

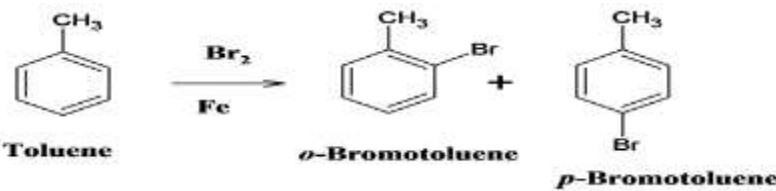
**MARKING SCHEME**

**PRACTICE PAPER 5**

**SECTION A**

Q.No.	Value Point	Marks
1(i)	A	1
(ii)	D OR A	1
(iii)	C	1
(iv)	B	1
2 (i)	C	1
(ii)	B	1
(iii)	A	1
(iv)	A OR D	1
3	D	1
4	D OR C	1
5	D	1
6	D OR D	1
7	C OR B	1
8	C OR D	1
9	D	1
10	D	1
11	A	1
12	C	1
13	A	1
14	B OR B	1
15	D	1
16	A	1

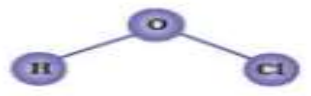
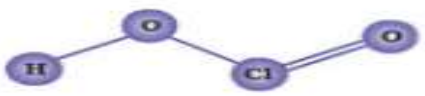
**SECTION B, C, D**

Q.No.	VALUE POINTS	MARKS
<b>SECTION B</b>		
17	 <p style="text-align: center;"> <b>Toluene</b> <math>\xrightarrow[\text{Fe}]{\text{Br}_2}</math> <b>o-Bromotoluene</b> + <b>p-Bromotoluene</b> </p> <p>The ortho and para isomers can be easily separated due to large difference in their melting points.</p> <p style="text-align: center;">OR</p> <p>(i) <math>\text{C}_6\text{H}_6 + \text{HNO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{C}_6\text{H}_5\text{NO}_2 + \text{Fe}/\text{HCl} \rightarrow \text{C}_6\text{H}_5\text{NH}_2</math>  (ii) <math>\text{C}_2\text{H}_5\text{OH} + \text{SO}_2\text{Cl} \rightarrow \text{C}_2\text{H}_5\text{Cl} + \text{AgF} \rightarrow \text{C}_2\text{H}_5\text{F}</math></p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
18	$X_{(\text{Nitrogen})} = P_{(\text{nitrogen})} / K_H = 0.987 \text{ bar} / 76,480 \text{ bar} = 1.29 \times 10^{-5}$ <p>As 1 litre of water contains 55.5 mol (1000 g / 18 g mol<sup>-1</sup>) of it, therefore if <i>n</i> represents number of moles of N<sub>2</sub> in solution,</p> $X_{(\text{Nitrogen})} = \frac{n \text{ mol}}{n + 55.5} \quad \text{if } 55.5 \gg n$ $X_{(\text{Nitrogen})} = n / 55.5$ <p>Thus <math>n = 1.29 \times 10^{-5} \times 55.5 \text{ mol} = 7.16 \times 10^{-4} \text{ mol}</math>  <math>= 7.16 \times 10^{-4} \text{ mol} \times 1000 \text{ m mol} = 0.716 \text{ m mol}.</math></p>	<p>1</p> <p>1</p>
19	<p>Complexes in which a metal is bound to only one kind of donor groups, e.g., <math>[\text{Co}(\text{NH}_3)_6]^{3+}</math> are known as homoleptic. Complexes in which a metal is bound to more than one kind of donor groups, e.g., <math>[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+</math> are known as heteroleptic.</p> <p style="text-align: center;">OR</p> <p>(i) In coordination compounds metals show two types of linkages (valences)-primary and secondary.  (ii) The primary valences are normally ionisable and are satisfied by negative ions.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
20	$\text{Rate} = k[\text{X}]^2$ $\text{Rate} = k[3\text{X}]^2$ $\text{Rate} = 9k[\text{X}]^2$	<p>1</p> <p>1</p>

