141557

51

INDIAN ASSOCIATION OF PHYSICS TEACHERS

National Standard Examination in Junior Science – 2025

Date of Examination November 23, 2025

Time: 2:30 PM to 4:30 PM

Question Paper Code: 51

Student's Roll No:											

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 to Candidates:

1. Use of mobile phone, smart watch, 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 the bubbles.
5. Your **Eleven-digit roll number and date of birth** entered on 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 2025.
6. Question paper has two parts. In part A-1 (Q. No.1 to 48) each question has four alternatives, out of which **only one** is correct. Choose the correct alternative and fill the appropriate bubble, as shown.

   Q.No.12 (a) (●) (c) (d)

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

   Q.No.52 (a) (●) (c) (●)
7. Attempt all sixty questions. For **Part A-1,** each correct answer carries 3 marks whereas 1 mark will be deducted for each wrong answer. In **Part A-2,** you get 6 marks if all the correct alternatives are marked and no incorrect. No negative marks in this part.
8. Rough work should be done in the space provided. There are **16** printed pages in this question 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 the OMR for your future 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 a wrong score.

DO NOT WRITE ON THE BACK OF THE OMR ANSWER SHEET.

Instructions to Candidates (Continued) :
You may read the following instructions after submitting the Answer Sheet.

12. **Comments/Inquiries/Grievances regarding this question paper, if any, can be shared on the Inquiry/Grievance column on www.iapt.org.in on the specified format till Dec 1, 2025**

13. **The Answers/Solutions to this Question Paper will be available on the website: www.iapt.org.in by Nov 29, 2025.** The score card may be downloaded after Dec 24, 2025

14. **CERTIFICATES and AWARDS:**
Following certificates are awarded by IAPT to students, successful in the National Standard Examination in Junior Science – 2025
(i) "CENTRE TOP 10 %" To be downloaded from iapt.org.in after 30.01.26
(ii) "STATE TOP 1 %" Will be dispatched to the examinee
(iii) "NATIONAL TOP 1 %" Will be dispatched to the examinee
(iv) "GOLD MEDAL & MERIT CERTIFICATE" to all students who attend OCSC – 2026 at HBCSE Mumbai
Certificate for centre toppers shall be uploaded on iapt.org.in

15. List of students (with centre number and roll number only) having a score equal and above **Minimum Admissible Score** will be displayed on the website: **www.iapt.org.in** by **Dec 25, 2025. See the MAS** clause on the student's brochure on the web.

16. List of students eligible to appear for Indian National Junior Science Olympiad (INJSO – 2026) shall be displayed on **www.iapt.org.in** by Dec 30, 2025.

Physical constants you may need....

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

INDIAN ASSOCIATION OF PHYSICS TEACHERS
NATIONAL STANDARD EXAMINATION IN JUNIOR SCIENCE
(NSEJS – 2025)

Time: 120 minute **Max. Marks: 216**

Attempt All Sixty Questions

A – 1

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

1. Which National Park derives its name from the abundance of Red Silk Cotton Trees?
   (a) Keoladeo (b) Simlipal (c) Sunderban (d) Kaziranga

2. Some algae live as endophytes in sea-weeds. Which of the following alga is endophytic to the aquatic fern, *Azolla*?
   (a) *Sarcodia* (b) *Anabaena* (c) *Nostoc* (d) *Chondrus*

3. St. Anthony's Fire disease is caused by consumption of infected grains of rye. Which of the following is responsible for this disease?
   (a) *Candida* (b) *Aspergillus* (c) *Russula* (d) *Claviceps*

