QP Code : 19764

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

N.B : 1. **All** questions are **compulsory**.
2. Answers to the same question must be written together.
3. **Figures** to the **right** indicate full marks.
4. Use of non-programmable calculator / logarithm table is permitted.

12

1. (A) Select the correct option and complete the following sentences :—

(i) Nitration of phenol is an example of _____ reaction.
(a) consecutive (b) parallel (c) opposing

(ii) The correct form of Arrhenius equation is _____.
(a) $k = Ae^{Ea/RT}$ (b) $\log k = Ae^{-Ea/RT}$ (c) $k = Ae^{-Ea/RT}$

(iii) Ideal solution is formed when its components.
(a) have zero heat of mixing only
(b) have zero heat of mixing and zero volume change
(c) can be converted into gases.

(iv) For the study of distribution law the two solvents should be _____.
(a) volatile (b) immiscible (c) miscible

(v) Tincal and Suhagain are the naturally occuring ores of _____.
(a) Borax (b) Diborane (c) Silicon dioxide

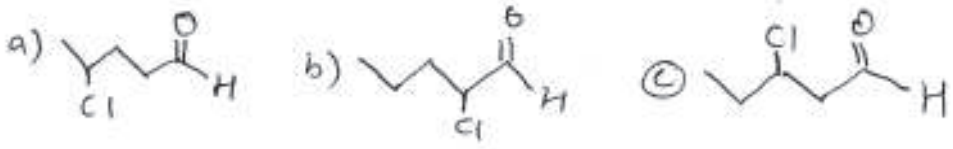
(vi) _____ among the following elements has remarkably low melting point and expands when it forms a solid.
(a) Indium (b) Gallium (c) Thallium

(vii) All elements in group-14 show covalency greater than four except ____.
(a) Silicon (b) Carbon (c) Germanium

(viii) Germanium is extracted from _____ ore.
(a) Colemenite (b) Argyrodite (c) Ilmenite

(ix) The aldehyde used in the Knoevengal reaction is having _____.
(a) no α – H atom
(b) α – H atom
(c) α and β – H atom

(x) 2 - chloropentanal is _____.



[TURN OVER

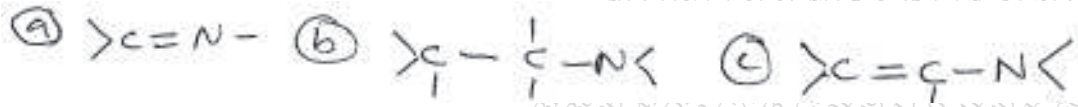
(xi) The active methylene group will have _____ groups attached to it.

(a) – CN and NO_2

(b) $-NH_2$ and – OR

(c) – NHCOR and – COR

(xii) The general structure of enamine is _____.



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

(i) The rate of most of the reactions increase considerably with increase in temperature.

(ii) Nitrogen exhibits allotropy.

(iii) Aldehydes are usually more reactive towards nucleophilic reagents than ketone.

(C) Match the columns :— **5**

(i)	Units of Energy of activation	(a)	Partially miscible with upper and lower CST
(ii)	Water + Nicotine System	(b)	$kJmol^{-1}$
(iii)	+3 oxidation state	(c)	Carbon
(iv)	$2s^2$, $2p^2$ valence configuration	(d)	electrophilic
(v)	'O' in > C = O is	(e)	Nucleophilic
		(f)	Aluminium
		(g)	JK^{-1} mol^{-1}
		(h)	Thallium

2. (A) (i) Explain the application of Collision Theory to Bimolecular reactions. **5**

(ii) Give any three merits of Collision Theory. **3**

OR

(A) (i) What are Chain carriers ? Explain the important steps in a chain reaction. **5**

(ii) Explain reversible reactions giving a suitable example. **3**

(B) (i) With the help of vapour pressure-composition diagram explain positive deviations from Raoult's law. **5**

(ii) Give three applications of distribution law. **3**

OR

(B) (i) Discuss the variation of mutual solubility with temperature for the 'Phenol-water' system. **5**

(ii) Give the techniques used to separate the components of an azeotropic mixture. **3**

