# Sample Paper

#### Time: 90 Minutes

### General Instructions

- 1. The Question Paper contains three sections.
- 2. Section A has 25 questions. Attempt any 20 questions.
- 3. Section B has 24 questions. Attempt any 20 questions.
- 4. Section C has 6 questions. Attempt any 5 questions.
- 5. All questions carry equal marks.
- 6. There is no negative marking.

#### **SECTION-A**

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

1.	If pł	phosphorous acid is allowed to react with sufficient quantity of KOH, the product obtained is									
	(a)	K <sub>3</sub> PO <sub>3</sub>	(b)	KH <sub>2</sub> PO <sub>3</sub>	(c)	K <sub>2</sub> HPO <sub>3</sub>	(d)	KHPO3			
2.	Tolu	Foluene reacts with a halogen in the presence of iron (III) chloride giving ortho and para halo compounds. The reaction i									
	(a)	electrophilic eliminat	ion re	action	(b)	electrophilic substitution reaction					
	(c)	free radical addition r	eaction	on	(d)	nucleophilic substitution reaction					
3.	Max	kimum amount of a sol	id sol	ute that can be dissolved	in a sp	n a specified amount of a given liquid solvent does not depend upor					
	······		(1-)	until a Constants	(-)		(1)				
	(a)	temperature	(D)	nature of solute	(c)	pressure	(a)	nature of solvent			
4.	Whi	ch of the following ac	rids fo	orms three series of salts	?		< 1\				
	(a)	H <sub>3</sub> PO <sub>2</sub>	(b)	H <sub>3</sub> BO <sub>3</sub>	(c)	H <sub>3</sub> PO <sub>4</sub>	(d)	H <sub>3</sub> PO <sub>3</sub>			
5.	A be	eaker contains a solution	on of	substance 'A'. Precipitat	tion of	substance 'A' takes place v	when s	small amount of 'A' is added			
	to th	e solution. The solution	n is								
	(a)	saturated	(b)	supersaturated	(c)	unsaturated	(d)	concentrated			
6.	In fi	brous proteins, polype	ptide	chains are held together	by						
	(a)	van der waals forces	ls forces (b) electrostatic forces of attraction								
	(c)	c) hydrogen bonds				covalent bonds					
7.	Whi	ch element out of He,	Ar, K	r and Xe forms least nu	nber o	ber of compounds?					
	(a)	Не	(b)	Ar	(c)	Kr	(d)	Xe			
8.	Whi	ch one is most reactiv	e tow	ards S <sub>N</sub> 1 reaction?							
	(a)	$C_6H_5CH(C_6H_5)Br$	(b)	$C_6H_5CH(CH_3)Br$	(c)	C <sub>6</sub> H <sub>5</sub> C(CH <sub>3</sub> )(C <sub>6</sub> H <sub>5</sub> )Br	(d)	C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> Br			
9.	The	The element which has not vet been reacted with F is									
	(a)	Ar	(b)	Xe	(c)	Kr	(d)	Rn			
10.	The	crystal system of a co	mnou	und with unit cell dimen	sions	a = 0.387 $b = 0.387$ and $a$	c = 0	504nm and $\alpha = \beta = 90^{\circ}$ and			
10.	$\gamma = 120^{\circ}$ " is ·										
	(a)	cubic	(b)	hexagonal	(c)	orthorhombic	(d)	rhombohedral			
11.	At e	quilibrium the rate of	disso	lution of a solid solute in	a vol	atile liquid solvent is					
	(a)	less than the rate of c	rvsta	llisation	(h)	greater than the rate of cry	sation				
	(a)	(a) equal to the rate of crystallication									
	(c) equal to the fate of crystallisation					2010					

