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SAMPLE PAPER - 63

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

PHYSICS

01. 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

02. If $\vec{A} = 2\hat{i} + 4\hat{j} - 5\hat{k}$ then the direction of cosines of the vector $\vec{A}$ are
(1) $\frac{2}{\sqrt{45}}, \frac{4}{\sqrt{45}}$ and $\frac{-5}{\sqrt{45}}$ (2) $\frac{1}{\sqrt{45}}, \frac{2}{\sqrt{45}}$ and $\frac{3}{\sqrt{45}}$
(3) $\frac{4}{\sqrt{45}}$, 0 and $\frac{4}{\sqrt{45}}$ (4) $\frac{3}{\sqrt{45}}, \frac{2}{\sqrt{45}}$ and $\frac{5}{\sqrt{45}}$

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

04. 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
(1) 180 m (2) 980 m (3) 500 m (4) 670 m

05. To the captain of a ship A travelling with velocity $\vec{v}_A = (3\hat{i} - 4\hat{j})$ km/h, a second ship B appears to have a velocity $(5\hat{i} + 12\hat{j})$ km/h. What is the true velocity of the ship B?
(1) $2\hat{i} + 16\hat{j}$ km/h (2) $13\hat{i} + 8\hat{j}$ km/h
(3) $-2\hat{i} - 16\hat{j}$ km/h (4) $8(\hat{i} + \hat{j})$ km/h

06. A car is going in south with a speed of 5 m/s. To a man sitting in car a bus appears to move towards west with a speed of $2\sqrt{6}$ m/s. What is the actual speed of the bus ?
(1) 4 ms^{-1} (2) 3 ms^{-1}
(3) 7 ms^{-1} (4) none of these

07. Rain is falling vertically with a speed of 35 m s^{-1}. Winds starts blowing after sometime with a speed of 12 m s^{-1} in east to west direction. At what angle with the vertical should a boy waiting at a bus stop hold his umbrella to protect himself from rain ?
(1) $\sin^{-1}\left(\frac{12}{35}\right)$ (2) $\cos^{-1}\left(\frac{12}{35}\right)$
(3) $\tan^{-1}\left(\frac{12}{35}\right)$ (4) $\cot^{-1}\left(\frac{12}{35}\right)$

08. A motor car is travelling at 60 m/s on a circular road of radius 1200 m. It is increasing its speed at the rate of 4 m/s. The acceleration of the car is
(1) 3 m/s^2 (2) 5 m/s^2
(3) 5 m/s^2 (4) 7 m/s^2

09. For a particle performing uniform circular motion, choose the incorrect statement from the following
(1) Magnitude of particle velocity (speed) remains constant
(2) Particle velocity remains directed perpendicular to radius vector
(3) Direction of acceleration keeps changing as particle moves
(4) Magnitude of acceleration does not remain constant

10. A stone tied to the end of a string 100 cm long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 22s, then the acceleration of the stone is (Take $\pi = 22/7$)
(1) 16 m s^{-2}
(2) 4 m s^{-2}
(3) 12 m s^{-2}
(4) 8 m s^{-2}

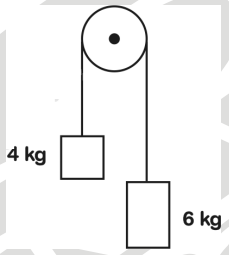
11. A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle, the motion of the particle takes in a plane. It follows that
(1) its velocity is constant
(2) its acceleration is constant
(3) its kinetic energy is constant
(4) it moves in a straight line

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 swimmer wishes to cross a 500 m river flowing at 5 km/h. His speed with respect to water is 3 km/h. The shortest possible time to cross the river is :
(1) 10 min (2) 20 min
(3) 6 min (4) 7.5 min

14. When a horse pulls a wagon, the force that causes the horse to move forward is the force.
(1) exerted by horse on the wagon
(2) exerted by wagon on horse
(3) exerted on horse by surface
(4) exerted by horse on the ground

15. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



(1) g (2) g/2 (3) g/5 (4) g/10

CHEMISTRY

16. Which of the following is not true about the Raoult's law?
(1) It is applicable to only very dilute solutions
(2) It is applicable to solution containing non-volatile solute
(3) It is applicable to solution containing electrolytic solute
(4) All of the above statements are true

17. Which of the following solution obey Raoult's law at almost all concentration ranges ?
(1) Ideal solution
(2) Non-ideal solution with positive deviation
(3) Non-ideal solution with negative deviation
(4) All of the above solution

18. The unit of ebullioscopic constant is
(1) K kg mol^{-1} or K $(molality)^{-1}$
(2) mol kg K^{-1} or K^{-1}(molality)
(3) kg mol^{-1} K^{-1} or $K^{-1}(molality)^{-1}$
(4) K mol kg^{-1} or K (molality)

19. Which of the following has the maximum osmotic pressure at temperature T ?
(1) 100 mL of 1 M urea solution
(2) 300 mL of 1 M glucose solution
(3) Mixture of 100 mL of 1 M urea solution and 300 mL of 1 M glucose solution
(4) All the above are isotonic

20. Sum of mole fraction of all the solutes and that of a solvent in a solution is always
(1) 0 (2) 1 (3) 100 (4) ∞

21. In case of true solution of a solid in liquid the interactions among solute particles (say A) and solvent particles (say B) should be like
(1) A–A = B–B > A–B (2) A–A = B–B < A–B
(3) A–A = B–B = A–B (4) A–A > B–B > A–B

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

23. We have 100 mL of 0.1 M KCl solution. To make it 0.2 M
(1) evaporate 50 mL water
(2) evaporate 50 mL solution
(3) add 0.1 mol KCl
(4) add 0.01 mol KCl

24. Which of the following has the highest boiling point?
(1) 0.1 M Na_2SO_4
(2) 0.1 M $C_6H_{12}O_6$ (glucose)
(3) 0.1 M $MgCl_2$ (4) 0.1 M $Al(NO_3)_3$

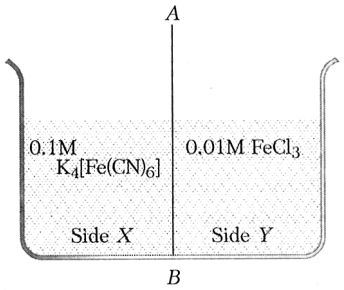
25. van't Hoff factors are x, y, z in the case of association, dissociation and no change respectively. Increasing order is
(1) x < y < z (2) x = y = z
(3) y < x < z (4) x < z < y

26. We have three aqueous solutions of NaCl labelled as A, B and C with concentrations 0.1 M, 0.01 M and 0.001 M, respectively. The value of van't Hoff factor for these solutions will be in the order.....
(1) $i_A < i_B < i_C$ (2) $i_A > i_B > i_C$
(3) $i_A = i_B = i_C$ (4) $i_A < i_B > i_C$

27. Cellulose acetate is used as semipermeable membrane in desalination of sea water (reverse osmosis). It is because it is
(1) permeable to water, but impermeable to impurities and ions
(2) permeable to water, but permeable to impurities and ions
(3) permeable to water, impermeable and ions
(4) impermeable to water, impurities and ions

28. Which statement best explains the meaning of the phrases "like dissolves like"?
(1) A solute will easily dissolve a solute of similar mass
(2) A solvent and solute with similar intermolecular forces will readily form a solution
(3) The only true solutions are formed when water dissolves a non-polar solute
(4) The only true solutions are formed when water dissolves a polar solute

29. $FeCl_3$ on reaction with $K_4[Fe(CN)_6]$ in aqueous solution gives blue colour. These are separated by a semi permeable membrane AB as shown.



