

233/1
CHEMISTRY
PAPER 1
Time: 2 Hours

**STRATHMORE SCHOOL
MOCK EXAM**

Instructions to candidates

- Write your name and index number in the spaces provided above. Sign and write the date of the examination in the spaces provided above.
- Answer **ALL** the questions in the spaces provided.
- Mathematical tables and electronic calculators may be used.
- All working **MUST** be clearly shown where necessary.

For Examiner's use only

| MAXIMUM SCORE | ATTAINED SCORE |
|------------------|-------------------|
| 80 | |

This paper consists of 7 printed pages.

Candidates should check the question paper to ensure that all the pages are printed as indicated and that no questions are missing.

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TURNOVER

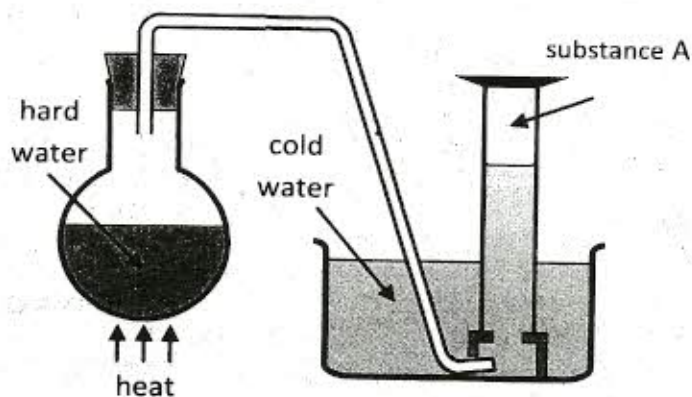
1. Some sodium chloride was found to be contaminated with copper (II) oxide. Describe how a sample of sodium chloride can be separated from the mixture. (3 marks)

2. Calcium oxide can be used to dry ammonia gas. (2 marks)

(a) Explain why calcium oxide is **not** used to dry hydrogen chloride gas.

(b) Name one drying agent for hydrogen chloride gas.

3. The set-up below was used to demonstrate the effect of heat on hard water.



(a) Name substance A. (1 mark)

(b) Explain why the heating of hard water produced substance A. (2 marks)

4. Using dots (•) and crosses (x) to represent electrons, show the bonding in the compounds formed when the following elements react: (Si = 14, Na = 11, Cl = 17)

(a) sodium and chlorine (2 marks)

(b) silicon and chlorine (2 marks)

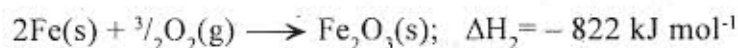
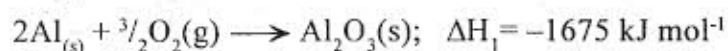
5. Zinc oxide reacts with acids and alkalis.

(a) Write the equation for the reaction between zinc oxide and dilute sulphuric acid (1 mark)

(b) Write the equation for the reaction between zinc oxide and sodium hydroxide solution (1 mark)

(c) What property of zinc oxide is shown by the reactions above? (1 mark)

6. Use the following equations to derive the reaction between aluminium and Iron (III) Oxide and then determine the heat evolved in the reaction. (3 marks)



7. Give the name and draw the structural formula of the compound formed when one mole of ethyne reacts with one mole of chlorine gas. (2 marks)

8. Determine the oxidation state of sulphur in the following compounds (2 marks)

(a) H_2S

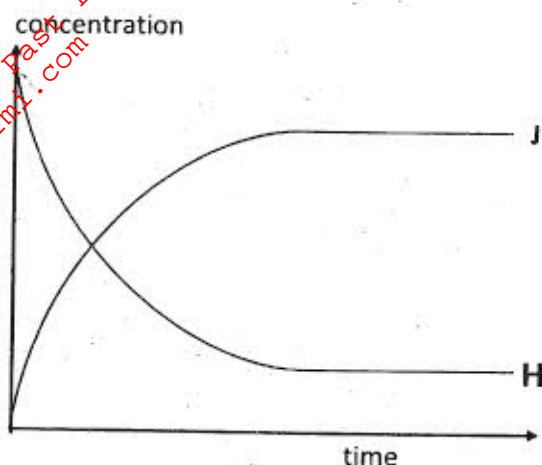
(b) $\text{Na}_2\text{S}_2\text{O}_3$

9. A certain carbonate, GCO_3 , reacts with dilute hydrochloric acid according to the equation given below:



If 1g of the carbonate reacts completely with 20cm³ of 1M hydrochloric acid, calculate the relative atomic mass of G. (C = 12, O = 16) (3 marks)

