AL JANOUB INTERNATIONAL SCHOOL

مدارس الجنوب العالمية

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PB No. 51029 KHAMIS MUSHAYT KINGDOM OF SAUDI ARABIA

CBSE DELHI Affln. No 5730023 SCHOOL CODE:90151

Predicted Questions
SESSION: 2022-23
Class: XII
Subject: CHEMISTRY (043)

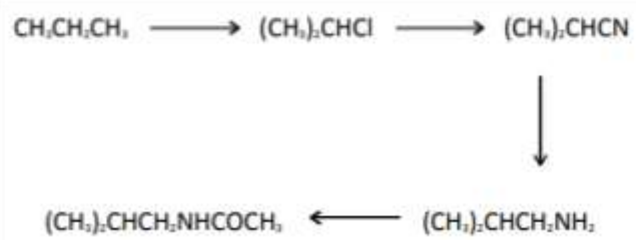
Maximum marks: 70 Time Allowed: 3 hours

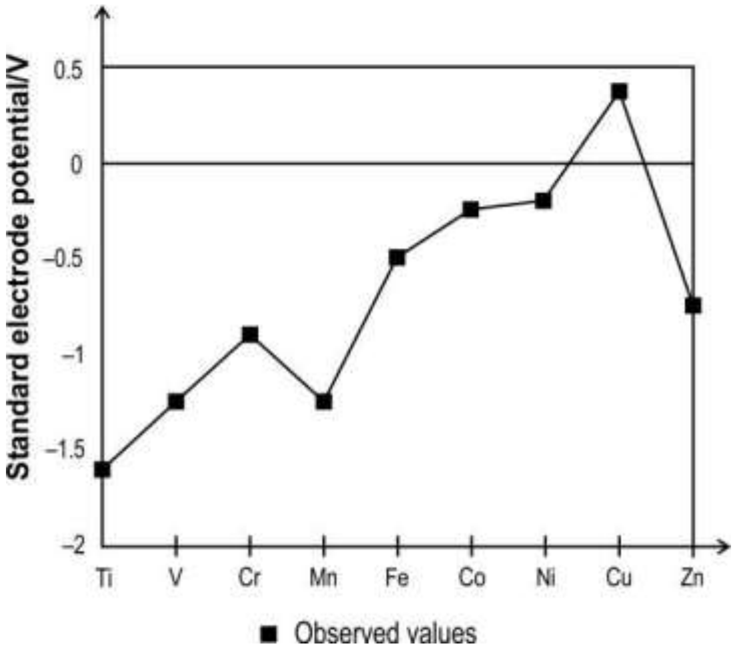
General instructions:

Read the following instructions carefully.

a) There are 35 questions in this question paper with internal choice.
b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
d) SECTION C consists of 5 short answer questions carrying 3 marks each.
e) SECTION D consists of 2 long answer questions carrying 4 marks each.
f) SECTION E consists of 3 long answer questions carrying 5 marks each.
g) All questions are compulsory.
h) Use of log tables and calculators is not allowed

Q. No	**Question**	**Marks**
	SECTION A The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.	

Q.1	De-icing is the process of removing snow, ice or frost from a surface. In extremely cold regions, car windows get covered by ice reducing the visibility. The image below shows the de-icing of the window of a car during extreme cold using a fluid.  Which of the following compounds could be present in the de-icing fluid used above? A. formaldehyde B. phenol C. propan-2-ol D. acetic acid	1
Q.2	Which of the following reaction mechanism is not involved in the given reaction sequence?	1
	 A. free-radical substitution B. nucleophilic substitution C. elimination D. nucleophilic addition-elimination	