Max. Marks: 35

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12.	The Ca <sup>2+</sup> and F <sup>-</sup> are located in CaF <sub>2</sub> crystal, respectively at face centred cubic lattice points and in									
	(a) tetrahedral voids	(b)	half of tetrahedral voids							
	(c) octahedral voids	(d)	half of octahedral voids							
13.	The order of reactivities of the following alkyl halides for a $S_N^2$ reaction is									
	(a) $RF > RCl > RBr > RI$	(b)	RF > RBr > RCl > RI							
	(c) $RCl > RBr > RF > RI$	(d) $RI > RBr > RCl > RF$								
14.	When chlorine is passed through propene at 400°C, which of the following is formed ?									
	(a) PVC (b) Allyl chloride	(c)	Alkyl chloride (d) 1, 2-Dichloroethane							
15.	Which of the following statement is true?									
	(a) Epimers are also anomers	(b) Anomers are also epimers								
	(c) Both of the above statements are true	(d) Neither of the two statement is true								
16.	2-Bromopentane is heated with potassium ethoxide in e	thano	l. The major product obtained is							
	(a) 2-ethoxypentane (b) pentene-1	(c)	trans-2-pentene (d) cis-pentene-2							
17.	Which of the following is the life saving mixture for an	asthn	na patient?							
	(a) Mixture of helium and oxygen	(b)	(b) Mixture of neon and oxygen							
	(c) Mixture of xenon and nitrogen	(d)	d) Mixture of argon and oxygen							
18.	Which of the following is not true in case of reaction wi	th hea	ited copper at 300°C?							
	(a) Phenol $\longrightarrow$ Benzyl alcohol	(b)	Secondary alcohol $\longrightarrow$ Ketone							
	(c) Primary alcohol $\longrightarrow$ Aldehyde	(d)	Tertiary alcohol $\longrightarrow$ Olefin							
19.	In CsCl type structure, the co-ordination number of Cs <sup>+</sup>	and C	Cl <sup>-</sup> respectively are :							
	(a) 6,6 (b) 6,8	(c)	8,8 (d) 8,6							
20.	Propene, $CH_3CH = CH_2$ can be converted into 1-propano	l by ox	tidation. Indicate which set of reagents amongst the following is							
	ideal to effect the above conversion?									
	(a) KMnO <sub>4</sub> (alkaline)	(b)	Osmium tetraoxide ( $OsO_4/CH_2Cl_2$ )							
	(c) $B_2H_6$ and alk. $H_2O_2$	(d)	(d) $O_3/Zn$							
21.	The value of Henry's constant $K_{\rm H}$ is									
	(a) greater for gases with higher solubility.	(b)	greater for gases with lower solubility.							
	(c) constant for all gases.	(d)	not related to the solubility of gases.							
22.	Give IUPAC name of the compound given below.									
	$CH_3 - CH - CH_2 - CH_2 - CH CH_3$									
	CI OH									
	(a) 2-chloro-5-hydroxyhexane	(b)	2-hydroxy-5-chlorohexane							
	(c) 5-chlorohexan-2-ol	(d)	2-chlorohexan-5-ol							
23.	Which of the following noble gases has the highest pos	sitive	electron gain enthalpy value?							
	(a) Helium (b) Krypton	(c)	Argon (d) Neon							
24.	Benedict's reagent is reduced by which type of carbohy	drate								
Э <i>Е</i>	(a) Acetais (b) Hemiacetais	(c)	Glucose pentaacetate (d) None of the three							
23.	when <i>m</i> -choicontu openzene is treated with sodamide in presene of figure ammonia, main product is									
	(a) $0$ -initialitie (b) $p$ -initialitie (c) $m$ -initialitie (d) All of these									
	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 will be considered for evaluation.

