General Instructions :

(i) *This questions paper contains **55** questions out of which **45** questions are to be attempted.*

(ii) *All questions carry equal marks.*

(iii) *This question paper consists of **three** sections, Section A, Section B and Section C.*

(iv) *Section A contains **25** questions. Attempt any **20** questions from questions no. 1 to 25.*

(v) *Section B contains **24** questions. Attempt any **20** questions from questions no. 26 to 49.*

(vi) *Section C contains **6** questions. Attempt any **5** questions from questions no. 50 to 55.*

(vii) *The first **20** questions attempted in Section A and Section B and first **5** questions attempted in Section C by a candidate will be evaluated.*

(viii) *There is only **one** correct option for every multiple choice question (MCQ). Marks will not be awarded for answering more than one option.*

(ix) *There is no negative marking.*

SECTION A

*This section consists of **25** multiple choice questions with over all choice to attempt any **20** questions. In case more than desirable number of questions are attempted, only first **20** questions will be considered for evaluation.*

1. Which one of the following pairs will ***not*** form an ideal solution ?

(a) Benzene and Toluene (b) n-Hexane and n-Heptane

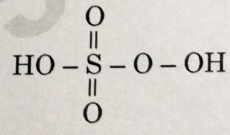
(c) Ethanol and Acetone (d) Bromoethane and Chloroethane

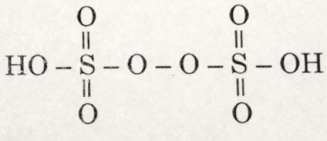
2. When NaCl is doped with $SrCl_2$, there will be a formation of :

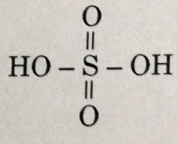
(a) Anion vacancies (b) Cation vacancies

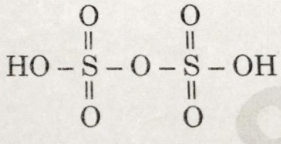
(c) Both cation and anion vacancies (d) F-centre

3. The structure of Oleum is :

(a) 

(b) 

(c) 

(d) 

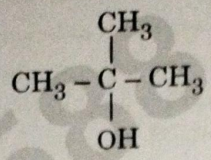
4. The C – O – C bond angle in the ether molecule is :

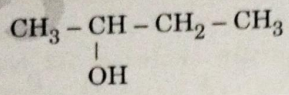
(a) 111° (b) 90° (c) 120° (d) 180°

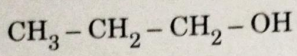
5. Which of the following reagents will ***not*** convert ethyl alcohol into ethyl chloride ?

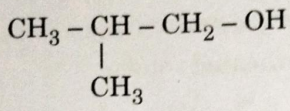
(a) PCl_5 (b) NaCl (c) $SOCl_2$ (d) $HCl/ZnCl_2$

15. Lucas reagent produces cloudiness immediately with :

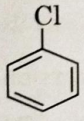
(a) 

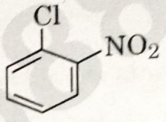
(b) 

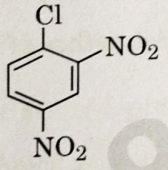
(c) 

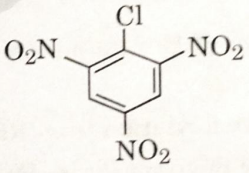
(d) 

16. Which of the following is most reactive towards nucleophilic substitution reaction ?

(a) 

(b) 

(c) 

(d) 

17. Pressure does not have any significant effect on solubility of solids in liquids because :

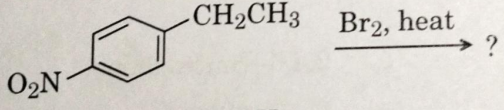
(a) Solids are highly compressible

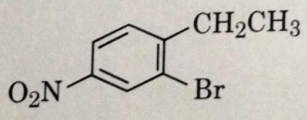
(b) Liquids are highly compressible

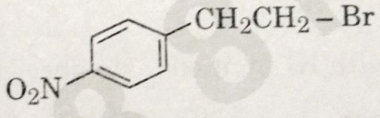
(c) Solubility of solid in liquid is directly proportional to partial pressure