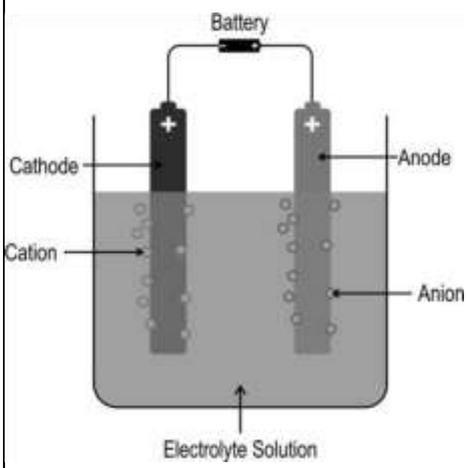
Q.3	The graph below shows the observed standard electrode potential of some transition elements.  Which of the following reactions can be predicted based on the graph above? A. $Cu + 2\ H_2SO_4 \dashrightarrow CuSO_4 + SO_2 + 2\ H_2O$ B. $Cu + 2\ HNO_3 \dashrightarrow Cu(NO_3)_2 + H_2$ C. $CuO + 2\ HCl \dashrightarrow CuCl_2 + H_2O$ D. $Cu^{2+} + 2\ NaOH \dashrightarrow Cu(OH)_2 + 2\ Na^+$	1
Q.4	Kamlesh was conducting an experiment to figure out the rate equation of the following reaction: $2\ NO + O_2 \dashrightarrow 2\ NO_2$ He measured the rate of this reaction as a function of initial concentrations of the reactants as follows:	1

Experiment Number	Initial [NO]	Initial [O_2]	Initial rate of formation of No_2
1	0.2	0.2	0.074
2	0.2	0.4	0.15
3	0.4	0.2	0.29
4	0.4	0.4	0.20

Which of the following could be a reason for the inconsistency in the initial rate of formation of NO_2 data for experiment 4?

A. The rate of reaction does not depend on the concentration of the reactants.
B. Higher concentration of O_2 could have resulted in slowing down the rate of reaction.
C. Higher concentration of NO could have resulted in slowing down the rate of reaction.
D. The temperature of the reactants in experiment 4 could have been different than for the other experiments.

Q.5 The image below shows electrolysis of an electrolyte using a DC voltage source. 1



Based on this, Which of the following statements is/are correct?

(i) The solution remains electrically neutral during electrolysis.
(ii) Electrons flow from the current source towards the solution at one electrode, and an equal number of electrons flow away from the solution at the other electrode.
(iii) The number of positive ions moving towards one electrode is always equal to the number of negative ions moving towards the other electrode.

A. i only
B. i and ii only
C. ii and iii only
D. all- i, ii, and iii

Q.6 For a certain reaction X, rate = $0.7Z_{AB}e^{-E_A/RT}$. **1**

It is seen that for another reaction, Y, rate = $Z_{AB}e^{-E_A/RT}$.

Based on the above, what can be said about reactions X and Y?

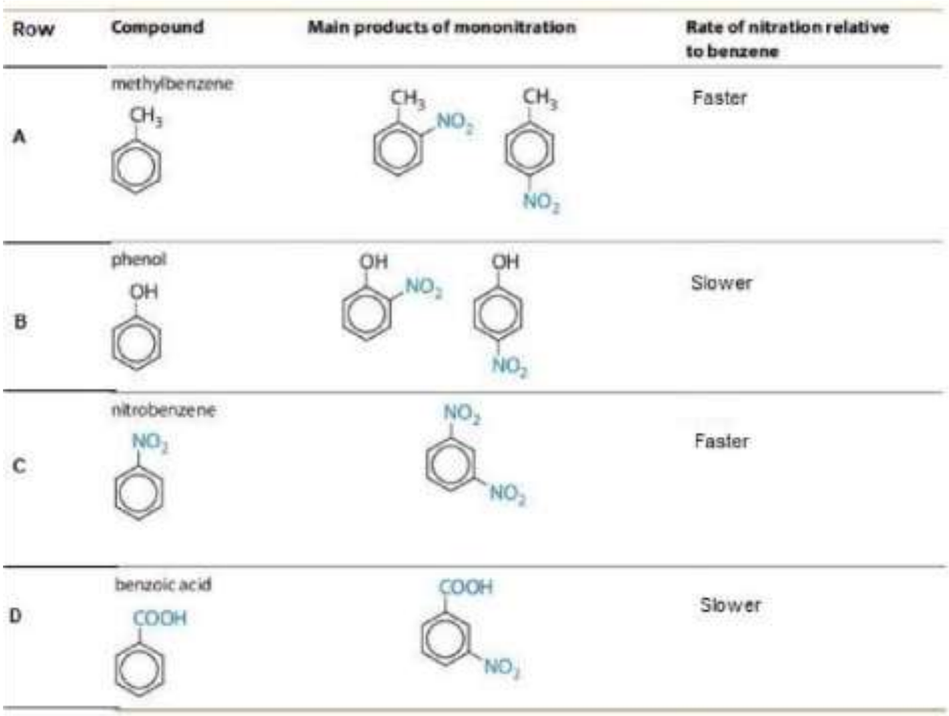
A. Both the reactions involve complex molecules.
B. Both the reactions involve simple molecules or atomic species.
C. Reaction X involves simple molecules or atomic species, while reaction Y involves complex molecules.
D. Reaction X involves complex molecules, while reaction Y involves simple molecules or atomic species.

