INDIAN SCHOOL AL WADI AL KABIR

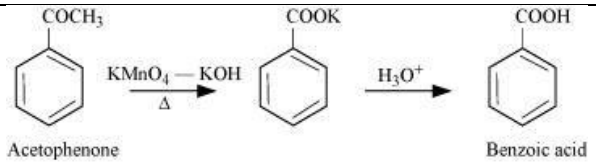
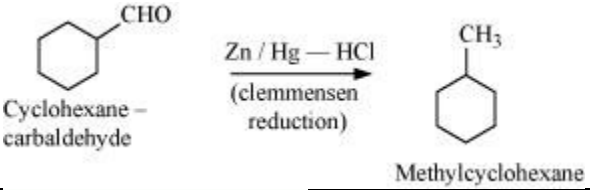
SAMPLE PAPER 3

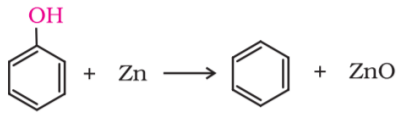
CLASS XII **MAX. MARKS: 70**

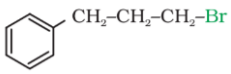
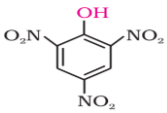
SUBJECT: CHEMISTRY **(043)** **TIME: 3 Hrs.**

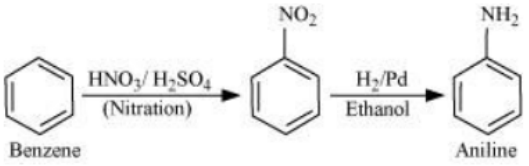
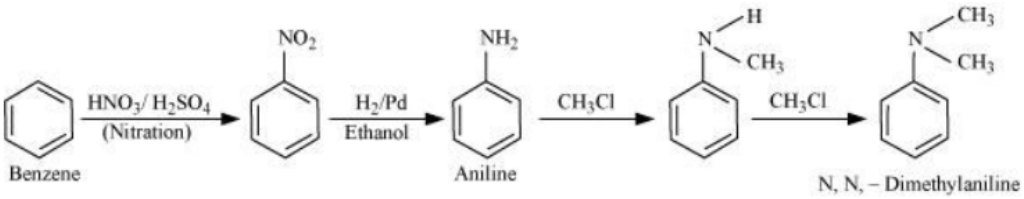
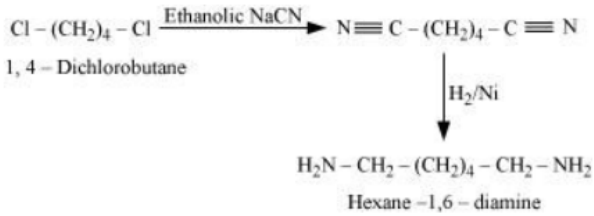
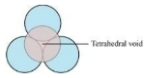
ANSWER KEY

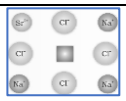
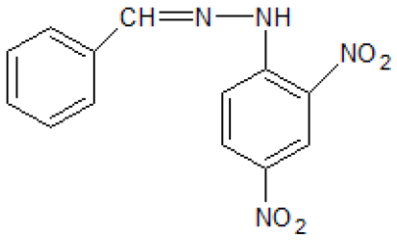
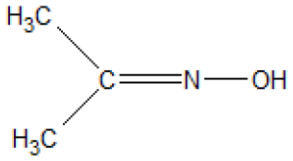
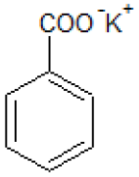
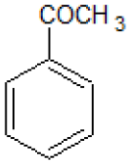
Q.No	Answer key – Value points SECTION A	Marks
1	i. option a – of the increase in the nuclear charge by unity. ii. option b – same OR option c – these elements belong to 4d and 5d series. iii. option a – same ionic radii and same physical and chemical properties iv. option a – s>p>d>f	4
2	i. option c – Assertion is correct statement but reason is wrong statement. ii. option d – Assertion is wrong statement but reason is correct statement. OR option a – Assertion and reason both are correct statements and reason is correct explanation for assertion. iii. option c: Assertion is correct statement but reason is wrong statement. iv. option b: Assertion and reason both are correct statements but reason is not correct explanation for assertion.	4
3	a. Fe/HCl	1
4	a. Glycine OR c. hydrogen bonds	1 1
5.	d. Aerosol	1
6	c. Swarts reaction OR a. RI >RBr>RCl>RF	1 1
7.	d. Inductive effect, solvation effect and steric effect. OR c. N-Phenylethanamide	1 1
8.	c. Both Absorption and Adsorption take place OR b. negative	1 1
9	a. at a fixed pressure, there is a decrease in physical adsorption with increase in temperature.	1