10. The sketch below shows the rate at which substance **H** is converted into **J**. Study it and answer the question that follows.



Why do the two curves become horizontal after some time?

(2 marks)

11. The reaction between cold dilute sodium hydroxide and chlorine produces sodium chlorate(I), sodium chloride and water.

(a) Write the equation for the reaction.

(1 mark)

(b) Give one use of sodium chlorate(I).

(1 mark)

12. Sulphur exists in two crystalline forms.

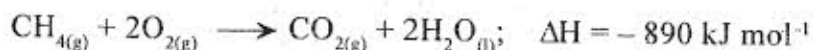
(a) Name **one** crystalline form of sulphur.

(1 mark)

(b) State **one** use of sulphur.

(1 mark)

13. Methane reacts with oxygen according to the equation below:



Calculate the volume of methane that would produce 111.25 kJ when completely burnt.

(Molar volume of gas = 24 litres)

(2 marks)

14. An atom of hydrogen can form two ions. Write **two** equations to show how a neutral atom of hydrogen can form the two ions. In each case show the sign of the energy change involved. (2 marks)

15. In terms of structure and bonding, explain why graphite is used as a lubricant? (2 marks)

16. The table below gives some information about elements **I, II, III** and **IV** which are in the same group of the periodic table. Use the information to answer the question that follows.

| Element | Atomic radius (μm) | First ionisation energy kJ mol^{-1} |
|---------|---------------------------------|--|
| I | 0.15 | 520 |
| II | 0.19 | 500 |
| III | 0.23 | 420 |
| IV | 0.25 | 400 |

State and explain the relationship between the variations in the first ionisation energies and the atomic radii. (3 marks)

17. (a) What condition is necessary for an equilibrium to be established? (1 mark)

(b) When calcium carbonate is heated, the equilibrium shown below is established:

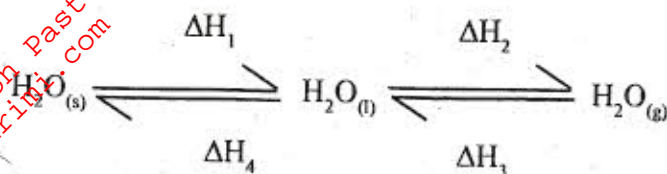


How would the position of equilibrium be affected if a small amount of dilute potassium hydroxide is added to the equilibrium mixture? Explain. (2 marks)

18. (a) What is meant by heat of vaporization? (1 mark)

(b) The boiling points of ethanol, propanol and butanol are 78°C , 97°C and 117°C respectively. Explain this trend. (3 marks)

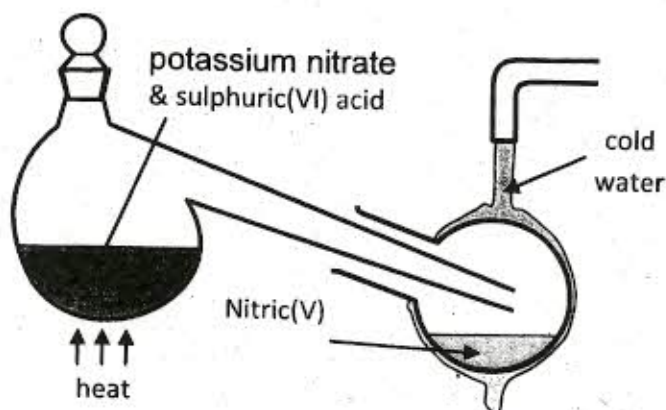
19. The scheme below shows the energy changes that are involved between ice, water and steam. Study it and answer the questions that follow.



