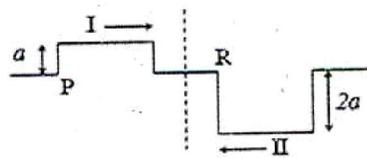


**INDIAN ASSOCIATION OF PHYSICS TEACHERS**  
**NATIONAL STANDARD EXAMINATION IN JUNIOR SCIENCE (NSEJS) 2017 – 18**  
**Question Paper Code: JS534**  
**Held on: November 19, 2017**

1. Two wave pulses I and II have the same wavelength. They are travelling in the directions as shown by the single headed arrows. The resultant sketch of the two wave pulses at some instant of time when P coincides with R is \_\_\_\_\_.

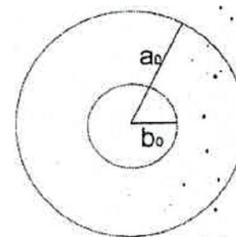


- (a) (b)
- (c) (d)

2. The equivalent resistance of two resistance in series is 'S'. These resistances are now joined in parallel. The parallel equivalent resistance is 'P'. If  $S = nP$ . Then the minimum possible value on 'n' is

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

3. A copper disc of radius  $a_0$  has a hole of radius  $b_0$  at the centre, at  $0^\circ\text{C}$ . The disc is now heated and maintained at  $200^\circ\text{C}$ . The new radii of disc and hole are  $a_t$  and  $b_t$  respectively. For the heated disc it can be concluded that:

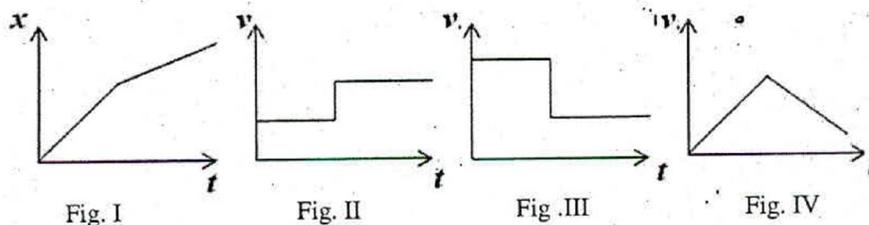


- (a)  $a_0 < a_t$ ,  $b_0 > b_t$  and density of disc increases.  
(b)  $a_0 < a_t$ ,  $b_0 > b_t$  and density of disc decreases.  
(c)  $a_0 < a_t$ ,  $b_0 < b_t$  and density of disc increases.  
(d)  $a_0 < a_t$ ,  $b_0 < b_t$  and density of disc decreases.
4. A liquid, whose density doesn't change during the motion, is flowing steadily through a pipe of varying cross sectional areas as shown in the adjacent figure. If  $a_1$ ,  $a_2$  are the cross sectional areas,  $v_1$ ,  $v_2$  are the values of velocities (or speeds) at L and H respectively, then the correct relation between  $a_1$ ,  $a_2$  and  $v_1$ ,  $v_2$  is:



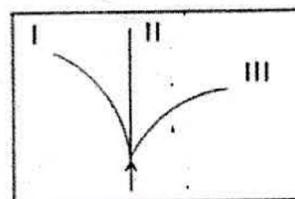
- (a)  $a_1 v_1 = a_2 v_2$  (b)  $a_1 v_2 = a_2 v_1$   
(c)  $a_1^2 v_2 = a_2^2 v_1$  (d)  $a_1 v_1^2 = a_2 v_2^2$
5. A common hydrometer has a uniform scale and its stem is graduated downward from 0 to 20. While floating in water, it reads 0 and while floating in a liquid of density  $1.40 \text{ g/cm}^3$ , it reads 20. Then the density of the liquid in which it will read 10 is \_\_\_\_\_.
- (a)  $0.7 \text{ g/cm}^3$  (b)  $0.85 \text{ g/cm}^3$   
(c)  $1.17 \text{ g/cm}^3$  (d)  $2.8 \text{ g/cm}^3$

