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MARANDA HIGH SCHOOL
Kenya Certificate Of Secondary Education
THE 2025 MOCK EXAMINATION

233/1

CHEMISTRY
June, 2025

PAPER 1

TIME: 2 Hrs

Name: Marking Guide

Admission No:

Stream: Signature:

233/1 - CHEMISTRY

Date:.....

Instructions

- (a) Write your name, admission number, date, stream and signature in the spaces provided above.
- (b) All answers must be written in the spaces provided in the booklet.
- (c) This paper consists of 13 printed pages with 27 questions. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing
- (d) Candidate should answer the questions in English



FOR EXAMINERS USE ONLY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

19	20	21	22	23	24	25	26	27

Grand Total	80
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1. Name the apparatus use to measure the Relative atomic mass.

(1mark)

Mass spectrometer. ✓ 1 rej spectrometer. 1

b) An element Y has three isotopes, A having 18 neutrons, B having 21 neutrons and C with 25 neutrons. If the relative abundancies of A, B and C are 1,5 and 9 respectively and the number of protons of Y is 20. Calculate the relative atomic mass of Y.

(2 marks)

$$R.A.M = (38 \times 1) + (41 \times 5) + (45 \times 9)$$

$$= \frac{38 + 205 + 405}{15} = \frac{648}{15} = 43.2$$

2. a) State Boyle's Law.

(1mark)

At constant temperature, the volume of a given mass of a gas is inversely proportional to its pressure. ✓ 1

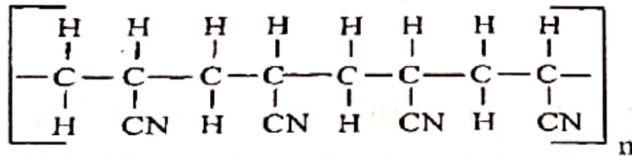
(b) A given mass of the gas occupies 20cm^3 at 25°C and 670mmHg pressure. Find the volume it will occupy at 10°C and 335mmHg .

(2marks)

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad \left| \quad \frac{670 \times 20}{298} = \frac{335 \times V_2}{283} \right.$$

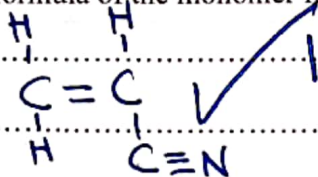
$$V_2 = 37.995$$

3. The diagram below shows part of a synthetic polymer. Study it and answer the questions that follow.



a) Draw the structural formula of the monomer from which the polymer is made.

(1mark)



b) A sample of the polymer has a molecular mass of 63600. Calculate the number of monomers in the sample.

(2marks)

$$n = \frac{63600}{53} = 1200$$



4. Chlorine gas is bubbled into an aqueous solution of potassium iodide

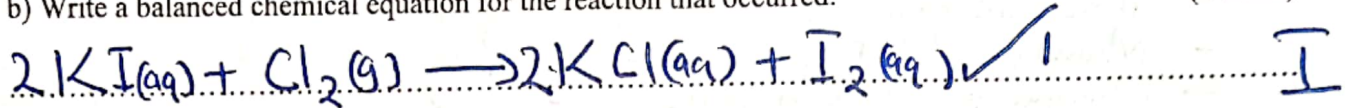
a) State the observation that would be made.

(1 mark) I

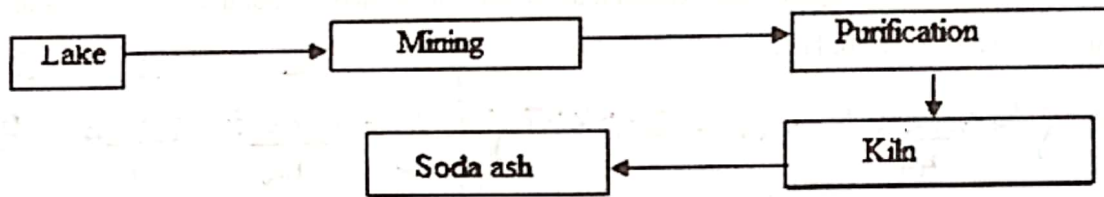
Colourless solution changes to dark brown / Black solid formed

b) Write a balanced chemical equation for the reaction that occurred.

