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// SAMPLE PAPER - 88 //

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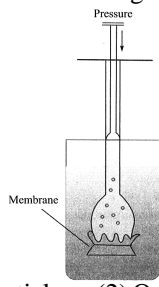
// PHYSICS //

01. Each of the two point charges are doubled and their distance is halved. Force of interaction becomes n times, where n is
    (1) 4   (2) 1   (3) 1/16   (4) 16

02. Two charged spheres separated at a distance d exert a force F on each other. If they are immersed in a liquid of dielectric constant K = 2, then the force is (if all in conditions are same)
    (1) F/2   (2) F   (3) 2F   (4) 4F

03. When 10^{19} electrons are removed from a neutral metal plate, the electric charge on it is
    (1) $-1.6\,C$ (2) $+1.6\,C$ (3) $10^{+19}\,C$ (4) $10^{-19}\,C$

04. Two point charges A and B, having charges +Q and –Q respectively, are placed at certain distance apart and force acting between them is F. If 75% charge of A is transferred to B, then force between the charges becomes
    (1) $\dfrac{F}{16}$ (2) $\dfrac{9F}{16}$ (3) $\dfrac{4F}{3}$ (4) F

05. The force exerted by two charged bodies on one another obey Coulomb's law provided that
    (1) The charges are not too small
    (2) The charges are not too large
    (3) The charges are in vacuum
    (4) Linear dimensions of the bodies are much smaller than the distance between the bodies

06. Determine the electric field strength vector if the potential of this field depends on x, y coordinates as V = 10 axy
    (1) $10\,a\left(y\hat{i}+x\hat{j}\right)$ (2) $-10\,a\left(y\hat{i}+x\hat{j}\right)$
    (3) $-a\left(y\hat{i}+x\hat{j}\right)$ (4) $-10\,a\left(x\hat{i}+y\hat{k}\right)$

07. Select the correct statement about electric charge
    (1) Charge can be converted into energy and energy can be converted into charge
    (2) Charge of a particle increases with increase in its velocity
    (3) Charge on a body is always integral multiple of a certain charge called charge of electron
    (4) Charge on a body is always positive or zero

08. An electric dipole consisting of two opposite charges of $2 \times 10^{-6}\,C$ each separated by a distance of 3 cm is placed in an electric field of $2 \times 10^{5}\,N/C$. The maximum torque on the dipole will be
    (1) $12 \times 10^{-1}\,Nm$ (2) $12 \times 10^{-3}\,Nm$
    (3) $24 \times 10^{-1}\,Nm$ (4) $24 \times 10^{-3}\,Nm$

09. An electric dipole is placed in a uniform electric field $\vec{E}$ of magnitude 40 N/C. Graph shows the magnitude of the torque on the dipole versus the angle θ between the field $\vec{E}$ and the dipole moment $\vec{p}$. The magnitude of dipole moment $\vec{p}$ is equal to:

    (1) $1.25 \times 10^{-28}\,C\text{-}m$ (2) $2.0 \times 10^{-25}\,C\text{-}m$
    (3) $2.5 \times 10^{-28}\,C\text{-}m$ (4) $5.0 \times 10^{-28}\,C\text{-}m$

10. Two equal and opposite charges of masses M_1 and M_2 are accelerated in a uniform electric field through the same distance. What is the ratio of their accelerations, if their ratio of masses is $M_1/M_2 = 0.5$?
    (1) $\dfrac{a_1}{a_2}=0.5$ (2) $\dfrac{a_1}{a_2}=1$ (3) $\dfrac{a_1}{a_2}=2$ (4) $\dfrac{a_1}{a_2}=3$

11. The distance between two charges $6\mu C$ and $15\mu C$ is 2 m. At what point on the line joining the two, the intensity will be zero?
    (1) At a distance 1 m from 6 μC
    (2) At a distance 1 m from 15 μC
    (3) At a distance 0.77 m from 6 μC
    (4) At a distance 0.77 m from 15 μC

12. The point charges Q and –2Q are placed some distance apart. If the electric field at the location of Q is $\vec{E}$, then the electric field at the location of –2Q will be