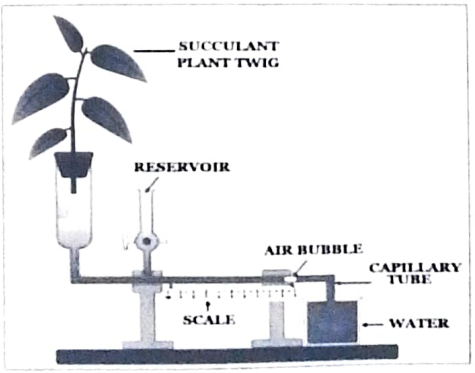
4. Given below are two statements, one labeled as Assertion (A) and the other labeled as Reason (R). Choose the correct option from the codes given below.
   Assertion (A): Each of the two strands of the original DNA molecule serves as a template for the synthesis of a new complementary strand. The result is two DNA molecules, each composed of one old (parental) strand and one new (daughter) strand.
   Reason (R): During replication, the original DNA molecule is broken into fragments and each fragment is replicated. The newly synthesized DNA fragments and the original fragments are then interspersed, resulting in both strands of the daughter DNA containing a mix of old (parental) and new (daughter) DNA segments.
   Code:
   (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

5. Who among the following is the launching leader of the Human Genome Project?
   (a) Alec Jeffreys (b) Francis Collins
   (c) Craig Venter (d) John Sulston and Bob Waterston

6. Which of the following is often referred to as the Old Man of the Jungle?
   (a) Orangutan (b) Gibbon (c) Gorilla (d) Chimpanzee

7. In the following experimental set-up, a twig of a succulent plant (*Crassula*) was inserted in the glass tube. The apparatus was kept in sun light for 6 hours. The inserted bubble will:

   (a) Move very fast to show high rate of transpiration.
   (b) Move slowly to show lower rate of transpiration.
   (c) Not move at all.
   (d) Move according to temperature of water.



8. Make the correct matches of the items M,N,O & P with (i) – (iv):

[M] International Day of Forests	(i) 22, May
[N] International Day for Biological Diversity	(ii) 29, July
[O] World Nature Conservation Day	(iii) 21, March
[P] International Tiger Day	(iv) 28, July

Choose the option showing correct matches:

(a) M- (ii), N- (iii), O- (i), P- (iv)
(b) M- (iv), N- (iii), O- (ii), P- (i)
(c) M- (iii), N- (i), O- (iv), P- (ii)
(d) M- (i), N- (iii), O- (ii), P- (iv)

9. Singly or in combination with other nucleotides, which of the following produce co-enzymes for oxidation-reduction reactions?

(a) Vitamin B2 and B5
(b) Vitamin B1 and B3
(c) Vitamin B2 and B6
(d) Vitamin B7 and B9

10. Match the characteristics (V-Z) listed in Column I with the Groups (i-v) listed under Column II:

CHARACTERISTICS	GROUPS
(V) Presence of gelatinous mesogloea.	(i) Nematoda
(W) Presence of syncytial epidermis.	(ii) Platyhelminthes
(X) Presence of parapodia.	(iii) Cnidaria
(Y) Presence of parenchymatous tissue.	(iv) Mollusca
(Z) Presence of Radula.	(v) Annelida

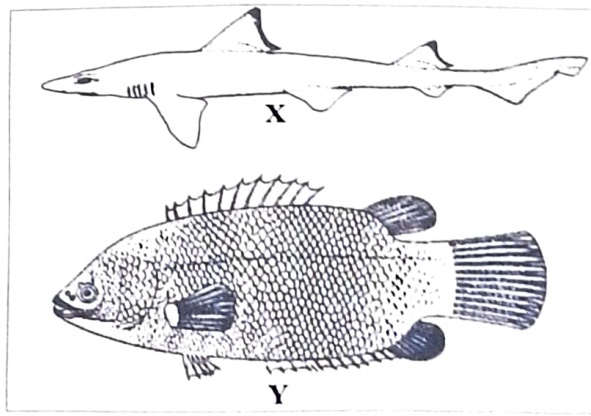
Choose the option showing the correct matches:

(a) V-iii, W-i, X-v, Y-ii & Z-iv
(b) V-iv, W-iii, X-ii, Y-i & Z-v
(c) V-i, W-ii, X-iv, Y-v & Z-iii
(d) V-v, W-iv, X-iii, Y-ii & Z-i

