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40 YEARS OF TEACHING EXCELLENCE
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PRABAL TEST PAPER

Time : 1 : 00 Hr. **Question : 50**

PHYSICS

01. When the angle of incidence is 53° on the surface of a glass slab, it is found that the reflected ray is completely polarised. The velocity of light in glass is:
(1) 1.5×10^8 ms^{-1} (2) 2.0×10^8 ms^{-1}
(3) 3.0×10^8 ms^{-1} (4) 2.25×10^8 ms^{-1}

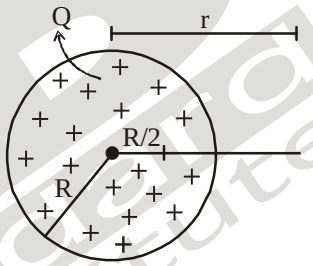
02. At the first minimum adjacent to the central maximum of a single-slit diffraction pattern, the phase difference between the Huygen's wavelet from the edge of the slit and the wavelet from the midpoint of the slit is
(1) $\frac{\pi}{2}$ radian (2) π radian
(3) $\frac{\pi}{8}$ radian (4) $\frac{\pi}{4}$ radian

03. Two positive ions, each carrying a charge q, are separated by a distance d. If F is the force of repulsion between the ions, the number of electrons missing from each ion will be (e being the charge on an electron):
(1) $\sqrt{\frac{4\pi \in_o Fd^2}{e^2}}$ (2) $\frac{4\pi \in_o Fd^2}{q^2}$
(3) $\frac{4\pi \in_o Fd^2}{e^2}$ (4) $\sqrt{\frac{4\pi \in_o Fe^2}{d^2}}$

04. The maximum electric field at a point on the axis of a uniformly charged ring is E_0. At how many points on the axis will the magnitude of the electric field to be $E_0/2$?
(1) 1 (2) 2
(3) 3 (4) 4

05. A square of side 3cm is placed at a distance of 25cm from a concave mirror of focal length 10cm. The centre of the square is at the axis of the mirror and the plane is normal to the axis. The area enclosed by the image of the square is
(1) 4 cm^2 (2) 6 cm^2
(3) 16 cm^2 (4) 36 cm^2

06. For a uniformly charged non conducting sphere with charge Q and radius 'R'. The distance from centre where electric field is same as at distance R/2 from centre.



(1) $r = \sqrt{2}\,R$ (2) $r = \sqrt{3}\,R$
(3) $r = R$ (4) $r = \frac{R}{4}$

07. **Assertion :** The refractive index of diamond is $\sqrt{6}$ and that of liquid is $\sqrt{3}$. If the light travels from diamond to the liquid, it will totally reflected when the angle of incidence is 30°.

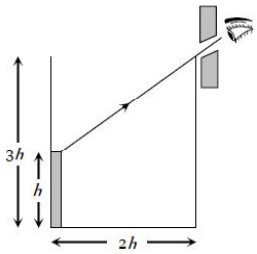
Reason : $\mu = \frac{1}{\sin C}$, where μ is the refractive index of diamond with respect to liquid.
(1) Both assertion and reason are true and the reason is the correct explanation of the assertion.
(2) Both assertion and reason are true but reason is not the correct explanation of the assertion.
(3) Assertion is true but reason is false.
(4) Assertion is false but reason is true.

08. Match the corresponding entries of column 1 with column 2. [Where m is the magnification produced by the mirror]

	Column-I		Column-II
(A)	m = –2	(a)	Convex mirror
(B)	$m = -\frac{1}{2}$	(b)	Concave mirror
(C)	m = + 2	(c)	Real image
(D)	$m = +\frac{1}{2}$	(d)	Virtual image

(1) A → c and d; B → b and d; C → b and c; D → a and d
(2) A → b and c; B → b and c; C → b and d; D → a and d
(3) A → a and c; B → a and d; C → a and b; D → c and d
(4) A → a and d; B → b and d; C → b and d; D → a and d

09. An observer can see through a pin–hole the top end of a thin rod of height h, placed as shown in the figure. The beaker height is 3h and its radius h. When the beaker is filled with a liquid up to a height 2h, he can see the lower end of the rod. Then the refractive index of the liquid is



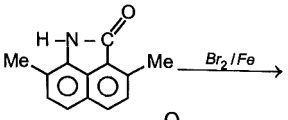
(1) 5/2 (2) $\sqrt{(5/2)}$
(3) $\sqrt{(3/2)}$ (4) 3/2

