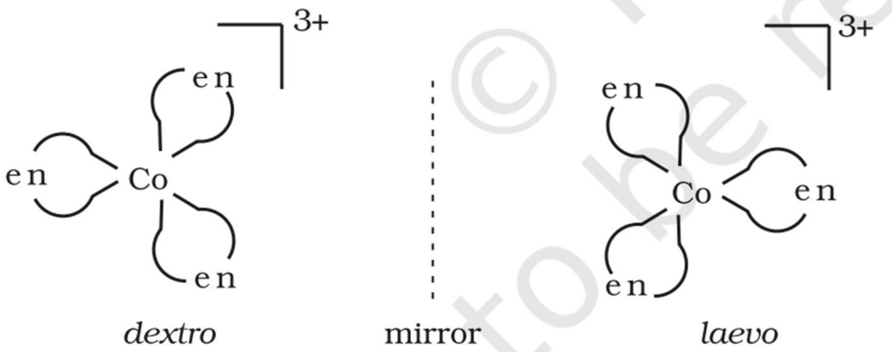
BSEH MARKING SCHEME

CLASS- XII **Chemistry (March-2024)** **Code: C**

- **The answer points given in the marking scheme are not final. These are suggestive and indicative. If the examinee has given different, but appropriate answers, then he should be given appropriate marks.**

Q. No.	Answers	Marks
1.	b) K kg mol^{-1}	1
2.	b) increases	1
3.	d) Nickel-Cadmium cell	1
4.	a) Thorium	1
5.	b) 2	1
6.	d) All of the above	1
7.	a) Etard reaction	1
8.	b) Alkaline sodium potassium tartarate	1
9.	c) Methylamine	1
10.	a) $C_6H_5SO_2Cl$	1
11.	b) Lysine	1
12.	b) Vitamin B_2	1
13.	b) Tyrosine	1
14.	b) Secondary	1
15.	c) A is true but R is false.	1
16.	d) A is false but R is true.	1

17.	c) A is true but R is false.	1
18.	d) A is false but R is true	1
19.	The shielding effect of 5f orbitals is poorer than the shielding effect of 4f orbitals. (1 mark) Due to this, the valence shell electrons of actinide experience greater effective nuclear charge than that experienced by lanthanides. Hence, actinoid contraction is greater than lanthanoid contraction. (1 mark)	2
20.	An alloy is a homogeneous mixture of a metal with other metal or non - metals. (1 mark) An important alloy containing some of the lanthanoid metal is mischmetal. (1 mark) Or Number of unpaired electrons in M^{2+} = 3 (½ mark) $\mu = \sqrt{n(n+2)}$ (½ mark) $= \sqrt{3(3+2)}$	2

	$= \sqrt{15}$ $= 3.87$ BM (½ mark for answer, ½ mark for unit)	
21.	Manganese (Z=25) shows maximum number of oxidation states. (1 mark) This is because its electronic configuration is $3d^5 4s^2$. As 3d and 4s are close in energy, it has maximum number of electrons to lose or share (as all the 3d electrons are unpaired). (1 mark)	2
22.		2
23.	i) N,N-Dimethylmethanamine (1 mark) ii) N-Methylaniline (1 mark)	2
24.	$C_6H_5NH_2 + C_6H_5COCl \longrightarrow C_6H_5NHCOC_6H_5 + HCl$ (1 mark) N Methylbenzamide (1 mark)	2