Q.7 A metal ion M^{n+} forms a complex ion of formula $[ML_2]^{(n-4)+}$ where L represents a bidentate ligand. **1**

Which of the following could be the charge on the ligand L?

A. -2
B. -1
C. 0
D. +2

Q.8 The image below shows different benzene derivates that give mononitration product at ortho, meta and para positions along with the rate of nitration relative to benzene. **1**



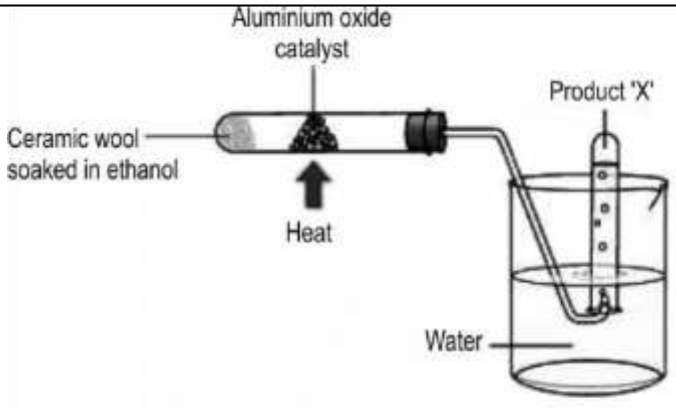
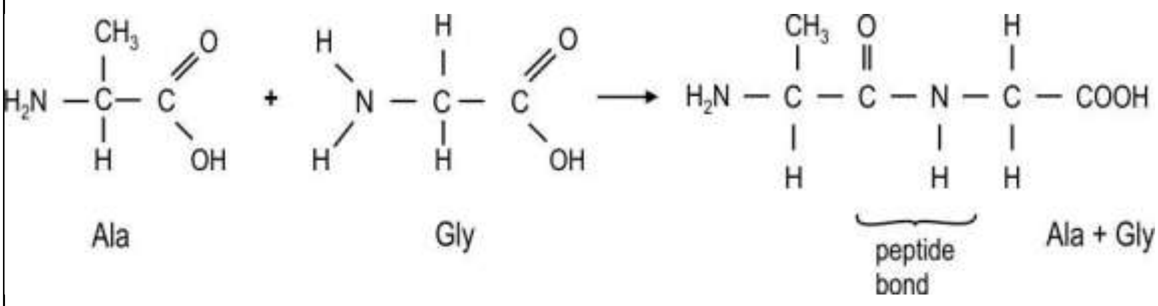
Which of the following row shows atleast one INCORRECT description about the reaction?

	A. only B B. only C C. only B and C D. only C and D	
Q.9	The rate constants of a reaction at 400 K and 600 K are 5 x 10^{-3} s^{-1} and 8 x 10^{-3} s^{-1} respectively. What extra piece of information is needed to calculate the value of A (frequency factor)? (According to the Arrhenius equation, rate constant is given by, $k = Ae^{-E_a/RT}$.) A. the order of the reaction B. the activation energy of the reaction C. the initial concentration of the reactants D. [No extra information is needed. A can be calculated with the information available]	1
Q.10	The compound $[Co(NH_3)_5Cl]SO_4$ is isomeric with the compound $[Co(NH_3)_5SO_4]Cl$. Which of the following rows correctly represents the oxidation state of cobalt in these compounds?	1