11. In the animal Kingdom some examples of structures (internal or external) with similar name and function are found in distantly related animals. This is a fascinating example of convergent evolution. Choose the correct option exhibiting such similarity by possessing an organ called 'CROP':

(a) *Taenia*, Prawn and Toad
(b) Earthworm, *Nereis* and *Balanoglossus*
(c) Leech, Cockroach and Bird
(d) *Ascaris*, Crab and Fish

12. Identify the animals X and Y:



Choose the correct option showing their diagnostic characteristic of scales:

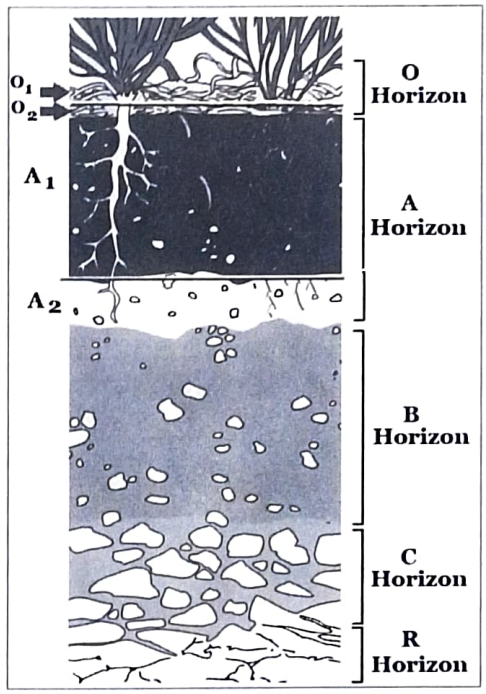
(a) X-Ctenoid Scale; Y-Cycloid Scale
(b) X-Placoid Scale; Y-Ctenoid Scale
(c) X-Ganoid Scale; Y-Cosmoid Scale
(d) X-Elasmoid Scale; Y-Placoid Scale

13. Which of the following is not only the most abundant biopolymer on earth but a Nitrogenous Polysaccharide, too?
(a) Inulin (b) Hyaluronic Acid (c) Chitin (d) Trehalose

14. The mathematical relationship called 'Fibonacci Series' is commonly observed in the arrangement of:
(a) Stipules on twig (b) Leaves
(c) Stamens (d) Flowers in an inflorescence

15. Santalin, Red Brasilin and Haematoxylin dyes are naturally found in:
(a) Alburnum (b) Rhytidome (c) Duramen (d) Phelloderm

16. Although, profiles of different types of soil differ markedly with respect to their physico-chemical and biological properties; the following diagram shows a typical hypothetical soil profile with its 5 principal horizons [O to R].



Study the given diagram. The characteristics [Q to U] related to various horizons and the names of horizons [i to v] are tabulated below:

CHARACTERISTICS	HORIZONS
(Q) Solum	(i) O2
(R) Podsolic Zone	(ii) A1
(S) Fairly decomposed matter – 'Duff'	(iii) A + B
(T) Melanized Region	(iv) A
(U) Zone of Eluviation	(v) A2

Make the correct matches of the characteristics [Q to U] with the horizons [i to v] and choose the correct option:
(a) Q-i, R-iv, S- v, T-iii, U-ii (b) Q-v, R-ii, S-iv, T-iii, U-i
(c) Q-iii, R-v, S- i, T-ii, U-iv (d) Q-ii, R-iv, S-iii, T-i, U-v

17. A mixture of hydrogen and chlorine kept in a closed flask at a constant temperature was irradiated with scattered light. After a certain time the chlorine content decreased by 20% compared with that of the starting mixture and the resulting mixture had the composition as follows: 60 volume % of chlorine, 10 volume % of hydrogen, and 30 volume % of hydrogen chloride. Determine the composition of the initial gaseous mixture

(a) $Cl_2 = 60\ \%, H_2 = 40\ \%$ (b) $H_2 = 60\ \%, Cl_2 = 40\ \%$

(c) $Cl_2 = 45\ \%, H_2 = 55\ \%$ (d) $H_2 = 25\ \%, Cl_2 = 75\ \%$

18. A research scholar requires 50 mL aqueous $NaNO_3$ solution containing 70.0 mg Na^+ per mL. The amount of $NaNO_3$ required is