	<b>OR</b>	
	$t_{1/2} = \frac{0.693}{k}$ $t_{1/2} = \frac{0.693}{5.5 \times 10^{-14} \text{ s}^{-1}}$ $t_{1/2} = 1.26 \times 10^{13} \text{ s}^{-1}$	1  1
21	<p>(i) Chloromethane &lt; Bromomethane &lt; Dibromomethane &lt; Bromoform,</p> <p>(ii) Isopropyl chloride &lt; 1-Chloropropane &lt; 1-Chlorobutane</p>	1  1
22	<p>(i) The dehydration of secondary and tertiary alcohols to give corresponding ethers is unsuccessful as elimination competes over substitution and as a consequence, alkenes are easily formed.</p> <p>(ii) Primary amine can act as a nucleophile and combine with alkyl halide (if available) to give secondary amine and the reaction continues in the same way to form tertiary amine and finally quaternary ammonium salt. Thus, a mixture of products is formed and it is not possible to separate individual amines from the mixture.</p>	1  1
23	<p>F being the most electronegative element.</p> <p>Atomicity of S<sub>8</sub> is greater than O<sub>2</sub>, hence stronger intermolecular forces of attraction.</p>	1  1

24.	Sterically, the presence of two relatively large substituents in ketones hinders the approach of nucleophile to carbonyl carbon than in aldehydes having only one such substituent. Electronically, aldehydes are more reactive than ketones because two alkyl groups reduce the electrophilicity of the carbonyl carbon more effectively than in former.	1 1
25	(i) $C_6H_5NH_2 < NH_3 < C_2H_5NH_2 < (C_2H_5)_2NH$  (ii) $C_6H_5NH_2 < (CH_3)_3N < CH_3NH_2 < (CH_3)_2NH < C_6H_5NH_2$	1  1
<b>SECTION C</b>		
26	(i) As transition metals have a large number of unpaired electrons in the <i>d</i> -orbitals of their atoms. (ii) As transition metals have a large number of unpaired electrons in the <i>d</i> -orbitals of their atoms, they have strong interatomic attraction or metallic bonds. (ii) This activity is ascribed to their ability to adopt multiple oxidation states, ability to adsorb the reactant(s) and ability to form complexes. <b>OR</b> (i) Lowest oxidation compounds of transition metals are basic due to their ability to get oxidised to higher oxidation states. Whereas the higher oxidation state of metal and compounds gets reduced to lower ones and hence acts as acidic in nature. (ii) Due to presence of unpaired electrons in <i>d</i> -orbitals and its <i>d-d</i> transitions, compounds of the transition metals are generally coloured. (iii) As manganese has maximum number of unpaired electrons (5) in 3 <i>d</i> subshell in addition to 2 electrons in the 4 <i>s</i> subshell, it can use the 7 electrons for bonding purpose.	1 1 1  1 1 1
27	(i) Ethylamine is soluble in water due to formation of intermolecular hydrogen bonds with water molecules. However, in aniline due to large hydrophobic aryl group the extent of hydrogen bonding decreases considerably. (ii) In Friedel – Crafts reaction, $AlCl_3$ is added as a catalyst which is a Lewis acid. It forms a salt with aniline due to which the nitrogen of aniline acquires positive charge. $\text{—}$ is positively charged nitrogen acts as a strong deactivating group. (iii) Due to resonance stabilisation. <b>OR</b>  [A] = $C_2H_5CN$ [B] = $C_2H_5CONH_2$ [C] = $C_2H_5NH_2$	1 1 1  1 1 1
28	Moles of glucose = $18 \text{ g} / 180 \text{ g mol}^{-1} = 0.1 \text{ mol}$ Number of kilograms of solvent = 1 kg Thus molality of glucose solution = $0.1 \text{ mol kg}^{-1}$ For water, change in boiling point $\Delta T_b = K_b \times m = 0.52 \text{ K kg mol}^{-1} \times 0.1 \text{ mol kg}^{-1} = 0.052 \text{ K}$ Since water boils at 373.15 K at 1.013 bar pressure, therefore, the boiling point of solution will be $373.15 + 0.052 = 373.202 \text{ K}$ .	$\frac{1}{2}$  1  1 1/2
29	Refer to NCERT Chapter 11	3

30	<p>The difference of energy between two states of splitted <i>d</i>-orbitals is called crystal field splitting energy. It is denoted by <math>\Delta_o</math> or <math>10 Dq</math>.  For octahedral <math>\Delta_o</math>, for tetrahedral it is <math>\Delta_t</math> .  For CFSE diagram refer to NCERT Chapter 9  When <math>\Delta_o &gt; P</math>, <math>t_{2g}^4 e_g^0</math>  When <math>\Delta_o &lt; P</math>, <math>t_{2g}^3 e_g^1</math></p>	<p>1  1  1</p>

