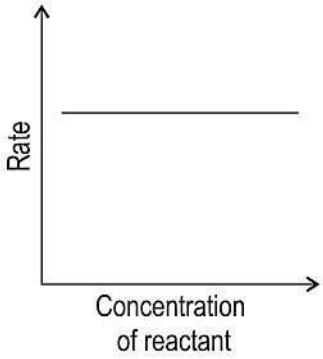
CBSE

Additional Practice Questions - Marking Scheme
Subject: Chemistry Theory (043)
Class: XII 2023-24

Section A	
1	(c) Zinc is deposited at the zinc electrode and copper dissolves at copper electrode in case (P).
2	(b) Compound M is an aldehyde and compound N is a ketone.
3	(a) Team A wins the quiz as both the responses are correct.
4	(d) sp^2 to sp^3
5	(c) C_2H_5Br
6	(a) Cu
7	(a) $k[P]^2[Q]$
8	(d) Oxygen > Hydrogen > Nitrogen > Helium
9	(b) phenol, acetic acid, benzoic acid, 2, 4, 6 - Trinitrophenol
10	(c) 13,300 years
11	(b) acetylation of salicylic acid in presence of an acid
12	(b) atomic radii of 3d< atomic radii of 4d ≈ atomic radii of 5d
13	(c) A is true, but R is false.
14	(a) Both A and R are true, and R is a correct explanation of A.

15	(b) Both (A) and (R) true but (R) is not the correct explanation of (A).
16	(c) A is true, but R is false.
	Section B
17	(a) 1 mark for the correct graph:  (b) The rate of the reaction is independent of the concentration of the reactant. Therefore, the reaction is a zero-order reaction. *[1 mark]*
18	The method based on osmotic pressure is preferred over others for determining molar masses of biomolecules. It is preferred for biomolecules as the pressure measurement is done around room temperature and biomolecules are generally not stable at higher temperatures. *[Give 1 mark for identifying the correct property and 1 mark for the correct reason. Students may write the answer in their own words.]*
19	The C-Cl bond in $CH_3CH_2CH_2Cl$ is longer than C-Cl bond in C_6H_5Cl. *[1 mark]* Reason: - The C-atom of C-Cl bond in $CH_3CH_2CH_2Cl$ is sp^3 hybridised while that in C_6H_5Cl is sp^2 hybridised. So the C-Cl bond in $CH_3CH_2CH_2Cl$ is longer than in C_6H_5Cl. **OR** - The C-Cl bond in chlorobenzene has a partial double bond character due to resonance. So, the C-Cl bond in chlorobenzene is shorter than in $CH_3CH_2CH_2Cl$. *[1 mark]*

20

Reactants	Products
(a)	(iii)
(b)	(i)

[Give 1 mark for each correct match]

OR

The rate of reaction will be faster in ethanal. In propanone, the presence of the two methyl groups causes steric hindrance that reduces the access of the nucleophile toward the carbonyl C. This is not the case for ethanal. Hence the rate of reaction will be faster with ethanal than with propanone.

[Give 1 mark for identifying the compound which will react faster and 1 mark for the reason. Students may write the answer in their own words.]

21

(a) The -OH group present on the C5 atom in the glucose molecule forms a six-membered ring with the -CHO group to form a cyclic hemiacetal structure. Thus, glucose does not give a positive result with the Schiff's reagent in the Schiff's test. *[1 mark]*

(b) The carbonyl group present in glucose is aldehydic. *[1 mark]*

Section C

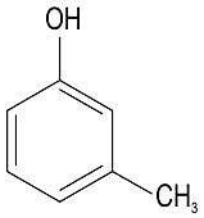
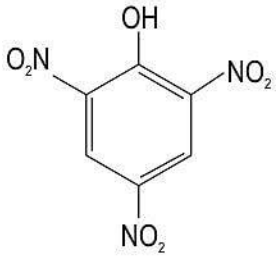
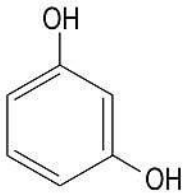
22

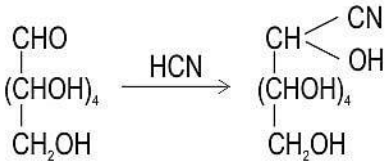
	Compound O	Compound P
Field strength of the ligands	weak field ligand	strong field ligand
Electronic configuration for metal M in the complex	t_{2g}^3, e_g^1	t_{2g}^4, e_g^0
Type of complex that will be formed (High spin/low spin)	high spin	low spin

[Give 0.5 marks for each correct answer]

23

(a) - The current carriers in setup P are free mobile electrons.
- The current carriers in setup Q are ions present in the solution.
[Give 0.5 marks for each correct answer]