(1) $-\dfrac{\vec{E}}{2}$ (2) $+\dfrac{\vec{E}}{2}$ (3) $-\vec{E}$ (4) $+\vec{E}$

13. In a region, the intensity of an electric field is given by $E = 2\hat{i} + 3\hat{j} + \hat{k}$ in NC^{-1}. The electric flux through surface $S = 10\hat{i}$ m^2 in the region is
   (1) $5\,Nm^2\,C^{-1}$ (2) $10\,Nm^2\,C^{-1}$
   (3) $15\,Nm^2\,C^{-1}$ (4) $20\,Nm^2\,C^{-1}$

14. A charge Q is enclosed by a Gaussian spherical surface of radius R. If the radius is doubled, then the outward electric flux will
   (1) be reduced to half   (2) remain the same
   (3) be doubled   (4) increase four times

15. Charge Q is given a displacement $\vec{r} = (a\hat{i} - b\hat{j})$ in an electric field $\vec{E} = (E_1\hat{i} - E_2\hat{j})$. The work done is:

   (1) $Q(E_1a + E_2b)$

   (2) $Q\sqrt{(E_1a)^2 + (E_2b)^2}$

   (3) $Q(E_1 + E_2)\sqrt{a^2 + b^2}$

   (4) $Q\left(\sqrt{E_1^2 + E_2^2}\right)\sqrt{a^2 + b^2}$

CHEMISTRY

16. The largest number of molecules is in
   (1) 36 g of water
   (2) 28 g of carbon monoxide
   (3) 46 g of ethyl alcohol
   (4) 54 g of nitrogen pentoxide

17. The total number of electrons in one molecule of carbon dioxide is
   (1) 22   (2) 44   (3) 66   (4) 88

18. Four one litre flasks are separately filled with the gases H_2, He, O_2 and O_3 at the same temperature and pressure. The ratio of total number of atoms of these gases present in different flask would be:
   (1) 1 : 1 : 1 : 1   (2) 1 : 2 : 2 : 3
   (3) 2 : 1 : 2 : 3   (4) 3 : 2 : 2 : 1

19. 4.4 g of CO_2 and 2.24 litre of H_2 at STP are mixed in a container. The total number of molecules present in the container will be:
   (1) 6.022×10^{23} (2) 1.2044×10^{23}
   (3) 2 mole   (4) 6.023×10^{24}

20. Number of mole in 1 m^3 gas at NTP are:
   (1) 44.6   (2) 40.6   (3) 42.6   (4) 48.6

21. One litre N_2, $\dfrac{7}{8}$ litre O_2 and 1 litre CO are taken in a mixture under identical conditions of P and T. The amount of gases present in mixture is given by:
   (1) $w_{N_2} = w_{O_2} > w_{CO}$ (2) $w_{N_2} = w_{CO} > w_{O_2}$

   (3) $w_{N_2} = w_{O_2} = w_{CO}$ (4) $w_{CO} > w_{N_2} > w_{O_2}$

22. 1 mol of CH_4 contains
   (1) 6.02×10^{23} atoms of H
   (2) 4 g atom of Hydrogen
   (3) 1.81×10^{23} molecules of CH_4
   (4) 3.0 g of carbon

23. The atomic weights of two elements A and B are 40 and 80 respectively. If x g of A contains y atoms, how many atoms are present in 2x g of B?

   (1) $\dfrac{y}{2}$ (2) $\dfrac{y}{4}$ (3) y   (4) 2y

24. Haemoglobin contains 0.33% of iron by weight. The molecular weight of haemoglobin is approximately 67200. The number of iron atoms (At. wt. of Fe = 56) present in one molecule of haemoglobin is
   (1) 6   (2) 1   (3) 4   (4) 2

25. In a compound C, H, N atoms are present in 9 : 1 : 3.5 by weight. Molecular weight of compound is 108. Its molecular formula is:
   (1) $C_2H_6N_2$ (2) C_3H_4N (3) $C_6H_8N_2$ (4) $C_9H_{12}N_3$

