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ESTD. 1985
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SAMPLE PAPER - 120

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

PHYSICS

01. A block is projected over a rough surface with speed 9.8 m/s. If friction coefficient of surface-block interface is 0.5. Find distance after which block stops
(1) 4.9 m (2) 9.8 m
(3) 14.7 m (4) 19.6 m

02. The stream of a river is flowing with a speed of 2 km/h. A swimmer can swim at a speed of 4 km/h. What should be the direction of the swimmer with respect to the flow of the river to cross the river straight?
(1) 60° (2) 120°
(3) 90° (4) 150°

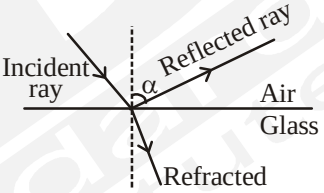
03. Two small satellites are moving in circular orbits around the earth at a distance R and R + ΔR from the centre of the earth. If their time period of rotation are T and T + ΔT respectively, then (ΔT<<< T, ΔR<<< R)
(1) $\Delta T = T\frac{\Delta R}{R}$ (2) $\Delta T = 3T\frac{\Delta R}{R}$
(3) $\Delta T = \frac{3}{2}T\frac{\Delta R}{R}$ (4) $\Delta T = \frac{2}{3}T\frac{\Delta R}{R}$

04. The centre of mass a system of particles does not depend on :
(1) masses of the particles
(2) forces on the particles
(3) position of the particles
(4) relative distance between the particles

05. If $y = \sin x + \cos x$, then $\frac{d^2y}{dx^2}$ is equal to
(1) sin x – cos x (2) cos x – sin x
(3) – (sin x + cos x) (4) None of these

06. Assertion (A) : The number of significant figures depends on the least count of measuring instrument
Reason (R) : Significant figures define the accuracy of measuring instrument.
(1) (A) is not correct but (R) is correct
(2) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(3) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(4) (A) is correct but (R) is not correct

07. A ray of light strikes an air-glass interface such that a part of it is reflected into air and the rest enters glass as shown in the figure given below.



If angle of refraction and refractive index of glass with respect to air is r and n respectively, then value of α is
(1) r (2) n sin r
(3) $\sin^{-1}$ (n sin r) (4) $\sin^{-1}\left(\frac{\sin r}{n}\right)$

08. For an electric dipole placed in an electric field of a plane conducting sheet then on its either side which of the following are correct for dipole
(a) electric force is zero
(b) electric force is not zero
(c) torque is zero
(d) torque is not zero
(1) a, d (2) a, c
(3) c, d (4) b, d

09. Two charge +q and –q are situated at a certain distance. At the point exactly midway between them
(1) Electric field and potential both are zero
(2) Electric field is zero but potential is not zero
(3) Electric field is not zero but potential is zero
(4) Neither electric field nor potential is zero

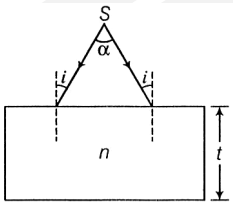
10. 15 joule of work has to be done against an existing electric field to take a charge of 0.01 C from A to B. Then, the potential difference ($V_B - V_A$) is
(1) 1500 V (2) –1500 V
(3) 0.15 V (4) None of these

11. Two guns A and B can fire bullets at speeds 1 km/s and 2 km/s, respectively. From a point on a horizontal ground, they are fired in all possible directions. The ratio of maximum areas covered by the bullets on the ground fired by the two guns is
(1) 1 : 4 (2) 1 : 16
(3) 1 : 8 (4) 1 : 2

12. The ratio of radius of gyration of a solid sphere of mass M and radius R about its own axis to the radius of gyration of the thin hollow sphere of same mass and radius about its axis is :
(1) $\sqrt{3}:\sqrt{5}$ (2) 5:3
(3) 2:5 (4) 5:2