	(b) - In NaCl solution conductivity rises with a rise in temperature. - In Cu wire, the conductivity reduces with a rise in temperature. *[Give 0.5 marks for each correct answer]* (c) - When current is passed through the setup Q for prolonged time, the chemical composition changes due to electrochemical reactions. - When current is passed through setup P for prolonged time, the chemical composition remains the same. *[Give 0.5 marks for each correct answer]*
24	(a) The structure of 3-Methylphenol is  (b) The structure of 2,4,6-Trinitrophenol is  (c) The structure of Benzene-1,3-diol is  *[Give 1 mark for each correct answer]*
25	(a) Acetaldehyde and ethyl alcohol are expected to be at the third and the fourth positions respectively. *[Give 0.5 marks for each correct answer.]*

	(b) The structure (3) is most stable. This is because structure (3) has all the atoms with a complete octet or duplet in case of hydrogen. *(Give 1 mark each for the explanation and identification of the most stable resonance structure.)*
26	(a) The balanced reaction between glucose and hydrogen cyanide is:  The inference drawn from the above reaction is that glucose contains a carbonyl group in it. *[Give 0.5 marks each for the correct structural formula of glucose and the product formed. Name of the product is not required, and 1 mark for the correct inference]* (b) - The reaction will not help her to determine the number of secondary alcoholic groups and the number of primary alcoholic groups in a glucose molecule. [0.5 marks] - The primary and secondary alcoholic groups in a glucose molecule, both undergo acetylation with acetic anhydride. [0.5 marks]
27	1 mark for each of the following: (a) Both the reactions occur at the same rate as S_N1 reactions are independent of the concentration of the nucleophile. (b) The reaction (i) will be slower as Br^- is a better leaving group than Cl^-. (c) Reaction (ii) will not occur as the C-Cl bond has a partial double bond character due to resonance. *[No marks to be awarded if justification is not given.]*
28	(a) 0.5 marks each for any four correct points such as: - increasing the concentration of reactants - decreasing the concentration of products - using a catalyst - carrying out the reaction at the optimum temperature. *[marks to be given for any other relevant point]* (b) mol $m^{-3}s^{-1}$ *[1 mark]*

Section D

29

(a) Another complex that shows similar properties as shown in the compound of Cu stated here is $[Ti(H_2O)_6]Cl_3$. The geometry of the complex is octahedral.

[Give 0.5 marks for each correct answer. Any other correct answer to be accepted.]

(b) When a ligand can bind through two donor atoms as in the ligand 'en' added to $[Ni(H_2O)_6]^{2+}$ it is said to be a didentate ligand. *[1 mark]*

(c)

en:Ni	Colour absorbed
2:1	red
3:1	blue green

[Give 1 mark for each correct answer]

OR

en:Ni	Formula of the ion formed
1:1	$[Ni(H_2O)_4(en)]^{2+}$
3:1	$[Ni(en)_3]^{2+}$

[Give 1 mark for each correct answer]

30

(a) Cell constant = 10 ohms × 0.13 S/m = 1.3 m^{-1} *[1 mark]*

(b) TDS = 10^4 × 0.65 x conductivity (S/m)
TDS = 10^4 × 0.65 × 0.13 = 845 mg/L *[1 mark]*

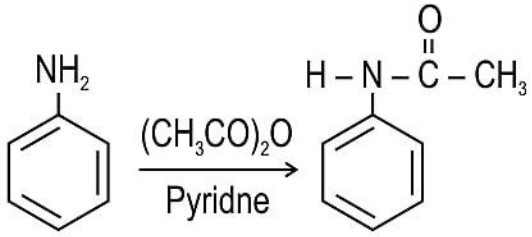
(c) TDS = 10^4 × 0.65 x conductivity (S/m)
conductivity = 250/(10^4 × 0.65)

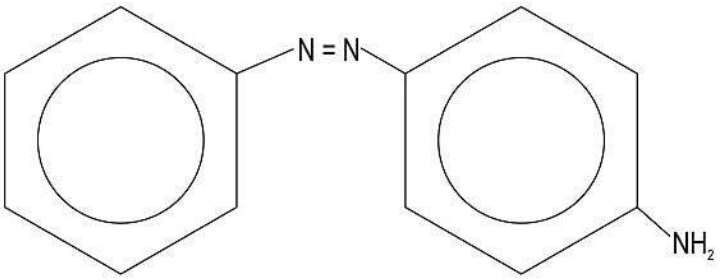
conductivity = 0.038 S/m *[1 mark]*

conductivity = cell constant/R
R = cell constant/ conductivity
R = 1.3/0.038 = 34.2 ohms *[1 mark]*