(a) What is the name given to the energy change ΔH_1 ? (1 mark)

(b) What is the sign of ΔH_3 ? Give a reason. (2 marks)

20. The diagram below shows the set-up that was used to prepare and collect a sample of nitric(V) acid.



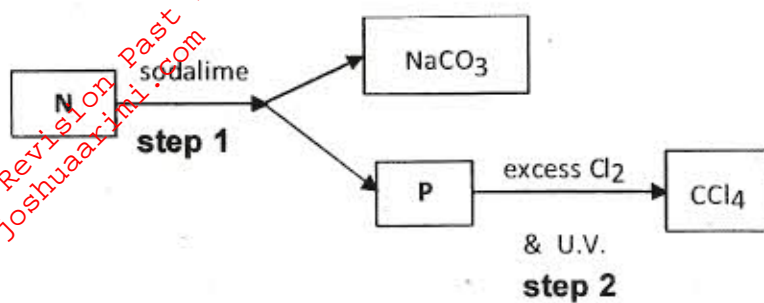
(a) Give a reason why it is possible to separate nitric acid from sulphuric(VI) acid in the set-up. (1 mark)

(b) Name another substance that can be used instead of potassium nitrate. (1 mark)

(c) Give **one** use of nitric(V) acid. (1 mark)

21. Equal volumes of 1M monobasic acids L and M were each reacted with excess magnesium turnings. The volumes of gas produced after one minute were: L, 40cm³ and M, 100cm³. Explain the difference in the volumes of gas produced. (2 marks)

22. Study the flow chart below and answer the questions that follow.



(a) Identify N and P.

(2 marks)

N:

P:

(b) What name is given to the type of halogenation / chlorination reaction in step 2?

(1 mark)

23. Carbon (II) oxide and nitrogen(IV) oxide are some of the gases released from car exhaust pipes. State how these gases affect the environment. (4 marks)

24. In an experiment, a gas jar containing moist sulphur dioxide was inverted over another one containing hydrogen sulphide gas.

(a) State and explain the observation that was made.

(2 marks)

(b) State the precaution that should be taken when carrying out this experiment. (1 mark)

25. When a few drops of aqueous ammonia were added to copper(II) nitrate solution, a light blue precipitate was formed. On addition of more aqueous ammonia, a deep blue solution was formed.

(a) Identify the substance responsible for the light blue precipitate.

(1 mark)

(b) Identify the substance responsible for the deep blue solution.

(1 mark)

26. A few crystals of potassium permanganate were carefully placed into water in a beaker at one spot. The beaker was left undisturbed for two hours. State and explain the observation that was made. (2 marks)

27. Dry carbon monoxide reacts with heated lead(II) oxide as shown in the equation below.

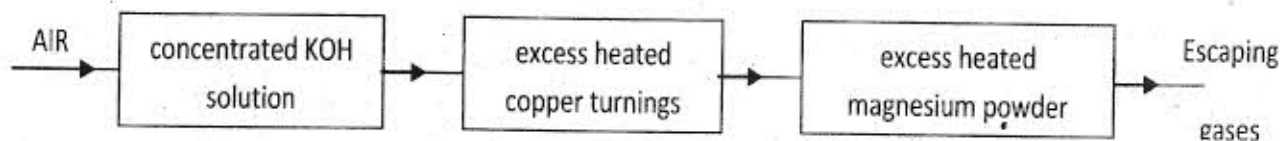


(a) Name the process undergone by the lead(II) oxide. (1 mark)

(b) Give a reason for your answer in (a) above. (1 mark)

(c) Name another gas that can be used to perform the same function as carbon monoxide gas in the above reaction. (1 mark)

28. Air was passed through several reagents as shown in the flow chart below.



(a) Write an equation for the reaction that takes place in the chamber with magnesium powder. (1 mark)

(b) Name **one** gas which escapes from the chamber containing magnesium powder. Give a reason for your answer. (2 marks)