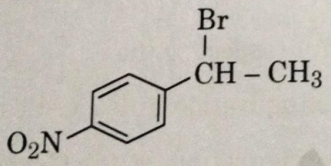
(d) Solids and liquids are highly incompressible

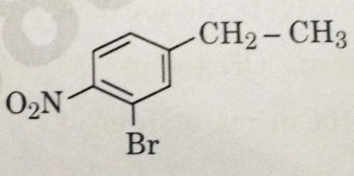
18. Main product in the following reaction is :



(a) 

(b) 

(c) 

(d) 

19. Which of the following forms strong $p\pi - p\pi$ bonding ?

(a) P_4 (b) N_2 (c) Sb_4 (d) As_4

20. Which of the following halogens can replace all other halogens from their halide compounds ?

(a) F_2 (b) Cl_2 (c) Br_2 (d) I_2

21. The functional unit that is repeated in a protein molecule is :

(a) An ester linkage (b) A glycosidic linkage

(c) A peptide linkage (d) An ether linkage

22. The lowest boiling point of 'He' is due to :

(a) Its inertness (b) Its high polarizability

(c) Its small size (d) Weak dispersion forces between its atoms

23. Major products formed by heating $(CH_3)_3C - O - CH_2 - CH_3$ with HI are :

(a) $(CH_3)_3C - I$ and CH_3CH_2OH

(b) $(CH_3)_3C - OH$ and CH_3CH_2I

(c) $(CH_3)_3C - I$ and CH_3CH_2I

(d) $(CH_3)_3C - OH$ and CH_3CH_2OH

24. The osmotic pressure of a solution increases if :

(a) The volume of the solution is increased

(b) The number of solute molecules is increased

(c) Temperature is decreased

(d) Solution constant (R) is increased

25. Chlorine reacts with hot and concentrated NaOH to give :

(a) NaCl and NaClO (b) NaClO and $NaClO_3$

(c) NaCl and $NaClO_4$ (d) NaCl and $NaClO_3$

SECTION B

*This section consists of **24** multiple choice questions with overall choice to attempt any **20** questions. In case more than desirable number of questions are attempted, only first **20** questions will be considered for evaluation.*

26. Vapour pressure of dilute aqueous solution of glucose is 750 mm Hg at 373 K. The mole fraction of solute is :

(a) $\frac{1}{7{\cdot}6}$ (b) $\frac{1}{38}$ (c) $\frac{1}{76}$ (d) $\frac{1}{10}$

27. The bases that are common in both DNA and RNA are :

(a) Adenine, Guanine and Cytosine (b) Adenine, Guanine and Thymine

(c) Adenine, Uracil and Cytosine (d) Guanine, Uracil and Thymine

28. A compound (X) with the molecular formula C_3H_8O can be oxidised to another compound (Y) whose molecular formula is $C_3H_6O_2$. The compound (X) may be :

(a) $CH_3CH_2-O-CH_3$

(b) $CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$

(c) $CH_3-CH_2-CH_2-OH$

(d) CH_3-CH_2-CHO

29. Which reagent is required for one step conversion of benzene diazonium chloride to bromobenzene ?

(a) PBr_3 (b) HBr (c) Cu_2Br_2 (d) Br_2

30. The number of lone pair of electrons on Xe in XeF_2, XeF_4 and XeF_6 compounds are respectively :

(a) 4, 3 and 2

(b) 2, 3 and 1

(c) 3, 2 and 0

(d) 3, 2 and 1

31. Which form of sulphur shows paramagnetic behaviour ?

(a) S_8 (b) S_4 (c) S_2 (d) S_6

32. An element with density 3 g cm^{-3} forms a bcc lattice with edge length of 3×10^{-8} cm. The molar mass of the element is : ($N_A = 6 \times 10^{23}$ mol^{-1})