13. From a disc of radius R and mass M, a circular hole of diameter R, whose rim passes through the centre is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre?
(1) $\frac{9MR^2}{32}$ (2) $\frac{15MR^2}{32}$
(3) $\frac{13MR^2}{32}$ (4) $\frac{11MR^2}{32}$

14. A divergent beam of light from a point source S having divergence angle α falls symmetrically on a glass slab as shown in the figure. The angles of incidence of the two extreme rays are equal. If the thickness of the glass slab is t and its refractive index is n, then the divergence angle of the emergent beam is



(1) zero (2) α
(3) $\sin^{-1}(1/n)$ (4) $2\sin^{-1}(1/n)$

15. Water rises in a capillary tube and it reads 2 cm. If the tube is tilted 45° from the vertical. What will be the new reading of tube ?
(1) 4.0 cm (2) 2.0 cm
(3) 2.8 cm (4) water will not rise at all

CHEMISTRY

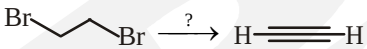
16. One mole of alkene on ozonolysis gives 2 moles of butanone. The alkene is:
(1) 3,4-dimethylhex-2-ene
(2) 2,3-dimethylhex-3-ene
(3) 2,3-dimethylhex-2-ene
(4) 3,4-dimethylhex-3-ene

17. In the reactions

$$(B) \xleftarrow[H_2]{\text{Lindlar catalyst}} R-C\equiv C-R \xrightarrow{Na/NH_3} (A)$$

(A) and (B) are geometrical isomers. Then:
(1) A is cis and B is trans
(2) A is trans and B is cis
(3) A and B are cis
(4) A and B are trans

18. The reagent(s) for the following conversion,



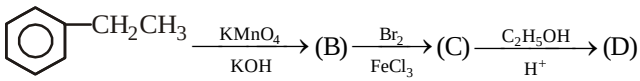
is/are:
(1) alcoholic KOH
(2) alcoholic KOH followed by $NaNH_2$
(3) aqueous KOH followed by $NaNH_2$
(4) Zn/CH_3OH

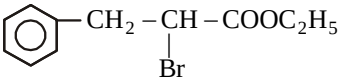
19. The compound that is most reactive towards electrophilic nitration is:
(1) toluene (2) benzene
(3) nitrobenzene (4) benzoic acid

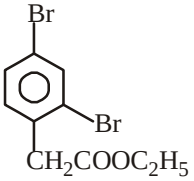
20. Some meta-directing substituents in aromatic substitution are given. Which one is most deactivating?
(1) $-NO_2$ (2) $-COOH$
(3) $-C\equiv N$ (4) $-SO_3H$

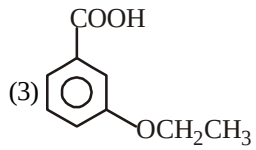
21. The oxidation of toluene to benzaldehyde with chromyl chloride in carbon tetrachloride is called:
(1) Sandmeyer's reaction
(2) Perkin's reaction
(3) Fittig reaction
(4) Etard's reaction

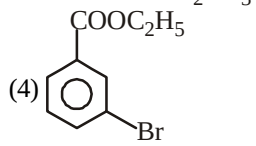
22. In a set of reactions, ethylbenzene yielded a product(D).



(D) would be:
(1) 

(2) 

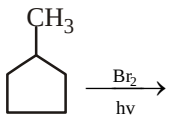
(3) 

(4) 

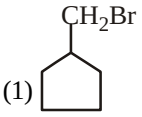
23. A solution is obtained by mixing 200 g of 30% and 300 g of 20% solution by weight. What is the percentage of solute in the final solution?
(1) 50% (2) 28% (3) 64% (4) 24%

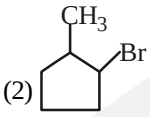
24. For the following equilibrium,
$N_2O_4(g) \rightleftharpoons 2NO_2(g)$, at what temperature the value of K_p and K_C will become equal [R = 0.0821 L atm mol^{-1} K^{-1}?
(1) T = 1.0 K (2) T = 12.18 K
(3) T = 27.3 K (4) T = 273 K

