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SAMPLE PAPER - 84

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

PHYSICS

01. When a ceiling fan is switched off, its angular velocity falls to half while it makes 36 rotations. How many rotations will it make before coming to rest?
(1) 24 (2) 36
(3) 18 (4) 12

02. If a body is lying in yz-plane, then according to the theorem of perpendicular axes the correct expression will be
(1) $I_z = I_x + I_y$ (2) $I_y = I_x + I_z$
(3) $I_x = I_y + I_z$ (4) $I_y = I_z + I_x$

03. The time period of a satellite of earth is 5 h. If the separation between the earth and the satellite is increased to 4 times the previous value, the new time period will become
(1) 40 h (2) 20 h
(3) 10 h (4) 80 h

04. The radius of the earth is R. The height of a point vertically above the earth's surface at which acceleration due to gravity becomes 1% of its value at the surface is
(1) 8 R (2) 9 R
(3) 10 R (4) 20 R

05. A particle of mass 3 kg, attached to a spring with force constant 48 N m^{-1} execute simple harmonic motion on a frictionless horizontal surface. The time period of oscillation of the particle, in seconds, is
(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{2}$
(3) 2π (4) 8π

06. A point performs simple harmonic oscillation of period T and the equation of motion is given by $x = a\sin\left(\omega t + \frac{\pi}{6}\right)$. After the elapse of what fraction of the time period the velocity of the point will be equal to half of its maximum velocity?
(1) $\frac{T}{3}$ (2) $\frac{T}{12}$ (3) $\frac{T}{8}$ (4) $\frac{T}{6}$

07. If the end correction of an open pipe is 0.8 cm then the inner radius of that pipe will
(1) $\frac{1}{3}$ cm (2) $\frac{2}{3}$ cm (3) $\frac{3}{2}$ cm (4) 0.2 cm

08. A transverse wave pulse is generated at the free end of a string which is hanging from a rigid support. The speed of the wave pulse at distance x from the free end is proportional to
(1) x^2 (2) x (3) $\sqrt{x}$ (4) 1/x

09. A police car with a siren of frequency 8 kHz is moving with uniform velocity 36 km h^{-1} towards a tall building which reflects the sound waves. The speed of sound in air is 320 ms^{-1}. The frequency of the siren heard by the car driver is
(1) 8.5 kHz (2) 8.25 kHz
(3) 7.25 kHz (4) 7.5 kHz

10. Change in temperature of the medium changes
(1) frequency of sound waves.
(2) amplitude of sound waves.
(3) wavelength of sound waves.
(4) loudness of sound waves.

11. A car is moving on a circular level road of the radius of curvature 300 m. If the coefficient of friction is 0.3 and acceleration due to gravity is 10 m s^{-2}, the maximum speed the car can have is (in km h^{-1})
(1) 30 km h^{-1} (2) 81 km h^{-1}
(3) 108 km h^{-1} (4) 162 km h^{-1}

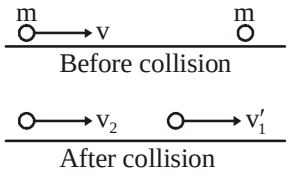
12. The x and y coordinates of a particle at any time t are given by $x = 7t + 4t^2$ and $y = 5t$, where x and y are in metre and t in second. The acceleration of the particle at t = 5 s is
(1) zero (2) 8 m s^{-2}
(3) 20 m s^{-2} (4) 40 m s^{-2}

13. A space-ship travelling in the interstellar medium is picking up dust at a rate $\frac{dM}{dt} = \alpha v$, where α is a positive constant, v is the instantaneous velocity and M is the total mass of the space-ship at any instant. The instantaneous acceleration of the space-ship is

(1) $\frac{-2\alpha v^2}{M}$ (2) $\frac{-\alpha v^2}{M}$

(3) $\frac{-\alpha v^2}{2M}$ (4) $-\alpha v^2$

14. A ball of mass m moving at a speed v makes a head-on collision with an identical ball at rest. The kinetic energy of the balls after the collision is $\frac{3}{4}^{th}$ of the original. What is the coefficient of restitution?