26. Comment on the following reactions

(i)  $CH_3OH + NaCl \longrightarrow$ 

(ii)  $CH_{3}OH + HCl \longrightarrow$ 

(a) Both reactions take place easily

(c) Reaction (ii) takes places faster than (i) (d

- (b) Only reaction (ii) takes place
- (d) None of the two reactions in possible
- 27. On heating, lead (II) nitrate gives a brown gas (A). The gas (A) on cooling changes to a colourless solid/liquid (B). (B) on heating with NO changes to a blue solid (C). The oxidation number of nitrogen in solid (C) is :
  - (a) +5 (b) +2 (c) +3 (d) +4

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**28.** A solution of urea (mol. mass 56 g mol<sup>-1</sup>) boils at 100.18°C at the atmospheric pressure. If  $K_f$  and  $K_b$  for water are 1.86 and 0.512 K kg mol<sup>-1</sup> respectively, the above solution will freeze at (a) 0.654°C (b) -0.654°C (c) 6.54°C (d) -6.54°C

(a) 
$$0.654^{\circ}C$$
 (b)  $-0.654^{\circ}C$  (c)  $6.54^{\circ}C$  (d)

**29.** White phosphorus on reaction with concentrated NaOH solution in an inert atmosphere of  $CO_2$  gives phosphine and compound (*X*). (*X*) on acidification with HCl gives compound (*Y*). The basicity of compound (*Y*) is:

**30.** Increase in pH of the solution converts  $RCHCOO^{-1}$  to

(a) RCHCOOH (b) RCHCOOH (c) RCHCOO  $\parallel_{NH_2}$ 

**31.** The correct order of the oxidation states of nitrogen in NO,  $N_2O$ ,  $NO_2$  and  $N_2O_3$  is:

(a) 
$$NO_2 \le NO \le N_2O_3 \le N_2O$$
 (b)  $NO_2 \le N_2O_3 \le NO \le N_2O$ 

(c) 
$$N_2O < N_2O_3 < NO < NO_2$$
 (d)  $N_2O < NO < N_2O_3 < NO_2$ 

32. Which of the following compounds is aromatic alcohol?



(a) 
$$A, B, C, D$$
 (b)  $A, D$  (c)  $B, C$  (d)  $A$ 

- **33.** If the boiling point of  $H_2O$  is 373 K, the boiling point of  $H_2S$  will be :
  - (a) less than 300 K (b) equal to 373 K
  - (c) more than 373 K (d) greater than 300 K but less than 373 K
- **34.** Osmotic pressure of 0.4% urea solution is 1.64 atm and that of 3.42% cane sugar is 2.46 atm. When the above two solutions are mixed, the osmotic pressure of the resulting solution is :

(a) 0.82 atm (b) 2.46 atm (c) 1.64 atm (d) 4.10 atm

- **35.** Osmotic pressure of blood is 7.40 atm, at 27°C. Number of moles of glucose to be used per litre for an intravenous injection that is to have same osmotic pressure of blood is:
  - (a) 0.3 (b) 0.2 (c) 0.1 (d) 0.4
- **36.** Aryl halides are extremely less reactive towards nucleophilic substitution than alkylhalides. Which of the following accounts for this ?
  - (i) Due to resonance in aryl halides.
  - (ii) In alkyl halides carbon atom in C-X bond is sp<sup>2</sup> hybridised whereas in aryl halides carbon atom in C-X bond is sp<sup>3</sup> hybridized.
  - (iii) Due to stability of phenyl cation.
  - (iv) Due to possible repulsion there are less chances of nucleophile to approach electron rich arenes.
  - (a) (i), (ii) and (iv) (b) (i), (ii) and (iii) (c) (i) and (iv) (d) (ii), (iii) and (iv)
- **37.** Reaction of an inorganic sulphite X with dilute  $H_2SO_4$  generates compound Y. Reaction of Y with NaOH gives X. Further, the reaction of X with Y and water affords compound Z. Y and Z, respectively, are:

(a)  $SO_2$  and  $Na_2SO_3$  (b)  $SO_3$  and  $NaHSO_3$  (c)  $SO_2$  and  $NaHSO_3$  (d) S and  $Na_2SO_3$ 

- **38.** Which of the following statements is incorrect?
  - (a) In α-helix structure a polypeptide chain forms all possible hydrogen bonds by twisting into a right handed screw.
  - (b) In  $\beta$ -structure of proteins all peptide chains are stretched out to nearly maximum extension.
  - (c) During denaturation 1° and 2° structures are destroyed but 3° structure remains intact.
  - (d) All the above statements are incorrect.