(1 mark)



5. The flow chart below shows the soda ash manufacturing process at Lake Magadi. Study it and answer the questions that follow.



a) Why is it difficult to show that trona contains water of crystallization by heating alone? (1 mark)

Contains $NaHCO_3$ which also decompose on heating to form water as one of the products.

b) Name the method used to separate the salts from the lake.

(1 mark)

Fractional Crystallization

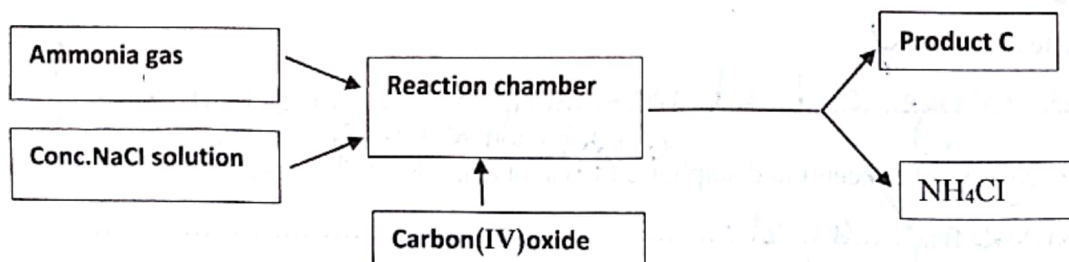
c) State one use of sodium hydrogen carbonate

(1 mark)

- Making baking powder.
- Used in Health drinks / Laxative.
- Pest Control.

Any 1 @ 1mk

6. Study the flow chart below representing a part of an industrial process and answer the questions that follow



(a) Give the name of the industrial process represented above

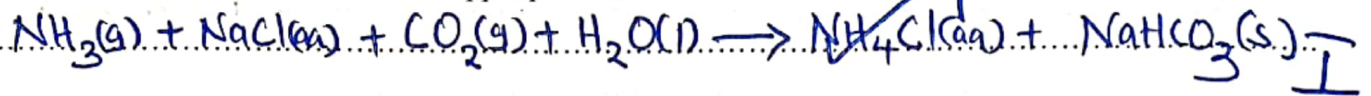
(1mark)

Solvay Process ✓

I

(b) Write an equation that occurs on upper part of the reaction chamber.

(1mark)



(1mark)

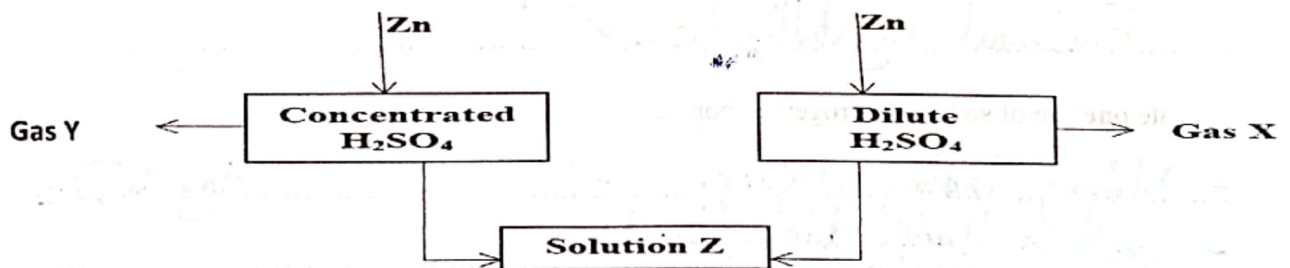
(c) State one use of the main product of the above process.

