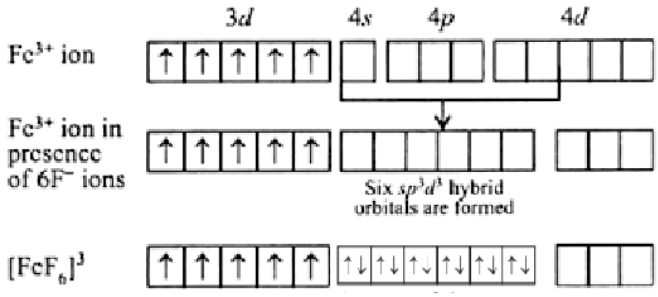
INDIAN SCHOOL AL WADI AL KABIR
SAMPLE PAPER 1

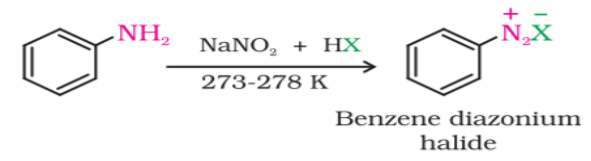
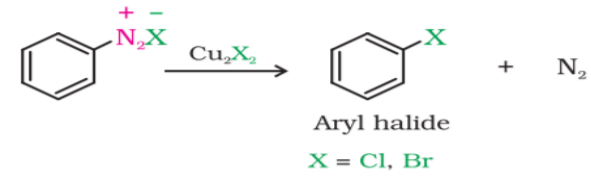
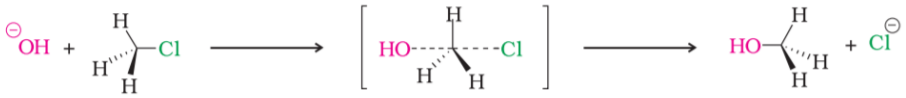
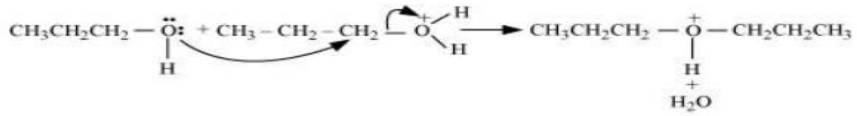
CLASS XII MAX. MARKS: 70

SUBJECT: CHEMISTRY (043) TIME: 3 Hrs.
SET - I

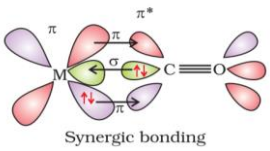
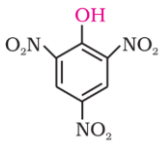
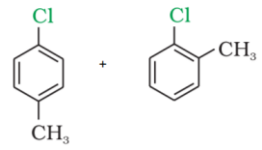
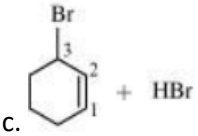
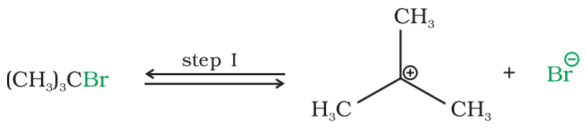
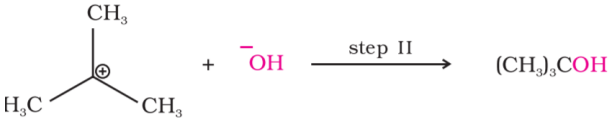
ANSWER KEY

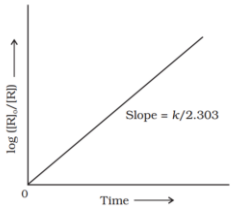
CLASS 12 – CHEMISTRY – REHEARSAL 1 – 2020 - 21		
Q.NO.	**ANSWER KEY – VALUE POINTS**	**MARKS**
1 (i)	d	1
1 (ii)	b OR a	1
1(iii)	a	1
1(iv)	b	1
2(i)	a	1
2(ii)	b	1
2(iii)	c	1
2(iv)	a OR d	1
3	d OR c	1
4	d	1
5	a OR c	1
6	a	1
7	c OR b	1
8	b	1
9	c	1
10	a or b	1
11	c OR b	1
12	b	1
13	c	1
14	a	1
15	a	1
16	b OR c	1
17	$d = \frac{z\,M}{a^3\,N_A}$ $\Rightarrow a^3 = \frac{z\,M}{d\,N_A}$ $= \frac{2 \times 93\ gmol^{-1}}{8.55\ gcm^{-3} \times 6.022 \times 10^{23} mol^{-1}}$ $= 3.612 \times 10^{-23}\ cm^3$ So, $a = 3.306 \times 10^{-8}$ cm OR	1 1

