

NAME.....INDEX NUMBER.....

CLASS.....CANDIDATE'S SIGNATURE.....

DATE.....

233/2

CHEMISTRY

THEORY

Paper 2

Time: 2 Hours

LANJET MARKING SCHEME 2022

1. The grid below shows part of the periodic table study it and answer the questions that follow. The letters do not represent the true symbols.

					A		
	B		C	D		E	
F	G						
						H	

(a) Which element forms ions with charge of 2-? Explain (2mks)

A(1)- gains two electrons to become stable(1)

(b) What is the nature of the oxide formed by C. (1mk)

amphoteric

(c) How does the reactivity of H compare with that of E. Explain? (2mks)

H is less reactive than E(1)

H has a larger atomic radius hence lower attraction to electrons(1)

(d) Write down a balanced equation between F and Chlorine. (1mk)



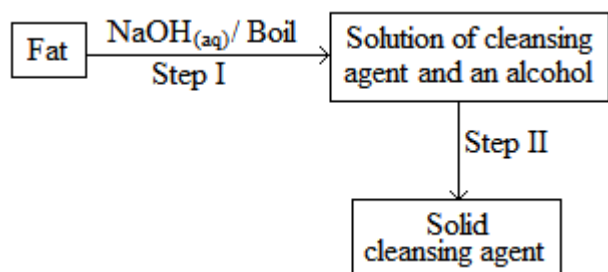
(e) Explain how the atomic radii of B and C compare. (2mk)

C has a smaller atomic radius than B(1), C has more protons hence stronger nuclear charge/attraction for outermost electrons(1)

(f) If the oxides of F and D are separately dissolved in water, state and explain the effects of their aqueous solutions on litmus. (2mks)

Oxide of F changes litmus to blue (1/2) – dissolves in water to form alkaline/basic solution (1/2)
Oxide of D changes litmus to red (1/2) – dissolves in water to form acidic solution (1/2)

2 (a) The scheme below was used to prepare a cleansing agent. Study it and answer the questions that follow.



(i) What name is given to the type of cleansing agent prepared by the method above? (1 mark)

Soap. ✓ 1/2

(ii) Name one chemical substance added in step II (1 mark)

Concentrated NaCl/ Brine/ NaCl(l) ✓1

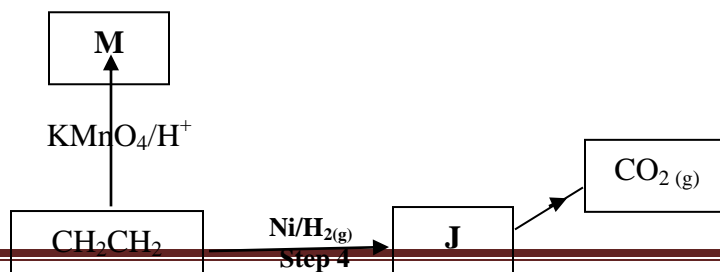
(iii) What is the purpose of adding the chemical substance named in a (ii) above? (1 mark)

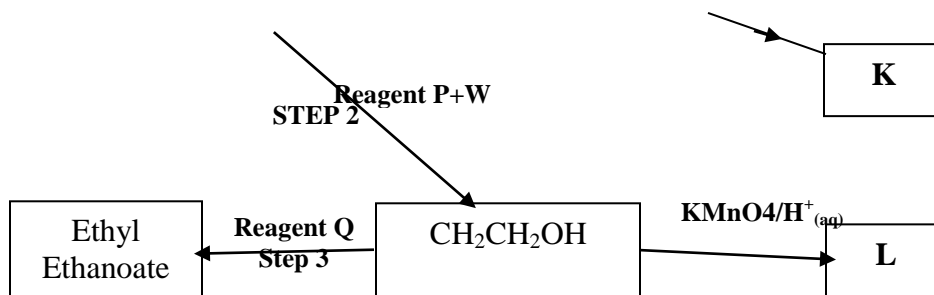
To precipitate out the soap ✓1

(iv) Name any other suitable substance that can be used in step I (1 mark)

potassium hydroxide/ KOH(aq) ✓1

(b). Study the flow chart below and answer the questions that follow





(a) (i) Name the following organic compounds: (2mks)

M..Ethan-1,2-diol/Glycol

L Ethanoic acid

(ii) Name the process in step (2mks)