- Glass making
 - Making paper
 - Manufacture of detergents
 - Making borax salt.
 - Softening of water
- Any @ 1mk ✓

7. 0.2g of organic compound containing carbon, hydrogen and oxygen on combustion gave 0.296g of carbon (IV) oxide and 0.12g of water. Given that its molecular mass is 180, determine its molecular formula. (C=12.0, O=16.0, H=1.0)

<p>Mass of C = $\frac{12}{44} \times 0.296 = 0.0807g$ ✓</p> <p>Mass of H = $\frac{2}{18} \times 0.12g = 0.0133g$ ✓</p> <p>Mass of O₂ = $0.2 - (0.0807 + 0.0133) = 0.106g$ ✓</p>	<table border="0" style="width: 100%;"> <tr> <td></td> <td style="text-align: center;">C</td> <td style="text-align: center;">H</td> <td style="text-align: center;">O</td> <td></td> </tr> <tr> <td style="text-align: right;">moles =</td> <td style="text-align: center;">$\frac{0.0807}{12}$</td> <td style="text-align: center;">$\frac{0.0133}{1}$</td> <td style="text-align: center;">$\frac{0.106}{16}$</td> <td style="text-align: right;">(3marks)</td> </tr> <tr> <td style="text-align: right;">mole ratio =</td> <td style="text-align: center;">$\frac{0.0067}{0.0066}$</td> <td style="text-align: center;">$\frac{0.0133}{0.0066}$</td> <td style="text-align: center;">$\frac{0.0066}{0.0066}$</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">1</td> <td></td> </tr> <tr> <td></td> <td colspan="3" style="text-align: center;">E.F = CH₂O</td> <td></td> </tr> <tr> <td></td> <td colspan="3" style="text-align: center;">$n = \frac{180}{30} = 6$ ✓</td> <td></td> </tr> <tr> <td></td> <td colspan="3" style="text-align: center;">M.F = (CH₂O)₆</td> <td style="text-align: right;">3</td> </tr> <tr> <td></td> <td colspan="3" style="text-align: center;">= C₆H₁₂O₆ ✓</td> <td></td> </tr> </table>		C	H	O		moles =	$\frac{0.0807}{12}$	$\frac{0.0133}{1}$	$\frac{0.106}{16}$	(3marks)	mole ratio =	$\frac{0.0067}{0.0066}$	$\frac{0.0133}{0.0066}$	$\frac{0.0066}{0.0066}$			1	2	1			E.F = CH ₂ O					$n = \frac{180}{30} = 6$ ✓					M.F = (CH ₂ O) ₆			3		= C ₆ H ₁₂ O ₆ ✓			
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	= C ₆ H ₁₂ O ₆ ✓																																								

8. Study the flow chart diagram below and use it to answer the questions that follow



a) Identify gas X ✓

(1mark)

Hydrogen ✓

I

b) Give the test for gas X ✓

(1mark)

- Changes orange acidified potassium dichromate (VI) green ✓
(Accept soln or paper) // Accept H⁺ / KMnO₄

I

c) State the property of concentrated sulphuric (VI) acid demonstrated above.

(1mark)

Oxidizing agent ✓

I



9. Solutions can be classified as acids, bases or neutral. The table below shows solutions and their pH values

Solution	pH values
A	1.6
B	7
C	13.7

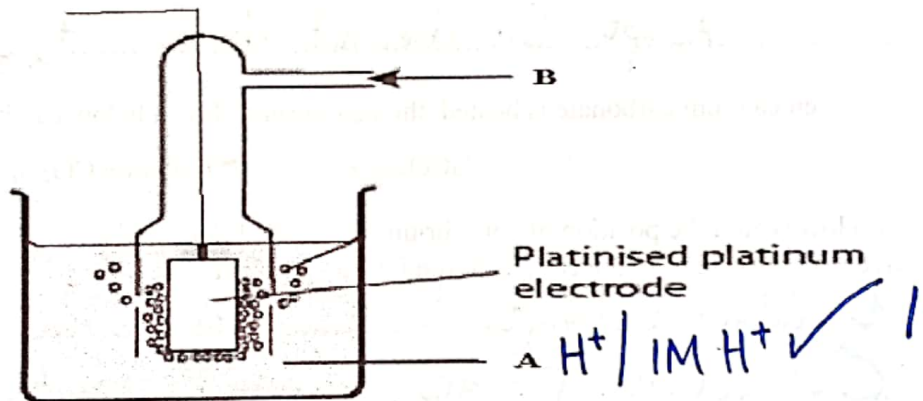
a) Select any pair that would react to form a solution of pH 7 (1mark)

A and C ✓ tied 1

b) Identify two solutions that would react with Aluminium hydroxide. Explain (2marks)

A and C. $Al(OH)_3$ is amphoteric, (reacts with both strong acids and alkalis). 2

10. The diagram below shows a hydrogen half-cell.



a) Label A (1 mark)

On the diagram.