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hydrogen bonds, disulphide linkages, van der Waals and electrostatic forces of attraction.
(½ mark each)
Or
<table>
<tr><th>Globular proteins</th><th>Fibrous Proteins</th></tr>
<tr><td>1. In this chains of polypeptides coil around to give a spherical shape.</td><td>1. In this polypeptide chains run parallel and fibre- like structure is formed.</td></tr>
<tr><td>2. These are usually soluble in water.</td><td>2. These are usually insoluble in water.</td></tr>
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(1 mark each)
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<td>26.</td>
<td>
The reactions occurring in cell is as following:
$Ni^{2+} + 2e^{-} \rightarrow Ni$
(½ mark)
Given:
I = 5 A
T = 20 minutes = 1200 s
Q =It = 1200 x 5 C = 6000 C
(½ mark)
2 x 96500 C charge deposits Ni = 59 g
(½ mark)
1 C charge deposits Ni = $\frac{59}{2 \times 96500} g$
6000 C charge deposits Ni = $\frac{59 \times 6000}{2 \times 96500} g$
(½ mark)
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<td>3</td>
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	= 1.83 g (½ mark for answer, ½ mark for unit)	
27.	Consider the reaction, R → P is first order reaction. $Rate = -\frac{d[R]}{dt} = k[R]^1$ (½ mark) $\Rightarrow \frac{d[R]}{[R]} = -kdt$ Integrating both sides $ln[R] = -kt + I$ ....Eq. 1 Where I is the constant of integration (½ mark) At t = 0, the concentration of the reactant R = $[R]_0$, where $[R]_0$ is the initial concentration of the reactant. (½ mark) Substituting in above equation 1 $ln[R]_0 = -k \times 0 + I$ $ln[R]_0 = I$ (½ mark) Substituting the value of I in the equation 1 $ln[R] = -kt + ln[R]_0$ (½ mark) $\Rightarrow k = \frac{1}{t} ln \frac{[R]_0}{[R]} = \frac{2.303}{t} log \frac{[R]_0}{[R]}$ This is the integrated rate equation for a zero-order reaction. (½ mark)	3

28. Given:

Order of reaction = 1

Time = 40 minutes

Let $[R]_o$ = 100

Then after 30% decomposition [R] = 70

(½ mark)

$$\because k = \frac{2.303}{t} log \frac{[R]_0}{[R]}$$

(½ mark)

$$\Rightarrow \quad k = \frac{2.303}{40} log \frac{100}{70}$$

$$\Rightarrow \quad k = 0.0089\, min^{-1}$$

(½ mark)

$$\because t_{1/2} = \frac{0.693}{k}$$

(½ mark)

$$\Rightarrow \quad t_{1/2} = \frac{0.693}{0.0089}\, min$$

$$\Rightarrow \quad t_{1/2} = 77.8\, min$$

(½ mark for answer, ½ mark for unit)

3

Or

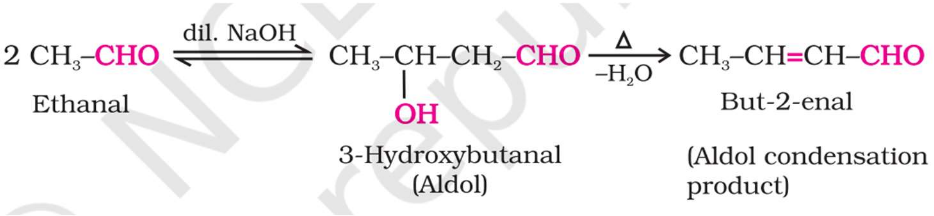
Given:

T_1=293 K

T_2=313 K

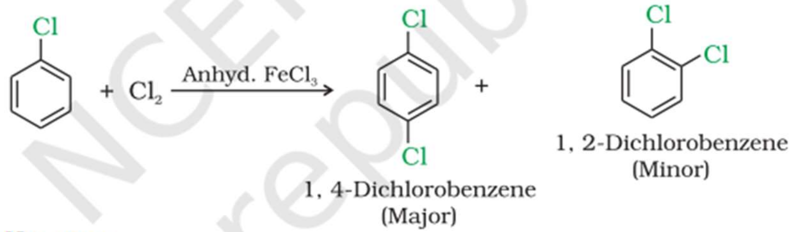
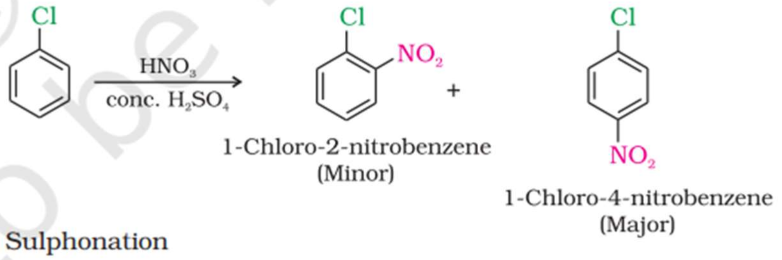
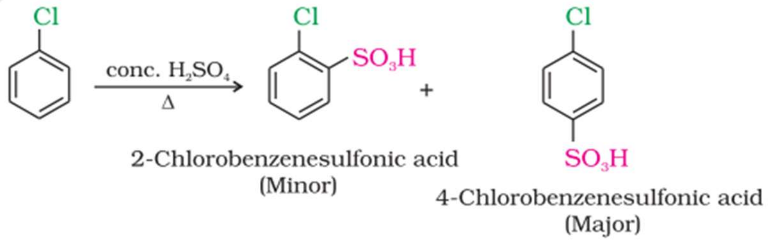
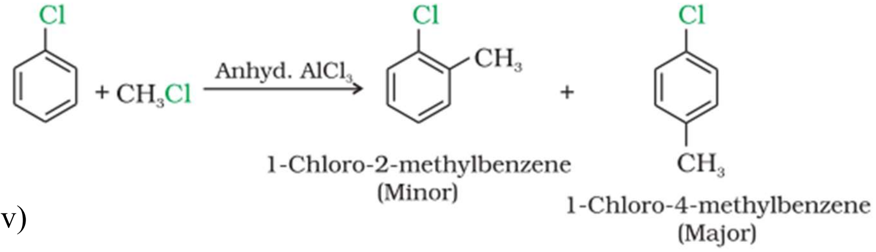
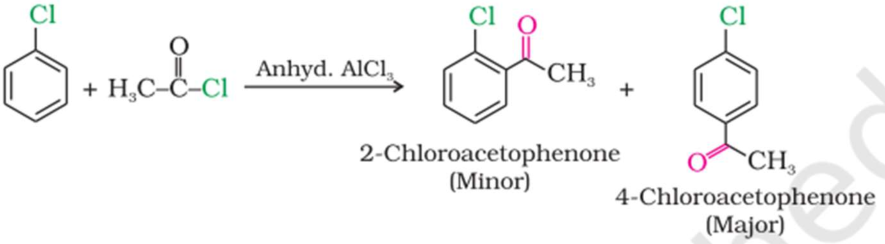
Let us take the value of K_1=K

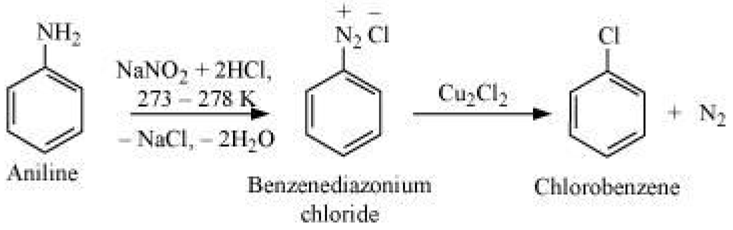
	Now, K_2=4K Also, R=8.314$JK^{-1}mol^{-1}$ (½ mark) Now, substituting these values in the Arrhenius equation: $log(\frac{k_2}{k_1}) = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1T_2}\right]$ (1 mark) We get: $log(\frac{4k}{k}) = \frac{E_a}{2.303 \times 8.314}\left[\frac{313 - 293}{313 \times 293}\right]$ (½ mark) $\therefore E_a = 52863.3\ J\ mol^{-1}$ $=52.8\ kJ\ mol^{-1}$ (½ mark for answer, ½ mark for unit)	
29.	i) Di-*tert*-butyl ketone < Methyl *tert*-butyl ketone < Acetone < Acetaldehyde ii) $(CH_3)_2CHCOOH$ < $CH_3CH_2CH_2COOH$ < $CH_3CH(Br)CH_2COOH$ < $CH_3CH_2CH(Br)COOH$ iii) 4-Methoxybenzoic acid < Benzoic acid < 4-Nitrobenzoic acid < 3,4-Dinitrobenzoic acid (1 mark each)	3