Step 2 ...Hydrolysis

Step 4..Hydrogenation

(iii) Identify the reagent **P** and **Q** (2mks)

P ...Concentrated sulphuric(vi) acid

Q...Ethanoic acid

(iv) Write an equation for the reaction between CH₃CH₂CH₂OH and sodium metal **(1mk)**



3. a) Define radioactivity

(1mark)

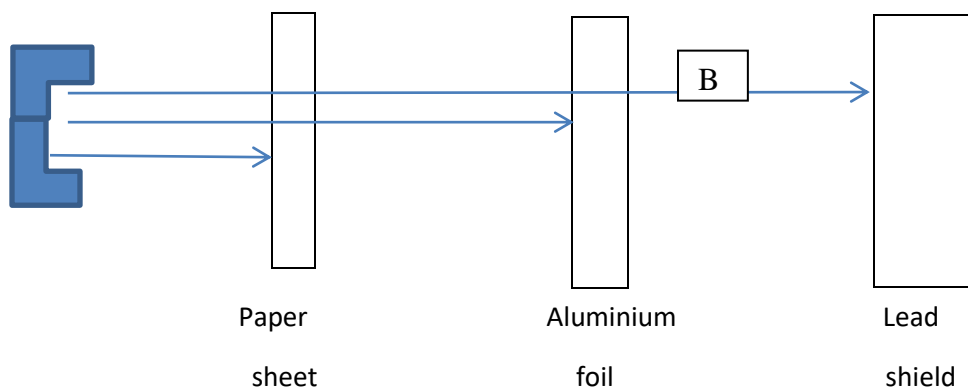
Process where unstable nuclide breaks up to yield another nuclide of different composition with emission of particles and energy

b) Give two differences between chemical reactions and nuclear reactions.

(2marks)

Chemical reactions	Nuclear reactions
<i>1 Occur in energy levels</i>	<i>1 occur in nucleus</i>
<i>2 Involve delocised electrons</i>	<i>2 Involve protons and neutrons</i>
<i>3 Produce less energy</i>	<i>3 Produce huge amount of energy</i>
<i>4 Affected by environmental condition</i>	<i>4 Not affected by environmental conditions</i>
<i>5. Do not form new element</i>	<i>5 Form new element</i>

c) Study the diagram below and answer the questions that follow



i) What property of radiations is being investigated by the illustration above

(1mark)

Penetration power of radiations

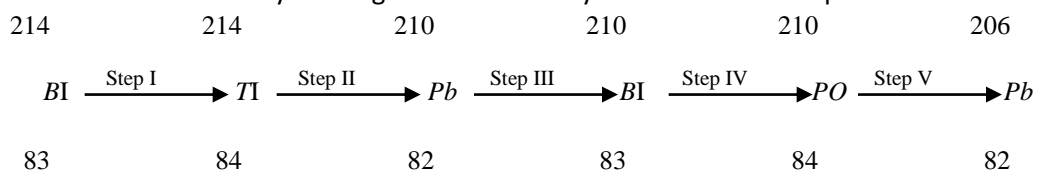
ii) Give the name of the radiation B and give a reason.

(2marks)

Gamma radiation ,

Can penetrate paper and aluminium foil but only stopped by lead

iii) Below is the radioactive decay starting with ^{214}Bi study it and answer the questions that follow.

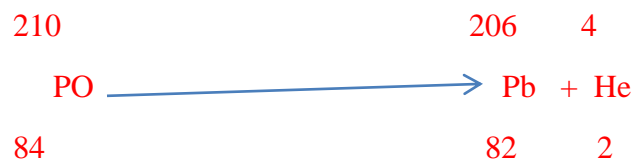


(a) Identify the particle emitted in step I and II. (2mks)

Step 1...**Beta**

Step 11..**Alpha**

(b) Write the nuclear equation for the reaction which takes place in step V (1mk)



iv) State one danger associated with frequent exposure to radiations. (1mark)

