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SAMPLE PAPER - 60

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

PHYSICS

01. The ratio of the energy required to raise a satellite upto a height h above the earth to the kinetic energy of the satellite into the orbit there is : (R = radius of the earth)
(1) h : R (2) R : 2h (3) 2h : R (4) R : h

02. The satellite of mass m revolving in a circular orbit of radius r around the earth has kinetic energy E. Then, its angular momentum will be :

(1) $\sqrt{\frac{E}{mr^2}}$ (2) $\frac{E}{2mr^2}$

(3) $\sqrt{2Emr^2}$ (4) $\sqrt{2Emr}$

03. Two planets of same density have the ratio of their radii as 1 : 3. The ratio of escape speed on them will be
(1) 9 : 1 (2) 1 : 9 (3) 1 : 3 (4) 3 : 1

04. Two satellites of equal mass are revolving around earth in elliptical orbits of different semi-major axis. If their angular momenta about earth centre are in the ratio 3 : 4 then ratio of their areal velocities is

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

(3) $\frac{1}{3}$ (4) $\frac{4}{3}$

05. An earth satellite X is revolving around earth in an orbit whose radius is one-fourth the radius of orbit of a geostationary satellite. Time period of revolution of X is
(1) 3 hrs (2) 6 hrs (3) 4 days (4) 72 days

06. The acceleration of a body due to the attraction of the earth (radius R) at a distance 2R from the surface of the earth is (g = acceleration due to gravity at the surface of the earth):-

(1) $\frac{g}{9}$ (2) $\frac{g}{3}$ (3) $\frac{g}{4}$ (4) g

07. A wheel whose moment of inertia is 10 kgm^2 has an initial angular velocity of 20 rad/s. A constant torque of 200 Nm acts on the wheel. The time in which wheel is accelerated to 100 rad/s is
(1) 4 s (2) 40 s (3) 80 s (4) 8 s

08. A solid sphere of radius R is placed on a smooth horizontal surface. A horizontal force F is applied at height h from the lowest point. For the maximum acceleration of centre of mass, which is correct ?
(1) h = R (2) h = 2R
(3) h = 0
(4) Centre of mass has same acceleration in each case

09. Two rings of the same radius and mass are placed such that their centres are at a common point and their planes are perpendicular to each other. The moment of inertia of the system about an axis passing through the centre and perpendicular to the plane one of the rings is: (mass of ring = m, radius r)
(1) $(1/2)mr^2$ (2) mr^2 (3) $(3/2)mr^2$ (4) $2mr^2$

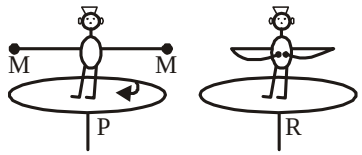
10. Two identical solid cylinders run a race starting from rest at the top of an inclined plane. If one cylinder slides and the other rolls:
(1) the sliding cylinder will reach the bottom first with greater speed
(2) the rolling cylinder will reach the bottom first with greater speed
(3) both will reach the bottom simultaneously with the same speed
(4) both will reach the bottom simultaneously but with different speeds

11. A uniform metre stick of mass M is hinged at one end and supported in a horizontal direction by a string attached to the other end. What should be the initial angular acceleration (in rad/sec^2) of the stick if the string is cut?

(1) $\frac{3}{2}$ g (2) g (3) 3 g (4) 4 g

12. The moment of inertia of a uniform circular disc about its diameter is *l*. Its moment of inertia about an axis parallel to its plane and passing through a point on its rim will be
(1) 3*l* (2) 4*l* (3) 5*l* (4) 6*l*

13. Figure P below shows a boy on a frictionless turning wheel, carrying two masses M, M on stretched arms. The wheel is set turning at angular velocity ω. The boy now folds his arms so that the masses come close to his chest . Let the moment of inertial of the wheel and boy about the axis of rotation be 3.0 kg. m^2, let each mass M be 1.0 kg. and initial separation MM = 1.4 m. As a result of the boy folding his arms, the angular velocity will become close to



(1) (5/3) ω (2) (4/3) ω
(3) (7/3) ω (4) (9/7) ω

14. Moment of inertia of a rigid body is expressed in units of kg-m^2. There are two rods A and B made of same metal. Both of them have equal cross-sectional area but rod A is double in length as compared to rod B. What is the ratio of moment of inertial of rod A to that of rod B ?
(1) 1 (2) 2 (3) 4 (4) 8

