SAMPLE PAPER - 90

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

PHYSICS

01. A boy walks to his school at a distance of 6 km with constant speed of 2.5 km/h and walks back with a constant speed of 4 km/h. His average speed for round trip expressed in km /h, is
(1) $\frac{24}{13}$ (2) $\frac{40}{13}$
(3) 3 (4) $\frac{1}{2}$

02. A body starting from rest is accelerated uniformly for 15 s. If x_1, x_2, x_3 are the distance travelled in 1^{st} 5 s, next 5 s and last 5 s, then $x_1 : x_2 : x_3$ =
(1) 1 : 2 : 3 (2) 1 : 1 : 1
(3) 1 : 3 : 5 (4) 1 : 3 : 9

03. A particle has an initial velocity of 9 m/s due east and a constant acceleration of $2 m/s^2$ due west. The distance covered by the particle in the fifth second of its motion is:
(1) 0 (2) 0.5 m
(3) 2 m (4) none of these

04. Mark the wrong statement for a particle going on a straight line :
(1) If the velocity and acceleration have opposite sign, the object is slowing down.
(2) If the position and velocity have opposite sign, the particle is moving towards the origin
(3) If the velocity is zero at an instant, the acceleration should also be zero at that instant
(4) If the velocity is zero for a time interval, the acceleration is zero at any instant within the time interval.

05. The area under velocity-time graph for a particle in a given interval of time represents
(1) velocity (2) acceleration
(3) work done (4) displacement

06. A car accelerates from rest at a constant rate $2 m/s^2$ for some time. Then it retards at constant rate of $4 m/s^2$ and comes to rest. If the total time for which it remains in motion is 12 s, the total distance travelled is :
(1) 32 m (2) 48 m (3) 64 m (4) 96 m

07. A bullet moving with a velocity of 100 m/s can just penetrate two planks of equal thickness. The number of such planks penetrated by the same bullet, when the velocity is doubled, will be
(1) 4 (2) 6 (3) 8 (4) 10

08. A ball is dropped from the top of a building 100 m high. At the same instant another ball is thrown upwards with a velocity of 40 m/s from the bottom of the building. The two balls will meet after
(1) 3 s (2) 2 s
(3) 2.5 s (4) 5 s

09. An aeroplane is flying horizontally with a velocity of 720 km/hr and at a height of 1960 m. When it is vertically above a point A on the ground, a bomb is released from it. The bomb strikes the ground at a point B. The distance AB is (ignoring air resistance)
(1) 2 km (2) 4 km
(3) 1 km (4) None of these

10. A cricketer can throw a ball to a maximum horizontal distance of 100 m. With the same speed how much high above the ground can the cricketer throw the same ball?
(1) 50 m (2) 100 m
(3) 150 m (4) 200 m

11. A particle is projected from a horizontal plane with a velocity of $8\sqrt{2}$ m s^{-1} at an angle θ. At highest point its velocity is found to be 8 m s^{-1}. Its range will be ($g = 10 m s^{-2}$)
(1) 3.2 m (3) 4.6 m
(2) 6.4 m (4) 12.8 m

12. With respect to a rectangular cartesian co-ordinate system three vectors are expressed as $\vec{a} = 4\hat{i} - \hat{j}$, $\vec{b} = -3\hat{i} + 2\hat{j}$ and $\vec{c} = -\hat{k}$ where $\hat{i}, \hat{j}, \hat{k}$ are unit vectors, along the x, y, z axes respectively. The unit vector along the direction of the sum of these vectors is

(1) $\hat{r} = \frac{1}{\sqrt{3}}(\hat{i} + \hat{j} - \hat{k})$ (2) $\hat{r} = \frac{1}{\sqrt{2}}(\hat{i} + \hat{j} - \hat{k})$

(3) $\hat{r} = \frac{1}{3}(\hat{i} - \hat{j} + \hat{k})$ (4) $\hat{r} = \frac{1}{\sqrt{3}}(\hat{i} + \hat{j} + \hat{k})$

13. A man moves on his motorbike with 54 km/h and then takes a U-turn and continues to move with same speed. The time of U-turn is 10 s. Find the magnitude of average acceleration during U-turn

(1) 0 (2) 3 ms^{-2}

(3) $1.5\sqrt{2}$ ms^{-2} (4) none of these

14. A bucket tied at the end of a 1.6 m long string, is whirled in a vertical circle. What should be the minimum speed so that the water from the bucket does not split when the bucket is at highest position?

(1) 16 m/s (2) 4 m/s

(3) 6.25 m/s (4) none of these

15. A particle is thrown upwards from ground. It experiences a constant air resistance force which can produce a retardation of 2 m/s^2. The ratio of time of ascent to the time of descent is

(1) 1 : 1 (2) $\sqrt{\frac{2}{3}}$ (3) $\frac{2}{3}$ (4) $\sqrt{\frac{3}{2}}$

CHEMISTRY

16. 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) ∞

17. 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

18. The vapour pressure of a liquid in pure state is 50 mm Hg while that in solution state is 40 mm Hg. Find the mole fraction of that liquid in solution state.