6. A boy throws a steel ball straight up. Consider the motion of the ball only after it has left the boy's hand but before it touches the ground and assume that forces exerted by the air are negligible. For these conditions, the force(s) acting on the ball is (are):
- a downward force of gravity along with a steadily decreasing upward force.
  - a steadily decreasing upward force from the moment it leaves the boy's hand until it reaches its highest point on the way down there is a steadily increasing downward force of gravity as the object gets closer to the earth.
  - constant downward force of gravity along with an upward force that steadily decreases until the ball reaches its highest point on the way down there is only a constant downward force of gravity.
  - constant downward force of gravity only.
7. In bringing a  $\alpha$ -particle towards another  $\alpha$ -particle, the electrostatic potential energy of the system \_\_\_\_\_ .
- increases
  - decreases
  - remains unchanged
  - becomes zero
8. An empty office chair is at rest on a floor. Consider the following forces:
- A downward force of gravity.
  - An upward force exerted by the floor.
  - A net downward force exerted by the air.
- Then, which of the force(s) is (are) acting on the office chair?
- I only
  - I and II
  - I, II and III
  - none of the forces. (Since the chair is at rest there are no forces acting upon it.)
9. If  $x$ ,  $v$  and  $t$  represent displacement (m), velocity (m/s) and time (s) respectively for a certain particle then which pair of the following figures can be best correlated to each other:



- I and II
  - I and III
  - I and IV
  - none
10. In rural areas, an indigenous way of keeping kitchen materials cool is to put them in a box and wrap the box with wet blanket; the blanket is kept wet as tap is allowed to drip in to its corner. Choose the correct statement:
- This method works because the water from the tap is cold. If one uses room temperature water, it will not work.
  - Method will work only if the box is a bad conductor of heat. If one uses tin box, it will not work.
  - Method doesn't work.
  - This method works because the latent heat necessary for evaporation of water in the blanket is taken from the box so the box and its content remain cool.

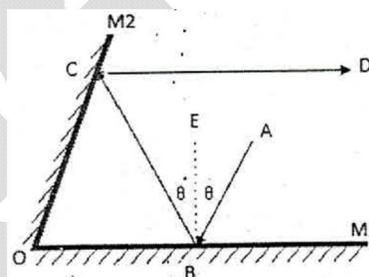
11. An electron and  $\alpha$ -particle enter a region of uniform magnetic field ( of induction B) with equal velocities. The direction of B is perpendicular and into the plane of the paper. Then qualitatively identify the direction of paths of electron and the  $\alpha$ -particle.



- (a) I for  $\alpha$ -particle, III for electron  
 (b) I for electron, II for  $\alpha$ -particle  
 (c) I for  $\alpha$ -particle, II for electron  
 (d) I for electron, III for  $\alpha$ -particle
12. A concave mirror of radius of curvature 1 m is placed at the bottom of a water tank. The mirror forms an image of the sun when it is directly overhead. If the depth of water in the tank is 80 cm, then the distance of the image formed is \_\_\_\_\_ . (refractive index of water is 1.33)

- (a) 50 cm above mirror  
 (b) on surface of water  
 (c) 110 cm above mirror  
 (d) image cannot be formed

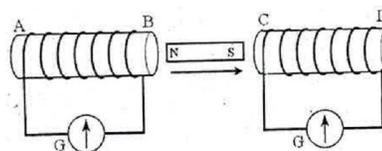
13. As shown in adjacent figure, two plane mirrors M1 and M2 are inclined to each other at an angle  $70^\circ$  (angle M1OM2). Incident ray AB makes an angle of incidence  $\theta$  on M1. This ray after reflection at B on M1 and further at C on M2 travels along the direction CD, such that path CD is parallel to M1. Then angle  $\theta$  is \_\_\_\_\_ .