15. In the HCl molecule., the separation between the nuclei of the two atoms is about 1.27 Å(1Å=10^{-10}m) The approximate location of the centre of mass of the molecule from H atom is, assuming the chlorine atom to be about 35.5 times massive as hydrogen atom is :
(1) 1Å (2) 2.5Å (3) 1.24Å (4) 1.5Å

CHEMISTRY

16. The number of atoms in 0.1 moles of a triatomic gas is $\left(N_A = 6.023\times10^{23}\,mol^{-1}\right)$
(1) 3.600×10^{23} (2) 1.806×10^{23}
(3) 6.026×10^{22} (4) 1.800×10^{22}

17. The molecular weight of O_2 and SO_2 are 32 and 64 respectively. At 15 ºC and 150 mm of Hg pressure, one litre of O_2 contains 'N' molecules. The number of molecules in two litres of SO_2 under the same conditions of temperature and pressure will be:
(1) $\frac{N}{2}$ (2) N (3) 4N (4) 2N

18. One atom of an element X weighs 6.643×10^{-23} g. Number of moles of atom in 20 kg is
(1) 140 (2) 150 (3) 250 (4) 500

19. 3.011×10^{22} atoms of an element weigh 1.15 gm. The atomic mass of the element is
(1) 23 (2) 10 (3) 16 (4) 35.5

20. One mole of P_4 molecules contain:
(1) 1 molecule (2) 4 molecule
(3) $\frac{1}{4}\times6.022\times10^{23}$ atoms
(4) 24.088×10^{23} atoms

21. The total number of electrons in one molecule of carbon dioxide is
(1) 22 e (2) 22 mol e
(3) 66 e (4) 66 mol e

22. A molal solution is one that contains one mole of a solute in
(1) 1000 g of the solvent
(2) one litre of the solvent
(3) one litre of the solution
(4) 22.4 litres of the solution

23. Which of the following changes with increase in temperature?
(1) Molality
(2) Weight fraction of solute
(3) Fraction of solute present in water
(4) Mole fraction

24. 6.02×10^{20} molecules of urea are present in 100 mL of its solution. The concentration of solution is
(1) 0.02 M (2) 0.01 M
(3) 0.001 M (4) 0.1 M

25. 0.126 g of an acid is titrated with 0.1 N 20 mL of an base. The equivalent weight of the acid is
(1) 63 (2) 50 (3) 53 (4) 23

26. 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

27. What volume of CO_2 will be liberated at NTP, if 12 g of carbon is burnt in excess of oxygen?
(1) 11.2 L (2) 22.4 L
(3) 2.24 L (4) 1.12L

28. The equivalent weight of phosphoric acid (H_3PO_4) in the reaction,
$NaOH + H_3PO_4 \longrightarrow NaH_2PO_4 + H_2O$ is
(1) 59 (2) 49
(3) 25 (4) 98

29. When 10 mL of propane (gas) is combusted completely, the volume of CO_2(g) obtained in similar condition is
(1) 10 mL (2) 20 mL
(3) 30 mL (4) 40 mL

30. A mixture contains 5.4 g of Al, 1.2 g of Mg and 4.6 g of C_2H_5OH. The ratio of their moles is
(Atomic weights of Al = 27 u, Mg = 24 u, C = 12 u, O = 16 u, H = 1 u)
(1) 4 : 1 : 2 (2) 2 : 1 : 5 (3) 2 : 1 : 4 (4) 2 : 3 : 4

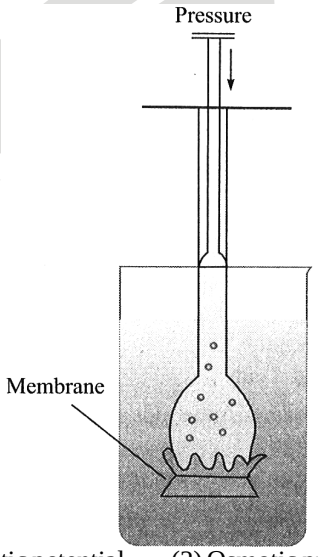
BOTANY

31. Read the following statements and find out the incorrect statements.
(a) Water is essential for all physiological activities of the plant and plays a very important role in all living organisms
(b) A mature corn plant absorbs almost five litres of water in a day
(c) A mustard plant absorbs water equal to its own weight in about 3 hours
(d) Water is often the limiting factor for plant growth and productivity in both agricultural and natural environments
(e) A watermelon has over 92 percent water, most herbaceous plants have only about 10 to 20 percent of its fresh weight as dry matter
(1) b, c, e (2) a, b, d
(3) a, c, e (4) b, c, d