(a) 0.350 g (b) 0.161 g (c) 29.75 g (d) 12.93 g

19. A sample of crystalline soda (A) with a mass of 1.287 g was allowed to react with an excess of hydrochloric acid and 100.8 mL of a gas was liberated (measured at STP). How many molecules of water in relation to one molecule of Na_2CO_3 are contained in the sample of soda?
(Relative atomic masses are: Na = 23; H = 1; C = 12; O = 16)

(a) 5 (b) 6 (c) 4 (d) 10

20. Which of the following ammonium salt, release SO_3 gas on thermal decomposition:

(I) $(NH_4)_2SO_4 \xrightarrow{\Delta}$

(II) $(NH_4)_2S_2O_8 \xrightarrow{\Delta}$

(a) I only (b) II only (c) Both (I) and (II) (d) None of these

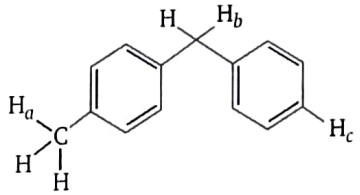
21. Which of the following group contains solid compounds at 10°C?

(a) $H_2O, NH_3\ CH_4$ (b) F_2, Cl_2, Br_2 (c) $SO_3, I_2, NaCl$ (d) Si, S_8, CH_3COCH_3

22. How many 1°-amine are possible for $C_5H_{13}N$?

(a) 6 (b) 7 (c) 8 (d) 9

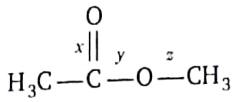
23. For the compound given below, the correct increasing order of C–H bond strength is



(a) $C-H_a > C-H_b > C-H_c$ (b) $C-H_a > C-H_c > C-H_b$

(c) $C-H_b > C-H_a > C-H_c$ (d) $C-H_c > C-H_a > C-H_b$

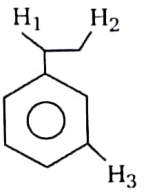
24. Consider the C–O bonds x, y and z present in the compound given below



The increasing order of C–O bond length is

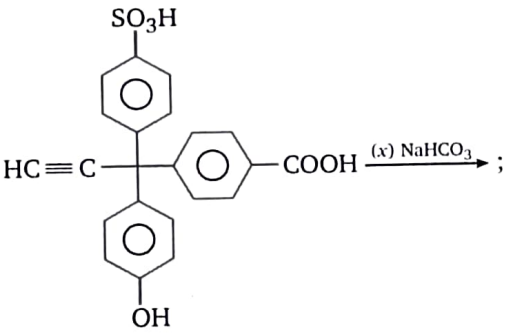
(a) $x = y = z$ (b) $x < y < z$ (c) $x < z < y$ (d) $y < x < z$

25. The correct order of the bond energy of different C–H bonds in the given compound is



(a) $C-H_1 > C-H_2 > C-H_3$
(b) $C-H_2 > C-H_1 > C-H_3$
(c) $C-H_3 > C-H_2 > C-H_1$
(d) $C-H_3 > C-H_1 > C-H_2$

26. The total number of moles of $NaHCO_3$ consumed during the given reaction is x.



The value of x is

(a) 1 (b) 2 (c) 3 (d) 4

27. If 1 mL of water contains 20 drops, the number of water molecules, in each drop of water, is (A is Avogadro number)

(a) $\frac{0.5}{18}$A (b) 0.05 A (c) 0.5 A (d) $\frac{0.05}{18}$A

28. In which of the below given sets, all types of bonds (ionic, covalent and coordinate) are present in all the molecules?