Rows	**$[Co(NH_3)_5Cl]SO_4$**	**$[Co(NH_3)_5SO_4]Cl$**
A	+2	+3
B	+3	+2
C	+2	+1
D	+3	+3

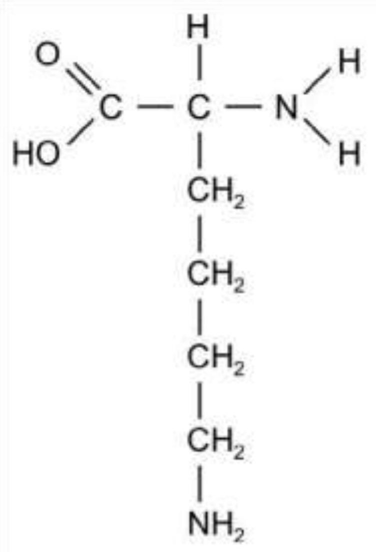
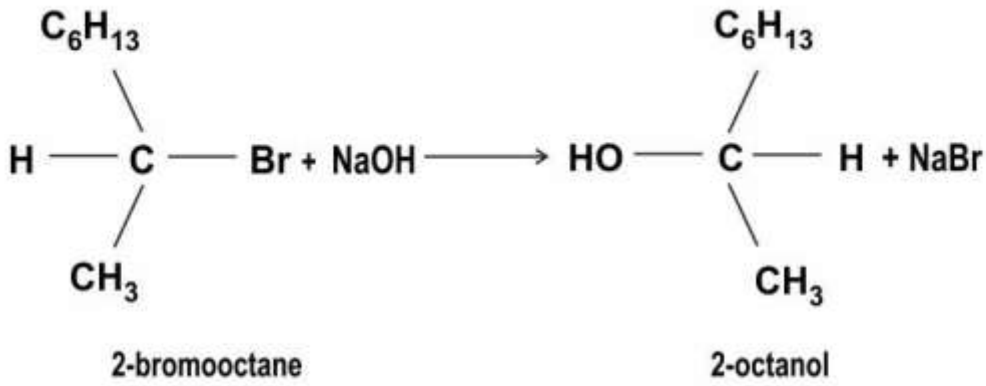
A. A
B. B
C. C
D. D

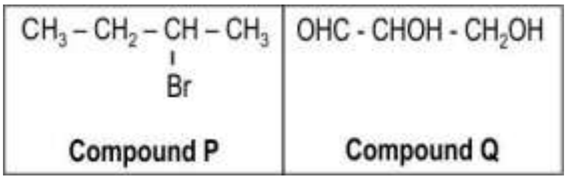
Q.11	The image below shows an experimental setup to prepare an organic product X.	1

	 Which of the following could 'X' be? A. ethane B. ethene C. ethanoic acid D. diethyl ether	
Q.12	During protein synthesis in cells, amino acids condense (in the presence of enzymes) through the formation of the amide link (–CONH–), or peptide bond, to form a polypeptide chain, which then folds to form a biologically active protein. The equation below shows the formation of a dipeptide, Ala-Gly, formed by condensation of the two amino acids, alanine and glycine in a test tube.  Which of the following statements is/are true for the above reaction? (i) A dipeptide Gly-Ala is equally likely to be formed by condensation of alanine and glycine. (ii) Water is eliminated in the above condensation reaction. (iii) Oxygen and hydrogen is released as gases in the above condensation reaction. A. i only B. i and ii only C. ii and iii only D. all- i,ii, and iii	1