- (a)  $45^\circ$   
 (b)  $50^\circ$   
 (c)  $55^\circ$   
 (d)  $60^\circ$
14. For the same angle of incidence, the angle of refraction in three different media A, B, C are  $15^\circ$ ,  $25^\circ$  and  $35^\circ$  respectively. Then which statement is correct? ( $\mu_A$  is refractive index of A).
- (a)  $\mu_A$  is maximum and velocity of light is minimum in medium A.  
 (b)  $\mu_A$  is minimum and velocity of light is maximum in medium A.  
 (c)  $\mu_A$  is maximum and velocity of light is maximum in medium A.  
 (d)  $\mu_A$  is minimum and velocity of light is minimum in medium A.

15. A large truck collides head-on with a small compact car. During the collision:
- (a) the truck exerts a greater force on the car than the car exerts on the truck.  
 (b) the car exerts a greater force on the truck than the truck exerts on the car.  
 (c) the truck exerts a force on the car but the car does not exert a force on the truck.  
 (d) the truck exerts the same force on the car as the car exerts on the truck.

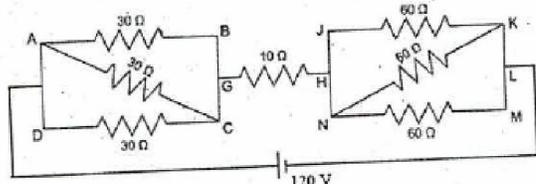
16. A magnet is placed between two coils AB and CD as shown. It is being moved in the direction as shown by the arrow, then which of the following statements is correct:



- (a) looking from end A, current in coil AB will be anticlockwise and looking from end D, the direction of current in coil CD will be clockwise.  
 (b) looking from end A, current in coil AB will be clockwise and looking from end D, the direction of current in coil CD will be clockwise.  
 (c) looking from end A, current in coil AB will be clockwise and looking from end D, the direction of current in coil CD will be anticlockwise.  
 (d) looking from end A, current in coil AB will be anticlockwise and looking from end D, the direction of current in coil CD will be anticlockwise.

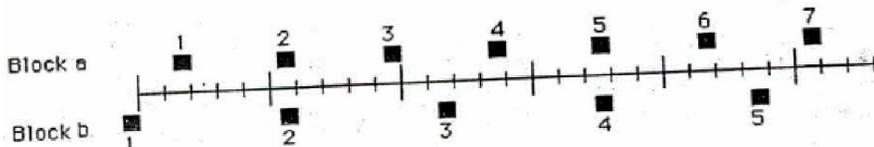
17. The ability of eye to focus both near and distant objects, by adjusting its focal length, is called  
 (a) Myopia (b) Presbyopia  
 (c) accommodation of eye (d) Tyndall effect
18. The take-off speed of Airbus A340 is 288 km/hr. From the taxi track it comes to the main runway and waits for a while for the final clearance from Air Traffic Control. The aircraft then achieves this speed within 50 seconds. Neglecting the effect of the wind direction and friction, what should be the minimum length of main runway decided by civil engineers for this aircraft for a take-off?  
 (a) 1800 m (b) 2000 m  
 (c) 2200 m (d) 2400 m

19.



In the adjacent circuit what is the current flowing from N to K?

- (a) 3 A (b) 2 A  
 (c) 1 A (d) 0.5 A
20. The position of two blocks at successive 0.20 – second time interval are represented by the numbered squares in the figure below. The blocks are moving towards right.



The accelerations of the blocks are related as follows:

- (a) acceleration of 'a' is greater than acceleration of 'b'  
 (b) acceleration of 'a' equals acceleration of 'b'. Both accelerations are greater than zero.  
 (c) acceleration of 'b' is greater than acceleration of 'a'  
 (d) acceleration of 'a' equals acceleration of 'b'. Both accelerations are zero
21. Panting is a means of thermoregulation in dogs. This is due to:  
 (a) high specific heat of water (b) high vapour pressure of water  
 (c) high specific gravity of water (d) high latent heat of vapourization
22. In a dihybrid cross, what is the proportion of organisms with dihybrid genotype?  
 (a) 2/16 (b) 6/16  
 (c) 4/16 (d) 9/16
23. A mammal adapted to desert conditions is likely to have large  
 (a) Nostrils (b) Muzzle  
 (c) Pinnae (d) Nails
24. If a flower is producing a large number of minute and smooth pollen, the agency for cross pollination is most likely to be:  
 (a) Bats (b) Water  
 (c) Insects (d) Air

