**Name…………………………………………………… Adm No……………… Class…………………………………………………….**

**Student’s Signature………………………. Date …………………..**

**FORM 2**

**233**

**CHEMISTRY**

**2 Hours**

**TOP SCHOOLS MULTILATERAL END OF YEAR JOINT EXAMS 2023.**

**Instructions to students**

* Write your name and admission number in the spaces provided above.
* Sign and write the date of examination in the spaces provided above.
* Answer **all** the questions in the spaces provided.
* KNEC mathematical tables and silent non-programmable electronic calculators may be used for calculations.
* All working **MUST** be clearly shown where necessary.
* ***This paper consists of 11 printed pages.***
* ***Students should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.***
* ***Students should answer the questions in English.***

**For examiner’s USE only**

|  |  |  |
| --- | --- | --- |
| **questionS** | **maximum score** | **STUDENT’S score** |
| **1 - 17** | **80** |  |

1. Name a method that can be used to separate each of the following substances. (3mks)
2. A mixture of petrol and diesel.

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1. Kerosene and water.

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1. Food coloring ingredients in a sauce.

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1. The table below shoes the formulae of elements P, Q, R and S (not actual symbols) and their chlorides.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Elements | P | Q | R | S |
| Formulae of chlorides | PCl | QCl2 | RCl3 | SCl5 |

1. State the group in which element Q belongs. (1mrk)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

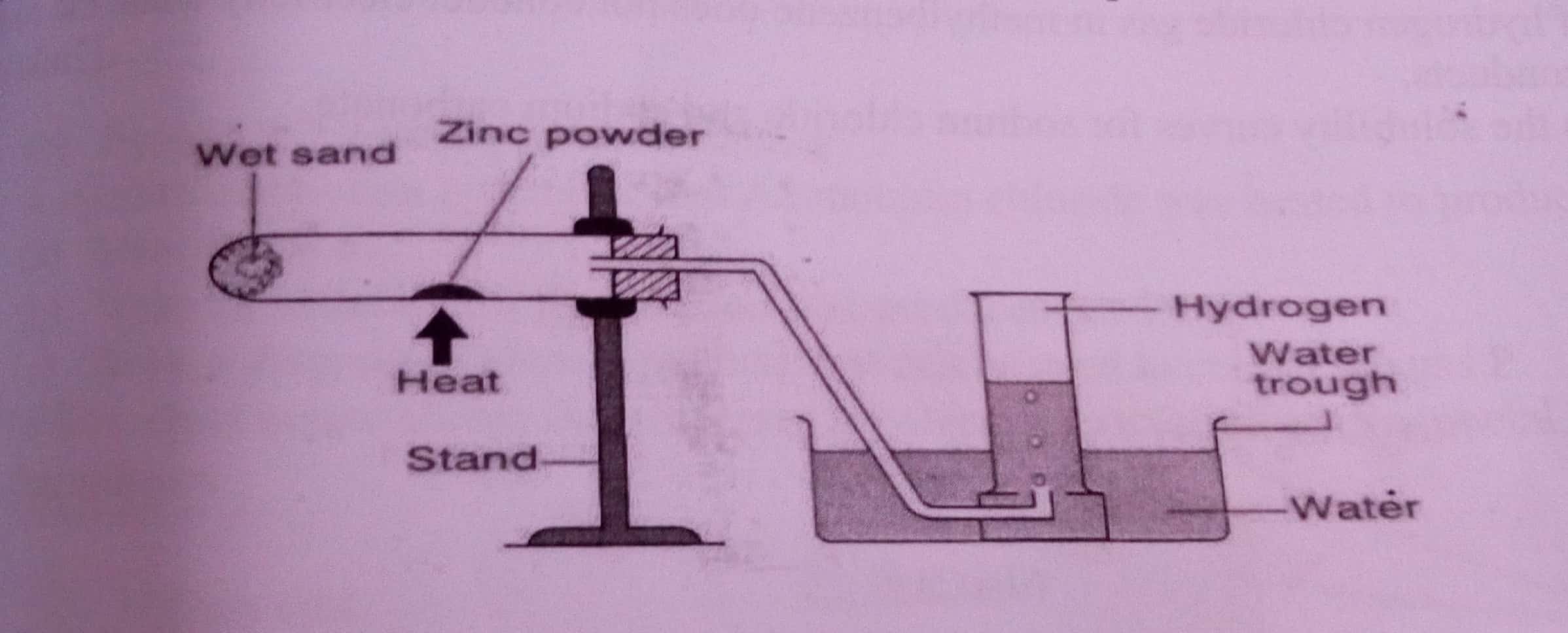
1. Identify one element which is a non-metal. (1mk)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Write down the formulae of P oxide. (1mk)