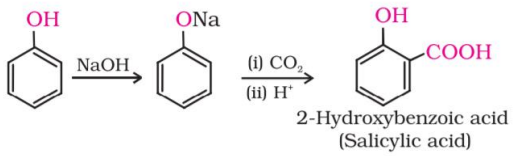
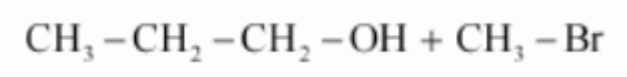
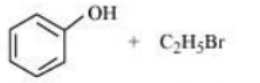
	From ΔABC, we have: $AC^2 = BC^2 + AB^2$ $\Rightarrow b^2 = a^2 + a^2$ $\Rightarrow b^2 = 2a^2$ $\Rightarrow b = \sqrt{2}a$ $b = 4r$ $\Rightarrow \sqrt{2}a = 4r$ $\therefore \text{Packing efficiency} = \frac{\text{Volume occupied by four spheres in the unit cell}}{\text{Total volume of the unit cell}} \times 100\%$ **= 74%**	1 1
18	(i) Tyndall effect (ii) Coagulation	1 1
19	$\Lambda_m = \frac{1000 \times \kappa}{M} = \frac{1000 \times 8 \times 10^{-5}}{2 \times 10^{-3}} = 40\ S\ cm^2\ mol^{-1}$	1 1
20	When chlorine reacts with water, it produces nascent oxygen. $Cl_2 + H_2O \longrightarrow 2HCl + [O]$ Coloured substances + [O] → Oxidized colourless substance OR $3Cu + 8HNO_{3(dilute)} \longrightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$ $Cu + 4HNO_{3(conc.)} \longrightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$	1 1 1 1
21	a. $[Co(NH_3)_6]_2 (SO_4)_3$ b. Tris(ethane-1, 2-diamine) cobalt(III) ion	1 1
22		1 1

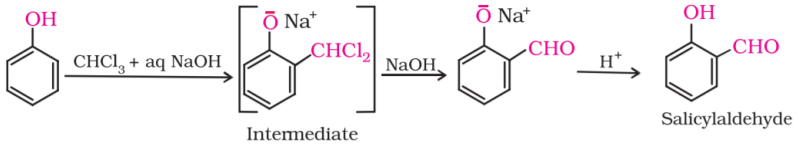
23	 Benzene diazonium halide  Aryl halide X = Cl, Br 	1 1
24	(i) n-hexane is formed. (ii) D- gluconic acid is produced. (chemical equations) OR **(1)** Aldehydes give 2, 4-DNP test, Schiff's test, and react with $NaHSO_4$ to form the hydrogen sulphite addition product. However, glucose does not undergo these reactions. **(2)** The pentaacetate of glucose does not react with hydroxylamine. This indicates that a free −CHO group is absent from glucose.	1 1 1 1
25	**Step 1:** Protonation  Popan – 1 – ol **Step 2:** Nucleophilic attack  **Step 3:** Deprotonation  1 – Propoxypropane	½ 1 ½
26	a. Impurity Defects If molten NaCl containing a little amount of SrCl2 is crystallised, some of the sites of Na+ ions are occupied by Sr2+ (Fig.1.27). Each Sr2+ replaces two Na+ ions. It occupies the site of one ion and the other site remains vacant. The cationic vacancies thus produced are equal in number to that of Sr2+ ions. b. (i) Frenkel Defect (ii) AgBr shows both, Frenkel as well as Schottky defects. c. Metal excess defect due to the presence of extra cations at interstitial sites: On heating it loses oxygen and turns yellow.	1 1 1

	$ZnO \xrightarrow{\text{heating}} Zn^{2+} + \frac{1}{2}O_2 + 2e^-$ Now there is excess of zinc in the crystal and its formula becomes $Zn_{1+x}O$. The excess Zn^{2+} ions move to interstitial sites and the electrons to neighbouring interstitial sites. OR $2x + (294 - 3x) + (-200) = 0$ $\Rightarrow -x + 94 = 0$ $\Rightarrow x = 94$ Therefore, number of Ni^{2+} ions = 94 Hence, fraction of nickel that exists as $Ni^{2+} = \frac{94}{98}$ $= 0.959$ And, fraction of nickel that exists as $Ni^{3+} = \frac{4}{98}$ $= 0.041$	1 1 1

27	$\frac{0.850 \text{ bar} - 0.845 \text{ bar}}{0.850 \text{ bar}} = \frac{0.5 \text{ g} \times 78 \text{ g mol}^{-1}}{M_2 \times 39 \text{ g}}$ Therefore, $M_2 = 170 \text{ g mol}^{-1}$	1+1 1
28	$E_{cell} = E^{\ominus}_{cell} - \frac{0.0591}{n}\log\frac{[Mg^{2+}]}{[Cu^{2+}]}$ $= \{0.34 - (-2.36)\} - \frac{0.0591}{2}\log\frac{.001}{.0001}$ $= 2.7 - \frac{0.0591}{2}\log 10$ = 2.7 – 0.02955 = 2.67 V	1 1 1
29.	a. Decacarbonyldimanganese (0) b.  Synergic bonding The metal-carbon bond in metal carbonyls possess both *s* and *p* character. The M–C σ bond is formed by the donation of lone pair of electrons on the carbonyl carbon into a vacant orbital of the metal. The M–C π bond is formed by the donation of a pair of electrons from a filled *d* orbital of metal into the vacant antibonding π* orbital of carbon monoxide. The metal to ligand bonding creates a synergic effect which strengthens the bond between CO and the metal	1 1+1
30.	 a.  b.  c. OR   Explanation (atleast two points)	1+1+1 1 1 1