25. When heated, the hydrogen bonds between the complementary strands of DNA break and the 2 strands separate in a process called melting. Which of the following pieces of DNA will require maximum temperature for melting?
- (a) 3' AAGGTATACAAT 5'  
5' TTCCATATGTTA 3'
- (b) 3' ACGTCCGCTGCG 5'  
5' TGCAGGCGACGC 3'
- (c) 3' GAGCUAUCCGAG 5'  
5' CUCGAUAGGCUC 3'
- (d) 3' ATTAGCTAGCAA 5'  
5' TAATCGATCGTT 3'
26. A plant may not exchange CO<sub>2</sub> or O<sub>2</sub> with air at:
- (a) twilight  
(b) mid – light  
(c) late hours in the morning  
(d) noon
27. Metamerism is a characteristic of
- (a) Hirudinaria  
(b) Taenia  
(c) Asterias  
(d) Pila
28. What would be the minimum required length of codon to encode 400 amino acids, if there existed three purines and pyrimidines each?
- (a) 6  
(b) 5  
(c) 4  
(d) 3
29. During a study the number of cells was recorded to increase as follows:  
64 → 128 → 256 → 512 → 1024. This represents
- (a) Budding  
(b) Meiosis  
(c) Binary fission  
(d) Fragmentation
30. Which amongst the following shows the characters of both plants and animals  
i. Anabaena ii. Paramecium iii. Euglena iv. Amoeba
- (a) i and iv  
(b) iii  
(c) ii  
(d) i and iii
31. If the cell is using less oxygen molecules than the molecules of carbon dioxide evolved in respiration, the substrate for respiration has to be:
- (a) simple sugars  
(b) organic acids  
(c) fatty acids  
(d) cholesterol
32. Which of the following features indicates omnivorous feeding of human species?
- (a) Presence of canines as well as premolar and molars  
(b) Presence of appendix  
(c) Presence of 11<sup>th</sup> and 12<sup>th</sup> pair of ribs  
(d) Presence of opposable thumb
33. To meet the increasing demand for food, there have been several 'revolutions'. Which of the following revolutions is likely to have contributed most to global warming?
- (a) Green  
(b) White  
(c) Blue  
(d) Silver
34. In a self – pollinated plant, what would be minimum number of meiotic divisions required for setting 400 seeds?
- (a) 500  
(b) 400  
(c) 200  
(d) 100
35. If a small part of the esophagus of a person is excised, the consequence would be:
- (a) larger portion of food with large time interval  
(b) small portions of food at small time interval  
(c) small portions of food at large time interval  
(d) majorly subsist on liquid diet