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(d) None

**39.** What is the product of the following reaction ?

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$$(CH_{3)_2 \text{NLi}} \xrightarrow{(CH_3)_2 \text{NLi}} ?$$

- (a) N, N-dimethylaniline
- (c) *para*-chloro-N, N-dimethylaniline
- (b) phenyllithium ( $C_6H_5Li$ )
- (d) meta-chloro-N, N-dimethylaniline
- 40. Arrange the following bonds according to their average bond energies in descending order: C-Cl,C-Br, C-F, C-I
  - (a) C-F > C-Cl > C-Br > C-I (b) C
  - (c) C-I > C-Br > C-Cl > C-F
- (b) C-Br > C-I > C-C1 > C-F
- (d) C-Cl>C-Br>C-I>C-F

 $NaClO_3$  and  $Ca(ClO_3)_2$ 

- 41. An element (atomic mass = 100 g/mol) having bcc structure has unit cell edge 400 pm. Then, density of the element is (a)  $10.376 \text{ g/cm}^3$  (b)  $5.188 \text{ g/cm}^3$  (c)  $7.289 \text{ g/cm}^3$  (d)  $2.144 \text{ g/cm}^{36}$
- **42.** Which of the following synthetic schemes would be the best for the synthesis of the compound, 2-bromo-1-chloro-4-nitrobenzene?



2-bromo-1-chloro-4-nitrobenzene



- 43. In the following reactions, products (A) and (B), respectively, are: NaOH +  $Cl_2 \rightarrow (A)$  + side products (hot and conc.)  $Ca(OH)_2 + Cl_2 \rightarrow (B)$  + side products (dry)
  - (a)  $NaClO_3$ , and  $Ca(OCl)_2$
  - (c) NaOCl and Ca(OCl)<sub>2</sub> (d) NaOCl and Ca(ClO<sub>3</sub>)<sub>2</sub>
- 44. A solution of sucrose (molar mass =  $342 \text{ g mol}^{-1}$ ) has been prepared by dissolving 68.5 g of sucrose in 1000 g of water. The freezing point of the solution obtained will be ( $K_{\text{f}}$  for water =  $1.86 \text{ K kg mol}^{-1}$ ). (a)  $-0.372^{\circ}\text{C}$  (b)  $-0.520^{\circ}\text{C}$  (c)  $+0.372^{\circ}\text{C}$  (c)  $-0.570^{\circ}\text{C}$

(b)

Given below are two statements labelled as Assertion (A) and Reason (R). Select the most appropriate answer from the options given below:

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false and R is also false.
- **45.** Assertion : With HI, anisole gives iodobenzene and methanol. Reason : I<sup>-</sup> is a good leaving group.
- **46.** Assertion : Fluorine exists only in -1 oxidation state. Reason : Fluorine has  $2s^22p^5$  configuration.
- 47. Assertion : Graphite is an example hexagonal crystal system. Reason : For a hexagonal system,  $a = b \neq c$ ,  $\alpha = \beta = 90^{\circ}$ ,  $\gamma = 120^{\circ}$ .

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52.

- **48.** Assertion : The fluorine has lower reactivity. **Reason :** F – F bond has low bond dissociation energy.
- **49**. Assertion : Reaction of HNO<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub> with phenol yields nitrophenol. **Reason :**  $-NO_2$  can displace OH from phenol.

#### SECTION-C

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

50. Match the starting materials given in Column I with the products formed by these (Column II) in the reaction with HI.



For Kolbe's reaction, complete the following analogy where A is the product for step 1 and B is the product for step 2.