31	a. $R \rightarrow P$ $\text{Rate} = -\frac{d[R]}{dt} = k[R]$ or $\frac{d[R]}{[R]} = -k dt$ Integrating this equation, we get ln [R] = − kt + I $k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$ ln $[R]_0$ = −k × 0 + I ln $[R]_0$ = I Substituting the value of I in equation ln[R] = -kt + ln$[R]_0$ b.  c. For the first order reaction, $k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$ at $t_{1/2}$ $[R] = \frac{[R]_0}{2}$ So, the above equation becomes $k = \frac{2.303}{t_{1/2}} \log \frac{[R]_0}{[R]/2}$ or $t_{1/2} = \frac{2.303}{k} \log 2$ $t_{1/2} = \frac{2.303}{k} \times 0.301$ $t_{1/2} = \frac{0.693}{k}$ OR $\text{Rate} = k[A]^x [B]^y$ According to the question, $6.0 \times 10^{-3} = k[0.1]^x [0.1]^y$ (i) $7.2 \times 10^{-2} = k[0.3]^x [0.2]^y$ (ii) $2.88 \times 10^{-1} = k[0.3]^x [0.4]^y$ (iii) $2.40 \times 10^{-2} = k[0.4]^x [0.1]^y$ (iv) $\Rightarrow x = 1$ $\Rightarrow y = 2$ Therefore, the rate law is Rate = k [A] $[B]^2$ $\Rightarrow k = \frac{\text{Rate}}{[A][B]^2}$ $k = \frac{6.0 \times 10^{-3} \text{ mol L}^{-1} \text{ min}^{-1}}{(0.1 \text{ mol L}^{-1})(0.1 \text{ mol L}^{-1})^2}$ = 6.0 L^2 mol^{-2} min^{-1}	1+1 1+1 1 1 2 2
32.	a. (i) The general trend towards less negative E° V values across the series is related to the general increase in the sum of the first and second ionisation enthalpies. (ii) The high energy to transform Cu(s) to Cu^{2+} (aq) is not balanced by its	1 1 1

	hydration enthalpy. (iii) The stability of the half-filled *d* sub-shell in Mn^{2+} and the completely filled d^{10} configuration in Zn^{2+} are related to their more negative E^{o} V values	
	b. (i)Due to large surface area and ability to show variable oxidation states	1
	(ii)Due to high value of third ionisation enthalpy	1
	OR	
	a. +2 oxidation state is attained by the loss of the two 4*s* electrons by these metals. Since the number of *d* electrons in (+2) state also increases from Ti(+2) to Mn(+ 2), the stability of +2 state increases (as *d*-orbital is becoming more and more half-filled). Mn (+2) has d^5 electrons (that is half-filled *d* shell, which is highly stable).	1
	b. Cr^{2+} is strongly reducing in nature. It has a d^4 configuration. While acting as a reducing agent, it gets oxidized to Cr^{3+} (electronic configuration, d^3). This d^3 configuration can be written as t_{2g}^3 configuration, which is a more stable configuration. In the case of Mn^{3+} (d^4), it acts as an oxidizing agent and gets reduced to Mn^{2+} (d^5). This has an exactly half-filled *d*-orbital and is highly stable. $\therefore \mu = \sqrt{1(1+2)} = \sqrt{3} = 1.732\ \text{B.M}$	1
	c. $[Xe]\ 4f^1\ 5d^1\ 6s^2$	1
	d. since fluorine and oxygen are the smaller in size and more electronegative elements.	1
	e. due to the high ionisation or high atomization energy and low hydration energy associated with it	1
33.	a.i.  2-Hydroxybenzoic acid (Salicylic acid)	1
	ii. 	1
	b. 	1
		1
	c.	1

	Intramolecular H-bonding is present in *o*-nitrophenol. In *p*-nitrophenol, the molecules are strongly associated due to the presence of intermolecular bonding. Hence, *o*-nitrophenol is steam volatile. OR a.i  Intermediate Salicylaldehyde Ii b. Unsymmetrical ethers with example. 2, 5-Dimethylphenol 2-Ethoxybutane c. The nitro-group is an electron-withdrawing group. decreases the electron density in the O−H bond. the phenoxide ion formed after the loss of protons is stabilized by resonance. On the other hand, methoxy group is an electron-releasing group. Thus, it increases the electron density in the O−H bond and hence, the proton cannot be given out easily.	1 1 1 1 1

Prepared by : The Department of Science 2020 -21
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