36. Health is all about 'eating - fasting' balance. When you fast for extended periods, your cells clean out and recycle the intracellular garbage. The organelles responsible for this are:  
 (a) Microtubules (b) Microfilaments  
 (c) Golgi Apparatus (d) Lysosomes
37. A 'life - style' disorder among these is:  
 (a) Hypertension (b) Presbyopia  
 (c) Herpes (d) Scurvy
38. A plant kept in a box with only a hole for entry of light shows bending, the process called phototropism. It occurs due to:  
 (a) Synthesis and diffusion of cytokinin in the leaves  
 (b) Breakdown of auxin in the shoot  
 (c) Synthesis and diffusion of auxin in the shoot  
 (d) Synthesis and diffusion of abscisic acid
39. Which amongst the following are not plastids?  
 (a) Leucoplasts (b) Chromoplasts  
 (c) Amyloplasts (d) Tonoplasts
40. Ravi mixed two substances A and B in a vessel and left it as it is. After few hours he detected an alcoholic smell emanating from the vessel. Identify what A and B are:  
 (a) Salt solution and Lactobacillus (b) Fruit juice and Saccharomyces  
 (c) Fruit juice and Lactobacillus (d) Salt solution and Saccharomyces
41. If  $x^2 - 3x + 2$  is a factor of  $x^4 - px^2 + q$  then p, q are  
 (a) 0, 0 (b) 2, 3  
 (c) 4, 5 (d) 5, 4
42. If the roots of the equation  $\frac{x^2 - bx}{ax - c} = \frac{m - 1}{m + 1}$  are equal and the opposite signs, then the value of 'm' is \_\_\_\_  
 (a)  $\frac{ab}{a + b}$  (b)  $\frac{a + b}{ab}$   
 (c)  $\frac{a - b}{a + b}$  (d)  $\frac{a + b}{a - b}$
43. If  $p + q + r = 2$ ,  $p^2 + q^2 + r^2 = 30$  and  $pqr = 10$ , the value of  $(1 - p)(1 - q)(1 - r)$   
 (a) 18 (b) -24  
 (c) -27 (d) -35
44. What is the radius of the circumcircle of a triangle whose sides are 30 cm, 36 cm and 30 cm  
 (a) 15 cm (b) 16 cm  
 (c) 17 cm (d) 18 cm
45. If ABCD is a cyclic quadrilateral,  $AB = 204$ ,  $BC = 104$ ,  $CD = 195$ ,  $DA = 85$  and  $BD = 221$ , then  $AC =$   
 (a) 240 (b) 225  
 (c) 220 (d) 210
46. By which smallest number we should divide 198396198 to get a perfect square?  
 (a) 14 (b) 18  
 (c) 22 (d) 28

47. If  $(a + b + c + d) = 4$ , then

$$\frac{1}{(1-a)(1-b)(1-c)} + \frac{1}{(1-b)(1-c)(1-d)} + \frac{1}{(1-c)(1-d)(1-a)} + \frac{1}{(1-d)(1-a)(1-b)} =$$

- (a) 0  
(c) 1  
(b) 0.25  
(d) 4

48. In triangle ABC, segment AD, segment BE and segment CF are altitudes. If  $AB \times AC = 172.8 \text{ cm}^2$  and  $BE \times CF = 108.3 \text{ cm}^2$  then  $AD \times BC =$

- (a)  $136.8 \text{ cm}^2$   
(c)  $129.2 \text{ cm}^2$   
(b)  $132.4 \text{ cm}^2$   
(d)  $128.6 \text{ cm}^2$

49.  $1\frac{1}{2} + 1\frac{1}{6} + 1\frac{1}{12} + 1\frac{1}{20} + 1\frac{1}{30} + \dots + 1\frac{1}{380} =$  \_\_\_\_\_

- (a) 19.85  
(c) 20.05  
(b) 19.95  
(d) 20.25

50. If  $x = (\sqrt{21} - \sqrt{20})$  and  $y = (\sqrt{18} - \sqrt{17})$ , then

- (a)  $x = y$   
(c)  $x > y$   
(b)  $x + y = 0$   
(d)  $x < y$

51. If  $\left(x + \frac{1}{x}\right) = 5$ , then  $\left(x^3 + \frac{1}{x^3}\right) - 5\left(x^2 + \frac{1}{x^2}\right) + \left(x + \frac{1}{x}\right) =$  \_\_\_\_\_

- (a) 0  
(c) -5  
(b) 5  
(d) 10

52. The mean of the following frequency distribution is \_\_\_\_\_

Class interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	4	6	8	10	12

- (a) 25  
(c) 30  
(b) 28  
(d) 32

53. On seventy first 'Independence day' there was Tuesday. After how many years there will be Tuesday on 'Independence day'?