Q.13	Zirconium (Zr, Atomic number 40) and Hafnium (Hf, Atomic number 72) are transition series metals of group 4. They are found together in nature and are difficult to separate from each other. Which of the following is the reason for the above? A. The almost identical radii of the atoms. B. The elements belong to the same group. C. The elements belong to adjacent periods. D. The presence of the same number of unpaired electrons in both the elements.	1
Q.14	Which of the following would be among the products of the reactions between ammonia reacts with bromoethane? (i) $CH_3CH_2NH_2$ (ii) $(CH_3CH_2)_2NH$ (iii) $(CH_3CH_2)_3N$ (iv) $(CH_3CH_2)_4N^+Br^-$ A. only i B. only i and ii C. only i, ii, and iii D. all- i, ii, iii and iv	1
Q.15	Given below are two statements labelled as Assertion (A) and Reason (R). Assertion (A): Dimethyl amine has higher boiling point than trimethyl amine. Reason (R): The molecular mass of trimethyl amine is relatively higher than that of dimethyl amine. Select the most appropriate answer from the options given below: A. Both A and R are true and R is the correct explanation of A. B. Both A and R are true but R is not the correct explanation of A. C. A is true but R is false. D. A is false but R is true.	1
Q.16	Given below are two statements labelled as Assertion (A) and Reason (R). Assertion (A): A silver mirror can be created at the wall of a test tube using ethanal. Reason (R): Ethanal can react with Fehling's solution Select the most appropriate answer from the options given below: A. Both A and R are true and R is the correct explanation of A. B. Both A and R are true but R is not the correct explanation of A. C. A is true but R is false. D. A is false but R is true.	1

Q.17	Given below are two statements labelled as Assertion (A) and Reason (R). Assertion (A): At a constant temperature, the dissociation constant of chloroethanoic acid will be higher than that of propanoic acid. Reason (R): Higher the number of carbon atoms in a compound, lower will be the dissociation constant. Select the most appropriate answer from the options given below: A. Both A and R are true and R is the correct explanation of A. B. Both A and R are true but R is not the correct explanation of A. C. A is true but R is false. D. A is false but R is true.	1
Q.18	Given below are two statements labelled as Assertion (A) and Reason (R). Assertion (A): At room temperature, propan-2-ol and 2-methylpropan-2-ol, when heated with acidified potassium dichromate, slowly turns the colour of orange dichromate to green. Reason (R): Secondary and tertiary alcohols are readily oxidised to aldehydes which gets oxidised to acids. Select the most appropriate answer from the options given below: A. Both A and R are true and R is the correct explanation of A. B. Both A and R are true but R is not the correct explanation of A. C. A is true but R is false. D. Both A and R are false.	1
	SECTION B This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.	
Q.19	At high temperatures, ethyl chloride produces HCl and ethylene by the following first order reaction: $CH_3CH_2Cl \rightarrow HCl + C_2H_4$ In an experiment, when the initial concentration of ethyl chloride was 0.01 M, the rate of the reaction was found to be 1.6×10^{-8} M/s. What will be the rate of reaction if the initial concentration of ethyl chloride is 0.07 M?	2
Q.20	Pineapple contains a protease enzyme that breaks down proteins. If you try to make a jelly with fresh chunks of pineapple, the jelly won't set but it would set if you use canned pineapple. Explain.	2

	OR The chain structure of Lysine is shown below.	2
	 (i) Based on the structure, is Lysine acidic, basic, or neutral overall? Explain. (ii) What will be the structure of lysine if it is placed in a solution of pH value as 1?	
Q.21	2-bromooctane reacts with alcoholic NaOH to give 2-octanol as shown below.  (a) Identify the type of substitution reaction mechanism. Justify your answer. (b) What effect will it have on the rate of the reaction if: (i) the concentration of NaOH is reduced by half? (ii) the concentration of 2-bromooctane is reduced by half?	2