Cause cancer

Cause mutation

v) The isotope X -31 has a half life of 2.5 hours. Calculate the remaining percentage (%) of the isotope left after 7.5 hours? (2mks)

$$n = 7.5/2.5$$

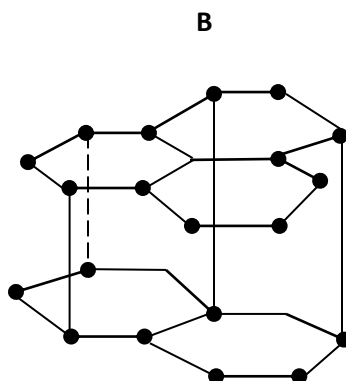
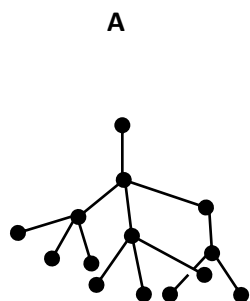
$$=3$$

$$X = (1/2)^3 \times 100$$

$$X = 1/8 \times 100$$

$$\text{Remaining \%} = 12.5\%$$

4. The following diagrams show the structure of two allotropes of carbon. Study them and answer the questions that follow.



(a) Name the allotropes.

(1mark)

A ...Diamond

B ...Graphite

(b) Give **one** use of **A**.

(1mark)

Making drilling bit

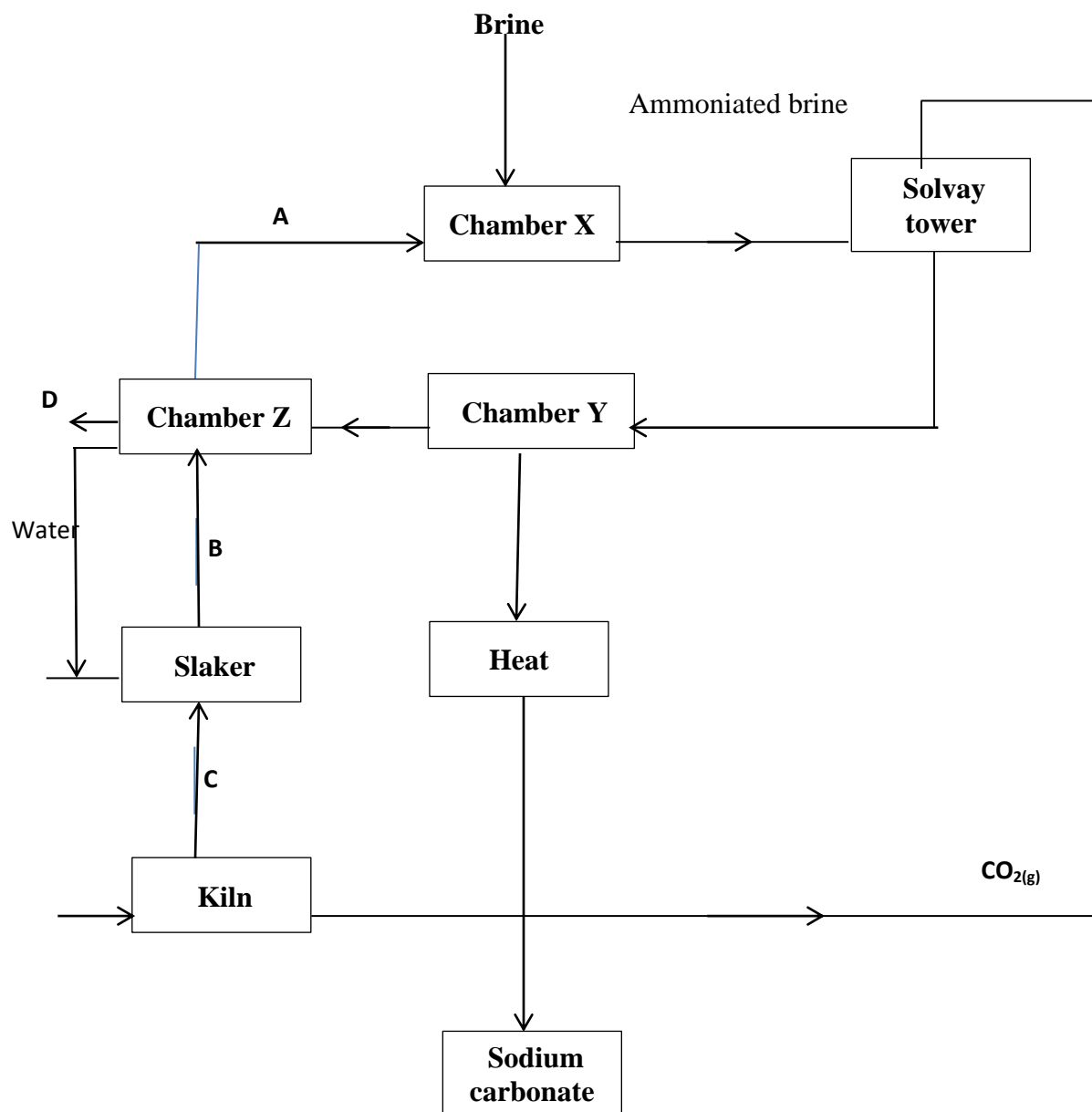
Making jewelery

(c) Which allotrope conducts electricity? Explain

(2 marks)