32. Transpiration and root pressure cause water to rise in plants by
(1) Pushing it upward
(2) Pushing and pulling it, respectively
(3) Pulling it upward
(4) Pulling and pushing it, respectively

33. 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

34. The pressure shown in the figure is called



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

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

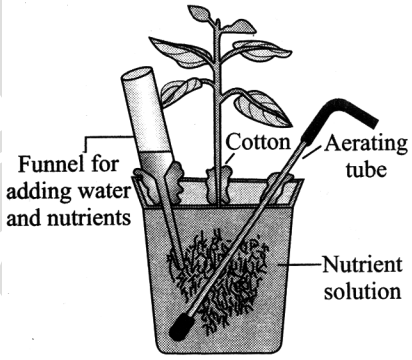
36. Ions are absorbed from the soil by
(1) Passive transprot
(2) Active transport
(3) Both active and passive transport
(4) Imbibition

37. 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

38. Diffusion of water through selectively permeable membrane is
(1) Diffusion (2) Imbibition
(3) Osmosis (4) Translocation

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

40. The following figure shows the typical set-up for



(1) Demostration of osmosis
(2) Thistle funnel experiment
(3) Nutrient solution culture
(4) Sachs technique for water less culture

41. Number of elements beneficial for higher plants are
(1) 17 (2) 10
(3) 4 (4) 21

42. The two sub-units of ribosome remain united at a critical-ion level or ribosomes structure is maintained by
(1) Magnesium (2) Calcium
(3) Copper (4) Manganese

43. Component of nitrogenase and nitrate reductase is
(1) N (2) Mo
(3) Co
(4) No specific component

44. In plants flowering is delayd due to the deficiency of
(1) Mo, S and N (2) Mo, S, N and K
(3) Ca, Mg, Cu and K (4) Mg, Zn, Mn and K

45. 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

ZOOLOGY

46. Hormones are
(1) Non-nutrient chemicals
(2) Intercellular messengers
(3) Produced in traces
(4) All of these

47. Hypothalamus directly regulates the _____ endocrine gland.
(1) Pituitary (2) Thyroid
(3) Thymus (4) Pancreas

48. Pars distalis produces how many trophic hormones?
(1) 4 (2) 5 (3) 6 (4) 8

49. Posterior pituitary stores and releases hormones
(1) Oxytocin (2) Vasopressin (ADH)
(3) Growth hormone (4) Both (1) and (2)

50. Which of the following hormone stimulates the synthesis and secretion of steroid hormones called glucocorticoids from the adrenal cortex?
(1) TSH (2) ACTH (3) LH (4) FSH

51. Low secretion of GH in child leads to
(1) Pituitary dwarfism
(2) Gigantism
(3) Cretinism
(4) Tetany

52. In females, _____ stimulates a vigorous contraction of uterus at the time of child birth.
(1) LH (2) FSH
(3) Oxytocin (4) Relaxin

53. Diuresis is reduced by
(1) Oxytocin (2) Prolactin
(3) Luteinizing hormone (4) Vasopressin

54. Which of the following regulates the function of anterior pituitary?
(1) Pineal gland
(2) Direct neural regulation of hypothalamus
(3) Hormones of hypothalamic neuron via hypothalamo hypophyseal portal system
(4) All the above

55. Melatonin influences
(1) Metabolism and pigmentation
(2) Menstrual cycle
(3) Defence capability
(4) All of these

56. A thin flap of connective tissues connecting two lobes of thyroid is known as
(1) Lobes (2) Ileum
(3) Isthmus (4) Ampulla

57. Hypothyroidism during pregnancy causes defective development and maturation of growing baby leading to
(1) Addison's disease (2) Cretinism
(3) Creatinin (4) Tetany

58. Thyroid gland secretes
(1) T_3 (2) T_4
(3) TCT (4) All of these

59. The adrenal medulla secretes two hormones called adrenaline or epinephrine and nor-adrenaline or nor-epinephrine. These are commonly known as
(1) Steroids (2) Terpenes
(3) Catecholamines (4) Cytokinin

60. Glucocorticoid causes all except
(1) Proteolysis (2) Lipolysis
(3) Glycogenolysis (4) Gluconeogenesis