(a) HCN, HNO_3, O_3
(b) KNO_3, HNO_3, $CuSO_4 . 5H_2O$
(c) NH_4Cl, KNO_3, $CuSO_4 . 5H_2O$
(d) Both (b) and (c)

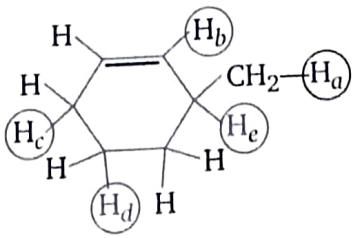
29. Which of the following C–H bonds has lowest bond dissociation energy?

(a) 3° C–H bond
(b) 2° C–H bond
(c) 1° C–H bond
(d) All have same bond dissociation energy

30. The total number of loan pair of electron in I_3^- is

(a) 2 (b) 3 (c) 6 (d) 9

31. The correct order of abstraction of hydrogen from the below given compound when treated with halogen is



(a) $e > b > c > a > d$
(b) $b > e = c > a > d$
(c) $e > c > d > a > b$
(d) $b > c > e > d > a$

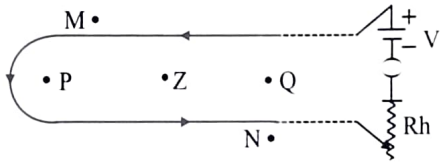
32. Which of the following will form foam in water containing Ca^{2+} and Mg^{2+} ions?
(a) Ba-stearate
(b) Na-palmitate
(c) Potassium *n*-dodecyl benzene sulphonate
(d) All of these

33. A student, intending to catch a bus on the bus stand, finds that the bus starts and accelerates away from him/her with uniform acceleration $a = 2 ms^{-2}$ when he is 16 m far from the bus. He runs fast enough with a uniform speed so as just to catch the bus. The minimum speed with which the student must run, is
(a) 2.0 ms^{-1}
(b) 4.0 ms^{-1}
(c) 8.0 ms^{-1}
(d) 16.0 ms^{-1}

34. A block of mass 2.0 kg is suspended from the ceiling by a massless string. The string is taut bearing a definite tension when the block is stationary. Suddenly, the string breaks and the block start falling freely. The difference in the tension in string just before and after it breaks is
(a) 9.8 N
(b) 19.6 N
(c) 4.9 N
(d) zero

35. Having been paddled continuously on a horizontal road, the speed of a bicycle is increasing, the force of friction exerted by the ground on the wheels is
(a) in the backward direction on both the wheels
(b) in the forward direction on both the wheels
(c) in the forward direction on the front wheel and in backward direction on the rear wheel
(d) in the backward direction on the front wheel and in forward direction on the rear wheel

36. A current i = 2 amp is established through the long straight conductors which are the arms of a hairpin like structure placed in the plane of paper as shown in the figure. Knowing that a current carrying conductor produces magnetic field represented by the lines of force, analyze the situations described

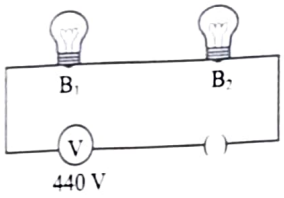


The correct option is
(a) The magnetic field at point P is directed outward, normal to the plane of paper
(b) The magnetic field at point Q is directed inward, normal to the plane of paper
(c) The magnetic field at point Z is directed normal to the line PQ in the plane of paper
(d) No magnetic field is produced outside the hair pin that is at points M & N

37. A certain water pump rated 500 watt lifts water from ground level to a height h = 10 meter at a rate of 240 kg/minute. Ignoring the kinetic energy gained by water, the efficiency of water pump is
(a) 74.8 %
(b) 78.4 %
(c) 84.7 %
(d) 87.4 %

38. An electric kettle consists of two filaments F_1 and F_2 of different resistances R_1 and R_2 respectively, connected in parallel with separate switches. With a certain fixed amount of water in the kettle pot to prepare the tea, when only F_1 is switched on, it takes 4 minute to boil the water. When F_1 and F_2 both are switched on simultaneously, it takes 3 minute to boil the same amount of water up to the same temperature. The time taken to boil the same amount of water when only F_2 is switched on (assume that entire heat radiated by filaments is used in boiling the water starting from the same room temperature in each case) is
(a) 7.0 min
(b) 8.4 min
(c) 9.6 min
(d) 12.0 min

