Q. P. Code: 51550

[Time : 3 Hours **[Total Marks : 100**

Please check whether you have got the right question paper.

N.B. : 1. All Questions are compulsory.

2. Figures to the right indicate full marks.

3. Use of log-table/nonprogrammable calculator is allowed.

4. Answers for the same question as far as possible should be written together.

1. (A) Select the correct option and complete the following sentences. **12**

(i) There are _____ crystal system and _____ Bravais lattices.
(a) 7,7 (b) 14,7 (c) 7 ,14

(ii) The total number of effective atoms in a unit cell of body centered cubic system is _____.
(a) 4 (b) 2 (c) 3

(iii) A _____ accelerates a reaction by decreasing the energy of activation of the reaction.
(a) catalyst (b) inhibitor (c) pressure

(iv) The enzyme which can catalyse the conversion of _____ into glucose is maltase.
(a) maltose (b) invertase (c) zymase

(v) During hydration of cation, _____ pole of water approaches the cation.
(a) positive (b) negative (c) neutral

(vi) Cation cannot render _____ to aqueous solution.
(a) acidity (b) basicity (c) neutrality

(vii) _____ is called as laughing gas.
(a) N_2O (b) NO (c) NO_2

(viii) Nitrous oxide is used as _____.
(a) anaesthetic (b) analgesic (c) antipyretic

(ix) Benzene diazonium salt on treatment with steam gives _____ .
(a) phenol (b) benzene (c) amine

(x) _____ amine does not undergo acetylation reaction.
(a) Primary (b)Secondary (c) Tertiary

(xi) Pyrrole is _____ .
(a) 5- membered carboxylic compound
(b) 6- membered heterocyclic compound
(c) 5- membered heterocyclic compound

(xii) Nitration of thiophene is carried out by con HNO_3 in presence of _____ .

(a) H_2SO_4 (b) CH_3COOH (c) H_2SO_3

(B) State whether the following statements are true or false. **3**

(i) As temperature increases the rate of reaction increases.

(ii) Water is amphoteric in nature.

(iii Sulphonation of the furan can be carried out by the action of H_2SO_4.

(C) Match the column. **5**

(i)	Inhibitor	(a)	decreases activity of catalyst.
(ii)	Oxide ion	(b)	increases activity of catalyst.
(iii)	Promoter	(c)	aromatic heterocyclic compound
(iv)	S^{2-}	(d)	feebly basic anion
(v)	Piperidine	(e)	retards rate of reaction
		(f)	non aromatic heterocyclic compound
		(g)	very strongly basic anion
		(h)	strongly basic anion

2. (A) (i) State Bragg's equation? Derive and explain n λ= 2dsinθ. **5**

(ii) What are (100) and (111) planes for the body-centered cube ? **3**

OR

(A) (i) How are X-rays used to determine the interplanar distances in cubic crystals ? **5**

(ii) Explain Weiss indices of a plane. **3**

(B) (i) What is heterogeneous catalysis? Explain with suitable examples. **5**

(ii) Write a note of activity of nanoparticles as a catalyst. **3**

OR

(B) (i) Describe the characteristic features of catalysis. 5

(ii) What are the different types of catalysed reactions? 3

(C) An inorganic salt of gram molecular weight 74.56 $gmol^{-1}$ and density 1.874×10^3 $kg.m^{-3}$ crystallises in a form like NaCl. Calculate the length of the edge of the unit cell if Avogadro's number is 6.023×10^{23} mol^{-1}. 4

OR

(C) Discuss the kinetics of acid-base catalysis. 4

3. (A) (i) With a suitable diagram, explain, how do water molecules surround cation in aqueous medium? What is the name of this phenomenon ? Will this reaction be exothermic or endothermic ? 4

(ii) Write and explain stepwise reactions for behaviour of Cr^{+3} ions in aqueous medium. 4

OR

(A) (i) Discuss hydration of sulphide anion with suitable hydrolysis reactions. 4

(ii) Discuss sources of emission of nitrogen oxides. 4

(B) (i) What is the effect of charge and size of cation in aqueous medium on its acidic behaviour ? 4

(ii) Calculate z^2/r ratio for Eu^{2+} (r = 131 pm). Explain its acid strength in aqueous medium. 4

OR

(B) (i) Draw a suitable predominance diagram and explain the following 4
a) moderately basic anion b) strongly basic anion .

(ii) Write uses of HNO_3. 4

(C) With a suitable predominance diagram, explain non acidic cation. Mention the reason for its non acidity. 4

OR

(C) Discuss physical properties of concentrated sulphuric acid. **4**

4. (A) (i) Explain the nitration and sulphonation reactions on furan and pyrrole. **5**

(ii) Discuss reduction of pyridine under different conditions. **3**

OR

(A) (i) Explain why?

a) in thiophene, the electrophilic substitution takes place at 2 or 5 position. **3**

b) Explain aromatic character of pyrrole. **2**

(ii) Write a note on Friedel Crafts alkylation of furan. **3**

(B) (i) a) Write a note on Sandmeyer reaction. **3**

b) What are azo compounds? Explain the preparation of azo compounds. **2**

(ii) Write a note on Gomberg reaction. **3**

OR

(B) (i) Explain the action of nitrous acid on primary amine, secondary amine and tertiary amine. **5**

(ii) What is the reaction of Benzene diazonium chloride with Phenol and Tertiary **3**

(C) Explain 'Pyridine undergoes nucleophilic substitution at 2,4 and 6 positions. **4**

OR

(C) i) How will you convert aniline to diphenyl amine ? **4**
ii) Write a note on carbylamines reaction.

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5. Attempt any **four** of the following.

(A) Sodium chloride has a face-centered cubic lattice and the length of the cube edge is 5.56A°. Calculate d_{100} and d_{111}. **5**

(B) Derive Michalis-Menten equation for enzyme catalysis. **5**

(C) Explain pK_a value range and acidity of monoatomic cations in aqueous medium. **5**

(D) Write a note on photochemical smog. **5**

(E) Explain the following reactions of amines **5**
i) reductive amination
ii) reductive alkylation

(F) i) Discuss Vilsmeier Haack reaction of thiophene **3**
ii) Write resonance structures of furan **2**

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