(a) 48·6 g mol^{-1}

(b) 24·3 g mol^{-1}

(c) 60 g mol^{-1}

(d) 56 g mol^{-1}

33. In the following reaction :

$$CH_3-Br \xrightarrow[\text{dry ether}]{Mg} X \xrightarrow{H_2O} Y$$

'Y' will be :

(a) CH_4 (b) CH_3MgBr (c) CH_3-OH (d) CH_3-CH_3

34. Which of the following has the greatest reducing power ?

(a) HI (b) HBr (c) HCl (d) HF

35. The freezing point of a 0·2 molal solution of a non-electrolyte in water is : (K_f for water = 1·86 K kg mol^{-1})

(a) – 0·372°C (b) – 1·86°C (c) + 0·372°C (d) + 1·86°C

36. In a bcc structure, the packing efficiency is approximately :

(a) 58% (b) 68% (c) 32% (d) 74%

37. NO_2 gas dimerises because :

(a) It is acidic in nature

(b) It contains even number of valence electrons

(c) It contains odd number of valence electrons

(d) It is inert at room temperature

38. A compound forms hcp structure. The number of tetrahedral voids in 0·5 mol of it is :

(a) $6{\cdot}022 \times 10^{23}$

(b) $9{\cdot}033 \times 10^{23}$

(c) $3{\cdot}011 \times 10^{23}$

(d) 5×10^{23}

39. XeF_2 on reaction with PF_5 forms :

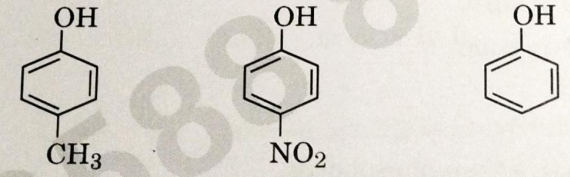
(a) $[XeF_3]^- [PF_4]^+$

(b) $[XeF_3]^+ [PF_4]^-$

(c) $[XeF]^+ [PF_6]^-$

(d) $[XeF_2]^+ [PF_5]^-$

40. Arrange the following compounds in decreasing order of their acidic character :



(I) (II) (III)

(a) II > I > III (b) II > III > I (c) III > I > II (d) I > II > III

41. Which of the following compounds undergoes racemisation on hydrolysis with aqueous KOH ?

(a) $CH_3 - CH_2 - Br$

(b) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - Br$

(c) $CH_3 - Br$

(d) $CH_3 - \underset{\displaystyle C_2H_5}{\underset{|}{CH}} - Br$

42. Which of the following is ***not*** true ?

(a) Fluorine exhibits only – 1 oxidation state.

(b) Among halide ions, I_2 is the strongest oxidising agent.

(c) F – F bond has lower bond dissociation enthalpy than Cl – Cl bond.

(d) Fluorine forms only one oxoacid.

43. The IUPAC name of isobutyl bromide is :

(a) 1-bromo-3-methylbutane

(b) 3-bromo-2-methylpropane

(c) 2-bromo-2-methylpropane

(d) 1-bromo-2-methylpropane

44. Chlorobenzene when treated with sodium in dry ether gives Diphenyl. It is called :

(a) Wurtz reaction

(b) Fittig reaction

(c) Wurtz-Fittig reaction

(d) Friedel-Crafts reaction

Question Nos. ***45*** *to* ***49*** *are Assertion (A) and Reason (R) type questions. Given below are two statements labelled as Assertion (A) and Reason (R). Select the most appropriate answer from the options given below.*

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

45. *Assertion (A) :* NH_3 is less basic than PH_3.

Reason (R) : Nitrogen is more electronegative than phosphorus.

46. *Assertion (A) :* Osmotic pressure is a colligative property.

Reason (R) : Osmotic pressure of a solution depends on the molar concentration of solute at any temperature T.

47. *Assertion (A) :* Aryl halides are extremely less reactive towards nucleophilic substitution reaction.

Reason (R) : Halogen atom shows +I effect in Aryl halides.

48. *Assertion (A) :* Due to Frenkel defect there is no effect on density of solid.