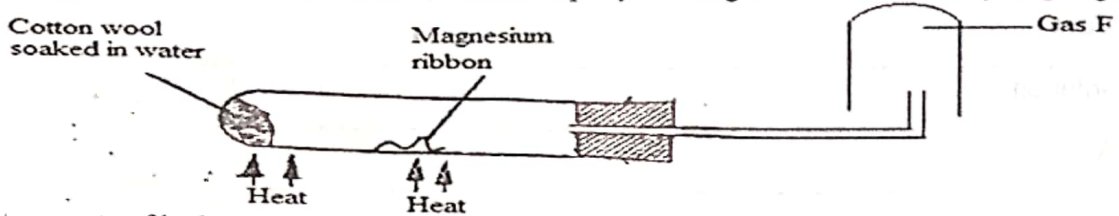
b) State one role of platinized platinum in this set up (1 mark)

- Inert electrode ✓
Accept: Porous nature - increases s.a for adsorption of H_2 /dissociation of H_2 .

c) Write an equation for the reaction that takes place in the half cell (1mark)

$\frac{1}{2} H_2(g) \rightarrow H^+(aq) + e^-$ ✓
rej $H_2(g) \rightarrow 2H^+(aq) + 2e^-$ 1

11. When magnesium is reacted with steam, it reacts rapidly forming a white solid and hydrogen gas.



(a) What property of hydrogen gas makes it to be collected as shown above.

(1 mark)

less dense than air ✓

I

(b) How would you show that the gas collected is hydrogen gas?

(1 mark)

Introduce a burning splint; puts off/extinguishes a burning splint with a "pop" sound.

(c) When copper turnings were used instead of magnesium ribbon, hydrogen gas was not produced.

Explain.

(1 mark)

Cu is less reactive and does not react with steam:
Accept Cu does not displace H₂ from steam.

12. When calcium carbonate is heated, the equilibrium shown below can be established.



(a) How would the position of equilibrium be affected if a small amount of the dilute potassium hydroxide is added to the equilibrium mixture? Explain.

(2 marks)

Equilibrium shifts to the right. KOH reacts with/absorbs CO₂ as thus favours forward reaction.

- Accept: KOH reacts with CO₂
- KOH reduces concentration of CO₂

(b) Explain how an increase in pressure would affect the equilibrium position.

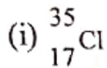
(1 mark)

Equilibrium shifts to the left. Pressure increase shifts it towards the side with fewer gaseous molecules.

13. A sample of sodium chloride was found to be a mixture of two isotopes, $^{35}_{17}\text{Cl}$ and $^{37}_{17}\text{Cl}$. Determine

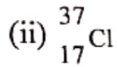
the relative formula masses of the compound formed when sodium burns in each of these isotopes (Na = 23.0)





(1 mark)

$$35 + 23 = 58 \checkmark \quad \text{rej } 58 \text{ alone.}$$



(1 mark)

$$37 + 23 = 60 \checkmark \quad \text{rej } 60 \text{ alone.}$$

b) Identify the method of salt preparation described in (a) above

(1 mark)

Direct synthesis

14. (a) Explain the factors that lead to emission of gamma rays

(1 mark)

- Radioactive decay of atomic nuclei. \checkmark
- Energetic nuclear reactions. \checkmark
- Produced when remaining particles in the nucleus reorganize into more stable arrangement.

(b) Gamma rays are not shown when writing an equation. Explain

(1 mark)

Atomic number and mass number of the nuclides remain the same. \checkmark

(c) Explain how radioactivity is used in food preservation

(1 mark)

- ~~X-rays~~ ^(Gamma) used to kill bacteria in canned food.