	OR R = cell constant/conductivity conductivity = 1.3/79 conductivity = 0.016 S/m *[1 mark]* TDS = $10^4 \times 0.65$ x conductivity TDS = $10^4 \times 0.65$ x 0.016 TDS = 104 mg/L *[1 mark]*
	Section E
31	(a) Sc^{+3} and Ti^{+4} are isoelectronic with 18 electrons in them. *[Give 1 mark for the correct answer]* (b) Colour of coordination compounds arise due to the d-d transitions. Sc^{+3} and Ti^{+4} ions do not have any electrons in their 3d orbitals and Zn^{+2} has fully filled 3d orbital. So, d-d transitions do not occur in these ions and thus they are colourless. *[Give 1 mark for the correct answer]* (c) Zn^{+2} ion from the list is not an ion of a transition metal because it has a complete $3d^{10}$ orbital. It cannot lose any electron from the $3d^{10}$ and they are all paired. So, it is not a transition metal ion. *[Give 1 mark for identifying the correct ion and the reason together]* (d) CrO is expected to turn red litmus blue as it is basic in nature. *[Give 1 mark for the correct answer]* (e) The increasing order of the magnetic moments of the given ions are: Sc^{+3}, V^{+4}, Ni^{+2}, V^{+2} *[Give 1 mark for the correct answer]* (f)The transition metals have similar radii. Hence, alloys are readily formed by these metals. *[Give 1 mark for the correct answer].* (g) Cu ion can also have a +1 oxidation state. *[Give 1 mark for the correct answer].*

32	a) Osmotic pressure = CRT If the concentration is doubled without a change in temperature, the osmotic pressure also will be doubled. Thus, osmotic pressure of the new solution will be 0.0052 atm. (1 mark) b) M = wRT/(πV), where w is the mass of the solute taken, V is the volume of the solution taken. In one liter of solution, there are 12.5 g of solute ∴ M = 12.5 g × 0.083 L bar mol-1 K-1 × 315 K/((0.00248 ×1.01 bar)(1 L) M = 130,474 g mol-1 (1 mark for correct formula, 1 mark for the correct answer) c) M1 = w1RT/(π1V1) - (1) for haemoglobin M2 = w2RT/(π2V2) - (2) for protein [1 mark] For isotonic solutions, osmotic pressure is equal. Dividing we get, M2/M1 = (C2RT)/(C1RT), where C1=w1/V1 and C2=w2/V2 130000/M1 = 10/5 ∴ M1= 65000 g/mol [1 mark] **OR** (a) The value of 'i' is expected to be the highest for solution C. From the given relations we can conclude that $\pi_C > \pi_A > \pi_B$ Since the osmotic pressure of solution C is the highest, therefore the value of 'i' will be highest in solution C. *[Give 1 mark each for the correct order and the reason]* (b) Solution C is most likely to be potassium sulphate. Solution A is most likely to be sodium chloride. Solution B is most likely to be glucose. [*Give 0.5 marks for each correct identification*] (c) Solution B is most likely to give a vapour pressure-mole fraction graph similar to that of an acetone-chloroform mixture. [*Give 0.5 marks for the correct answer]* Acetone-chloroform solution has strong H-bonding in it. H-bonding is seen only in the glucose solution but not in the potassium sulphate and sodium chloride

	solutions. Hence, it is expected to give a vapour pressure-mole fraction graph similar to that of an acetone-chloroform mixture. *[Give 1 mark for correct answer]*
33	(a) The reaction is:  Compound A *[Give 1 mark for the correct reaction.]* (b) The given statement is not correct. Compound A is aniline. The presence of a lone pair of electrons on the N-atom makes it a Lewis base. So, the pH of the aq. solution of aniline is always more than 7. *[Give 1 mark for the correct explanation. Students can write the answer in their own words]* (c) 1 mark each for the following: (i) introducing electron releasing groups like $-OCH_3$ and $-CH_3$ (ii) introducing electron withdrawing groups like $-NO_2$ and -COOH (d) Aniline reacts with bromine water at room temperature to give a white precipitate of 2,4,6-tribromoaniline. *[Give 1 mark for the correct observation. Name of the product formed may not be written. Students can write the answer in their own words]* **OR** (a) Benzenediazonium chloride (b) 1 mark each for the following: - Benzendiazonium chloride is prepared by adding sodium nitrite to a mixture of aniline in hydrochloric acid at 0 °C - 5 °C. - Benzenediazonium chloride is very unstable and therefore is prepared and used immediately. (c) Aniline reacts with the reagent to form the yellow dye.

	(d)  Yellow azo dye