- (a) 4 yrs  
(c) 6 yrs  
(b) 5 yrs  
(d) 7 yrs

54. If  $x^2 + xy + xz = 135$ ,  $y^2 + yz + xy = 351$  and  $z^2 + xz + yz = 243$ , then

$$x^2 + y^2 + z^2 =$$
 \_\_\_\_\_

- (a) 225  
(c) 275  
(b) 250  
(d) 300

55. What will be the remainder if the number  $(7)^{2017}$  is divided by 25?

- (a) 1  
(c) 18  
(b) 7  
(d) 24

56. The sum of two numbers is 13 and the sum of their cubes is 1066. Find the product of those two numbers.

- (a) 26  
(c) 28  
(b) 27  
(d) 29

57. Diagonals of quadrilateral bisect each other. Therefore the quadrilateral must be a \_\_\_\_\_

- (a) parallelogram  
(c) rectangle  
(b) rhombus  
(d) square

58. A train is running at a speed of 54 km/hr. It is not stopping at a certain station. It crosses the person showing green flag in 20 seconds and crosses the platform in 36 seconds. What is the length of the train?  
 (a) 240 m (b) 300 m  
 (c) 320 m (d) 360 m
59. What is the sum of all odd numbers between 500 and 600?  
 (a) 29500 (b) 27500  
 (c) 27000 (d) 26000
60. How many four digit numbers are there such that when they are divided by 101, they have 99 as remainder?  
 (a) 90 (b) 98  
 (c) 100 (d) 101
61. During meteorite shower a few meteorites fell into a water body having pH around 7. The pH of the water body was measured after meteorite shower and found to be  
 (a)  $> 7$   
 (b)  $< 7$   
 (c)  $= 7$   
 (d) no change in pH of water due to the meteorite shower
62. Arun needs 1.71 g of cane sugar ( $C_{12}H_{22}O_{11}$ ) to sweeten his tea. What would be the number of carbon atoms consumed through sugar in the tea?  
 (a)  $5 \times 10^{21}$  (b)  $7.2 \times 10^{21}$   
 (c)  $3.66 \times 10^{22}$  (d)  $6.6 \times 10^{22}$
63. Harsha was trying to neutralize phosphoric acid using various bases. Those available were caustic soda, lime water and hydrated alumina. If Harsha took 1 equivalent of phosphoric acid each time, what will be the ratio for the moles of each of the above bases required for complete neutralization?  
 (a) 1 : 1 : 1 (b) 1 : 0.5 : 0.33  
 (c) 1 : 2 : 3 (d) 1 : 0.33 : 0.5
64. What would be the atomic number of the next halogen element, if discovered in future?  
 (a) 103 (b) 115  
 (c) 117 (d) 121
65. An open vessel contains air at  $27^\circ\text{C}$ . The vessel is heated till two-fifth of the air in it has been expelled. Assuming the volume of the vessel remains constant. Find the temperature to which the vessel has to be heated?  
 (a) 500 K (b) 550 K  
 (c) 700 K (d) 750 K
66. Neeta mixed 10 mL of 0.1 M HCl solution with 15 mL of 0.067 M NaOH solution. She checked the pH of the resulting solution using pH paper. The colour obtained was

Red	Orange	Yellow	Green	Pale blue	Dark blue	Violet
Strong acid ← Weak acid			Neutral	Weak alkali → Strong alkali		

