[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. (any **twelve**) **12**

(i) Nitration of aniline is an example of -------- reaction.

(a) parallel (b) consecutive (c) opposing

(ii) The plot of $\log_{10}k$ v/s T^{-1} is linear with a slope of --------- .

(a) Ea/R (b) -Ea/2.303R (c) Ea/2.303R

(iii) The correct form of Arrhenius equation is ---------- .

(a) $k = A.e^{-Ea/RT}$ (b) $k = A.\ e^{Ea/RT}$ (c) $\log k = A.\ e^{-Ea/RT}$

(iv) ---------- is the mixture of an ideal solution.

(a) C_6H_6 and $C_6H_5CH_3$ (b) HNO_3 and H_2O (c) $CHCl_3$ and CH_3COCH_3

(v) The ---------- mixture of two or more components is termed as solution.

(a) homogeneous (b) heterogeneous (c) binary

(vi) The organic liquids which are steam volatile and immiscible with water can be separated by ---------- .

(a) fractional distillation (b) steam distillation (c) distillation

(vii) ---------- is the electron deficient compound.

(a) B_2H_6 (b) $SiCl_4$ (c) SiO_2

(viii) The tendency of BF_3 , BCl_3 & BBr_3 to behave as lewis acid decreases in the sequence ---------- .

(a) $BF_3 > BCl_3 > BBr_3$ (b) $BCl_3 > BF_3 > BBr_3$

(c) $BBr_3 > BCl_3 > BF_3$

(ix) ---------- is incorrect statement as far as structure of diborane is concerned

(a) 'There are two bridging hydrogen atoms in diborane.'

(b) 'The hydrogen atoms are not in the same plane in diborane.'

(c) 'All B-H bonds in diborane are similar.'

(x) Non - Combustible hydride is _____ .

(a) NH_3 (b) PH_3 (c) AsH_3

(xi) ---------- is not hydrolysed.

(a) $AsCl_3$ (b) PF_3 (c) NF_3

(xii) The least stable hydride of 15^{th} group elements is _____ .

(a) NH_3 (b) PH_3 (c) BiH_3

(xiii) ------ can be obtained from aromatic primary amine and aldehyde.

(a) Enamine (b) Iminium salt (c) Imine

(xiv) PCC means ------- .

(a) Pyridine chlorochromate (b) Pyrrole chlorochromate

(c) Pyridinium chlorochromate

(xv) Diehyl malonate is ---- .

(a) $H_5C_2OOC\text{-}CH_2\text{-}CH_2\text{-}COOC_2H_5$ (b) $H_5C_2OOC\text{-}CH_2\text{-}COOC_2H_5$

(c) $H_5C_2OOC\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}COOC_2H_5$

(xvi) The correct order of reactivity is ------ .

(a) H-CO-H > R-CHO >R_2CO (b) H-CO-H < R-CHO < R_2CO

(c) R-CHO > H-CO-H >R_2CO

(xvii) Hydrazones are ----- .

(a) >C=N-NH- (b) >HC-NH-NH- (c) -CO-NH-NH-

(xviii) Propyne on hydration gives ----- .

(a) ethanol (b) propanal (c) propanone

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

(i) The rate of reaction is inversely proportional to its energy of activation.

(ii) Phenol – water system is an example of upper critical solution temperature,

(iii) B_2H_6 is a hydride of boron.

(iv) Borax is basic in nature.

(v) Alkyl groups make the carbon in the carbonyl group less electrophilic.

(vi) In the carbonyl group, both C and O are sp^2 hybridized.

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

(i)	A→B→C	(a)	Group 13 element
(ii)	Water + nicotine	(b)	Group 14 element
(iii)	B	(c)	Group 15 element
(iv)	As	(d)	Partially miscible with upper and lower CST
(v)	Benzoin condensation	(e)	Self condensation of aromatic aldehyde having no α - H atom
(vi)	Claisen-Schmidt reaction	(f)	Consecutive reaction
		(g)	Self condensation of aromatic aldehyde having α - H atom
		(h)	Parallel reaction
		(i)	Base catalysed aldol type reaction

2. Attempt any **four** of the following. **20**

(A) Explain with suitable examples what is meant by reversible reactions and parallel reactions.

(B) What are the drawbacks of the collision theory of reaction rates.

(C) The energy of activation of a bimolecular reaction is 83.5kJmol^{-1}. Calculate the fraction of molecules reacting at 37^{0}C. (R = 8.314 kJmol^{-1}K^{-1})

(D) What is steam distillation? Describe it with a neat labeled diagram.

(E) Draw vapour pressure – composition diagrams. Explain positive and negative deviations from Raoult's law.

(F) An immiscible liquid A was found to distil freely in steam at a temperature of 85^{0}C. When the atmospheric pressure was 9.812 X 10^4 Nm^{-2}. The vapour pressure of pure water at this temperature is 8.551 X 10^4 Nm^{-2}. The distillate contained 53 % by weight of the immiscible liquid A. Calculate the molecular weight of liquid A. (H =1 , O =16).

3. Attempt any **four** of the following. **20**

(A) Draw the structure of BF_3. Why does it called Lewis acid ? Write its any three applications.

(B) What is borax? Explain any two methods used for its synthesis.

(C) Write a note on purification of germanium by any one method.

(D) What is atomic number of silicon ? What is its electronic configuration ? What is its position in the periodic table? Name any two compounds of silicon.

(E) Name and formulate any five oxides of nitrogen. Find oxidation state of nitrogen in each of them.

(F) With a suitable diagram, explain the synthesis of ammonia by Bosch – Haber process.

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

(A) Explain the mechanism of Knoevenagel condensation. **5**

(B) i) Write note on Gattermann – Koch formylation. **3**
ii) Discuss the reduction of crotonaldehyde by using $LiAlH_4$. **2**

(C) i) Give the Mechanism of base catalyzed enolisation. **3**
ii) How is tertiary alcohol obtained from Grignard reagent. **2**

(D) i) Explain the general mechanism of nucleophilic addition to carbonyl compound. **3**
ii) Explain preparation of cyclic ketal from propanone. **2**

(E) Give preparation of: **5**
i) propanoic acid from ethyl acetoacetate
ii) 2-pentanone from acetyl acetone.

(F) i) Write note on Rosenmund reduction. **3**
ii) What are stabilized enols? **2**

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

(A) Discuss the activated complex theory of reaction rates. **5**

(B) State and explain Nernst's distribution law. What are its important applications? **5**

(C) Draw the structure of tetraborane. Explain various bonds involved in the structure. Calculate total number of electrons involved in the bonding. **5**

(D) What is silica ? Explain its structure and bonding. Why is it inert? **5**

(E) Explain the mechanism of Cannizzaro reaction. **5**

(F) i) Write note on Friedel Craft acylation of arenes. **3**
ii) Discuss the reduction of *p*- nitrobenzalehyde by using $NaBH_4$. **2**