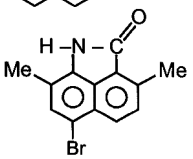
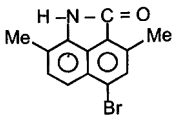
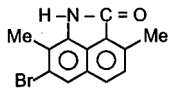
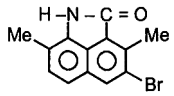
10. A ray of light falls on the surface of a spherical glass paper weight making an angle α with the normal and is refracted in the medium at an angle β . The angle of deviation of the emergent ray from the direction of the incident ray
(1) $(\alpha-\beta)$ (2) $2(\alpha-\beta)$
(3) $(\alpha-\beta)/2$ (4) $(\beta-\alpha)$

CHEMISTRY

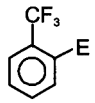
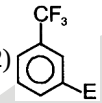
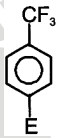
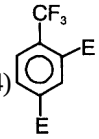
11. The correct statement regarding the basicity of arylamines is:
(1) Arylamines are generally more basic than alkylamines, because the nitrogen atom in arylamines is sp-hybridized.
(2) Arylamines are generally less basic than alkylamines because the nitrogen lone-pair electrons are delocalized by interaction with the aromatic ring electron system.
(3) Arylamines are generally more basic than alkylamines because the nitrogen lone-pair electrons are not delocalized by interaction with the aromatic ring electron system
(4) Arylamines are generally more basic than alkylamines because of aryl group.

12. Following compound react with Br_2/Fe to produce



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

13. The majar product of the reaction of  with electrophile E^+ is:

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

14. Match the terms of Column I with Column II and choose the correct option from the codes given below.

	Column-I (Structure of compound)		Column-II (Hybridisation of carbon)
A.	CH_3Cl	1.	sp^3 and sp^2
B.	$(CH_3)_2CO$	2.	sp^2
C.	CH_3CN	3.	sp^3
D.	$HCONH_2$	4.	sp^3 and sp

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

15. How many stereoisomer, does this molecule have $CH_3CH{=}CHCH_2CHBrCH_3$?
(1) 8 (2) 2 (3) 4 (4) 6

16. $C_5H_{10}O$ is a carbonyl compound. The number of structural isomers possible for this molecular formula are
(1) 5 (2) 8 (3) 6 (4) 7

17. Based upon VSEPR theory, match the shape (geometry) of the molecules in List–I with the molecules in List–II and select the most appropriate option

	List-I (Shape)		List-II (Molecules)
(A)	T-shaped	(I)	XeF_4
(B)	Trigonal planar	(II)	SF_4
(C)	Square planar	(III)	ClF_3
(D)	See-saw	(IV)	BF_3

(1) (A)–(I); (B)–(II); (C)–(III); (D)–(IV)
(2) (A)–(III); (B)–(IV); (C)–(I); (D)–(II)
(3) (A)–(III); (B)–(IV); (C)–(II); (D)–(I)
(4) (A)–(IV); (B)–(III); (C)–(I); (D)–(II)

18. **Statement I:** In a period, 2nd ionisation energy of alkali metal is minimum.
Statement II: After losing one electron, alkali metals attains inert gas electronic configuration.
(1) Both Statement I and Statement II are false.
(2) Statement I is true but Statement II is false.
(3) Statement I is false but Statement Il is true.
(4) Both Statement I and Statement II are true.

19. Match the Column I with Column II and choose the correct option using the codes given below.

	Column I (Electronic configuration)		Column II (Electron gain enthalpy/kJ mol^{-1})
A.	$1s^2\ 2s^2\ 2p^6$	1.	–53
B.	$1s^2\ 2s^2\ 2p^6\ 3s^1$	2.	–328
C.	$1s^2\ 2s^2\ 2p^5$	3.	–141
D.	$1s^2\ 2s^2\ 2p^4$	4.	+116

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

20. Consider the following salts. Which one(s) when dissolved in water will produce an acidic solution ?
1. NH_4Cl 2. $KHSO_4$
3. NaCN 4. KNO_3
(1) 2 and 3 (2) 1 and 2
(3) only 3 (4) 2 and 4

BOTANY

21. Respiratory substrates are the organic substances, which are ..... during respiration to liberate energy.
(1) oxidised (2) reduced
(3) synthesised (4) neutralised

22. Consider the given features possessed by plants.
I. Maximum transport of gases from one part to another.
II. Low demands for gaseous exchange.
III. Roots, stems and leaves respire at lower rates.
IV. Most cells have complete surfaces close to air.
How many of these features allow plant to get along without respiratory organs?
(1) 2 (2) 4
(3) 1 (4) 3

23. All living organisms retain the enzymatic machinery to partially oxidise glucose without the help of oxygen. This breakdown of glucose into pyruvic acid is called
(1) respiration
(2) glycolysis
(3) substrate level phosphorylation
(4) calvin cycle

24. Which of the following is the rate limiting step in EMP pathway?
(1) Glucose → Glucose
(2) Glucose 6P → Fructose 6P
(3) Fructose 6P → Fructose 1, 6-bisphosphate
(4) Fructose-1, 6-bisphosphate, → 3 PGAL