39. Two filament bulbs B_1 (100 W, 220 V) and B_2 (60W, 220 V) are connected in series with a 440 V supply voltage source as shown. When switched on, the bulb



(a) B_1 will fuse: B_2 will not fuse
(b) B_1 will not fuse: B_2 will fuse
(c) B_1 and B_2 both will fuse at the same instant
(d) B_1 and B_2 both will not fuse

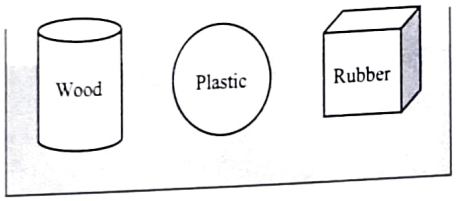
40. The volume of water, spilled out of a completely filled cubic container of side 4 m when the container has been accelerated horizontally with 1.96 m s^{-2}, is

(a) 0 (b) 12.8 m^3 (c) 6.4 m^3 (d) 3.2 m^3

41. Two athletes, A and B, run in the ground on an oval track of length L (say) at 8.0 m/s and 6.0 m/s respectively in the same direction starting from same initial point. How many laps (rounds) will the athlete A complete on the track before overtaking athlete B for the first time?

(a) 2 (b) 3 (c) 4 (d) 5

42. A wooden solid cylinder (density 0.80 kg m^{-3}), a plastic ball (density 0.90 kg/m^3) and a rubber cube (density 0.95 kg m^{-3}) all of equal mass M float partly immersed in a trough containing water (density 1.00 kg/m^3) as shown below (ignore any tilt during floatation)

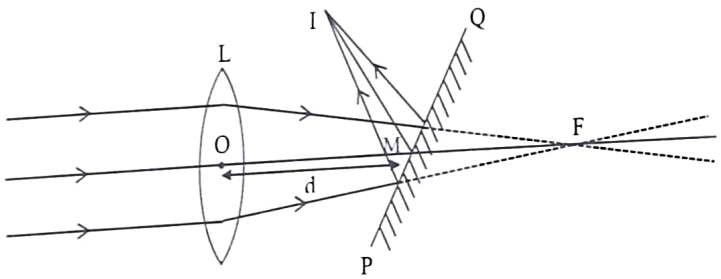


You may conclude that
(a) The buoyant force is largest on the wooden cylinder
(b) The buoyant force is largest on the Plastic ball
(c) The buoyant force is largest on the rubber cube
(d) The buoyant force is equal on all the three

43. A stone is thrown vertically down into a well, the splash is heard after a time t_1. If the stone is thrown vertically up with the same speed from the same point, the splash is heard after a time t_2. The common initial speed (u) of the stone in both the cases is given by (the time taken by the splash sound to reach the observer is ignored)

(a) $u = g(t_2 - t_1)$ (b) $u = g(t_2 + t_1)$ (c) $u = \frac{1}{2} g(t_2 + t_1)$ (d) $u = \frac{1}{2} g(t_2 - t_1)$

44. A beam of light is incident parallel to principal axis on a convex lens (L) of focal length f = 20 cm. A plane mirror PQ (See figure), inclined at 60° with the principal axis, is placed a distance 'd' behind the lens so as to form a real image I of the distant object at a distance 'd' from the optical center of the lens as shown in the figure. The value of 'd' is



(a) 5 cm (b) 10 cm (c) 15 cm (d) 20 cm

45. A 80 kg man skating with a speed of 10 m/s on a smooth horizontal surface collides with a 20 kg skater at rest, as a result the two cling to each other. What percentage of initial kinetic energy of skaters is lost during the collision? (Ignore any friction)