26. The simplest formula of a compound containing 50% of element X (atomic mass 10) and 50% of element Y (atomic mass 20) is
   (1) XY   (2) X_2Y
   (3) XY_3 (4) X_2Y_3

27. The empirical formula of an acid is CH_2O_2, the probable molecular formula of acid may be
   (1) CH_2O (2) CH_2O_2 (3) $C_2H_4O_2$ (4) $C_3H_6O_4$

28. The mass of a molecule of water is
   (1) $3 \times 10^{-26}\,kg$ (2) $3 \times 10^{-25}\,kg$
   (3) $1.5 \times 10^{-26}\,kg$ (4) $2.5 \times 10^{-26}\,kg$

29. A compound (80 g) on analysis gave C = 24 g, H = 4 g, O = 32 g. Its empirical formula is
   (1) $C_2H_2O_2$ (2) C_2H_2O (3) CH_2O_2 (4) CH_2O

30. 3.0 molal NaOH solution has a density of 1.110 g/mL. The molarity of the solution is:
   (1) 2.9732 M   (2) 3.05 M
   (3) 3.64 M   (4) 3.0504 M

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

32. In plants capillarity is aided by the
    (1) Small diameter of tracheids
    (2) large diameter of tracheids
    (3) Small diameter of vessel elements
    (4) Both (1) and (3)

33. Soil less cultivation of plant in a defined nutrient solution is called
    (1) Pisciculture
    (2) Bonsai
    (3) Hydroponics
    (4) Aquaculture

34. The prominent symptom of manganese toxicity is the appearance of
    (1) Chlorotic veins surrounded by black spots
    (2) Chlorotic veins surrounded by brown spots
    (3) Brown spots surrounded by chlorotic veins
    (4) Black spots surrounded by chlorotic veins

35. Any mineral ion concentration in tissues that .....a...... the dry weight of tissues by about ....b.... is considered to toxic
    (1) a-enhances, b-10 mmole/kg
    (2) a-reduces, b-10 mmole/kg
    (3) a-enhances, b-10percent
    (4) a-reduces, b-10 percent

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. Osmosis can be demonstrated by
    (1) Potato osmometer
    (2) Thistle funnel experiment
    (3) Cobalt-chloride paper method
    (4) Both (1) and (2)

38. Once water is absorbed by the root hairs, it can move deeper into root layers by two distinct pathways
    (1) One in xylem and second in phloem
    (2) One is active and second is passive
    (3) One is apoplast and second is symplast
    (4) One is tracheid and second is vessel

39. The pressure shown in the figure is called

    (1) Osmotic potential   (2) Osmotic pressure
    (3) Turgor pressure   (4) Suction pressure

40. Which pathway involves cell wall and intercellular spaces?
    (1) Vascular pathway
    (2) Protoplast pathway
    (3) Symplast pathway
    (4) Apoplast pathway

41. Path of water movement from soil to xylem is
    (1) Metaxylem → Protoxylem → Cortex → Soil →Root hair
    (2) Cortex → Root hair → Endodermis → Pericycle → Protoxylem → Metaxylem
    (3) Soil → Root hair → Cortex → Endodermis →Pericycle → Protoxylem → Metaxylem
    (4) Pericycle → Soil → Root Hair → Cortex →Endodermis → Protoxylem → Metaxylem

42. Ions are absorbed from the soil by
    (1) Passive transprot
    (2) Active transport
    (3) Both active and passive transport
    (4) Imbibition

43. Fill in the blanks
    1. Despite the absence of a heart or a circulatory system in plants, the flow of water upward through the xylem in plants can achieve fairly high rates up to ...a.... metres per hour.
    2. Less than ...b.... percent of the water reaching the leaves is used in photosynthesis and plant growth.
    3. Water loss from a leaf can be studied by using ...c...
    4. Most researchers agree that water is mainly ...d... through the plant.
    (1) a–10, b–5, c–potato osmometer, d–pushed
    (2) a–5, b–10, c–cobalt chloride paper, d–pulled
    (3) a–15, b–1, c–cobalt chloride paper, d–pulled
    (4) a–10, b–1, c–cobalt chloride paper, d–pulled