- (a) A : Phenoxide : : B : Salicylaldehyde A : Phenoxide : : B : Benzaldehyde (b)
- A : Phenoxide : : B : Benzoic acid (c) A : Phenoxide : : B : Salicylic acid (d)

**Case Study** : Read the following paragraph and answers the questions.

It is typical of aryl halides that they undergo nucleophilic substitution only with extreme difficulty. Except for certain industrial processes where very severe conditions are feasible, one does not ordinarily prepare phenols (ArOH), ethers (ArOR), amines (ArNH<sub>2</sub>), on nitriles (ArCN) by nucleophilic attack on aryl halides. The aryl halides cannot be used in the Friedel-Crafts's alkylation reaction just like alkyl halides, which can be used.

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However, aryl halides do undergo nucleophilic substitution readily if the aromatic ring contains, in addition to halogen, certain other properly placed groups. The presence of electron withdrawing groups like  $-NO_2$ ,  $-CF_3$  at ortho or para position to the halogen atom makes the aryl halides more susceptible to nucleophilic attack.

- **53.** Benzene reacts with *n*-propyl chloride in the presence of anhydrous  $AlCl_3$  to give
  - (a) 3 propyl 1 chlorobenzene (b) *n*-Propylbenzene
    - (d) Isopropylbenzene
- 54. Read the following statements and choose the correct code
  - (i)  $S_N^2$  reactions follows a second order kinetics whereas  $S_N^2$  reactions follows the first order kinetics
  - (ii)  $S_N 1$  reactions follows the second order kinetics whereas  $S_N 2$  follows the first order kinetics
  - (iii)  $S_N^2$  reactions take place in a single step whereas  $S_N^1$  reactions take place in two steps
  - (iv) Tertiary alkyl halides are least reactive towards  $S_N^2$  reactions but we observe high reactivity towards  $S_N^1$  reaction.

(d)

(c)

(a) (ii) and (iv) are correct

(c) No reaction

(b) (i), (iii) and (iv) are correct

(ii), (iii) and (iv) are correct

(c) (i), (ii) and (iv) are correct55. Consider the following bromides :



The correct order of  $S_N 1$  reactivity is

- (a) B > C > A (b) B > A > C

C > B > A

(d) A > B > C

# **OMR ANSWER SHEET**

## Sample Paper No -7

★ Use Blue / Black Ball pen only.

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- \* Please do not make any atray marks on the answer sheet.
- ★ Rough work must not be done on the answer sheet.
- ★ Darken one circle deeply for each question in the OMR Answer sheet, as faintly darkend / half darkened circle might by rejected.

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Start time : E				Enc	End time				_ Time taken						
1. N	1. Name (in Block Letters)														
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3 C	Candidate's Signature														
0. 0	SECTION-A														
1.															
2.		(b)	$\bigcirc$		10.		(b)	$\overset{\bigcirc}{\odot}$		19.		(b)	$\bigcirc$		
3.	a	b	Ċ	ď	11.	a	Ď	Ċ	ď	20.	a	b	Ċ	ď	
4.	a	b	C	d	12.	a	b	C	d	21.	a	b	C	d	
5.	a	b	C	d	13.	a	b	Ċ	d	22.		b	Ċ	d	
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	SECTION-B														
26.	(a)	(b)	$\bigcirc$	(d)	34.	(a)	(b)	$\bigcirc$	(d)	42.	(a)	(b)	$\bigcirc$	(d)	
27.	a	(b)	Ċ	ď	35.	a	<b>b</b>	Ċ	d	43.		(b)	$\overset{\smile}{\odot}$	d	
28.	a	b	Ċ	d	36.	a	b	Ċ	d	44.	<b>a</b>	b	Ċ	d	
29.	a	b	C	d	37.	a	b	C	d	45.		b	C	d	
30.	a	<b>b</b>	C	d	38.	(a)	<b>b</b>	C	d	46.		<b>b</b>	C	d	
31.	(a)	(b)	$\bigcirc$		39.	(a)	(b)	(c)		47.		(b)	$\bigcirc$		
32.			$\bigcirc$		40.			$\bigcirc$		48.			$\bigcirc$		
51.		(b)	$\bigcirc$		52.		(b)	$\bigcirc$		55.		(b)	0		
No. of Qns. Attempted					Corre	ct		Inc	correct			Mark	s		