B, Has one delocalized electron that conducts electricity

b) The flow below represents the main steps in the manufacture of sodium carbonate



(a) Identify the substance labeled.

(2marks)

AAmmonia

B...Calcium hydroxide

C .Calcium oxide

D .Calcium chloride

- (b) Cold water is made to circulate around solvay tower. What does this suggest about the reaction between A and brine. (1mark)

Reaction is exothermic

- (c) What process takes place in chamber Y? (1mark)

Filtration

- (d) Name **two** by-products that are recycled in this process. (2 marks)

Ammonia

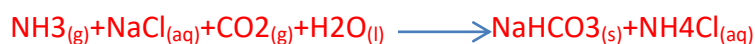
Carbon (I)oxide

Water.

- (e) Why is recycling important? (1mark)

Makes process economical/less expensive

- (f) Write the equation for the reaction that takes place in the Solvay tower. (1mark)



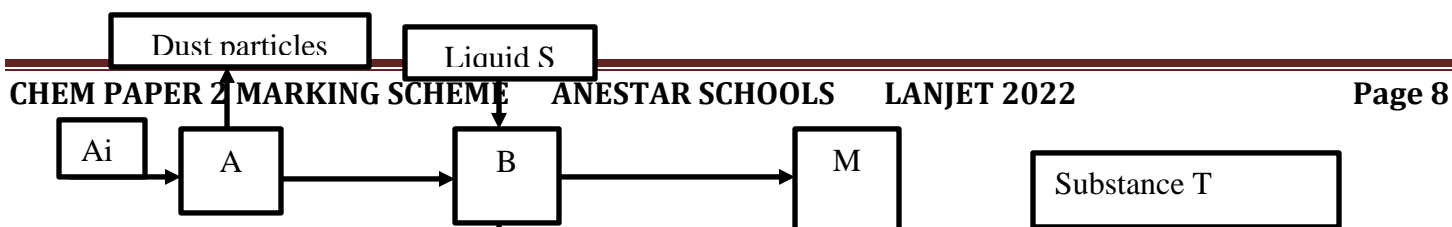
- (g) Give **two** industrial uses of sodium carbonate. (2marks)

Making glass

Making detergents

Softening hard water

5 Fractional distillation of air is used in the industrial isolation of oxygen. The diagram below shows the process.





a) What processes are taking place in chamber A,B,M and D

2marks

A *Electrostatic precipitation/Filtration*

B...*Absorption*

M Condensation/Isolation of ice

D *Cooling*

b) Name;

(i) Liquid S (1mk)

Concentrated NaOH (aq)

(ii) Substance T (1mk)

Ice / water

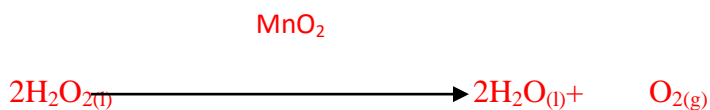
c) Explain why part Y in chamber D is curved? (1mark)

To increase surface area for cooling

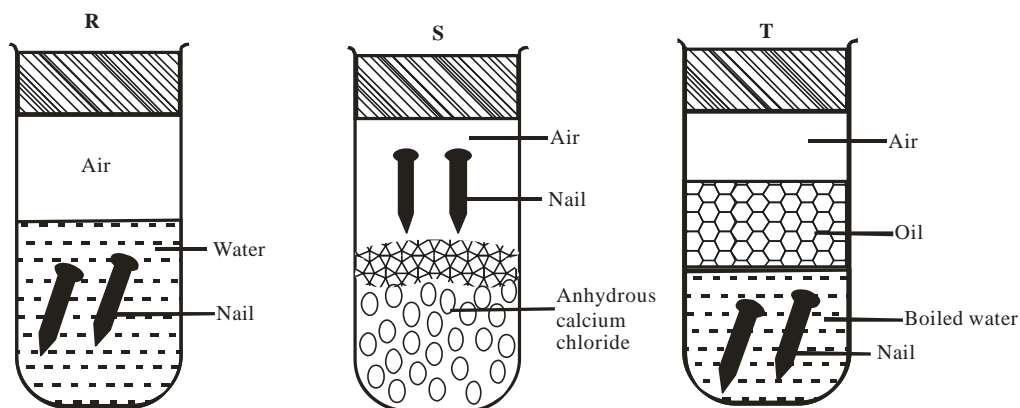
d) Give two industrial uses of oxygen gas? (2marks)