(a) 12 % (b) 18 % (c) 20 % (d) 25 %

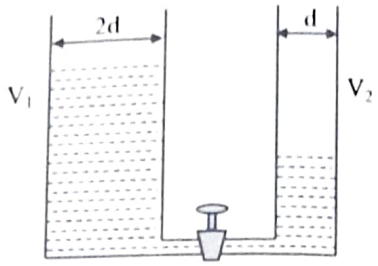
46. Two cylindrical vessels V_1 and V_2 are placed on the same horizontal level. Each vessel contains the same liquid of density ρ. Initially the vessels are not connected (valve closed). The height of liquid in vessel V_1 is h_1 and that in vessel V_2 is h_2. The diameter of vessels V_1 and V_2 are 2d and d respectively. When vessels are interconnected (valve opened) at the bottom, the height h of liquid in each vessel (neglecting the volume of liquid in connecting tube) will be

(a) $\frac{2h_1 + h_2}{3}$

(b) $\frac{4h_1 + h_2}{5}$

(c) $\frac{h_1 + h_2}{2}$

(d) $\frac{h_1 + 2h_2}{4}$



47. Two vertical object pins are located on the principal axis of a thin lens at distances of $x_1 = 9.0\,\text{cm}$ and $x_2 = 18.0\,\text{cm}$ from the lens on the two sides of the lens. The images of the two pins formed by the lens are at the same position (overlap). The focal length and the nature of the lens are

(a) 15 cm, convex (b) 12 cm, convex (c) 15 cm, concave (d) 12 cm, concave

48. A steam boat goes across a lake up to a distance of 1200 meter and comes back. There is a uniform wind blowing with velocity v so as to help the onward journey and to impede the journey back. If the uniform speed of launch of the boat is 5 ms^{-1} and total time taken by the boat in going and coming back is 500 s, the velocity v of the wind blow is

(a) 0.6 ms^{-1} (b) 0.8 ms^{-1} (c) 1.0 ms^{-1} (d) 1.2 ms^{-1}

A – 2

ANY NUMBER OF OPTIONS (4, 3, 2 or 1) MAY BE CORRECT

MARKS WILL BE AWARDED ONLY IF ALL THE CORRECT OPTIONS ARE BUBBLED AND NO INCORRECT.

49. Fine structure of striated muscle fibres has been elucidated with the help of electron microscope. Study the following statements and choose the **incorrect** ones:
    (a) The dark and light bands of myofibrils have been respectively, named as 'A' [Anisotropic under polarized light] and 'I' [Isotropic under polarized light] bands.
    (b) The 'A' bands contain about 120Å thick and 18Å long actin filaments.
    (c) Each 'I' band is divided into two equal halves by a thin, fibrous and transverse zig-zag partition called 'Z' band.
    (d) The major middle lighter region of 'A' band is called 'M' zone

50. The autonomic nervous system is divided into two parts- [A] Sympathetic and [B] Parasympathetic. Some effects of these systems are given below, respectively. Choose the correct option(s)
    (a) Pupil constricts; Glycogen converted into glucose
    (b) Salivation decreases; Bladder constricts
    (c) Adrenaline released; Glucose converted into glycogen
    (d) Bronchii constrict; Gastric activity stimulated

51. Study the following statements regarding Haemophilia and choose the incorrect option(s)
    (a) It follows criss-cross pattern of inheritance
    (b) It is a Y-linked dominant trait
    (c) It is common in women but rare in man
    (d) It is also called royal disease

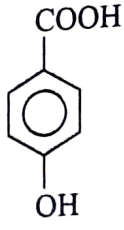
52. Which of the following trees does/do not show cheiropterophily?
    (a) Sausage tree (b) Kadamb (c) Coral tree (d) Silk Cotton

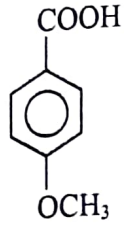
53. The pair(s) of elements which has/have equal number of electrons in the outer most shell is/are
    (a) Na, Sr (b) Se, Te (c) Mn, Fe (d) As, Bi