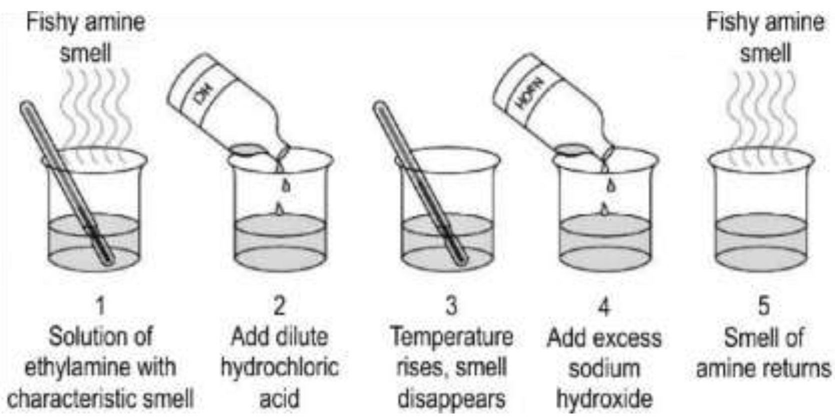
	OR (a) Which of the following two compounds has a chiral centre?  (b) Two compounds X and Y are enantiomers of each other. Name one physical property that: (i) is the same for X and Y. (ii) is different for X and Y.	2
Q.22	(i) The complex $[PtCl_2(NH_3)_2]$ has two isomers whereas $[CoCl_4]^{2-}$ does not show geometrical isomerism and has no isomers why? (ii) When NaOH solution is added to aqueous copper (II) sulphate solution, hydroxide ions displace water molecules forming a pale blue precipitate, X. If excess ammonia is now added, water molecules and hydroxide ions are exchanged by ammonia molecules, forming a deep blue solution, Y. Identify X and Y.	2
Q.23	The half equation for a redox reaction represents an equilibrium between two sides of an equation such as: Cu^{2+} (aq) + 2e- ---> Cu (s); E^o= +0.34 v (i) How will the value of E^o change if the concentration of Cu^{2+} increases? (ii) Will the conversion of Cu^{2+} to Cu become more or less feasible if the concentration of Cu^{2+} increases? Give reason(s).	2
Q.24	A first order reaction is found to have a half-life of 1.15×10^4 s. What will be the time required for completion of 99% of the reaction?	2
Q.25	Esterification of a carboxylic acid with an alcohol in the presence of mineral acid as catalyst is a reversible reaction. (i) Suggest two things that can be done with the products formed to push the reaction in the forward direction. (ii) If one mole of ethanoic acid and one mole of ethanol are allowed to reach equilibrium at 298K, how many moles of ethyl ethanoate and ethanoic acid are present at equilibrium? (Assume K_c = 4 at 298K)	2
	SECTION C This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.	

Q.26	(a) Is benzaldehyde less or more reactive to electrophilic substitution reactions than benzene (C_6H_6)? Give an explanation for your answer. (b) State the position on the ring at which electrophilic substitution is likely to predominate in benzaldehyde. Explain why. (c)Between 2-methyl-butan-2-ol and 2-methyl-butan-1-ol, which cannot be produced by the reduction of either an alcohol or an aldehyde? Why?	3
Q.27	In 20th century, German scientist Werner succeeded in clarifying the structures of the five compounds consisting of platinum, chlorine, and ammonia. Some of the properties of these compounds are shown below in the table.	3

Compound	Formula	Total number of free ions in the formula	Number of free Cl^{-1} ions in the formula
A	$PtCl_4{\cdot}6NH_3$	5	4
B	$PtCl_4{\cdot}5NH_3$	4	3
C	$PtCl_4{\cdot}4NH_3$	3	2
D	$PtCl_4{\cdot}3NH_3$	2	1
E	$PtCl_4{\cdot}2NH_3$	0	0

(i) What is the oxidation state and coordination number of Pt in compound C?
(ii) Which of the complexes formed for the compounds A, B, C, and D have structural isomers?
(iii) Predict the shape of each compound.

Q.28	Suman took two glasses of water from a water filter. She cools one glass in a fridge and warms the other glass on a stove. Which glass of water will hold more dissolved oxygen? Explain using Henry's law.	3
Q.29	The image below shows the effect of acid and base on the aqueous ethylamine.	3

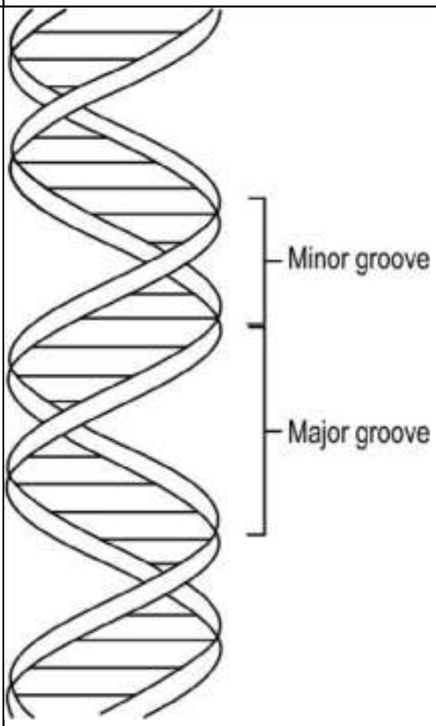


(a) What evidence is there for a chemical reaction between ethylamine and hydrochloric acid?
(b) Why does the smell of ethylamine disappear when hydrochloric acid is added?
(c) Why does the smell of ethylamine reappear when sodium hydroxide is added?