10	d. Covalent solids	1
11	c. 4 isomers	1
12	a) Assertion and reason both are correct statements and reason is correct explanation for assertion.	1
13	b) Assertion and reason both are correct statements but reason is not correct explanation for assertion. OR a) Assertion and reason both are correct statements and reason is correct explanation for assertion.	1 1
14	c) Assertion is correct statement but reason is wrong statement.	1
15	d) Assertion is wrong statement but reason is correct statement.	1
16	a) Assertion and reason both are correct statements and reason is correct explanation for assertion.	1
	SECTION B	
17	 Acetophenone Benzoic acid **OR**  Cyclohexane – carbaldehyde Methylcyclohexane	2 2
18	$\Delta T_f = \frac{K_f \times w_2 \times 1000}{M_2 \times w_1}$ $\Rightarrow w_2 = \frac{\Delta T_f \times M_2 \times w_1}{K_f \times 1000}$ $= \frac{1.5 \times 176 \times 75}{3.9 \times 1000}$ 5.08 g	1 1

19	<table><tr><th colspan="2">Physisorption</th><th>Chemisorption</th></tr><tr><td>1.</td><td>In this type of adsorption, the adsorbate is attached to the surface of the adsorbent with weak van der Waal's forces of attraction.</td><td>In this type of adsorption, strong chemical bonds are formed between the adsorbate and the surface of the adsorbent.</td></tr><tr><td>2.</td><td>No new compound is formed in the process.</td><td>New compounds are formed at the surface of the adsorbent.</td></tr></table> (Any two differences) OR **Surface area of the solid** The greater the surface area of the adsorbent, the greater is the adsorption of a gas on the solid surface. **Effect of temperature** Adsorption is an exothermic process. Thus, in accordance with Le-Chatelier's principle, the magnitude of adsorption decreases with an increase in temperature.	2 2
20	$t = \frac{2.303}{k} \log \frac{[R]_0}{[R]}$ $= \frac{2.303}{1.15 \times 10^{-3}} \log \frac{5}{3}$ $= \frac{2.303}{1.15 \times 10^{-3}} \times 0.2219$ =444s	1 1
21	order of reaction = $\frac{3}{2}$ $= L^{\frac{1}{2}} mol^{-\frac{1}{2}} s^{-1}$	1 1
22	$CH_3 - CH = CH_2 \xrightarrow{H_2O/H^+} CH_3 - \underset{OH}{CH} - CH_2$ Propene Propan-2-ol (i) $CH_3-CH_2-\underset{CH_3}{CH}-CHO \xrightarrow{NaBH_4} CH_3-CH_2-\underset{CH_3}{CH}-CH_2OH$ (ii) 2 – Methylbutanal 2 – Methylbutan – 1 – ol OR (a)  	2 2

	(b)  2-Hydroxybenzoic acid (Salicylic acid)	
23.	Mn^{3+} = 4 unpaired electrons Cr^{3+} = 3 unpaired electrons Cr^{3+} is more stable due to half filled t_{2g}^3 configuration	½ ½ ½ + ½
24.	a.  b.  	1 1
25.	**Amorphous solids** Polyurethane, Teflon, **Crystalline solids** potassium nitrate, copper	1 1
	SECTION C	
26	a. Due to highest electronegativity or absence of vacant d orbital or shows only one oxidation state or does not show positive oxidation state b. Due to lower bond dissociation enthalpy of Te-H than O-H c. Due to 8 valence electrons of Xe atom or draw and explain or due to electronic repulsion with the Xe-F bond. OR The general electronic configuration of halogen is ns2np5. These elements need one electron to complete their octet state. Fluorine molecule has the highest oxidising behaviour due to -1 oxidation state only. As we go down the group, this property decreases and iodine will be the least oxidising agent. The relative oxidising power is; $F_2 > Cl_2 > Br_2 > I_2$.	1 1 1 ½ x 6 = 3