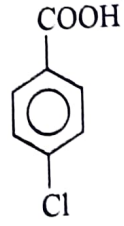
54. The correct statement(s) is/are
    (a) pH of 10^{-8} NaOH is 8
    (b) pH of 10^{-8} HCl is < 7
    (c) Aqueous solution of $FeCl_3$ is acidic
    (d) NaH_2PO_2 will react with NaOH to form Na_2HPO_2

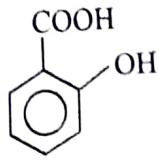
55. Considering the H-spectrum series, select the correctly matched pair(s)
    (a) Balmer: $n_2 > 2$
    (b) Pfund: $\frac{1}{\lambda} = R\left[\frac{1}{3^2} - \frac{1}{n^2}\right]$
    (c) Humphery: $n_1 > 6$
    (d) Paschen: IR region

56. Which of the following acids are stronger than benzoic acid?

    (a) 

    (b) 

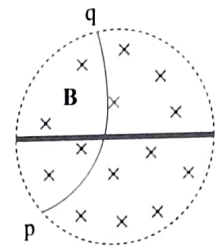
    (c) 

    (d) 

57. A trolley of mass 240 kg is initially at rest on the frictionless horizontal straight rails lying in east-west direction. The length of the trolley is 20 meter. A man of mass 60 kg is standing at the eastern end of the trolley. The man starts moving on the trolley from eastern end towards west with velocity 1.0 m/s relative to the trolley. Assume the displacement and the velocity in eastward direction to be positive.
Choose the correct option.

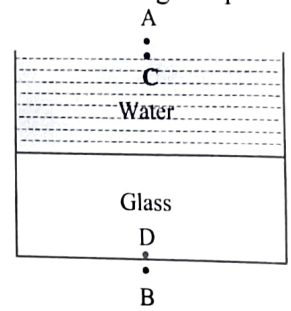
(a) The velocity of man relative to ground is $-1\ ms^{-1}$
(b) The recoil velocity of the trolley relative to ground is $+ 0.2\ ms^{-1}$
(c) The man reaches from one end of trolley to other end in time t = 20 s
(d) Displacement of trolley over the ground when the man reaches the other end of trolley is + 4.0 m.

58. In an experiment performed using a cloud chamber (a device that can show the tracks of subatomic particle) the nature of a particle can be analysed. Under the influence of a strong perpendicular magnetic field **B** directed into the plane of paper, a particle track like the one shown beside as p q was obtained. The track shown may depict



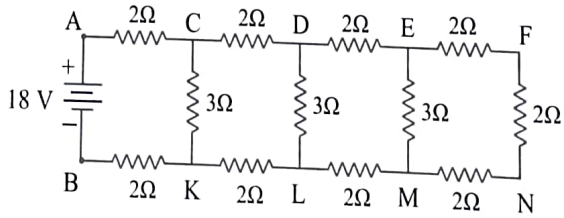
(a) a proton (charge + e) moving from point p to q
(b) an alpha particle (charge + 2e) moving from point p to q
(c) an electron (charge − e) moving from point q to p
(d) a neutron (charge zero) moving from point p to q

59. A homogeneous column of water $\left({}_a\mu_w = \frac{4}{3}\right)$ of height 8.0 cm fills the space above a 9.0 cm thick glass $\left({}_a\mu_g = \frac{3}{2}\right)$ slab. Observers A and B are in air just outside the top and the bottom whereas the observers C and D are inside just below the top and above the bottom. The total thickness of glass plus water observed by these observers are



(a) Observer A measures it as 12.0 cm
(b) Observer B measures it as 12.0 cm
(c) Observer C measures it as 16.0 cm
(d) Observer D measures it as 18.0 cm

60. Several resistances of 2Ω and 3Ω are used to form a typical electric network as shown in the figure below. A dc supply of emf 18 volt and negligible internal resistance has been connected between points A and B.



Choose the correct option(s)

(a) Total resistance between A and B is 6 Ω
(b) The power consumed in the network is 60 W
(c) The current through resistance of 2Ω on the branch AC is 3A
(d) The current through resistance of 3Ω in the branch CK is 2A