*Oxygen is used to remove impurities during steel making
Is used in cutting and welding of metals*

e) In the laboratory preparation of oxygen, manganese (iv) oxide and hydrogen peroxide are used. Write an equation to show how oxygen gas is formed. (1mark)



f) An investigation was carried out using the set-up below. Study it and answer the questions that follow.



(i) State and explain what will happen in the three test-tubes R, S and T after seven days. (2marks)

R - *Rusting occurred ✓ 1 ½ mk because of air and water being present ✓ ½ mk*

S - *No rusting ✓ ½ mk Water is absent ✓ ½ mk*

T - *No rusting ✓ ½ mk Air is absent ✓ ½ mk*

(ii) Give one reason why some metals are electroplated.

(1mark)

To prevent rusting ✓1mk
To increase aesthetic value of the metal

6. a) define the following terms

(i) Saturated solution

(1mk)

A solution that cannot dissolve any more of the solute at that particular temperature.

(ii) Fractional crystallization

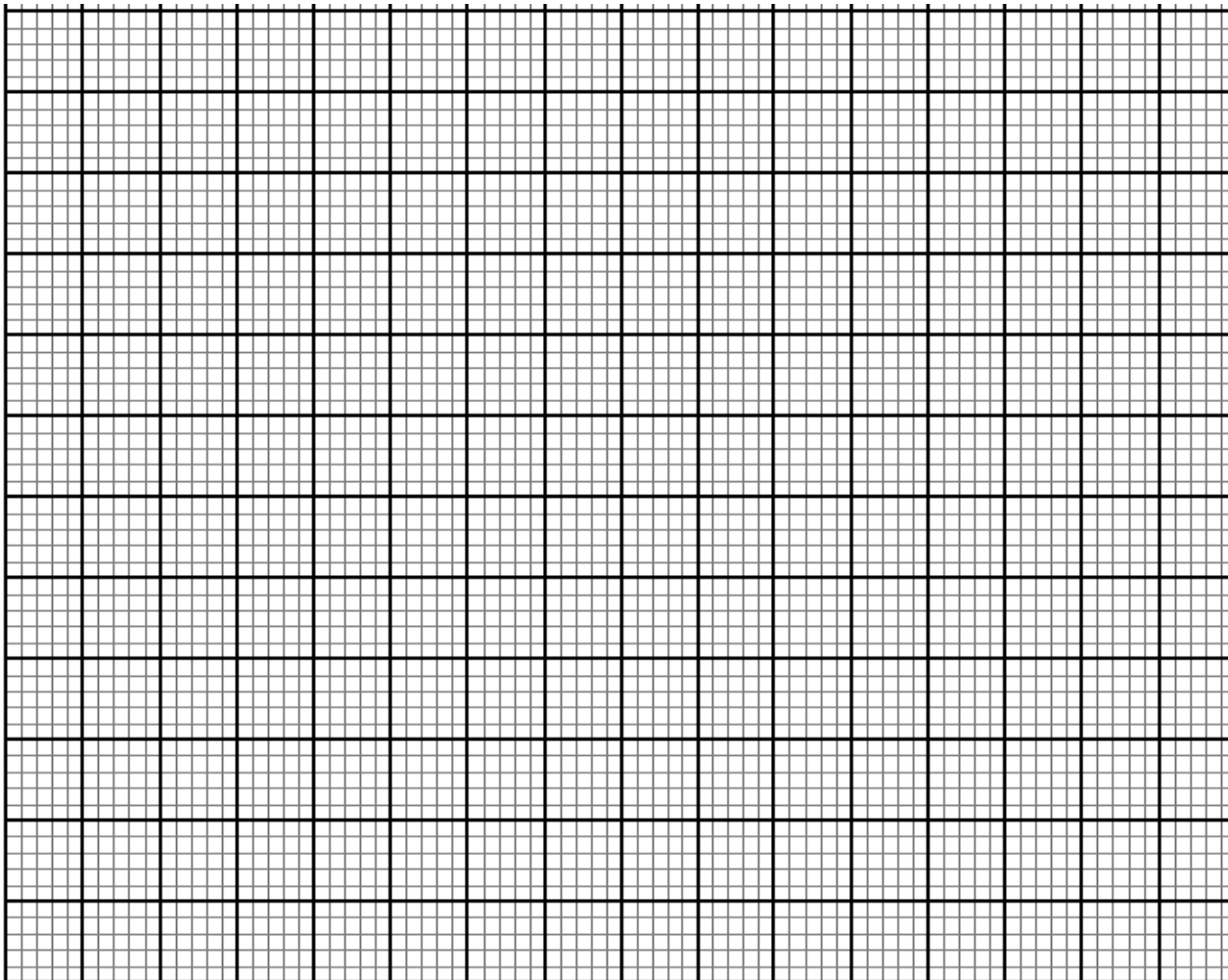
(1mk)