15. (a) What is the role of froth floatation in extraction of metals.

(1 mark)

Concentration of the ore.

(b) State one industrial use of zinc metal

(1 mark)

- Galvanization of iron.
- Making brass alloy.
- Making outer casing of dry cells.
- Making zinc cyanide for refining silver and gold.

Any 1 @ 1ml



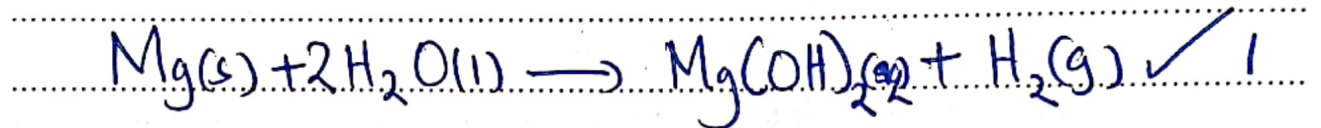
(c) State one reason why alloy of sodium and potassium is used as a coolant in nuclear reactors (1 mark)

- low melting point
 - Good conductor of heat.
- Any @ 1mk: 1

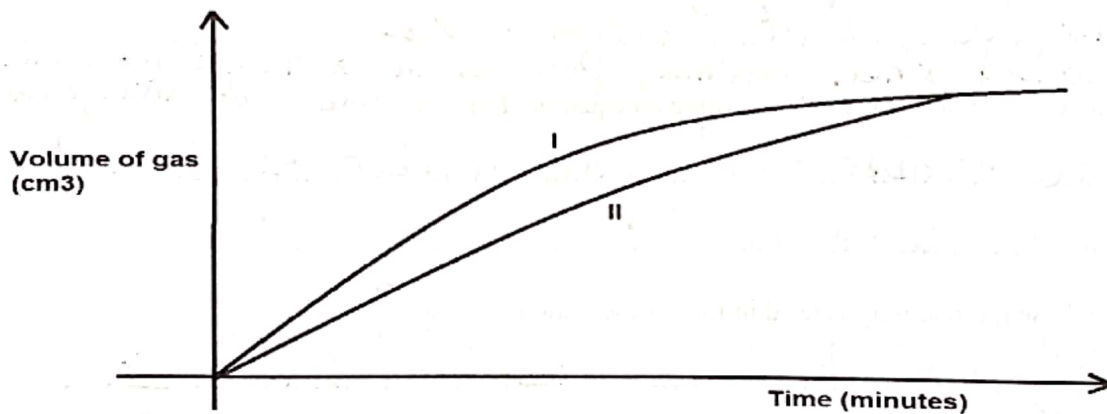
16.) Magnesium reacts with air to produce two solids. Name the solids. (2 marks)

- Magnesium oxide ✓ 1
- Magnesium nitride ✓ 1

b) Cold water reacts slowly with a piece of magnesium to produce bubbles of hydrogen gas. Write the equation for the reaction between cold water and magnesium (1 mark)



17. The curves below were obtained when two equal volumes of hydrogen peroxide of the same concentration were allowed to decompose separately. In one case, manganese(IV) oxide was added to the hydrogen peroxide



(a) Which curve represents the decomposition of hydrogen peroxide with manganese (IV) oxide? Explain (2 marks)

- I. ✓ Manganese (IV) oxide is a Catalyst which increases the rate of reaction. (2 marks)
- Accept: lowers activation energy. 2

(b) Give a reason why different reactions have different activation energies (1 mark)

- Different reactions have different bond energies which require different amount of energy to break. 1



18. a) Name two crystalline allotropes of sulphur

(2 marks)

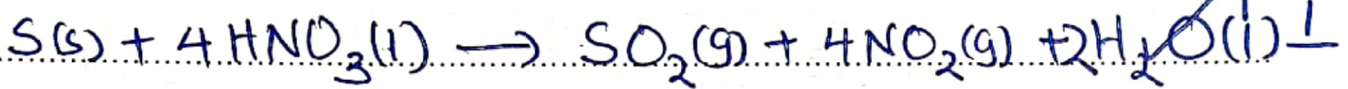
Rhombic and Monoclinic

Accept: Alpha / Beta / prismatic / Octahedral
rej: α and β

b) In an experiment to investigate a certain property of sulphur, a student added few drops of concentrated HNO_3 to sulphur in a test tube and warmed the mixture

a) Write a chemical equation of the reaction that occurred

(1 mark)



b) State one observation made

(1 mark)