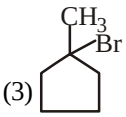
25. In the following reaction,

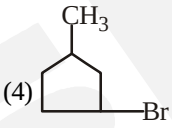


The major product obtained is:

(1) 

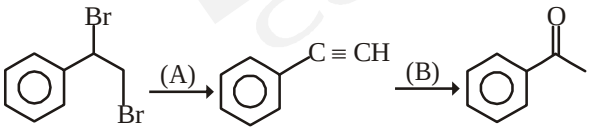
(2) 

(3) 

(4) 

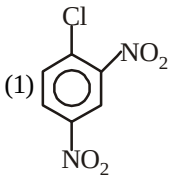
26. The correct order of reactivity of the halides, ethyl chloride (I) iso-propyl chloride (II) and benzyl chloride (III) in $S_{N}1$ reactions is:
(1) III > II > I (2) I > II > III
(3) II > I > III (4) I > III > II

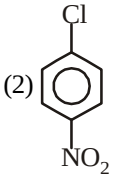
27. Identify the reagents in the following transformations:

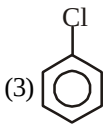


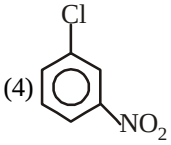
(1) $NaNH_2$ and $KMnO_4/H^+$
(2) $NaNH_2$ and H_2O, $HgSO_4$, H_2SO_4
(3) Aq. KOH and H_2O, $HgSO_4$, H_2SO_4
(4) Alc. KOH and $KMnO_4/H^+$

28. The compound that reacts the fastest with sodium methoxide is:

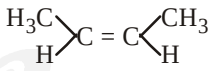
(1) 

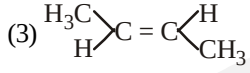
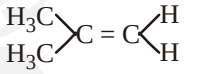
(2) 

(3) 

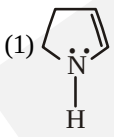
(4) 

29. The compound which reacts with HBr obeying Markownikoff's rule is:

(1) $H_2C = CH_2$ (2) 

(3)  (4) 

30. Which one of the following is an aromatic compound?

(1)  (2)  (3)  (4) 

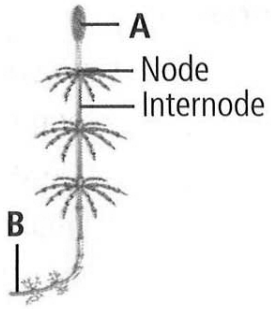
BOTANY

31. Select the correct match of algal class and its characteristic flagellation.
(1) Chlorophyceae – 2-8 equal, apical
(2) Phaeophyceae – 2, unequal, lateral
(3) Rhodophyceae – Absent
(4) All of these

32. Read the given statements and select the correct option.
Statement 1 : Bryophytes are amphibians of plant kingdom.
Statement 2 : They live in soil but depend on water for sexual reproduction.
(1) Both statements 1 and 2 are correct.
(2) Statement 1 is correct but statement 2 is incorrect.
(3) Statement 1 is incorrect but statement 2 is correct.
(4) Both statements 1 and 2 are incorrect.

33. Study the following statements and select the correct ones.
(i) Herbarium is a store house of collected plant specimens that are dried, pressed and preserved on sheets.
(ii) Flora provides the index to the plant species found in a particular area.
(iii) Monographs contain information about particular taxon.
(1) (i) and (ii) only (2) (ii) and (iii) only
(3) (i) and (iii) only (4) (i), (ii) and (iii)

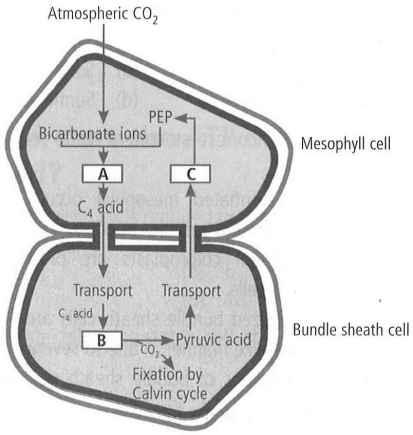
34. Identify the parts labelled as A and B in the given figure of Equisetum and select the correct option.



