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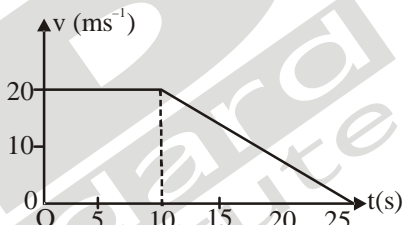
SAMPLE PAPER - 78

Time : 1 : 15 Hr.   **Question : 60**

PHYSICS

01. The two ends of a train moving with a constant acceleration pass a certain point with velocities 14 m/s and 2 m/s. The velocity with which the middle point of the train passes the same point is :
(1) 10 ms^{-1} (2) 8 ms^{-1}
(3) 100 ms^{-1} (4) $10\sqrt{2} \text{ ms}^{-1}$

02. A particle starts from rest and moving with constant acceleration covers a distance x_1 in the 4th second and x_2 in the 6th second. The ratio $x_1/x_2=$
(1) 11/7   (2) 7/11   (3) 5/3   (4) 3/5

03. A particle slides from rest from the topmost point of a vertical circle of radius 5 metre along a smooth chord making an angle 60° with the vertical. The time of descent is :
(1) 2.0 s   (2) 2.8 s
(3) 1.4 s   (4) none of these

04. A particle moves along a straight line OX. At a time t (in seconds) the distance x (in metres) of the particle from O is given by :
$x = 8+12\,t - t^3$
How far would the particle travel before coming to rest?
(1) 12 m   (2) 16 m   (3) 24 m   (4) 40 m.

05. The position of a particle as a function of time t, is given by $x(t) = 3t + 2t^2 - t^3$ where x is in metre and t is in second. When the particle attains zero acceleration, then its velocity will be
(1) 5 ms^{-1} (2) 4 ms^{-1}
(3) 4.3 ms^{-1} (4) 7 ms^{-1}

06. A train starts from rest at station A moving at constant acceleration 2 ms^{-2} for some time, then with constant retardation 3 ms^{-2} coming to rest at another station B. If total time spent is 3 minute 20 second, the distance between stations A & B is
(1) 48 km   (2) 24 km
(3) 28.8 km   (4) none of these

07. In previous question No.11, the maximum velocity of train is
(1) 240 ms^{-1} (2) 120 ms^{-1}
(3) 60 ms^{-1} (4) none of these

08. From the given v-t graph, the average velocity of particle in interval $0 \le t \le 25$ s, is

(1) 20 ms^{-1} (2) 10 ms^{-1}
(3) 12 ms^{-1} (4) 14 ms^{-1}

09. A person moves 30 m north, then 30 m east, then $30\sqrt{2}$ south-west. His displacement from the original position is
(1) zero   (2) 28 m towards south
(3) 10 m towards west   (4) 15 m towards east

10. If unit vectors $\hat{A}$ and $\hat{B}$ are inclined at an angle θ, then $|\hat{A} - \hat{B}|$ is
(1) $2 \sin \dfrac{\theta}{2}$ (2) $2 \cos \dfrac{\theta}{2}$ (3) $2 \tan \dfrac{\theta}{2}$ (4) $\tan \theta$

11. An airplane moving horizontally with a speed of 180 km/hr drops a food packet while flying at a height of 500 m. The horizontal range is : $(g = 10 \text{ ms}^{-2})$
(1) 180 m   (2) 980 m
(3) 500 m   (4) 670 m

12. The resultant of two forces, one double the other in magnitude, is perpendicular to the smaller of the two forces. The angle between the two forces is :
(1) 120^0 (2) 60^0
(3) 90^0 (4) 150^0

13. A force is inclined at 60° to the horizontal. If its rectangular component in the horizontal direction is 50 N, then magnitude of the vertical component of force is approximately
(1) 25 N　　(2) 84 N　　(3) 87 N　　(4) 90 N

14. A body has an initial velocity of 3 m/s and has an acceleration of 1 m/sec^2 normal to the direction of the initial velocity. Then its velocity 4 seconds after the start is
(1) 7 m/sec along the direction of initial velocity
(2) 7 m/sec along the normal to the direction of initial velocity
(3) 7 m/sec mid-way between the two directions
(4) 5 m/sec at an angle off tan^{-1} (4/3) with the direction of initial velocity.