- (a) Green (b) Yellow  
 (c) Pale blue (d) Violet

67. Tooth decay starts when the pH around tooth is around  
 (a) 7.5 (b) 7  
 (c) 6.5 (d) 5.5
68. The molecular formula of some organic compounds are given below, which of these compounds contains a Ketone group?  
 (a)  $C_3H_6O_2$  (b)  $C_3H_8O$   
 (c)  $C_3H_4O$  (d)  $C_3H_6O$
69. The average atomic mass of an element X is 80u. The percent of isotopes  $^{79}X_{35}$  and  $^{82}X_{35}$  in the sample is  
 (a) 50 and 50 (b) 90.99 and 9.01  
 (c) 80.8 and 19.2 (d) 66.67 and 33.34
70. The ratio of atoms present in 4 g of magnesium and 4 g of sulphur is (Mg = 24; S = 32)  
 (a) 1: 1 (b) 2 :1  
 (c) 3 : 2 (d) 3 : 4
71. Choose the correct sets which represents the oxides as  $\rightarrow$  Acidic : basic : neutral : amphoteric respectively (i)  $CO_2$  : MgO :  $N_2O$  :  $H_2O$  (ii)  $SO_2$  : NO : CO :  $Al_2O_3$  (iii)  $P_2O_5$  : ZnO : NO :  $Al_2O_3$  (iv)  $SO_3$  : CaO :  $N_2O$  : PbO  
 (a) i & ii (b) ii & iii  
 (c) iii & iv (d) i & iv
72. A flask containing  $SO_2$  gas was weighed at a particular temperature and pressure. The flask was then flushed and filled with oxygen gas at the same temperature and pressure. The weight of  $SO_2$  in the flask will be about  
 (a) same as that of oxygen (b) one-fourth that of oxygen  
 (c) four time that of oxygen (d) twice that of oxygen
73. A white solid known to be a compound of sodium, gives rise to water vapour and a colourless gas on heating. The residual white powder is dissolved in water and when the solution is added to alum solution, a white gelatinous precipitate is obtained. The original solid was  
 (a) sodium carbonate (b) sodium nitrate  
 (c) sodium hydroxide (d) sodium bicarbonate
74. A teacher wanted to give acid base titration to her students. For that she prepared (i) HCl solution by dissolving 73 g of hydrochloride acid in one litre of water and (ii) sodium hydride solution by dissolving 0.46 g of sodium metal in one litre of water. Find the volume of the hydrochloric acid solution required for complete neutralization of sodium hydroxide solution (Cl = 35.5; Na = 23.0; O = 16.0)  
 (a) 5 mL (b) 10 mL  
 (c) 20 mL (d) 46 mL
75. I.  $Zn + CuSO_4(aq) \longrightarrow$  Reaction occurs  
 II.  $Zn + Al_2(SO_4)_3(aq) \longrightarrow$  Reaction does not occurs  
 III.  $Zn + AgNO_3(aq) \longrightarrow$  Reaction does not occurs  
 IV  $Zn + PbNO_3(aq) \longrightarrow$  Reaction occurs  
 Which of the above statement is not correct?  
 (a) I (b) II  
 (c) III (d) IV

76. What will happen if a copper piece is dipped in aqueous solution of silver nitrate for quite some time?  
(i) Solution will remain colourless  
(ii) Solution will turn blue  
(iii) Silver will deposit on the copper piece  
(iv) Bubbles of brown gas will be formed around copper piece  
(a) i and iv  
(b) ii and iv  
(c) ii and iii  
(d) iii and iv
77. 'Duralumin' is an alloy of aluminium with  
(a) iron, manganese and magnesium  
(b) copper, manganese and magnesium  
(c) copper, chromium and magnesium  
(d) iron, nickel and magnesium
78. An aqueous solution used to preserve biological specimen is  
(a) methane  
(b) methanol  
(c) methanal  
(d) methanoic acid
79. If  $Z = 10$  the valency of the element is \_\_\_\_\_  
(a) zero  
(b) one  
(c) two  
(d) three
80. Rajiv, Nikhil, Shubha and Nilima wanted to establish a relationship between loss in weight of a solid with weight of water displaced by immersing it in tap water and sea water. After performing their experiment, they noted their observations for the same solid as follows:  
Rajiv: Loss of weight of solid is more in tap water.  
Nikhil: Loss of weight of solid is more in sea water.  
Shubha: Loss of weight of solid is equal in the tap water and the sea water.  
Nilima: Loss of weight of solid may be more in tap water or sea water, depending upon how deeply it is immersed.  
Identify the correct observation  
(a) Nikhil  
(b) Nilima  
(c) Shubha  
(d) Rajiv