(1) A–Strobilus; B–Rhizome
(2) A–Sporophylis; B–Tuber
(3) A–Sporangia; B–Rhizome
(4) A–Sporophyte; B–Tuber

35. Which of the following tissue systems constitutes bulk of the plant body?
(1) Epidermal tissue system
(2) Ground tissue system
(3) Vascular tissue system
(4) Both (1) and (3)

36. Given figure represents C_4 pathway. Select the suitable options for A, B and C.



(1) A–Decarboxylation; B–Reduction; C–Regeneration
(2) A–Fixation; B–Transamination; C–Regeneration
(3) A–Carboxylation; B–Decarboxylation; C–Reduction
(4) A–Fixation; B–Decarboxylation; C–Regeneration

37. Last e^- acceptor during ETS is
(1) O_2 (2) cyt a (3) cyt a_2 (4) cyt a_3

38. Different kinds of structures develop in plants in different phases of growth or in response to environment. This ability is called _____.
(1) plasticity (2) elasticity
(3) differentiation (4) none of these

39. A taxonomic category refers to
(1) the basic unit of classification
(2) a rank or level in a taxonomic hierarchy
(3) a group of related organisms able to interbreed
(4) a group of related organisms but unable to interbreed freely.

40. Match Column–I with Column–II and select the correct option from the given codes.

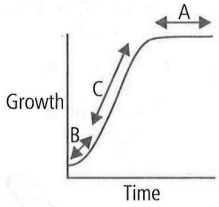
	Column–I		Column–II
A.	Monera	(i)	Cuscuta, Solanum
B.	Protista	(ii)	Bacillus, Nostoc
C.	Fungi	(iii)	Euglena, Trypanosoma
D.	Plantae	(iv)	Mucor, Penicillium
E.	Animalia	(v)	Felis, Panthera

(1) A–(iii), B–(ii), C–(iv), D–(i), E–(v)
(2) A–(ii), B–(iii), C–(iv), D–(i), E–(v)
(3) A–(ii), B–(iii), C–(i), D–(iv), E–(v)
(4) A–(ii), B–(v), C–(i), D–(iv), E–(iii)

41. _____ bacteria oxidise various inorganic substances such as nitrates, nitrites and ammonia and use the released energy for ATP production. They play an important role in recycling of nutrients (N, P, Fe, S etc.).
(1) Photosynthetic autotrophic
(2) Chemosynthetic autotrophic
(3) Parasitic
(4) Saprophytic

42. Which of the following statements is not correct regarding the Class Ascomycetes?
(1) Conidia are the asexual spores produced endogenously on conidiophores.
(2) Ascospores are the sexual spores produced endogenously in asci.
(3) Aspergillus, Neurospora and Claviceps are ascomycetes fungi.
(4) Mycelium is generally branched and septate in ascomycetes.

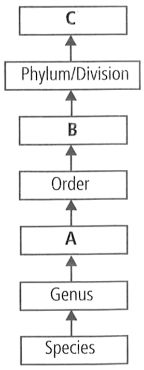
43. Given graph is drawn on the parameters of growth versus time. Here A, B and C respectively represent



(1) exponential phase, log phase and steady state phase
(2) steady state phase, lag phase and log phase
(3) log phase, steady state phase and logarithmic phase
(4) log phase, lag phase and steady state phase.