15. A body is projected at 60° with ground. It covers a horizontal distance of 100 m. If the same body is projected at 60° with vertical with same velocity, the new range is
(1) 50 m　　(2) 100 m　　(3) 200 m　　(4) 150 m

CHEMISTRY

16. 0.005 M Na$_2$SO$_4$ is isotonic with 0.01 M glucose. Degree of dissociation of Na$_2$SO$_4$ is :
(1) 75%　　(2) 50%　　(3) 25%　　(4) 85%

17. The solubility of common salt is 36.0 g in 100 g of water at 20ºC. If systems, I, II and III contain 40.0, 36.0 and 20.0 g of the salt added to 100.0 g of water in each case, the vapour pressures would be in the order
(1) I < II < III　　　　(2) I > II > III
(3) I = II > III　　　　(4) I = II < III

18. van't Hoff factors are x, y, z in the case of dissociation, association and no change respectively. Increasing order is
(1) x < y < z　　　　(2) x = y = z
(3) x > z > y　　　　(4) x < z < y

19. Sodium phosphate is 100% ionised in 0.01 molal aqueous solution. Hence, $\Delta T_b/K_b$ is
(1) 0.04　　　　　　(2) 0.015
(3) 0.0175　　　　　(4) 0.02

20. The freezing point of water is depressed by 0.37ºC in a 0.01 molal NaCl solution. The freezing point of 0.02 molal solution of urea is depressed by
(1) 0.37ºC　　　　　(2) 0ºC
(3) 0.56ºC　　　　　(4) 0.187ºC

21. The boiling point of 0.2 mol kg^{-1} solution of X in water is greater than equimolal solution of Y in water. Which one of the following statements is true in this case ?
(1) Molecular mass of x is greater than the molecular mass of Y.
(2) Molecular mass of x is less than the molecular mass of Y.
(3) Y is undergoing dissociation in water while X undergoes no change
(4) X is undergoing dissociation is water

22. Which of the following is likely to have negative enthalpy of dissolution ?
(1) NaCl　　　　　　(2) KCl
(3) CuSO$_4$　　　　　(4) FeSO$_4$.7H$_2$O

23. The van't Hoff factor i for a compound which undergoes dissociation in one solvent and association in other solvent is respectively
(1) less than one and greater than one
(2) less than one and less than one
(3) greater than one and less than one
(4) greater than one and greater than one

24. The value of Henry's constant K$_H$ is
(1) greater for gases with higher solubility
(2) greater for gases with lower solubility
(3) constant for all gases
(4) not related to the solubility of gases.

25. Which inorganic precipitate acts as semipermeable membrane ?
(1) Calcium sulphate　　(2) Barium oxalate
(3) Nickel phosphate　　(4) Copper ferrocyanide

26. The mixture that forms maximum boiling azeotrope is :
(1) Water + Nitric acid
(2) Ethanol + Water
(3) Acetone + Carbon disulphide
(4) Heptane + Octane

27. Dissolution of non volatile solute into a liquid leads to the :
(1) Decrease of entropy
(2) Increase in tendency of liquid to freeze
(3) Increase in tendency to pass into the vapour
(4) Decrease in tendency of the liquid to freeze

28. Which of the following represents the correct order of increasing first ionization enthalpy for Ca, Ba, S, Se and Ar?
(1) Ca < Ba < S < Se < Ar
(2) Ca < S < Ba < Se < Ar
(3) S < Se < Ca < Ba < Ar
(4) Ba < Ca < Se < S < Ar