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

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

15. A force of $(7\hat{i} + 6\hat{k})$ N makes a body move on a rough plane with a velocity of $(3\hat{j} + 4\hat{k})$ ms^{-1}. The power (in watt) delivered by the force is

(1) 24 (2) 34 (3) 21 (4) 45

CHEMISTRY

16. A gaseous mixture contains CH_4 and C_2H_6 in equimolecular proportion. The weight of 4.48 litres of this mixture at NTP is

(1) 4.6 g (2) 2.3 g (3) 1.6 g (4) 23 g

17. Consider a titration of potassium dichromate solution with acidified Mohr's salt solution using diphenylamine as indicator. The number of moles of Mohr's salt required per mole of dichromate is

(1) 3 (2) 4 (3) 5 (4) 6

18. One mole of NaCl(s) on melting absorbed 30.5 kJ of heat and its entropy is increased by 28.8 JK^{-1}. The melting point of NaCl is

(1) 1059 K (2) 30.5 K

(3) 28.8 K (4) 28800 K

19. The pH of 0.1 M CH_3COOH is 2.873. What is pH of 0.1 M NH_4OH? $K_a(CH_3COOH) = 1.8\times10^{-5}$ and $K_b(NH_4OH) = 1.8\times10^{-5}$.

(1) 11.127 (2) 2.873

(3) 7 (4) 9.53

20. When trigonal void of an hcp layers lies over trigonal void of another hcp layer beneath, the new type of void formed is

(1) tetrahedral (2) inverted tetrahedral

(3) octahedral (4) Both (1) and (3)

21. Given, $E^o_{Ag^+/Ag} = 0.80\,V$, $E^o_{Mg^{2+}/Mg} = -2.37\,V$, $E^o_{Cu^{2+}/Cu} = 0.34\,V$, $E^o_{Hg^{2+}/Hg} = 0.79\,V$

Which of the following statements is/are correct?

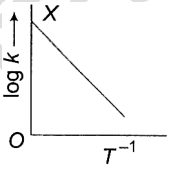
(1) $AgNO_3$ can be stored in copper vessel

(2) $Cu(NO_3)_2$ can be stored in magnesium vessel

(3) $CuCl_2$ can be stored in silver vessel

(4) $HgCl_2$ can be stored in copper vessel

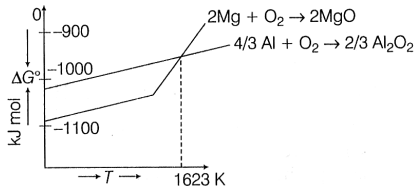
22. Graph between log k and $\frac{1}{T}$ (k is rate constant in s^{-1} and T is the temperature in K) is a straight line. If OX = 5 and slope of the line $= -\frac{1}{2.303}$ then E_a is



(1) 2.303 × 2 cal (2) $\frac{2}{2.303}$ cal

(3) 2 cal (4) None of these

23. Which of the following statements is correct wrt the following graph?



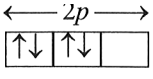
(1) Below 1623 K, Mg reduces Al_2O_3

(2) Above 1623 K, Al reduces MgO

(3) Both (1) and (2) are correct

(4) Both (1) and (2) are wrong

24. If the electronic structure of oxygen atom is written as



$1s^2, 2s^2$ it would violate–

(1) Hund's rule

(2) Pauli's exclusion principle

(3) Both Hund's and Pauli's principles

(4) None of these

25. A cylinder is filled with a gaseous mixture containing equal masses of CO and N_2. The partial pressure ratio is:
(1) $P_{N_2} = P_{CO}$ (2) $P_{CO} = 0.875\ P_{N_2}$
(3) $P_{CO} = 2\ P_{N_2}$ (4) $P_{CO} = \frac{1}{2} P_{N_2}$

26. The enthalpy change (ΔH) for the process $N_2H_{4(g)} \rightarrow 2N_{(g)} + 4H_{(g)}$ in 1724 KJ mol^{-1}. If the bond energy of N–H bond in ammonia is 391 KJ mol^{-1}. What is the bond energy of N–N bond is N_2H_4?
(1) 160 KJ mol^{-1}
(2) 391 KJ mol^{-1}
(3) 1173 KJ mol^{-1}
(4) 320 KJ mol^{-1}