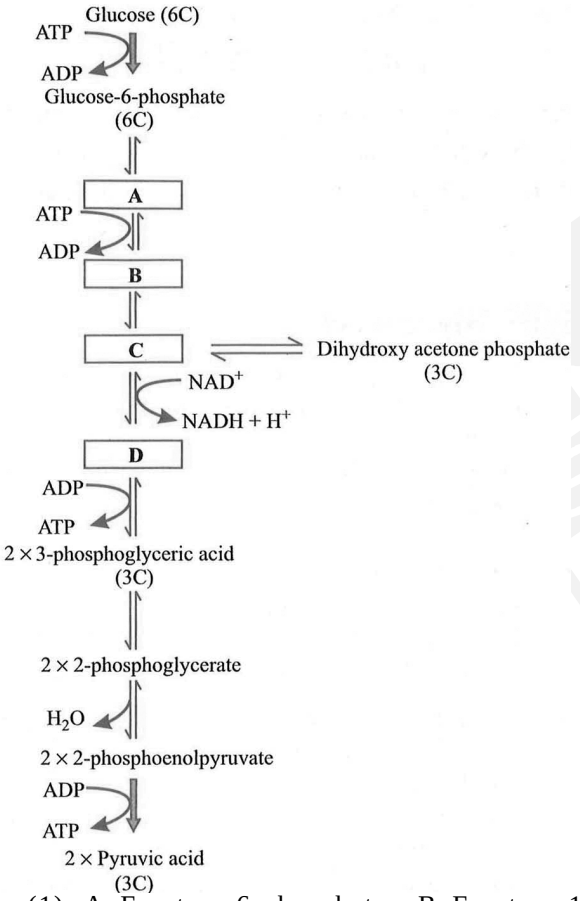
44. The given flow chart represents the hierarchy of various taxonomic categories. Identity the missing categories (A, B and C) and select the correct statements regarding these.
(i) A is the taxonomic category which contains a number of related genera.
(ii) Examples of category B are Monocotyledonae, Dicotyledonae, Mammalia, etc.
(iii) C represents the basic unit of taxonomic hierarchy.

(iv) Examples of category C are Fungi, Monera, Protista, etc.



(1) (i) and (ii) only (2) (iii) and (iv) only
(3) (i), (ii) and (iv) only (4) (i), (ii), (iii) and (iv)

45. The flow chart given below shows the steps in glycolysis. Select the option that correctly fills in the missing steps A, B, C and D.



(1) A–Fructose-6-phosphate; B–Fructose-1,6-bisphosphate; C–3-PGAL; D–1,3-bisphospho-glyceric acid

(2) A–Fructose-1,6-bisphosphate; B–3-PGAL; C–1,3-bisphospho-glyceric acid; D–3 PGA

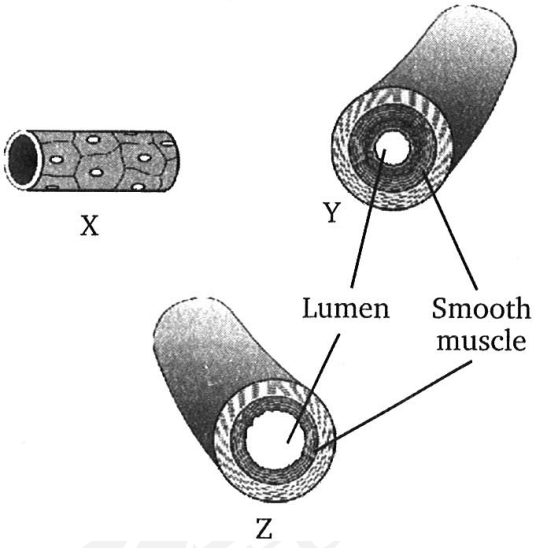
(3) A–3-PGA; B–1,3-bisphospho-glyceric acid; C–3-PGAL; D–Fructose-1,6-bisphosphate

(4) A–Fructose-1,6-bisphosphate; B–Fructose-6-phosphate; C–3-PGAL; D–1,3-bisphospho-glyceric acid

ZOOLOGY

46. Heart is protected by a:
(1) Single walled membranous bag called pericardium
(2) Double walled membranous bag called peritoneum
(3)Single walled membranous by called peritoneum
(4) Double walled membranous bag called pericardium

47. Identify the structures X, Y and Z.



Options	X	Y	Z
(1)	Vein	Capillary	Artery
(2)	Capillary	Artery	Vein
(3)	Artery	Vein	Capillary
(4)	Vein	Artery	Capillary