Brown fumes of NO_2

19. The table below gives some properties of three elements in group VII of the periodic table. Study it and answer the questions that follow

Element	Atomic number	Melting point ($^{\circ}\text{C}$)	Boiling point ($^{\circ}\text{C}$)
Chlorine	17	-101	-34.7
Bromine	35	-7	58.8
Iodine	53	114	184

(a) Which element is a gas at room temperature? Give a reason

(2 marks)

Chlorine: Melting point and Boiling point below the room temperature.

(b) Explain why the boiling point of bromine is higher than that of chlorine

(1 mark)

Bromine has larger molecular mass hence stronger / more Van der Waals.

20. (a) State two reasons why most apparatus are made of glass

(2 marks)

- Does not corrode / react with most chemicals.

- Transparent for clear observations.

- Easy to clean.

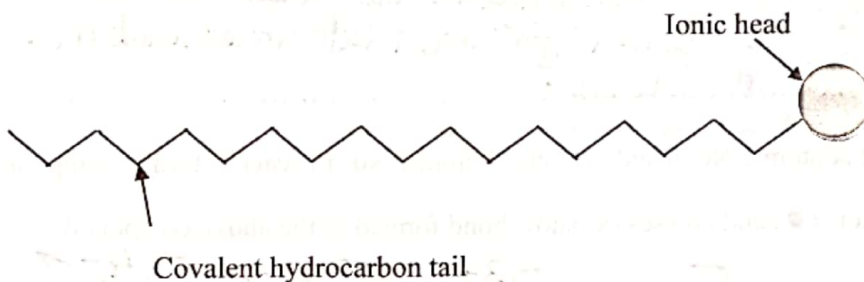
Any @ 1mk 2

Accept: Can withstand strong heating.

11
 i) Identify the likely electrolyte in solution H. (1 mark)
 - Lead(II) nitrate / Pb^{2+} ✓
 rej. $PbSO_4$ / $PbCl_2$ ✓

ii) Write an ionic equation for the reactions at cathode. (1 mark) 2
 $Pb^{2+}(aq) + 2e^- \rightarrow Pb(s)$ ✓

23. A detergent molecule may be represented by the following simplified diagram.



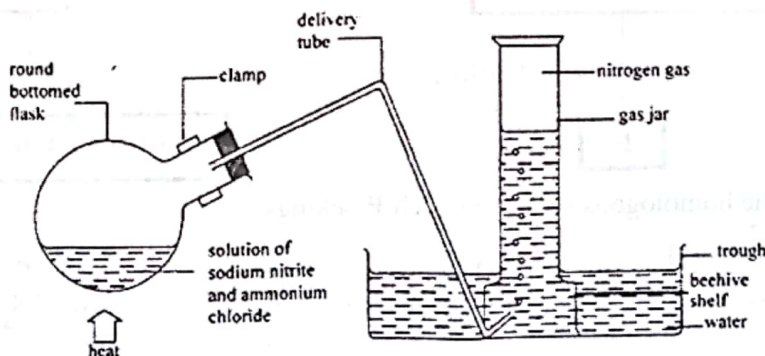
a) Explain how the detergent removes grease from a piece of a greasy cloth. (2 marks)

During washing, the polar end (ionic head) dissolves in water while the non-polar end (covalent hydrocarbon) dissolves grease. Agitation then takes place making grease to dislodge from the cloth.
 Accept: hydrophilic end and hydrophobic end

b) Explain why soapless detergents do not form scum with hard water (1 mark)

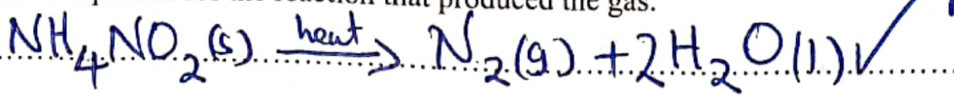
Contain oxophosphate // React with Mg^{2+} and Ca^{2+} to form soluble salts.