(1) 0.40 (2) 0.50 (3) 0.60 (4) 0.80

19. If vapour pressure of a pure solvent is p° and that of its solution, with a non-volatile solute is p. Then which of the following relationship is correct

(1) $p > p°$ (2) $p < p°$

(3) $p = p°$ (4) cannot be predicted

20. When certain amount of an organic compound is dissolved in acetone, its boiling point increase by 0.34°C. If K_b for acetone is 17.0°C kg mol^{-1}, then find the molality of the solution

(1) 0.1 molal (2) 0.2 molal

(3) 0.01 molal (4) 0.02 molal

21. If m_1 is the normal molar mass and m_2 is abnormal molar mass of an electrolyte in solution state. Then van't Hoff factor (i) is given as

(1) $i = \frac{m_1}{m_2}$ (2) $i = \frac{m_2}{m_1}$

(3) $i = m_1 \cdot m_2$ (4) $i = m_1 + m_2$

22. 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)

23. 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

24. 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

25. Persons are medically considered to have lead poisoning if they have a concentration of greater than 10 μg of lead per decilitre of blood. Concentration in parts per billion is

(1) 1000 (2) 100

(3) 10 (4) 1

26. Total vapour pressure of mixture of 1 mole of volatile component A($p°_A$ = 100 mmHg) and 3 moles of volatile component B($p°_B$ = 60 mmHg) is 75 mm. For such case

(1) there is positive deviation from Raoult's law

(2) boiling point has been lowered

(3) force of attraction between A and B is smaller than that between A and A or between B and B

(4) All the above statements are correct

27. Which of the following statements comparing solutions with pure solvent is not correct?

(1) A solution containing a non-volatile solute has a lower vapour pressure than pure solvent

(2) A solution containing a non-volatile solute has a lower boiling point than pure solvent

(3) A solution containing a non-volatile solute has a lower freezing point than pure solvent

(4) A solution will have a greater mass than an equal volume of pure solvent if the solute has a molar mass greater than the solvent

28. 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 $Al(NO_3)_3$

29. If A contains 2% NaCl and is separated by a semi permeable membrane from B which contains 10% NaCl then which of the following event will occur?
(1) NaCl will flow from A to B
(2) NaCl will flow from B to A
(3) Water will flow from A to B
(4) Water will flow from B to A

30. Acetic acid in benzene solution forms dimer due to intermolecular H-bonding. For this case van't Hoff factor is
(1) $i = 1$ (2) $i > 1$
(3) $i < 1$ (4) inclusive

BOTANY

31. Which of the following is incorrect about the experiment performed by T. W. Engelmann?
(1) Cladophora (a green algae) is used.
(2) Suspension of aerobic bacteria is used.
(3) Bacteria accumulated mainly in the region of orange and green light of the split spectrum.
(4) Prism was used to split light into its spectral component.

32. Antennae in LHC is useful for photosynthesis because
(1) They are of different colours.
(2) They are electron donors.
(3) Make photosynthesis more effective by absorbing different wavelength of light
(4) These molecules act as reaction centre

33. Some beneficial elements required by higher plants are
(1) Na, Si, Co, Se (2) Na, Si, Os, I
(3) Na, Co, Ir, At (4) Na, Si, W, Ag

34. Ureides have
(1) High N/C ratio (2) Low N/C ratio
(3) High C/N ratio (4) None of these

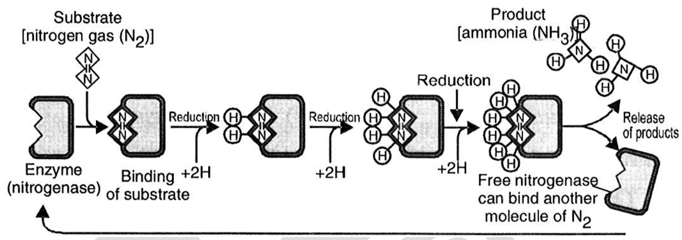
35. The pressure exerted by the protoplast due to the entry of water against the rigid cell wall is called
(1) Osmotic potential (2) Pressure potential
(3) Water potential (4) Matrix potential

36. One mineral activates enzyme nitrate reductase and other is constituent of chlorophyll. They are respectively
(1) Molybdenum and Magnesium
(2) Molybdenum and Manganese
(3) Magnesium and Manganese
(4) Iron and Calcium

37. Element(s) most readily mobilised is/are
(1) Potassium and phosphorus
(2) Nitrogen and sulphur
(3) Calcium
(4) Both (1) and (2)

38. Reaction of α-ketoglutatic acid with ammonia to form glutamic acid is
(1) Reductive deamination
(2) Reductive amination
(3) Transamination
(4) Ammonification

39. Following figure shows the mechanism of



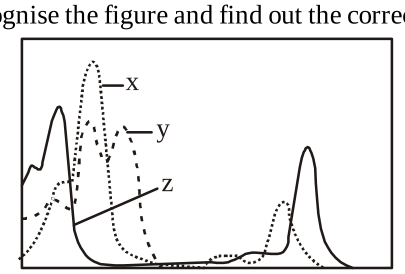
(1) N_2- fixation (2) Nitrification
(3) Ammonification (4) Denitrification