Due to osmosis there is
(1) blue colour formation in side X
(2) blue colour formation in side Y
(3) blue colour formation in both of the sides X and Y
(4) no blue colour formation

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

BOTANY

31. ADP $\rightarrow$ ATP reaction occurs when two protons (H^+) are passed from
(1) Thylakoid lumen to cytosol
(2) Thylakoid to lumen
(3) Lumen of thylakoid to stroma
(4) Stroma to thylakoid lumen

32. Which is sensitive to longer wavelengths of light?
(1) PS II
(2) PS I
(3) Phosphorylation
(4) Photolysis

33. ATP formation during photosynthesis is
(1) Phosphorylation
(2) Photophosphorylation
(3) Oxidative phosphorylation
(4) None of the above

34. Cyclic photophosphorylation produces
(1) NADPH (2) ATP and NADPH
(3) ATP, NADPH and O_2 (4) ATP only

35. Raw materials required for light reactions are
(1) ADP and H_2O (2) ADP, H_2O and NADP
(3) ADP and $NADPH_2$ (4) ATP and NADP

36. Essential elements are often supplied to the crop plants through fertilizers. The components of fertilizers are
(1) Micro-nutrients (Cu, Zn, Fe, Mn etc.)
(2) Macro-nutrients (N, P, K, S etc.)
(3) Both (1) and (2)
(4) Na, Se, Si, Co

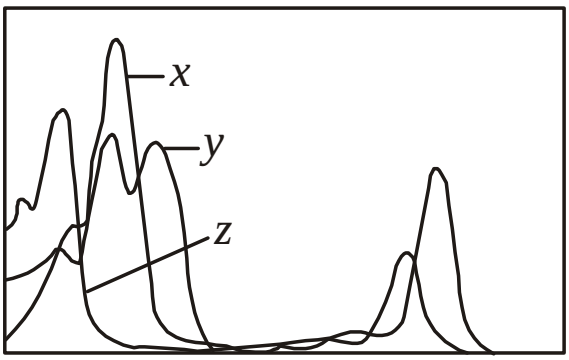
37. Conversion of ammonia to nitrite is affected by
(1) Nitrosomonas (2) Nitrobacter
(3) Nitrococcus (4) Both (1) and (3)

38. The following hypothesis, "Plants restore to the air whatever breathing animals and burning candles remove" was given by
(1) Joseph Priestley (2) Jan Ingenhousz
(3) T.W. Engelmann (4) C. van Niel

39. Which of the following scientist showed that it is only the green part of the plants that would release oxygen?
(1) Joseph Priestley (2) Jan Ingenhousz
(3) T.W. Engelmann (4) C. van Niel

40. A first action spectrum of photosynthesis was described by
(1) Julius von Sachs (2) Cornelius van Niel
(3) T.W. Engelmann (4) Jan Ingenhousz

41. Recognise the figure and find out the correct matching



(1) z - chlorophyll a, x - chlorophyll b, y - carotenoids
(2) z - chlorophyll a, y -chlorophyll b, x - carotenoids
(3) y - chlorophyll a, z - chlorophyll b, x - carotenoids
(4) y - chlorophyll a, x - chlorophyll b, z - carotenoids

42. Leaf pigments of any green plants can be separated by
(1) X-ray diffraction
(2) Sedimentation
(3) Paper chromatography
(4) Centrifugation

43. Match the column I and II, and choose the correct combination from the options given

Column-I	**Column-II**
A. Chlorophyll a	1. Yellow
B. Chlorophyll b	2. Yellow green
C. Carotenoids	3. Yellow to yellow orange
D. Xanthophylls	4. Bright or blue green

(1) 1-A, 3-B, 1-C, 2-D (2) 3-A, 4-B, 1-C, 2-D
(3) 4-A, 2-B, 3-C, 1-D (4) 2-A, 1-B, 4-C, 3-D

44. Light harvesting complexes (LHC) are made up of hundreds of pigment molecules bound to proteins. In LHC, reaction centre of formed by
(1) A single chlorophyll a molecule
(2) All the pigments except one molecule of chlorophyll a
(3) Carotenoids and xanthophylls
(4) Both (2) and (3)

45. Which one of the following statements about the events of non-cyclic photophosphorylation is not correct ?
(1) Photolysis of water takes place
(2) Only one photosystem participates
(3) ATP and NADPH are produced
(4) O_2 is released