30.	Aldol condensation: Aldehydes and ketones having at least one α-hydrogen undergo a reaction in the presence of dilute alkali as catalyst to form β-hydroxy aldehydes (aldol) or β-hydroxy ketones (ketol), respectively. This is known as Aldol reaction. (1 mark) The aldol and ketol readily lose water to give α,β-unsaturated carbonyl compounds which are aldol condensation products, and the reaction is called Aldol condensation. (1 mark) Example:  (1 mark) Or i) Tollen's test / Fehling's test; (½ mark) Propanal gives the test while propanone does not. (½ mark) Or Iodoform test (½ mark)	3

	Propanal does not give the test while propanone gives the test. (½ mark) ii) Sodium bicarbonate test; (½ mark) Benzoic acid gives the test while Ethyl benzoate does not. (½ mark) iii) Tollen's test; (½ mark) Benzaldehyde gives the test while acetophenone does not (½ mark) Or Iodoform test (½ mark) Acetophenone gives the test while Benzaldehyde does not (½ mark)	
31.	i) The process in which external source of voltage is used to bring about a chemical reaction. (1 mark)	4

	ii) An electrochemical cell converts the chemical energy of a spontaneous redox reaction into electrical energy. (1 mark) or By applying external voltage more than emf of electrochemical cell. (1 mark) iii) Sodium metal and Cl_2 gas. (½ mark+ ½ mark) iv) electrorefining of metals/ electroplating of metals/ extraction of metals like Na, Mg, Al (Any one,1 mark)	
32.	i) $[Co(NH_3)_6]^{3+}$ (1 mark) ii) d^2sp^3 (1 mark) iii) paramagnetic (1 mark) iv) Octahedral (1 mark) or zero (1 mark)	

33.	(i) Halogenation  1, 4-Dichlorobenzene (Major) 1, 2-Dichlorobenzene (Minor) (ii) Nitration  1-Chloro-2-nitrobenzene (Minor) 1-Chloro-4-nitrobenzene (Major) (iii) Sulphonation  2-Chlorobenzenesulfonic acid (Minor) 4-Chlorobenzenesulfonic acid (Major) (iv) Friedel-Crafts reaction  1-Chloro-2-methylbenzene (Minor) 1-Chloro-4-methylbenzene (Major) (v)  2-Chloroacetophenone (Minor) 4-Chloroacetophenone (Major) (1 mark each) Or i) $CH_3CH_2OH + HCl \xrightarrow{ZnCl_2} CH_3CH_2Cl \xrightarrow{AgF} CH_3CH_2F$ (1 mark)	5

	ii) $CH_3Br \xrightarrow{KCN} CH_3CN \xrightarrow{CH_3MgBr} (CH_3)_2C = NMgBr \xrightarrow{H_3O^+} CH_3COCH_3$ (1 mark) iii) $CH_3CH_2CH = CH_2 \xrightarrow{HBr} CH_3CH_2CH(Br)CH_3 \xrightarrow{alc.KOH} CH_3CH = CHCH_3$ (1 mark) iv)  (1 mark) v) $2CH_3CH_2Cl + Na \xrightarrow{dry\ ether} CH_3CH_2CH_2CH_3$ (1 mark)	
34.	i) Acidified $K_2Cr_2O_7$ or acidified $KMnO_4$ (1 mark) ii) Pyridinium chlorochromate (PCC) or CrO_3 (1 mark) iii) bromine water (1 mark) iv) Acidified $K_2Cr_2O_7$ or acidified $KMnO_4$ (1 mark) v) 85% phosphoric acid (H_3PO_4) (1 mark) Or i) Kolbe's reaction:	5

Phenoxide ion generated by treating phenol with sodium hydroxide is even more reactive than phenol towards electrophilic aromatic substitution.