44. The most widely accepted theory for ascent of sap in trees is
    (1) Capillarity
    (2) Role of atmospheric pressure
    (3) Pulsating action of living cell
    (4) Transpiration pull and cohesion theory of Dixon and Jolly

45. Most water flow in root occurs via apoplast as
(1) Cortical cells are living cells
(2) Cortical cells are loosely arranged
(3) Cortical cells are thin walled
(4) All of the above

ZOOLOGY

46. Hypothalamus contains several groups of neurosecretory cells called _____ which produce hormones.
(1) Ganglion   (2) Plexus
(3) Nuclei   (4) Astrocytes

47. Which of the following statement is incorrect about pituitary?
(1) Located in bony cavity called sella turcica
(2) Attached to hypothalamus by stalk
(3) Divided anatomically into adenohypophysis and neurohypophysis
(4) Secrete released and inhibitory hormones

48. Select the incorrect statement from the following.
(1) Hypersecretion of GH leads to gigantism
(2) ACTH stimulates synthesis and secretion of glucocorticoids from adrenal cortex
(3) Oxytocin acts on skeletal muscles of our body and stimulates their contraction
(4) ADH reduces loss of water through urine

49. 24 hour diurnal rhythms of our body is maintained by
(1) Melatonin   (2) Glucagon
(3) Thymosin   (4) Oxytocin

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

51. A. Increase alertness
B. Pupillary constriction
C. Piloerection
D. Increases heart rate
E. Increases respiratory rate
F. Sweating
Which of the above are effects of adrenaline/ noradrenaline?
(1) All except C   (2) All except B and F
(3) All except B   (4) All except B, E and F

52. Which of the following layers are present in adrenal cortex from inner to outer?
(1) Zona reticularis, zona fasciculata and zona glomerulosa
(2) Zona fasciculata, zona glomerulosa and zona reticularis
(3) Zona glomerulosa, zona reticularis and zona fasciculata
(4) Zona glomerulosa, zona fasciculata and zona reticularis.

53. A. Anabolic effect on protein and carbohydrate metabolism.
B. Influences male sexual behaviour (libido).
C. Stimulate spermatogenesis.
D. Muscular growth, aggressiveness and low pitch voice.
Above are the functions of which of the hormone?
(1) Estrogens   (2) Progesterone
(3) Testosterone   (4) Relaxin

54. Select the incorrect statement from the following.
(1) GIT secretes four major peptide hormones.
(2) Several other non-endocrine tissues secrete hormones called growth factors.
(3) Hormone receptors are located in target tissues only.
(4) Hormone receptors are non-specific in nature.

55. A steroid hormone typically alters the activity of its target cells by
(1) Changing the membrane permeability of cell.
(2) Entering the cell and altering gene expression.
(3) Activation of IP_3.
(4) Conversion of ATP to cAMP.

56. Which of the following hormones are iodothyronines?
(1) T_3 (2) T_4
(3) TCT   (4) Both (1) and (2)

57. Arrange the correct working sequence of 'FSH'.
(1) Binding to membrane receptor.
(2) Biochemical response.
(3) Generation of second messenger.
(4) Physiological response (Ovarian growth).
(1) $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$ (2) $1 \rightarrow 3 \rightarrow 2 \rightarrow 4$
(3) $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$ (4) $3 \rightarrow 1 \rightarrow 4 \rightarrow 2$

58. Which one of the following pair of organs includes only the endocrine glands?
(1) Thymus and testes
(2) Adrenal and ovary
(3) Parathyroid and adrenal
(4) Pancreas and parathyroid

59. Feeling the tremors of an earthquake, a scared resident from the seventh floor of a multi-storeyed building starts climbing down the stairs rapidly. Which hormone initiated this action?
(1) Adrenaline   (2) Glucagon
(3) Gastrin   (4) Thyroxine

60. Acromegaly is caused by
(1) Excess of G.H.
(2) Excess of thyroxin
(3) Deficiency of thyroxin
(4) Excess of adrenalin