24. The figure below shows a set-up of apparatus used to prepare a sample of nitrogen gas in the laboratory, study it and answer the questions that follow.



a) Write an equation for the reaction that produced the gas.

(1 mark)



b) What property of nitrogen gas makes it suitable to be collected as shown?

(1 mark)

Slightly soluble in water. ~~rej insoluble.~~

c) State one use of nitrogen gas.

(1 mark)

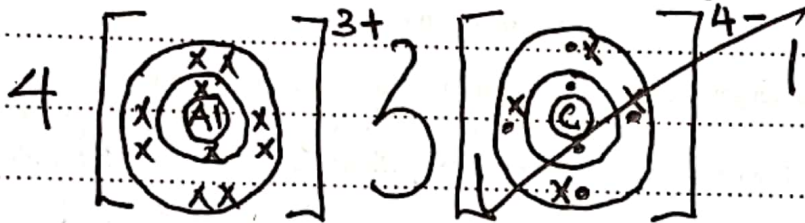
- Manufacture of Ammonia in the haber process
- Storage of semen for artificial insemination
- in light bulbs
- Filling tyres of aeroplanes

Any 1 @ 1mk

25. Element A atomic No. 6 and element B atomic No. 13 react to form a compound.

(a) Using dots (•) and crosses (x) show bond formed in the above compound.

(1 mark)



(b) Explain why the compound above has very high melting point.

(1 mark)

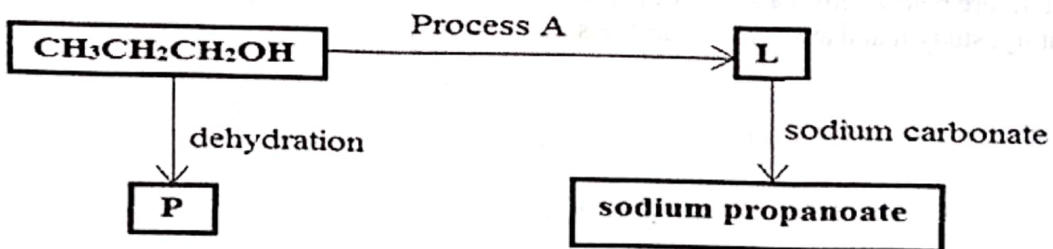
Has strong ionic bond in the giant ionic structure.

(c) Explain how the compound above will conduct electricity.

(1 mark)

Using mobile ions / free mobile ions ~~rej free ions~~

26. Study the flow chart below and answer the questions that follow:



a) Name the homologous series to which P belongs

(1 mark)

Alkenes ✓

rej Alkene.



07

b) Name **one** reagent that can be used to carry out **process A**

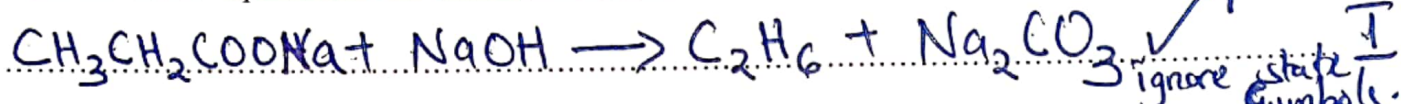
(1 mark)

Acidified potassium manganate(VII) // Acidified Potassium dichromate(VI)

c) The Sodium propanoate formed above is heated with a mixture of quick lime and sodium Hydroxide.

Write the formal equation for the reaction that occurs

(1 mark)



27 a). State two ways in which efficiency of the fractional distillation can be improved when separating a mixture of water and ethanol

(2marks)

- Controlling temperature gradient within the fractionating column.
- Increasing the height and surface area of fractionating column.
- Making fractionating column narrow / increasing diameter.

b) State one application of chromatography in sports

(1 mark)

✓ To detect banned substances in athletes.

05

THIS IS THE LAST PRINTED PAGE.