<table>
<tr><td>Q.30</td><td>A mixture of 0.5 moles acetaldehyde and 0.5 moles diethyl ketone is treated with 1 mole of sodium cyanide (NaCN).

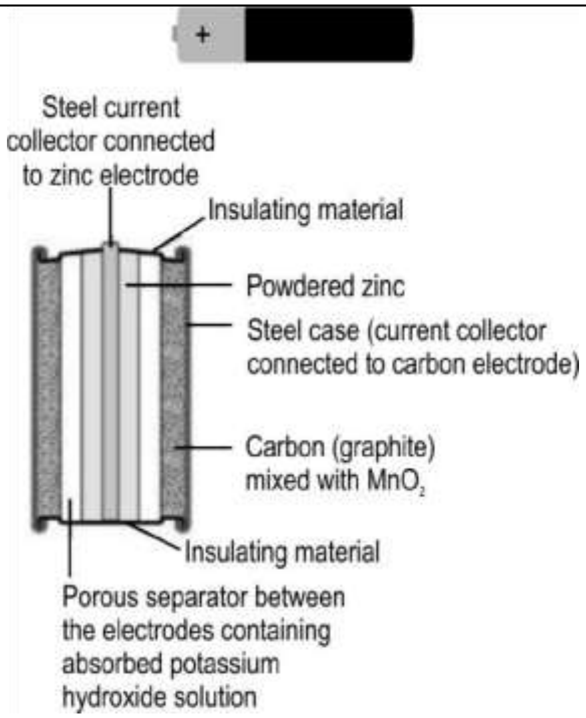
What will be the major product in this reaction? Give two reasons for your answer.</td><td>3</td></tr>
<tr><td></td><td>OR
(a) Show steps to convert nitrobenzene to phenol.

(b) The table below shows the observation when sodium reacts with ethanol and phenol.

<table><tr><th>Ethanol</th><th>Solution of phenol in ethanol</th></tr><tr><td>Sodium sinks, evolves hydrogen steadily</td><td>Sodium sinks, evolves hydrogen rapidly</td></tr></table>
(i) The reaction in each case involves reduction of hydrogen ion by sodium. Write down an ionic reaction for both the cases.
(ii) Which is stronger acid- phenol or ethanol? Why?</td><td>3</td></tr>
<tr><td></td><td>SECTION D
This section contains two questions and carry 4 marks each.</td><td></td></tr>
<tr><td>Q.31</td><td>The image below shows the double helix structure of a DNA.</td><td>4</td></tr>
<tr><td></td><td>

(i) The double helix structure is easily destroyed by change in (a) temperature and (b) pH value. Explain the reason for both the cases.
(ii) Suppose the bonds holding the DNA strands for double helix together were (a) covalent bonds (b) London dispersion force. What would be the problem in each case?</td><td></td></tr>
</table>

Q.32	During a titration, 240 ml of NaOH reacted completely with 100 ml of H_2SO_4 solution. The weight of H_2SO_4 taken was 9.8 g. i) What is the molarity of the NaOH used? ii) Calculate the amount of NaOH dissolved in solution. iii) How many grams of NaOH should be added to the original NaOH solution to make one litre of 0.5M NaOH solution? (*Molecular mass of NaOH is 40g/mol and molecular mass of H_2SO_4 is 98 g/mol.*)	4
	SECTION E Each question carries 5 marks each. Read the group text or image carefully and answer the questions that follow.	
Q.33	One of the most common cells that's been used in our daily life is Duracell, also known as an alkaline cell. The image below shows the internal structure of a Duracell.	5



This cell uses a zinc half-cell and another half-cell containing a carbon (graphite) electrode in contact of moist manganese oxide.
Given that the electrode potential for Zn^{2+}/Zn= -0.76 V and Mn^{4+}/Mn^{3+} (aq.) = +0.74V.