27 How many grams of CaC_2O_4 will dissolve in 1 L of saturated solution? K_{sp} of CaC_2O_4 is 2.5×10^{-9} mol^{-2} and its molecular weight is 128.
(1) 0.0064 g (2) 0.0128 g
(3) 0.0032 g (4) 0.0640 g

28. What will be the ratio of the masses of formalin (HCHO and glucose ($C_6H_{12}O_6$) contained in equal volumes of solutions having the same osmotic pressure at the given temperature?
(1) 1 : 1 (2) 1 : 2
(3) 1 : 3 (4) 1 : 6

29. Same quantity of current is passed through molten NaCl and molten cryolite containing Al_2O_3. If 4.6 g of sodium were liberated in one cell, the mass of aluminium liberated in other cell was
(1) 0.9 g (2) 2.7 g
(3) 1.8 g (4) 3.6 g

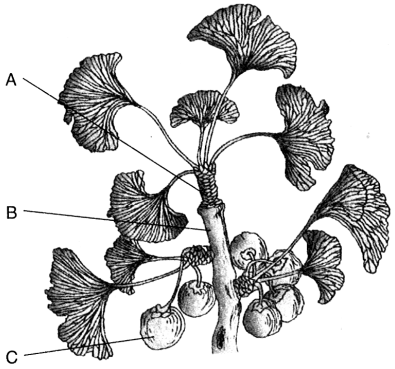
30. Read the following statements and predict the corresponding law. "At infinite dilution, when dissociation is complete, each ion makes a definite contribution towards total equivalent conductance of the electrolyte irrespective of the nature of the ion."
(1) Ostwald's dilution law
(2) Kohlrausch's law
(3) Nernst equation
(4) Ohm's law

BOTANY

31. Characters used to classify organism when no fossil evidence is supportive, is
(1) Numerical taxonomy
(2) Cytotaxonomy
(3) Chemotaxonomy
(4) All of these

32. Pteridophyte having microphylls is
(1) Ferns (2) Psilotum
(3) Selaginella (4) None of these

33. Identify A, B and C in the given figure.



(1) A–Dwarf shoot, B–Long shoot, C–Seeds
(2) A–Long shoot, B–Seeds, C–Dwarf shoot
(3) A–Long shoot, B–Dwarf shoot, C–Seeds
(4) A–Seeds, B–Long shoot, C–Dwarf shoot

34. The height of eucalyptus tree is approximately
(1) 100 m (2) 1000 m
(3) 10 m (4) 10–20 m

35. In haplontic life cycle, the zygote divides by
(1) Mitosis (2) Meiosis
(3) Any of them (4) Amitosis

36. Which of the following is true about guard cells?
(1) Outer wall is thin
(2) Inner wall (towards stomatal pore) is thick
(3) Bean-shaped in dicots and dumb-bell-shaped in grasses
(4) All the above

37. Root hairs are
(1) Acellular
(2) Unicellular
(3) Multicellular
(4) Multicellular and unicellular

38. Simple long distance transport cannot be achieved by
(1) Diffusion
(2) Facilitated diffusion
(3) Active transport
(4) All of these

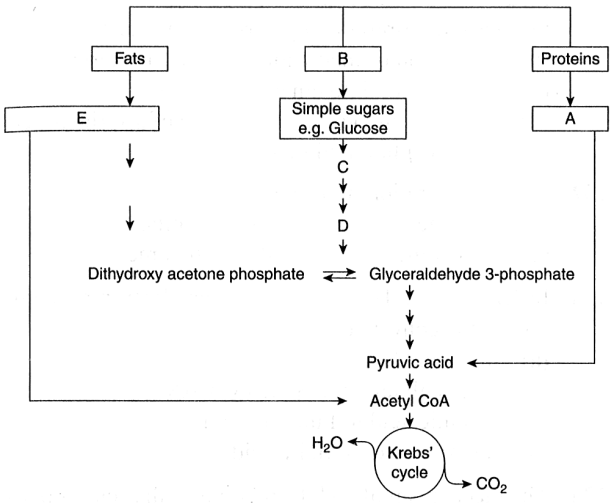
39. Find the true/false statement from the following.
(1) Only 50 elements are found in different plant.
(2) In hydroponics, nutrient solution must be adequately aerated to obtain optimum growth.
(3) Some plant species accumulate selenium.
(4) By hydroponics, essential elements were identified and their deficiency symptoms were discovered.
(1) FTTT (2) FFTT
(3) FTFT (4) FFFT