29. The correct sequence which shows decreasing order of the ionic radii of the element is
(1) O^{2-} > F$^-$ > Na$^+$ > Mg^{2+} > Al^{3+}
(2) Al^{3+} > Mg^{2+} > Na$^+$ > F$^-$ > O^{2-}
(3) Na$^+$ > Mg^{2+} > Al^{3+} > O^{2-} > F$^-$
(4) Na$^+$ > F$^-$ > Mg^{2+} > O^{2-} > Al^{3+}

30. Which of the following transitions involves maximum amount of energy?
(1) $M^-(g) \longrightarrow M(g)$
(2) $M(g) \longrightarrow M^-(g)$
(3) $M^+(g) \longrightarrow M^{2+}(g)$
(4) $M^{2+}(g) \longrightarrow M^{3+}(g)$

BOTANY

31. The process of plasmolysis is usually
(1) Reversible (2) Irreversible
(3) Active (4) both (1) and (3)

32. What is the approximate rate of ascent of sap?
(1) 5 m/hr (2) 15 m/hr
(3) 40 m/hr (4) 2 m/hr

33. Which of the following undergoes multi-directional transport?
(1) Water (2) Mineral nutrients
(3) Organic nutrients (4) Both (2) and (3)

34. Identify A to E in the given figure.

Membrane
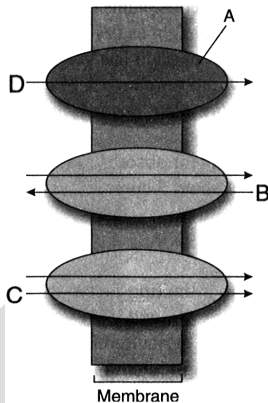
(1) A: Antiport B, B: Uniport A, C: Antiport A, D: Symport B, E: Carrier point
(2) A: Carrier point, B: Antiport A, C: Uniport A, D: Symport B, E: Antiport B
(3) A: Carrier point, B: Antiport C: Symport D: Uniport
(4) A: Symport B, B: Antiport A, C: Antiport B, D: Carrier point, E: Uniport A

35. Where is apoplastic movement shifted to symplastic pathway?
(1) Cortex (2) Endodermis
(3) Pericycle (4) Xylem

36. The value of solute potential is:
(1) Always positive
(2) Always negative
(3) Some time negative
(4) Some time negative or positive

37. In thistle funnel experiment, during osmosis the level of the solution in the funnel
(1) Increases
(2) Decreases
(3) Remains same
(4) First increases then decreases

38. Which one give the most valid and recent explanation for stomatal movements ?
(1) Starch hydrolysis
(2) Guard cell photosynthesis
(3) Transpiration
(4) Potassium influx and efflux

39. Root pressure contributes to the
(1) Ascent of sap in small herbaceous plants
(2) Re-establishment of continuous chains of water molecules in the xylem which often breaks under the enormous tension created by transpiration
(3) Guttation
(4) All the above

40. Recognise the figure and find out the correct statement
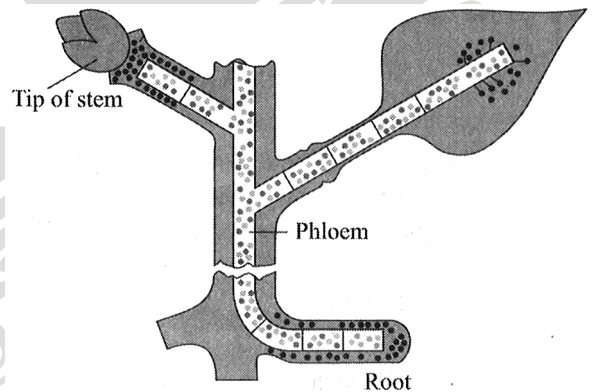
The following figure shows
(1) The mechanism of the absorption and translocation of water and minerals
(2) The demonstration of osmosis
(3) The translocation of food through phloem
(4) Transpiration pull for ascent of sap

41. Guttation occurs in well watered herbaceous plants of well drained soils during
(1) Evening (2) Morning
(3) Day (4) Viscous.