40. Read the following statements and select the incorrect statement
(1) Deficiency of Mg may leads to chlorosis and necrosis
(2) Deficiency of N may leads to inhibition of cell division and delay flowering
(3) Deficiency of S may leads to chlorosis and inhibition of cell division
(4) Deficiency of Mn may leads to loss of chlorophyll and death of tissue

41. Engelmann's experiment was on
(1) A green alga, *Cladophora*
(2) *Chlorella* and *Scenedesmus*
(3) Purple and green sulphur bacteria
(4) Mint plant

42. In purple and green sulphur bacteria, the hydrogen donor is
(1) H_2S (2) H_2O (3) H_2SO_4 (4) Sulphate

43. 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

44. 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

45. Joseph Priestley discovered O_2 in the year
(1) 1860 (2) 1854 (3) 1774 (4) 1770

ZOOLOGY

46. Stellar distances are measured in
(1) km (2) m
(3) Light year (4) pm

47. Miller simulated early Earth conditions in a laboratory by passing electric discharge through a closed flask raising its temperature to 800°C and containing
(1) CH_4 and H_2 (2) NH_3
(3) Water vapour (4) All of these

48. Evidence of evolution from fossils is known as
(1) Paleontological evidence
(2) Embryological evidence
(3) Physiological evidence
(4) Biochemical evidence

49. The early belief of the spontaneous origin of life was disproved by
(1) Lederberg
(2) Robert Koch
(3) Louis Pasteur
(4) Charles Darwin

50. Homologous organ represents
(1) Convergent evolution
(2) Divergent evolution
(3) Anthropogenic evolution
(4) Genetic drift

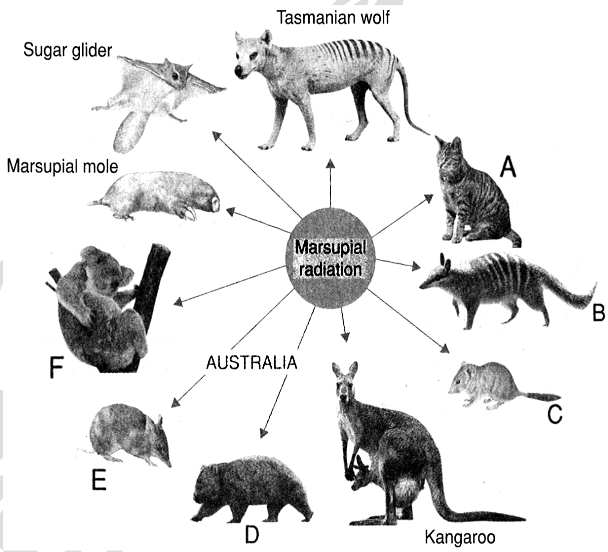
51. Which of the following shows analogy?
(1) Eye of octopus and mammals
(2) Vertebrate hearts
(3) Thorn of Bougainvillea and tendril of Cucurbita
(4) Vertebrate brains

52. The fossils are preserved in
(1) Sedimentary rocks
(2) Igneous rocks
(3) Metamorphic rocks
(4) None of these

53. Fossil X is older than fossil Y because
(1) Fossil Y was found in deeper sedimentation
(2) Fossil X was found in deeper sedimentation
(3) Fossil Y has some vestigial organs functional in X
(4) Fossil Y has homologous and analogous organs of X

54. Which of the following is an example of anthropogenic evolution?
(1) Selection of resistant varieties due to herbicides
(2) Selection of resistant varieties due to pesticides
(3) Industrial melanism
(4) All the above

55. Name the organism represented by A to F in the illustration.



(1) A–Tigercat, B–Banded anteater, C–Marsupial rat, D–Wombat, E–Bandicoot, F–Koala
(2) A–Bandicoot, B–Wombat, C–Marsupial rat, D–Koala, E–Tigercat, F–Banded anteater
(3) A–Koala, B–Banded anteater, C–Tigercat, D–Bandicoot, E–Marsupial rat, F–Wombat
(4) A–Wombat, B–Tigercat, C–Koala, D–Bandicoot, E–Banded anteater, F–Marsupial rat

56. The theory of use and disuse of organs was given by
(1) Lamarck (2) Darwin
(3) Weissmann (4) Hugo de Vries

57. Darwin's finches are an excellent example of
(1) Connecting links
(2) Brood parasitism
(3) Adaptive radiation
(4) Seasonal migration

58. Sweet potato and potato are examples of
(1) Homologous structures
(2) Analogous structures
(3) Both (1) and (2)
(4) None of these

59. Darwin travelled in which ship?
(1) H.N.S. Eagle (2) Titanic
(3) H.M.S. Beagle (4) D. Matrica

60. Survival of the fittest is possible due to
(1) Overproduction
(2) Favourable variations
(3) Environmental changes
(4) Inheritance of acquired characters