40. Reduction process of Calvin cycle requires how many ATP and NADPH for reduction of one molecule of CO_2?
(1) 2 mole ATP and 2 mole NADPH
(2) 2 mole ATP and 2 mole NADPH
(3) 1 mole ATP and 2 mole NADPH
(4) 3 mole ATP and 2 mole NADPH

41. C_4 plants are adapted to
(1) Hot and dry climate
(2) Temperate climate
(3) Cold and dry climate
(4) Hot and humid climate

42. Oxidative phosphorylation and photophosphorylation both require the electron carrier
(1) Cytochrome (2) Oxygen
(3) Carbon dioxide (4) Water

43. What indicates A to E in the given figure?



(1) A: Glucose 6-phosphate, B: Fatty acids and glycerol, C: Carbohydrate, D: Amino acid, E: Fructose 1, 6-bisphosphate.
(2) A: Fatty acids and glycerol, B: Glucose 6-phosphate, C: Amino acid, D: Carbohydrates, E: Fructose 1, 6-bisphosphate.
(3) A: Fructose 1, 6-bisphosphate, B: Amino acid, C: Glucose 6-phosphate, D: Fatty acids and glycerol, E: Carbohydrate.
(4) A: Amino acid, B: Carbohydrate, C: Glucose 6-phosphate, D: Fructose 1, 6-bisphosphate, E: Fatty acids and glycerol.

44. Intracellular factor for plant development includes _____.
(1) Chemical regulators (2) Genetics
(3) Light (4) Temperature

45. During photosynthesis, when PGA is changed into phosphoglyceraldehyde, which of the following reaction occurs?
(1) Oxidation (2) Reduction
(3) Electrolysis (4) Hydrolysis

ZOOLOGY

46. 'P' hormone released from 'Q' gland, inhibits the release of growth hormone from 'R' gland. P travels through 'S' to reach 'R': Identify P – S.
(1) P–Somatotrophic hormone; Q–Hypothalamus; R–Pituitary; S–Neurosecretory neurons
(2) P–Somatostatin; Q–Pituitary; R–Hypothalamus; S–Portal circulations
(3) P–Somatostatin; Q–Pituitary; R–Hypothalamus; S–Neurosecretory neurons
(4) P–Somatostatin; Q–Hypothalamus; R–Pituitary; S–Portal circulations

47. Read the following statements and choose incorrect one.
(1) Thymosins also promotes production of antibodies to provide humoral immunity
(2) Four parathyroid glands are present on the back side of the thyroid gland
(3) Post ganglionic nerve fibres of sympathetic nervous system uses acetylcholine
(4) Acetylcholine reduces the rate of heart beat

48. If after cutting through dorsal root of a spinal nerve of a mammal, the associated receptor in skin was stimulated the animal would:
(1) Still be able to feel the stimulation
(2) Respond but only at a different level of spinal cord
(3) Show a normal but slow response
(4) Show no response

49. Read the following statements and choose incorrect one.
(1) The aperture surrounded by the iris is called the pupil
(2) The diameter of the lens is regulated by the muscle fibres of iris
(3) Cerebellum has very convoluted surface in order to provide the additional space for many more neurons
(4) Brain is covered by an outer layer called duramater, a middle layer called arachnoid and an inner layer called piamater

50. Read the given statements and select the correct options:
A. Synaptic cleft of neurons is protoplasmic space.
B. Myelinated nerve fibres are enveloped with Schwann cells, which form a myelin sheath around the axon.
C. Non-myelinated nerve fibre is enclosed by a Schwann cell that does not form a myelin sheath
D. Spinal and cranial nerves are made of non-myelinated nerve fibres.
(1) A and B (2) A, B and C
(3) B, C and D (4) B and C