[TURN OVER

(C) For a first order reaction : $2N_2O_{5\,(g)} \rightarrow 4\,NO_{2\,(g)} + O_{2(g)}$; the frequency factor 'A' is $4{\cdot}3 \times 10^{13}\ s^{-1}$ and E_a is $103{\cdot}35\ kJmol^{-1}$. What is the rate constant ? 4
[Given : $R = 8{\cdot}314\ JK^{-1}\ mol^{-1}$]

OR

(C) A mixture of water and aniline boils at a temperature of 98·5ºC at pressure of $1{\cdot}013 \times 10^5 Nm^{-2}$, The vapour pressure of water at this temperature is $9{\cdot}558 \times 10^4 Nm^{-2}$, Find the composition of the distillate. 4
[Given : Molecular weight of water = 18, molecular weight of aniline = 93]

3. (A) (i) Discuss the gradation in properties of group 13 elements with respect to atomic radii and Ionisation energy values. 5

(ii) Give a brief account of structure of Diborane. 3

OR

(A) (i) Explain the purification of 'Germanium' by zone refining technique. 5

(ii) 'Zone refining technique is not effective for the purification of silicon'. Give reasons. 3

(B) (i) Write notes on 'Oxidation states' exhibited by the elements of group 15. 5

(ii) Name the hydrides of group 15 elements. Give an account of the physical state and solubility of these hydrides. 3

OR

(B) (i) Discuss the preparation of borax from 'boric acid'. Mention any two important properties and any two uses of borax. 5

(ii) Give an account of one method of preparation, and the physical properties of nitrous oxide. 3

(C) Discuss the structure of SiO_2. 4

OR

(C) Explain why boron trihalides can act as Lewis acids. 4

4. (A) (i) Explain the mechanism of Benzoin Condensation. 5

(ii) Give preparation of succinic acid from ethyl aceto acetate. 3

OR

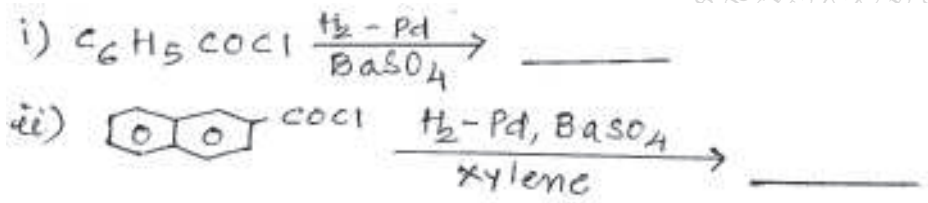
(A) (i) (a) Give preparation of benzaldehyde and acetophenone by oxidation of alcohol by using PCC. 3

(b) What are stabilised enols ? 2

(ii) How will you obtain isobutyric acid from ethyl acetoacetate ? 3

[TURN OVER

(B) (i) (a) Complete the following reactions and explain the role of $BaSO_4$ in the reaction. **3**



(b) Discuss the reduction of propanal by using $LiAlH_4$. **2**

(ii) Give the mechanism of acid catalysed enolisation. **3**

OR

(i) (a) Write a note on Gattermann - Koch formylation. **3**

(b) Discuss the reduction of 2-butenal by using $NaBH_4$. **2**

(ii) Explain the general mechanism of nuclephilic addition to carbonyl compound. **3**

(C) Discuss the synthesis of primary, secondary and tertiary alcohols from Grignard reagent. **4**

OR

(C) Explain the preparation of acetal and cyclic acetal from ethanal. **4**

5. Attempt any **four** :—

(A) State and explain any five conditions for the validity of Nernst Distribution Law. **5**

(B) Compare the Collision Theory with the Activated Complex theory of reaction rates. **5**

(C) How is silicon purified by Czochralski pulling technique ? **5**

(D) Give an account of the synthesis of NH_3 by Haber's process. **5**

(E) Explain the mechanism of Claisen - Schmidt reaction. **5**

(F) Give the IUPAC name of CH_3CHO, give its preparation using grignard reagent. What is the action of HCN on CH_3CHO ? **5**

———————