$



[Q.52] 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.

Ans. **(acd)**

Sol. More near to nucleus, more –ve the potential Correct

(B) Incorrect (C) Correct (D) Correct

[Q.53] 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

Ans. **(ab)**

Sol. **Conceptual.**

[Q.54] 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}

Ans. **(abc)**

Sol. Given:

- Initial velocity u=0
- Acceleration time t_1=10 s
- Distance s_1=100 m
- Constant velocity time = 60 s
- Braking distance = 100 m

Step 1: Calculate acceleration.

Using: $s = ut + \frac{12}{a}t^2$ $100 = 0 + \frac{12}{a}(10)^2$ $100 = 50a$ $\boxed{a_1 = 2\ \text{m/s}^2}$

Step 2: Calculate final velocity after 10 seconds.

$v = u + at$ $v = 0 + 2(10)$ $\boxed{v = 20\ \text{m/s}}$

[Q.55] 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

Ans. **(acd)**

Sol. Simply use formula of distance = speed × time

[Q.56] 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.

Ans. **(abc)**

Sol. Given:

Potential difference V = 600 V Current I = 50 A

Charging time = 45 minutes Electricity cost = ₹9 per kWh

Step 1: Calculate electrical power.

We know: $P = VI$ $P = 600 \times 50$ $P = 30000$ W $\boxed{P = 30 \text{ kW}}$

Step 2: Calculate electrical energy transferred.

Time in seconds: $t = 45 \times 60 = 2700$ s

Electrical energy: $E = Pt$ $E = 30000 \times 2700$ $E = 81000000$ J $\boxed{E = 81 \text{ MJ}}$

Therefore, option (b) is correct.

Step 3: Calculate the charging cost.

Convert time into hours: $t = \frac{45}{60} = 0.75$ h

Energy in kWh: $E = 30 \times 0.75$ $E = 22.5$ kWh

Cost: Cost $= 22.5 \times 9$ $\boxed{\text{Cost} = ₹202.50}$

Therefore, option (c) is correct.

Step 4: Calculate the charge flowing through the cable.

We know: $Q = It$ $Q = 50 \times 2700$ $\boxed{Q = 135000 \text{ C}}$ $Q = 1.35 \times 10^5$ C

The given option (d) states 1×10^6 C, which is incorrect.

[Q.57] 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.

Ans. **(a,c)**

[Q.58] 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.

Ans. **(b,d)**

[Q.59] Which of the following Phyla of algae have reserve food material as starch?

(a) Phaeophyta (b) Pyrrophyta (c) Chlorophyta (d) Rhodophyta

Ans. **(b,c,d)**

[Q.60] 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.

Ans. **(a,c,d)**