25. Which of the following steps in glycolysis yield ATP?
(1) 7^{th} and 8^{th} steps (2) 2^{nd} and 3^{rd} steps
(3) 6^{th} and 2^{nd} steps (4) 7^{th} and 10^{th} steps

26. An acrocentric chromosome at metaphase will be
(1) Condensed and lie near the equator
(2) Irregularly shaped and lie at one of the poles
(3) Condensed and lie at poles
(4) Coiled and get attached to spindle fibre

27. In an organism, if the normal diploid number of chromosomes is 8, how many chromatids are present in each daughter cell at the end of meiosis I
(1) 2 (2) 4
(3) 8 (4) 16

28. Which one is correct about bivalent?
(i) Bivalent are tetrads.
(ii) A bivalent means 4 chromatids and 2 centromere.
(iii) One bivalent consists of 2 homologous chromosomes each and sister chromatids.
(iv) Bivalents formation occurs in zygotene.
(1) All of these (2) Only (iii)
(3) (iii) and (iv) (4) Only (iv)

29. Number of bivalents are 8 in prophase I. What is the number of chromosomes during anaphase II?
(1) 8 (2) 4
(3) 13 (4) 32

30. **Assertion:** Crossing over leads to recombination of genetic material on the two chromosomes.
Reason: It is the exchange of genetic material between two homologous chromosomes.
(1) Assertion and Reason are correct and Reason is the correct explanation of Assertion.
(2) Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
(3) Assertion is correct but Reason is incorrect.
(4) Assertion and Reason are incorrect.

31. Consider the following products.
I. H_2O
II. Lactic acid
III. CO_2
IV. Ethanol
V. OAA
How many of these are not produced during fermentation?
(1) One
(2) Three
(3) Four
(4) Two

32. **Assertion:** The conversion of glyceraldehyde-3-phosphate into 1, 3-bisphosphoglycerate is an oxidation reaction.
Reason: The reaction in which 1, 3-bisphosphoglycerate is formed from glyceraldehyde-3-phosphate utilises NAD^+.
(1) If both Assertion and Reason are true and Reason is the correct explanation of Assertion
(2) If both Assertion and Reason are true, but Reason is not the correct explanation of Assertion
(3) If Assertion is true, but Reason is false
(4) If Assertion is false, but Reason is true

33. Chromosome number can be doubled by using which of the following?
(1) Indole acetic acid (2) GA
(3) Zeatin (4) Colchicine

34. Which of the following statement is not true for homologous chromosome pairs?
(1) They come from only one of the individual's parents.
(2) They usually contain slightly different versions of the same genetic information.
(3) They segregate from each other during meiosis I.
(4) They synapse during meiosis I.

35. Which of the following does not lead to genetic variability?
(1) Random fertilization.
(2) Crossing over during meiosis.
(3) Division of chromosomes during anaphase of mitosis.
(4) Orientation of chromosomes during metaphase I of meiosis.

ZOOLOGY

36. Match the columns I and II.

Column-I (Level of Organization)	**Column-II (Animals)**
a. Organ level	p. Pheretima
b. Cellular aggregate level	q. Fasciola
c. Tissue level	r. Spongilla
d. Organ system level	s. Obelia

(1) a-s, b-r, c-p, d-q (2) a-s, b-q, c-r, d-p
(3) a-q, b-s, c-r, d-p (4) a-q, b-r, c-s, d-p

37. Cnidoblasts are used for
(1) Capture of the prey (2) Anchorage
(3) Defense (4) All of the above

38. Fill in the blanks:
In sponges, fertilisation is ...a... and development is ...b... having a larval stage which is morphologically ... from the adult.
(1) a-Internal, b-Indirect, c-distinct
(2) a-Internal, b-Indirect, c-similar
(3) a-External, b-Direct, c-distinct
(4) a-External, b-Indirect, c-similar

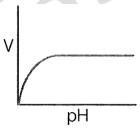
39. Which of the following is polymeric compound?
(1) Lemon grass oil (2) Rubber
(3) Cholesterol (4) Concanavalin A

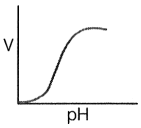
40. When more than one polypeptide chains are assembled together then called
(1) Tertiary structure
(2) Polysaccharide
(3) Quaternary structure
(4) Secondary structure

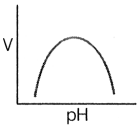
41. Which one of the following statement is incorrect?
(1) Primary metabolites have indefinable functions.
(2) Some secondary metabolites have ecological importance.
(3) Secondary metabolites like rubber, drugs, spices and pigments are useful for human welfare.
(4) Secondary metabolites are not found in fungi, microbes and plants.