27	**(i)**  **(ii)**  **(iii)**  OR i Due to the Inductive effect and resonance effect $C_6H_5NH_2 < NH_3 < C_6H_5CH_2NH_2 < C_2H_5NH_2 < (C_2H_5)_2NH$ ii Due to Inductive effect, steric hindrance and solvation effect $C_6H_5NH_2 < C_2H_5NH_2 < (C_2H_5)_3N < (C_2H_5)_2NH$ iii Considering the inductive effect and the steric hindrance of alkyl groups, $C_6H_5NH_2 < C_6H_5CH_2NH_2 < (CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$	1 x 3 1 x 3
28	 a. A void surrounded by 4 spheres is called a tetrahedral void  b. 14 lattice points (8 from the corners + 6 from the faces)	½ + ½ ½ + ½

	 c. When molten NaCl containing a little amount of $SrCl_2$ is crystallised, some of the sites of Na^+ ions are occupied by Sr^{2+} leading to one cation vacancy.	½ + ½
29	i. The amide formed between −COOH group of one molecule of an amino acid and $-NH_2$ group of another molecule of the amino acid by the elimination of a water molecule is called a peptide linkage. ii. The primary structure of protein refers to the specific sequence in which various amino acids are present in it, i.e., the sequence of linkages between amino acids in a polypeptide chain. The sequence in which amino acids are arranged is different in each protein. A change in the sequence creates a different protein. iii. In a biological system, a protein is found to have a unique 3-dimensional structure and a unique biological activity. In such a situation, the protein is called native protein. However, when the native protein is subjected to physical changes such as change in temperature or chemical changes such as change in pH, its H-bonds are disturbed. This disturbance unfolds the globules and uncoils the helix. As a result, the protein loses its biological activity. This loss of biological activity by the protein is called denaturation. During denaturation, the secondary and the tertiary structures of the protein get destroyed, but the primary structure remains unaltered. One of the examples of denaturation of proteins is the coagulation of egg white when an egg is boiled.	1 1 1
30	(i) Acidified potassium permanganate (ii) 85% phosphoric acid & 440K (iii) $NaBH_4$ or $LiAlH_4$	1 1 1
31	a) i)  ii)  b) i)  ii)  c) Carboxylate ion is more stabilised than phenoxide ion / conjugate base of carboxylic acid is more stable than that of phenol / carboxylate ion has two equivalent resonating structures while the structures are non equivalent in phenoxide ion/ negative charge in carboxylate ion is delocalised over more electronegative two Oxygen atoms while in phenoxide ion negative charge is delocalised over one Oxygen atom and less electronegative Phenyl ring (or C-atoms). /Carboxylic acid reacts with $NaHCO_3$ to give brisk effervescence of CO_2 while phenol doesn't **OR**	1+1 1+1 1

	a) $CH_3COOCH_2CH_3 \xrightarrow{H_2SO_{4\ dil}} CH_3COOH + CH_3CH_2OH$ A B C $CH_3CH_2OH \xrightarrow{oxidation} CH_3COOH$ $CH_3CH_2OH \xrightarrow{dehydration} CH_2{=}CH_2$ A = Ethyl acetate ($CH_3COOCH_2CH_3$) , B = Acetic or Ethanoic acid (CH_3COOH), C = Ethanol (CH_3CH_2OH) b) i) $CH_3CHO \xrightarrow{LiAlH_{4,\ dry\ ether}} CH_3CH_2OH$ ii) $CH_3CHO \xrightarrow{Zn/Hg\ in\ HCl_{conc.}} CH_3CH_3$ Or NH_2NH_2 with	½ x 3 ½ x 3 1 1
32	**a.** In pentahalides, the oxidation state is +5 and in trihalides, the oxidation state is +3. Since the metal ion with a high charge has more polarizing power, pentahalides are more covalent than trihalides. **b.** As we move down a group, the atomic size increases and the stability of the hydrides of group 15 elements decreases. Since the stability of hydrides decreases on moving from NH_3 to BiH_3, the reducing character of the hydrides increases on moving from NH_3 to BiH_3. **c.** Extensive intermolecular hydrogen bonding in H_2O, which is absent in H_2S. Molecules of H_2S are held together only by weak van der Waal's forces of attraction. **d. f**orms only one oxoacid as compared to other halogens that form a number of oxoacids. Ionisation enthalpy, electronegativity, and electrode potential of fluorine are much higher than expected. e. It is difficult to study the chemistry of radon because it is a radioactive substance having a half-life of only 3.82 days. Also, compounds of radon such as RnF_2 have not been isolated. They have only been identified. **OR** $6Li + N_2 \xrightarrow{Heat} 2Li_3N$ $NO(g) + O_3(g) \rightarrow NO_2(g) + O_2(g)$ $2F_2(g) + 2H_2O(l) \rightarrow 4H^+(aq) + 4F^-(aq) + O_2(g)$ $I_2 + Cl_2 \rightarrow 2ICl$; (equimolar) $XeF_6 + Na^+F^- \rightarrow Na^+[XeF_7]^-$	1 1 1 1 1 1 x 5
33	**(i)** a) At Anode: $2H_2O_{(l)} \longrightarrow 4H^+_{(aq)} + 4e^- + O_2$ At Cathode: $Cu^{2+}_{(aq)} + 2\ e^- \longrightarrow Cu_{(s)}$. / Copper is deposited at cathode and Oxygen gas is liberated at anode. b) At Anode: $2H_2O_{(l)} \longrightarrow 4H^+_{(aq)} + 4e^- + O_2$ At Cathode: $Ag^+_{(aq)} + e^- \longrightarrow Ag_{(s)}$. / Silver is deposited at cathode and oxygen gas is liberated at anode.	½ + ½ ½ + ½