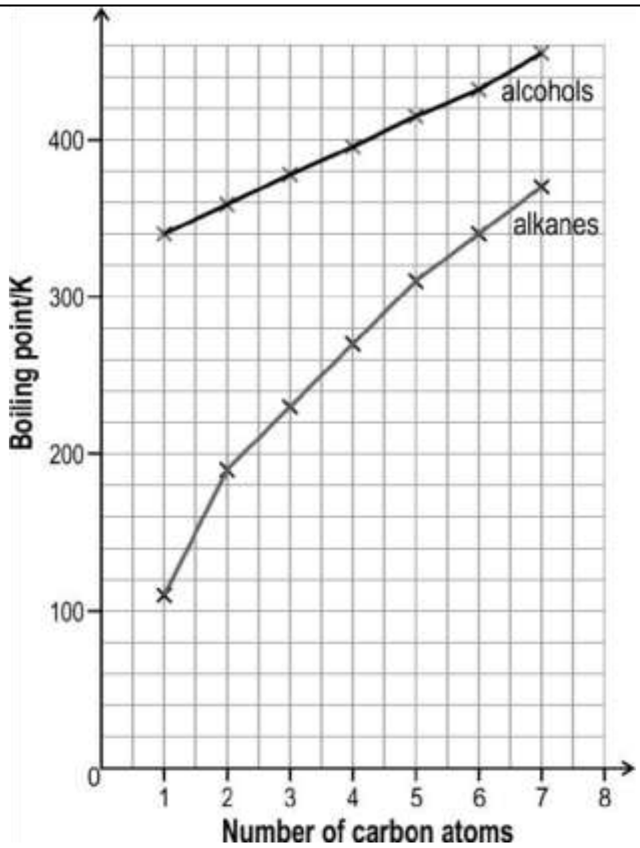
(i) Write down the half-cell reactions for this cell at each electrode.
(ii) Calculate the overall cell potential.
(iii) Which of the two will be the positive electrode and why?
(iv) Draw the cell diagram, representing the direction in which reaction occurs in this cell.

OR 5

Imagine you are in a chemistry lab and the teacher is explaining the electrolysis of $CuSO_4$ solution and the products liberated after electrolysis. The teacher made two Setups for the electrolysis process. In Set up-I electrolysis of $CuSO_4$ solution is done by using Pt electrodes and in Set up-II electrolysis of $CuSO_4$ solution is done by using Cu electrodes. Answer the following questions based on this:

i) In which Set up I or II will the colour of $CuSO_4$ solution fades away and why?
ii) Write the chemical reaction taking place at the Cu anode in Set up II.
iii) Name the product obtained at the anode in Set up I. iv) Which out of Set up I or II depict refining of crude copper?

Q.34 The image below shows the boiling point of first seven straight chain primary alcohols and first seven straight chain primary alkanes. 5



The boiling point of both the series increase monotonically with increasing size of the molecules. However, the slope of increment is different for both the series.

Observe the above graph and answer the following questions:
(i) Why are the boiling point of alcohols higher than that of corresponding alkanes? (ii) Why do the differences in boiling point between corresponding alcohols and alkanes get less as the number of carbon atoms increase?
(iii) Can the two graphs ever intersect?
(iv) Will the graph look like almost the same if boiling point is replaced with melting point?
(v) How will the boiling point graph for straight chain primary amines fare as compared to alcohols and alkanes?

Q.35 i) Write the outer shell electronic configuration of an element with atomic number 24. Why is this different from the elements that are adjacent to it in the periodic table? 5

ii) Why is Hg not considered as a transition element? iii) The third ionisation enthalpy of a few transition elements are given below:

Element	Sc	Ti	V	Cr	Mn	Fe	Co
Ionisation enthalpy (kJ mol^{-1})	2393	2657	2833	2990	3260	2962	3243

	Explain the reason for the break in the trend of steady increase in third ionisation enthalpy as shown in the table. Based on this, what can be said about the second ionisation energy of Cr as compared to that of Mn?	

……………………………… **End of Questions** ……………………………………………