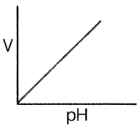
42. Select the correct option, which represents the homopolysaccharides made up of glucose monomers.
(1) Sucrose, lactose, maltose
(2) Chitin, glycogen, starch
(3) Starch, inulin, peptidoglycan
(4) Starch, glycogen, cellulose

43. Choose the correct graph, showing the effect of pH on the velocity (V) of a typical enzymatic reaction?

(1) 

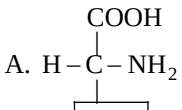
(2) 

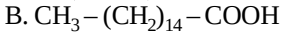
(3) 

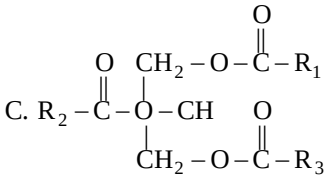
(4) 

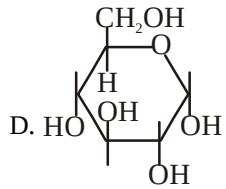
44. Which of the following statements are true for enzymes regarding temperature and pH?
(i) Enzymes generally function in a narrow range of temperature and pH.
(ii) Each enzyme, shows, its highest activity at a particular temperature and pH called the optimum temperature and optimum pH.
(iii) Activity declines both below and above the optimum value.
(iv) Low temperature destroys enzymatic activity because proteins are denatured.
(v) High temperature preserves the enzyme in a temporarily inactive state.
(1) (iii), (iv) and (v) (2) (i), (ii), (iv) and (v)
(3) (i), (ii) and (iii) (4) (iv) and (v)

45. Select correct information about the given diagrams:

A. 

B. 

C. 

D. 

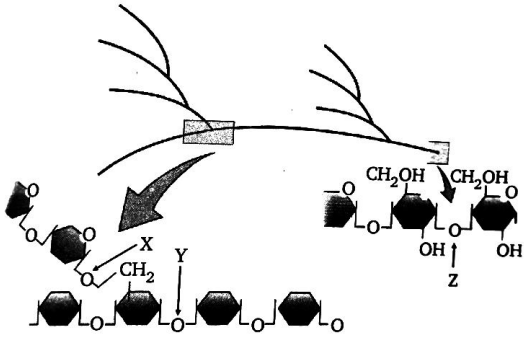
(1) B is triglyceride and is a type of lipid
(2) D is fructose and is a disaccharide sugar
(3) A is an amino acid and participates in protein formation
(4) C is a cholesterol and maintains membrane fluidity

46. Read the following statements (A-F):
A. Lecithin is found in cell membrane
B. Collagen is most abundant protein in the whole of the biosphere
C. Chitin is found in cell wall of fungi
D. Fats have higher melting point than oils
E. Zwitter ionic form can be observed in amino acids
F. Protein is a homopolymer
How many of the above statements are true?
(1) 0 (2) 1 (3) 4 (4) 2

47. The two functional groups characteristic of sugars are:
(1) Hydroxyl and methyl
(2) Carbonyl and methyl
(3) Carbonyl and phosphate
(4) Carbonyl and hydroxyl

48. The catalytic cycle of an enzyme action can be described by the steps given below.
A. The active site of the enzyme, now in close proximity of the substrate, breaks the chemical bonds of the substrate and the new enzyme-product complex is formed.
B. The binding of the substrate induces the enzymes to alter its shape, fitting more tighty around the substrate.
C. The substrate binds to the active site of the enzyme, fitting into the active site.
D. The enzyme releases the products of the reaction and the free enzyme is ready to bind to another molecule of the substrate and run through the catalytic cycle once again.
Arrange them in the correct sequence.
(1) $C \rightarrow B \rightarrow A \rightarrow D$ (2) $B \rightarrow C \rightarrow D \rightarrow A$
(3) $C \rightarrow B \rightarrow D \rightarrow A$ (4) $D \rightarrow B \rightarrow A \rightarrow C$

49. Identify the linkages X, Y and Z in the diagram:



(1) X = α-1, 6 ; Y = α-1, 4 ; Z = α-1, 4
(2) X = β-1, 6 ; Y = β-1, 4 ; Z = β-1, 4
(3) X = α-1, 6 ; Y = β-1, 4 ; Z = α-1, 4
(4) X = β-1, 6 ; Y = α-1, 4 ; Z = β-1, 4

50. Identify the correct statements about protein structure.
I. Proteins can arrange themselves in the form of a-helix and α-pleated sheets in their tertiary structure.
II. If protein is considered as a line, e.g., in primary structure, the right end represents N-terminal amino acid.
III. Tertiary structure is important for biological activity of a protein.
IV. Building blocks of proteins are amino acids.
(1) II and III (2) I, II, III and IV
(3) III and IV (4) I, II and IV