51. Which of the following structures or regions is incorrectly paired with its function?
(1) Medulla oblongata : controls respiration and cardiovascular reflexes

(2) Limbic system : consists of fibre tracts that interconnect different regions of brain; controls movement
(3) Hypothalamus : production of releasing hormones and regulation of temperature, hunger and thirst
(4) Corpus callosum : band of fibres connecting left and right cerebral hemispheres

52. Math the columns and find out the correct combination:

A.	Factor II	1.	Thromboplastin
B.	Factor III	2.	Prothrombin
C.	Factor VIII	3.	Hageman factor
D.	Factor XII	4.	Antihaemophillic globulin

(1) A–2; B–1; C–4; D–3 (2) A–1; B–2; C–3; D–4
(3) A–3; B–4; C–2; D–1 (4) A–4; B–4; C–2; D–1

53. Read the following statements and choose incorrect one.
(1) Neural signal through sympathetic nerves can increase the strength of ventricular contraction
(2) RBCs have a fixed life span of 120 days after which they are destroyed in the spleen
(3) Basophils are least in number among all WBCs
(4) During a cardiac cycle each ventricle pumps approximately 70 ml blood which is called stroke volume

54. Choose the correct statement.
(1) The T-wave in an ECG represents excitation of ventricles
(2) The sum of P and T waves in a given time period can determine the heart beat rate of an individual
(3) The end of the P-wave marks the end of the systole
(4) In a standard ECG, a person is connected to the machine with three electrical leads

55. Match the columns and find out the correct combination:

A.	Sphincter of anus	1.	Opening of hepatopancreatic duct into duodenum
B.	Cardiac sphincter	2.	Between duodenum and posterior stomach
C.	Sphincter Oddi	3.	Guarding the terminal part of alimentary canal
D.	Ileocaecal sphincter	4.	Between oesophagus and anterior stomach
E.	Pyloric sphincter	5.	Between small intestine and large intestine

(1) A–3; B–2; C–4; D–1; E–5
(2) A–2; B–5; C–1; D–4; E–3
(3) A–3; B–4; C–1; D–5; E–2
(4) A–4; B–3; C–1; D–2; E–5

56. Read the following statements and choose incorrect statements.
(1) Saliva contains a starch digesting enzyme which breaks α-glycosidic bond
(2) The undigested food becomes semisolid in nature due to the absorption of water in large intestine
(3) Tongue is only used for the finding taste of food
(4) Lymph vessels ultimately release the absorbed substance into the blood stream

57. Read the following statements carefully and choose the option which have all the wrong ones.
A. Colon is a blind sac which hosts some symbiotic micro-organisms.
B. The sigmoid part of colon opens into the rectum.
C. The oesophagus is a thick and short tube which extends anteriorly passing through the neck.
D. The tongue is a freely movable muscular organ attached to the floor of the oral cavity by franulum.
(1) A and C (2) B and C
(3) C and D (4) A, C and D

58. Choose the correct statement:
(1) All reptiles have a three–chambered heart.
(2) All Pisces have gills covered by an operculum.
(3) All mammals are viviparous.
(4) All cyclostomes do not possess jaws and paired fins.

59. Select incorrect statement from the following.
(1) In vertebrates, notochord is replaced by cartilaginous or bony vertebral column
(2) In cephalochordates, notochord extended from head to tail region and persistent throughout life
(3) Protochordates are exclusively marine
(4) Notochord is present in tail of adult in urochordata

60. Which of the following option correctly define the effects of cortisol on given substrate?
(1) Blood Glucose–Increase; Lipids–Breakdown; Proteins–Synthesis
(2) Blood Glucose–Increase; Lipids–Synthesis; Proteins–Breakdown
(3) Blood Glucose–Decrease; Lipids–Synthesis; Proteins–Synthesis
(4) Blood Glucose–Increase; Lipids–Breakdown; Proteins–Breakdown