42. Cytoplasmic streaming is easily seen in
(1) Leaf of hydrilla (2) Leaf of mango
(3) Stem cells of sunflower
(4) Pollen grains

43. Obligate symbiotic association is found in
(1) Cycas (2) Pinus seed
(3) Algae (4) All of the above

44. Perinuclear space is around
(1) 10 to 20 Å
(2) 10 to 20 nm
(3) 10 to 50 μm
(4) 10 to 50 nm

45. Recognise the figure and find out the correct matching.
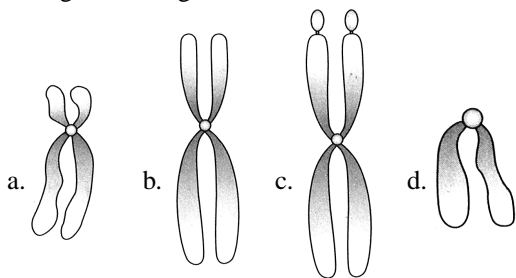
(1) b–acrocentric, a–telocentric, d–metacentric, c–submetacentric
(2) a–acrocentric, d–telocentric, c–metacentric, b–submetacentric
(3) a–acrocentric, d–telocentric, b–metacentric, c–submetacentric
(4) d–acrocentric, c–telocentric, a–metacentric, b–submetacentric

ZOOLOGY

46. 'DUP' sound is produced in cardiac cycle
(1) At the begining of atrial diastole
(2) At the begining of atrial systole
(3) At the begining of ventricular systole
(4) At the begining of ventricular diastole

47. The heart of man is
(1) cardiogenic
(2) digenic
(3) neurogenic
(4) myogenic

48. There are two major types lymphocytes (20-25%), B and T forms. Identify their function
(1) Blood coagulation
(2) Thickness of blood
(3) Immune responses
(4) All of the above

49. A 'Christmas disease' patient lacks antihaemophilic
(1) homogenetisic acid oxidase
(2) factor VIII
(3) factor XI
(4) factor IX

50. Mitral valve is present between
(1) left auricle and right auricle
(2) left vetricle and right ventricle
(3) left auricle and left ventricle
(4) right auricle and right ventricle

51. Diapedesis is
(1) Formation of WBC
(2) formation of pus
(3) squeezing out of WBC
(4) bursting of WBC

52. Fossa ovalis is present on
(1) right atrium
(2) left ventricle
(3) coronary sulcus
(4) interatrial septum

53. The volume of blood each vetricle pumps out during a cardiac cycle is about
(1) 70 mL
(2) 5000 mL
(3) 7 L
(4) 1200 mL

54. The QRS-complex in a standard ECG represents
(1) depolarisation of auricles
(2) depolarisation of ventricles
(3) repolarisation of ventricles
(4) repolarisation of auricles

55. Arteries are
(1) thin-walled and blood flows under high pressure
(2) thin-walled and blood flows under diminished pressure
(3) thick-walled and blood flows under high pressure
(4) thick-walled and blood flows under diminished pressure

56. The circulation in which blood flows from heart to lungs and back to heart is known as
(1) systemic circulation
(2) pulmonary circulation
(3) open circulation
(4) double circulation

57. Atherosclerosis is known as
(1) coronary artery disease
(2) angina
(3) heart failure
(4) hypertension

58. Male and female cockroach is morphologically distinguished by the presence of
(1) Anal cerci
(2) Anal style
(3) Compound eyes
(4) All of these

59. Nymph of cockroach grows by moulting about _____ times to reach the adult form.
(1) 12
(2) 11
(3) 13
(4) 10

60. How many oothecae are produced by female cockroach?
(1) 9–10
(2) 14–16
(3) 13
(4) 1–2