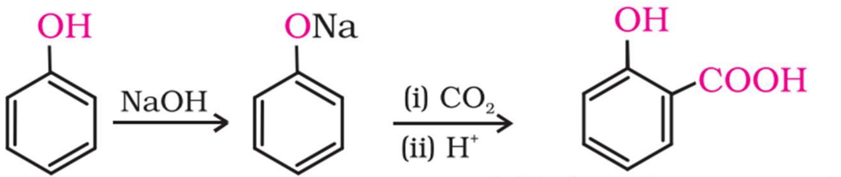
(½ mark)

Hence, it undergoes electrophilic substitution with carbon dioxide, a weak electrophile.

(½ mark)

Ortho hydroxybenzoic acid is formed as the main reaction product.

(½ mark)



2-Hydroxybenzoic acid
(Salicylic acid)

(1 mark)

ii) Reimer-Tiemann reaction:

On treating phenol with chloroform in the presence of sodium hydroxide, a -CHO group is introduced at ortho position of benzene ring.

(1 mark)

The intermediate substituted benzal chloride is hydrolysed in the presence of alkali to produce salicylaldehyde.

(½ mark)

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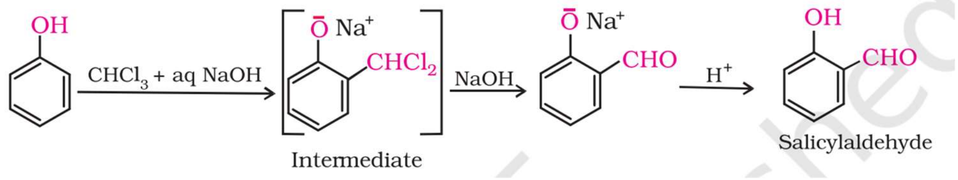

(1 mark)

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The properties which depend on the number of solute particles irrespective of their nature relative to the total number of particles present in the solution are called colligative properties.

(1 mark)

Osmotic pressure is considered the best to determine the molar mass of solute.

(1 mark)

i) The osmotic pressure method has the advantage over other methods as pressure measurement is around the room temperature and the molarity of the solution is used instead of molality.

ii) As compared to other colligative properties, its magnitude is large even for very dilute solutions.

iii) The technique of osmotic pressure for determination of molar mass of solutes is particularly useful for biomolecules as they are generally not stable at higher temperatures and polymers have poor solubility.

(1 mark each)

Or

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Azeotropes are binary mixtures having the same composition in liquid and vapour phase and boil at a constant temperature.

(1 mark)

In such cases, it is not possible to separate the components by fractional distillation.

(½ mark)

There are two types of azeotropes called minimum boiling azeotrope and maximum boiling azeotrope.

(½ mark)

The solutions which show a large positive deviation from Raoult's law form minimum boiling azeotrope at a specific composition.

(½ mark)

For example, ethanol-water mixture (obtained by fermentation of sugars) on fractional distillation gives a solution containing approximately 95% by volume of ethanol.

(½ mark)

Once this composition, known as azeotrope composition, has been achieved, the liquid and vapour have the same composition, and no further separation occurs.

(½ mark)

	The solutions that show large negative deviation from Raoult's law form maximum boiling azeotrope at a specific composition. (½ mark) Nitric acid and water is an example of this class of azeotrope. (½ mark) This azeotrope has the approximate composition, 68% nitric acid and 32% water by mass, with a boiling point of 393.5 K. (½ mark)	