(ii) 1

For hydrogen electrode, $H^+ + e^- \longrightarrow \frac{1}{2} H_2$, it is given that pH = 10

$\therefore [H^+] = 10^{-10}$ M 1

Now, using Nernst equation:

$$H_{\left(H^+/\frac{1}{2}H_2\right)} = E^{\ominus}_{\left(H^+/\frac{1}{2}H_2\right)} - \frac{RT}{nF} \ln \frac{1}{[H^+]}$$

$$= E^{\ominus}_{\left(H^+/\frac{1}{2}H_2\right)} - \frac{0.0591}{1} \log \frac{1}{[H^+]}$$ 1

$$= 0 - \frac{0.0591}{1} \log \frac{1}{[10^{-10}]}$$

$= -0.0591 \log 10^{10}$

$= -0.591$ V

OR

(i)

Here, $n = 2$, $E^{\ominus}_{cell} = 0.236$ V, T = 298 K 1

We know that:

$\Delta_r G^{\ominus} = -nFE^{\ominus}_{cell}$ 1

$= -2 \times 96487 \times 0.236$

$= -45541.864$ J mol^{-1} 1

$= -45.54$ kJ mol^{-1}

Again, $\Delta_r G^{\ominus} = -2.303RT \log K_c$

$$\Rightarrow \log K_c = -\frac{\Delta_r G^{\ominus}}{2.303\ RT}$$

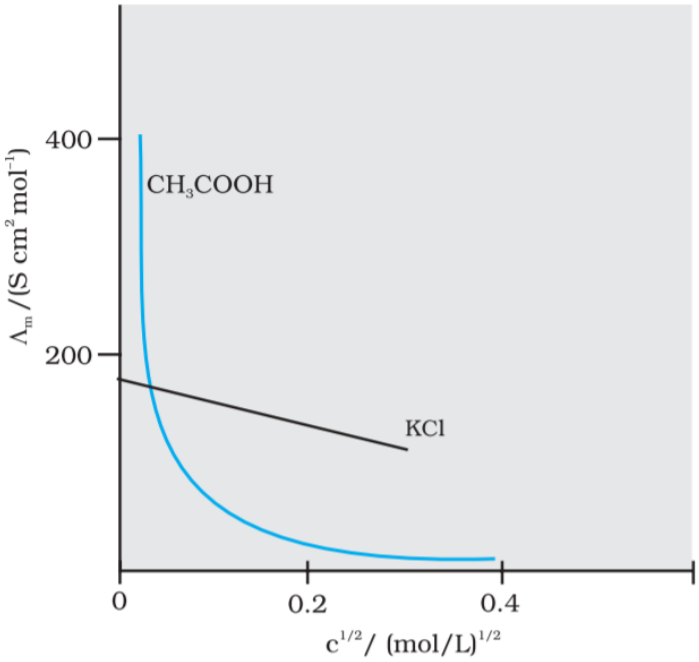
$$= -\frac{-45.54 \times 10^3}{2.303 \times 8.314 \times 298}$$

$= 7.981$

$\therefore K_c$ = Antilog (7.981)

$= 9.57 \times 10^7$

(Please note : Log and antilog values will be provided in the Board Paper)

	(ii)  	1 (diagram) 1 (labelling)

Prepared by: The Department of Science 2020 -21
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