48. The ..... region of pituitary, commonly called anterior pituitary produces GH, PRL, TSH, ACTH, LH and FSH.
(1) Pars distalis
(2) Pars intermedia
(3) Pars tuberalis
(4) Neurohyphophysis

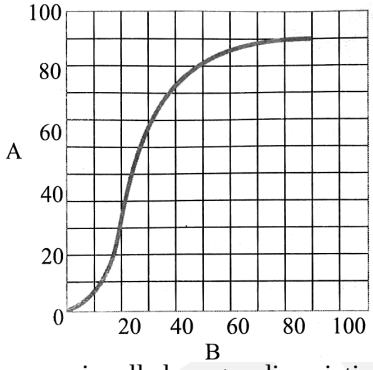
49. Which of the hormones increase the heart beat, the strength of heart contraction and the rate of respiration?
(1) Adrenaline and noradrenaline
(2) Thyroxine
(3) ACTH and glucagon
(4) ACTH and insulin

50. Which trait is not characteristic of Echinodermata?
(1) Aristotle's lantern
(2) Water vescular system
(3) Radial symmetry
(4) Trochophore larva

51. Assertion : Iodine deficiency causes simple goitre.
Reason : Reduced iodine intake decreases thyroxine production:
(1) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
(2) The Assertion and Reason are true but Reason is not correct explanation of Assertion
(3) Assertion is true but, Reason is false
(4) Assertion is false but, Reason is true

52. Study the following statements and identify the correct statements:
A. Living state is non-equilibrium steady state.
B. The system at equilibrium cannot perform work.
C. The living process is a constant effort to prevent the system falling into equilibrium.
D. Without metabolism, there cannot be a living state.
(1) C and D only (2) A, C and D only
(3) B and C only (4) All of the above

53. Which of the following is incorrect about the given graph?



(1) The curve is called oxygen dissociation curve.
(2) The part 'A' represents percentage saturation of haemoglobin with oxygen.
(3) The part 'B' represents partial pressure of carbon dioxide.
(4) This curve is highly useful in studying the effect of factors like pCO_2, H^+ concentration, etc.

54. Chemosensitve area in medulla is sensitive to:
(1) H^+ only
(2) CO_2 only
(3) H^+ and CO_2 both
(4) O_2 only

55. A decrease in blood pressure/volume will not cause the release of
(1) Renin
(2) Atrial Natriuretic Factor
(3) Aldosterone
(4) ADH

56. Find out the true statement(s)
A. Autoimmune neuromuscular disease leading to muscular weakness and fatigue is myasthenia gravis.
B. Rapid spasms (wild contractions) in muscle due to low Ca^{++} in body fluid is called tetany.
C. Muscles stiffen and become hard just after death is muscular dystrophy.
(1) A and C (2) B and C
(3) A and B (4) A, B and C

57. Choose incorrect statement for ribs.
(1) Rib is a thin flat bone connected dorsally to the vertebral column
(2) First seven pairs of ribs are called true ribs
(3) Rib has two articulation surface on it's ventral end and is hence called bicephalic
(4) Last 2 pairs of ribs are not connected ventrally, therefore, called the floating ribs.

58. Match the columns:

	Column-I		Column-II
A.	Ball & Socket joint	1.	Between humerus and pectoral girdle
B.	Hinge joint	2.	Between carpals and metatarsals
C.	Gliding joint	3.	Between the carpals
D.	Saddle joint	4.	Knee joint

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

59. Read the following paragraph with two blanks
Each testis has about ....(a).... compartments called testicular lobules. Each lobule contains ....(b)... highly coiled seminiferous tubules in which the sperms are produced.
The correct option for the two blanks is
(1) (a) 50, (b) 1-3 (2) (a) 100, (b) 1
(3) (a) 250, (b) 1-3 (4) (a) 500, (b) 3

60. Pineal gland is located on the :
(1) Ventral side of forebrain
(2) Ventral side of hindbrain
(3) Dorsal side of forebrain
(4) Ventral side of forebrain