31.	<p>(a) <math>\text{XeF}_6 + 3\text{H}_2\text{O} \rightarrow \text{XeO}_3 + 6\text{HF}</math>  <math>\text{XeF}_6 + \text{H}_2\text{O} \rightarrow \text{XeOF}_4 + 2\text{HF}</math></p> <p>(b)</p> <p>(i) <math>\text{I}_2 &lt; \text{F}_2 &lt; \text{Br}_2 &lt; \text{Cl}_2</math></p> <p>(ii) <math>\text{HF} &lt; \text{HCl} &lt; \text{HBr} &lt; \text{HI}</math></p> <p>(iii) <math>\text{BiH}_3 &lt; \text{SbH}_3 &lt; \text{AsH}_3 &lt; \text{PH}_3 &lt; \text{NH}_3</math></p> <p style="text-align: center;"><b>OR</b></p> <p>(a)</p> <div style="text-align: center;">  <p>Hypochlorous acid</p>  <p>Chlorous acid</p> </div> <p>(b) <math>2\text{Fe}^{3+} + \text{SO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Fe}^{2+} + \text{SO}_4^{2-} + 4\text{H}^+</math></p> <p>(c) Nitrogen oxide emitted from the exhausts of supersonic jet aeroplanes readily combines with ozone to form nitrogen dioxide and diatomic oxygen. Since supersonic jets fly in the stratosphere near the ozone layer, they are responsible for the depletion of ozone layer.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p>
32	<p>(a)</p> <p>(i) Resonance effect : In haloarenes the electron pairs on halogen atom are in conjugation with p-electrons of the ring and the bond acquire partial double bond character, difficult to substitute, greater s character in haloarenes makes bond shorter, instability of phenyl cation etc.</p> <p>(ii) In aqueous solution, KOH is almost completely involved to give OH<sup>-</sup> ion which being a better nucleophile gives a substitution reaction on alkyl halides to form alcohol. But an alcoholic solution of KOH containing alkoxide (RO<sup>-</sup>) ions which being a much stronger base than OH<sup>-</sup> ion preferentially snatches a H<sup>+</sup> ion from an alkyl chloride to form alkenes.</p> <p>(b) <math>\text{CH}_3\text{Cl} + \text{AgNO}_2 \rightarrow \text{CH}_3\text{NO}_2</math></p>	<p>2</p> <p>2</p> <p>1</p>

OR

- (a)  
(i) Ethanoic acid on reaction with  $\text{NaHCO}_3$  produce  $\text{CO}_2$  ,No reaction with ethanol. 1  
(ii) Iodoform is given by ethanal not by propanal. 1  
(b)  
(i) Propan-2-ol 1  
(ii) ethane. 1  
(iii) But-2-en-1-al. 1

33.

(a)  
The cell can be represented as :  $\text{Mg} \mid \text{Mg}^{2+}(0.130\text{M}) \mid \mid \text{Ag}^+(0.0001\text{M}) \mid \text{Ag}$  1

$$E_{\text{cell}} = E_{\text{cell}}^0 - \frac{0.059}{n} \log Q$$

$$E_{\text{cell}} = 3.17 - \frac{0.059}{2} \log \frac{[\text{Mg}^{2+}]}{[\text{Ag}^+]^2}$$

$$E_{\text{cell}} = 3.17 - \frac{0.059}{2} \log \frac{[0.130]}{[0.0001]^2}$$
 1

$$E_{\text{cell}} = 3.17 - \frac{0.059}{2} \log 1.3 \times 10^7$$

$$E_{\text{cell}} = 3.17 - \frac{0.059}{2} (\log 1.3 + \log 10^7)$$

$$E_{\text{cell}} = 3.17 - 0.059 (0.1139 + 7) = 3.17 \text{ V} - 0.21 \text{ V} = 2.96 \text{ V}$$
 1

(b)  
Order : Experimentally determined, can be 0, fraction.  
Molarity: Theoretically determined, can't be 0 or fraction.

OR

(a)  
$$\Lambda_m = \frac{K \times 1000}{C} = \frac{4.95 \times 10^{-5} \times 1000}{0.001028} = 48.15$$

$$\alpha = \frac{\Lambda_m}{\Lambda_m^0} = \frac{48.15}{390.5} = 0.1233$$

$$K_a = \frac{C \alpha^2}{1 - \alpha} = \frac{0.001028 \times (0.1233)^2}{1 - 0.1233} = 1.78 \times 10^{-5} \text{ mol L}^{-1}$$

(b) Refer to NCERT Part 1 chapter 4 page no 110.