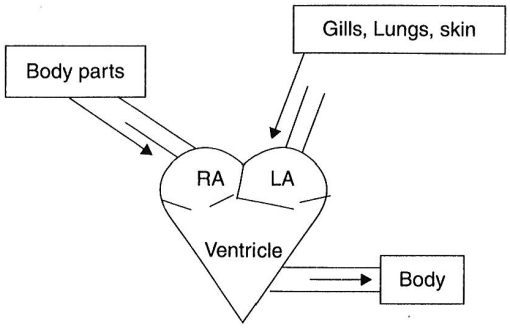
ZOOLOGY

46. Select the incorrect statement from the following.
(1) Clot or coagulum is formed mainly by network of fibrin in which died and damaged formed element of blood are trapped.
(2) Inactive fibrinogen is converted to fibrin by hormone thrombin.
(3) Prothrombin is converted into thrombin by the enzyme complex called thrombokinase.
(4) Platelet or injured tissue released certain factors which initiate coagulation.

47. The fundamental character of chordate is
(1) Notochord
(2) Dorsal hollow nerve cord
(3) Paired pharyngeal gill slits
(4) All of these

48. Lymph
(1) Transport oxygen to brain.
(2) Transporst CO_2 to lungs
(3) Returns interstial fluid to blood
(4) returns RBCs and WBCs to lymph nodes.

49. In the following diagram, the circulation is found in



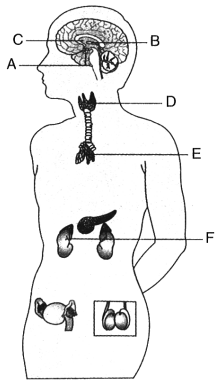
(1) Ambhibian (2) Reptiles
(3) Both (1) and (2) (4) Birds

50. Pulmonary circulation is required for
(1) Nuterient supply to lungs
(2) Elimination of waste products from the lungs.
(3) Oxygenation of deoxygenated blood.
(4) Nutrient supply to heart

51. A unique vascular connection existing between the hypothalamus and pituitary gland is called
(1) Renal portal system
(2) Hypophyseal portal system
(3) hepatic portal system
(4) All of these

52. Notochord is extended from head to tail region and persistent throughout their lief in
(1) Hemichordata (2) Urochordata
(3) Cephalochoradata (4) All of these

53. Identify A, B, C, D, E and F in the given figure.



(1) A: Hypothalamus, B: Pineal, C: Thymus, D: Adrenal, E: Pituitary, F: Thyroid and Parathyroid.
(2) A: Pituitary, B: Pineal, C: Hypothalamus, D: Thyroid and parathyroid, E: Thymus, F: Adrenal.
(3) A: Thymus, B: Pituitary, C: Thyroid and parathyroid, D: Pineal, E: Hypothalamus, F: Adrenal.
(4) A: Pineal, B: Thyroid and Parathyroid, C: Pituitary, D: Hypothalamus, E: Adreanal, F: Pineal

54. Hypothalamus is
(1) Roof of diencephalon.
(2) Basal part of diencephalon
(3) Lateral wall of diencephalon
(4) All of the above

55. The following organisms are marine but migrate for spawning to fresh water. After spawning within a few days, they die. After metamorphosis, their larvae returns to ocean. Choose the correct species from the following.
(1) Petromyzon (Lamprey)
(2) Myxine (Hagfish)
(3) Scoliodon
(4) Both (1) and (2)

56. Which of the below hormone stimulates the synthesis and secretion of thyroxin
(1) GH (Growth hormone)
(2) TSH (Thyroid stimulating hormone)
(3) PRL (Prolactin)
(4) ACTH (Adrenocorticotropic hormone)

57. The scales found in Chondrichthyes is/are
(1) Placoid (2) Cycloid
(3) Ctenoid (4) All of these

58. The features of cretinism include
(1) Stunted growth
(2) Mental retardation and low IQ.
(3) Abnormal skin and deaf mutism.
(4) All of these

59. Pineal gland is located on
(1) Dorsal side of midbrain.
(2) Dorsal side of hindbrain.
(3) Dorsal side of forebrain.
(4) Vertical side of forbrain.

60. Emergency hormone or hormones of fight or flight are
(1) Adrenaline
(2) Noradrenaline
(3) Cortisol
(4) Both (1) and (2)