Scientific technique used to separate substances due to their differences in their crystallization temperature. ✓ 1mk or w.t.t.e

b). Solubility of salt X and Y were determined at different temperatures as shown in the following data.

Temperature (°C)		0	20	40	60	80	100
Solubility of 100g of water	X	12	30	75	125	185	250
	Y	15	20	35	45	65	80

(i) On the grid provided, plot a graph of solubility (vertical axis) against temperature. (4mks)



ii. From the graph determine the solubility of each at 50°C.

X ... *100g/100ml ±1* (1mk)

Y ... *40g/100ml ±1* (1mk)

iii. At what temperature was the solubility of both salts equal. (1mk)

5°C ±1

b)(i)What is permanent hardness of water? (1mk)

Type of water hardness that cannot be removed by boiling

(ii) (ii) Saturated solution of salt X at 70°C was cooled to 20°C . What mass of the crystal were deposited.

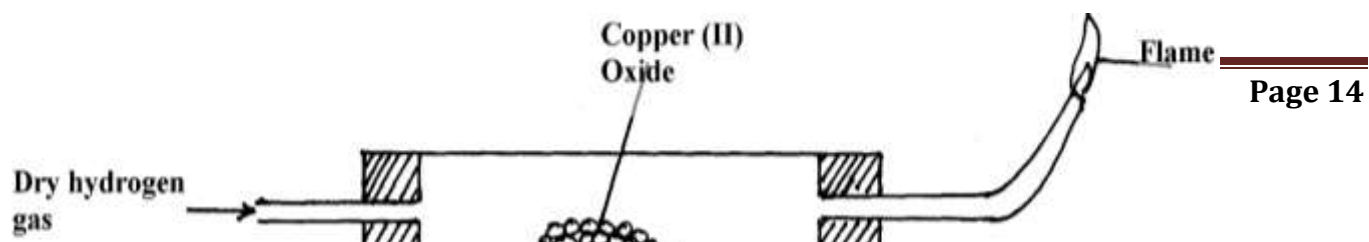
(1mk)

Mass at 70°C - Mass at 20°C

155-30

125g

7. a) The set-up below is used to investigate the properties of hydrogen.



(i) On the diagram, indicate what should be done for the reaction to occur (1mk)

Heating of copper (ii) Oxide to be shown on the diagram

(ii) Hydrogen gas is allowed to pass through the tube for some time before it is lit. Explain (2mks)

To drive out air because mixture of air and hydrogen is explosive when lit

(b) Write an equation for the reaction that occurs in the combustion tube (1mk)



(c) When the reaction is complete, hydrogen gas is passed through the apparatus until they cool down. Explain (2mks)

To prevent re-oxidation of hot copper by the atmospheric oxygen

(d) What property of hydrogen is being investigated? (1mk)

Reducing agent

(e) What observation confirms the property stated in (v) above? (1mk)

Black copper (ii) Oxide turns to brown showing that copper (ii) Oxide has been reduced to copper

(f) Why is zinc oxide not used to investigate this property of hydrogen gas? (1mk)

Zinc is more reactive than hydrogen and therefore cannot be reduced by hydrogen