Reason (R) : Ions shift from its normal site to an interstitial site in Frenkel defect.

49. *Assertion (A) :* Ozone is a powerful oxidising agent in comparison to O_2.

Reason (R) : Ozone is thermodynamically stable with respect to oxygen.

SECTION C

*This section consists of **6** multiple choice questions with an overall choice to attempt any 5 questions. In case more than the desirable number of questions are attempted, only the first 5 questions will be considered for evaluation.*

50. Match the following :

	I		*II*
i.	Salicyl aldehyde	A.	Kolbe's reaction
ii.	*o*-nitrophenol	B.	Williamson's synthesis
iii.	Salicylic acid	C.	Intramolecular Hydrogen bonding
iv.	*p*-nitrophenol	D.	Reimer-Tiemann reaction
v.	Unsymmetrical ethers		

Which of the following is the best matched option ?

(a) i-A, ii-C, iii-D, iv-B

(b) i-D, v-B, iii-C, iv-A

(c) i-D, v-B, ii-C, iii-A

(d) i-B, ii-C, iii-A, iv-D

51. Which of the following analogies is correct :

(a) Oxygen : $d\pi - p\pi$ :: Sulphur : $p\pi - p\pi$

(b) NH_3 : Hydrogen bonding :: PH_3 : No Hydrogen bonding

(c) Cl_2 : More reactive :: ClF : Less reactive

(d) Xe : No compounds :: He : Many compounds

52. Complete the following analogy :

ZnS : A :: SiC : B

(a) A : Molecular solid :: B : Ionic solid

(b) A : Ionic solid :: B : Metallic solid

(c) A : Metallic solid :: B : Covalent solid

(d) A : Ionic solid :: B : Covalent solid

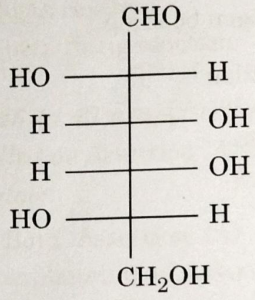
Case – Study

Read the passage given below and answer the following question nos. 53 – 55.

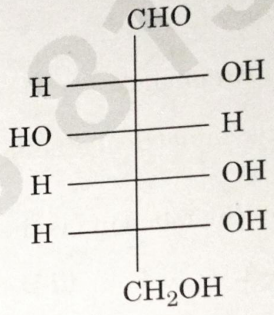
Carbohydrates are polyhydroxy aldehydes or ketones and are also called saccharides. Glucose is an example of monosaccharides. Glucose ($C_6H_{12}O_6$) is an aldohexose and its open chain structure was assigned on the basis of many reactions as evidences like presence of carbonyl group, presence of straight chain, presence of five –OH groups, etc. Glucose is correctly named as D(+)Glucose. Glucose is found to exist in two different crystalline forms which are named as α and β. Despite having the aldehyde group, glucose does not give 2,4-DNP test.

53. Which of the following represents D(+)Glucose ?

(a)



(b)



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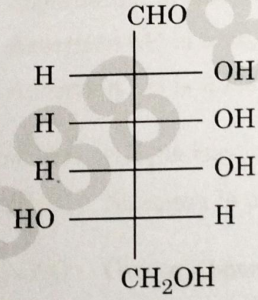
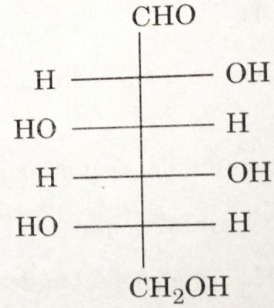


(d)



54. Glucose on oxidation with HNO_3 gives a dicarboxylic acid called saccharic acid. This result validates the fact that Glucose possesses :

(a) – CHO group

(b) – OH group

(c) a straight chain

(d) both – CHO and – CH_2OH groups at the terminals of the chain

55. The pentaacetate of glucose does not react with H_2N – OH indicating the absence of :

(a) – OH group (b) – CHO group

(c) – COOH group (d) – CH_2OH group