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1. Hydrogen can be prepared by passing steam over heated Zinc powder as shown in the diagram



a) Write down the chemical reaction that produces hydrogen gas. (1mrk)

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b) Explain why hydrogen should be burned if not collected over water. (1mrk)

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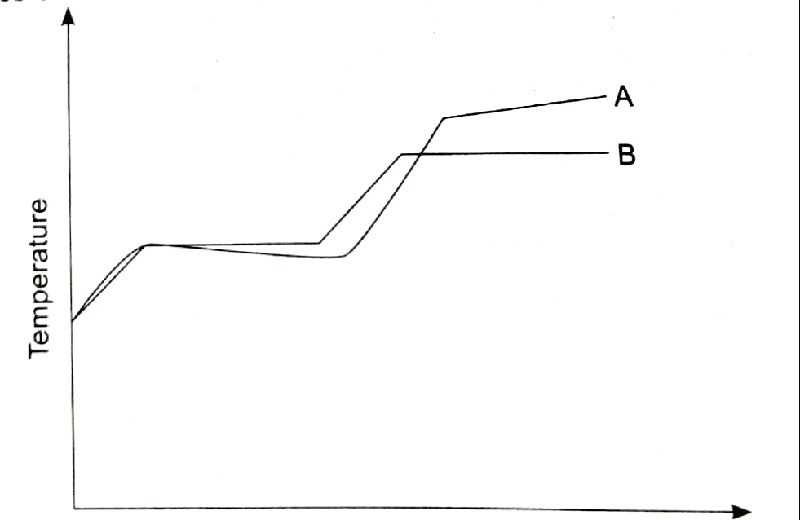
c) Give another metal that can be used instead of Zinc. (1mrk)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. A piece of sodium metal was placed in a trough half filled with cold water. State the observations that were made. (3mrks)

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1. The curves below represents the variation of temperature with time when pure and impure samples of a solid were heated separately.



1. Which curve shows the variation in temperature of the pure solid. Explain (2Mrks)

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1. State the effect of impurities in the melting and boiling points of a pure substance. (2Mrks)

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1. Air was passed through several reagents as shown below;

CHAMBER 3

Heated copper turnings

CHAMBER 2

Concentrated

Sulphuric VI acid

CHAMBER 1

Concentrated

Sodium hydroxide

CHAMBER 4

Heated magnesium

Powder

AIR Escaping

Gasses

a.) Name the main inactive component of air (1mk)

b.) Name the components of air that are removed in the following chambers

1. Chamber 1

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Chamber 3

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Chamber 4

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c.) What is the purpose of passing air through concentrated Sulphuric (VI) acid? (1mk)

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d.)Write a chemical equation for the reaction which takes place in

1. Chamber 1

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Chamber 4

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e.) Explain the observation made in chamber 3 during the reaction. (2mrks)

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f.)Name one gas which escapes from the scheme above. (1mrk)

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7.a) Distinguish between hygroscopy and efflorescence. (2mrks)

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b.)Starting with lead (II) oxide describe how you would prepare Lead (II) sulphate (3mrks)

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8.a) discuss the criteria for testing purity of water. (2mrks)

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b.) write the word equations for the reaction between dilute hydrochloric acid and the following.

(i) magnesium oxide

(ii) calcium hydrogen carbonate

(ii) zinc metal

(iv) potassium hydroxide (4mrks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. a) Using dots and crosses to represent electrons, draw a diagram to show bonding in Sodium Chloride(NaCl) (2mrks)

b.) name and draw two apparatus used in measuring exact volumes of solutions in the laboratory (2mrks)

10. Both ions Y2- and Z2+ have an electron configuration of 2.8.8

a.) Write the electron arrangement for (2mrks)

Y

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

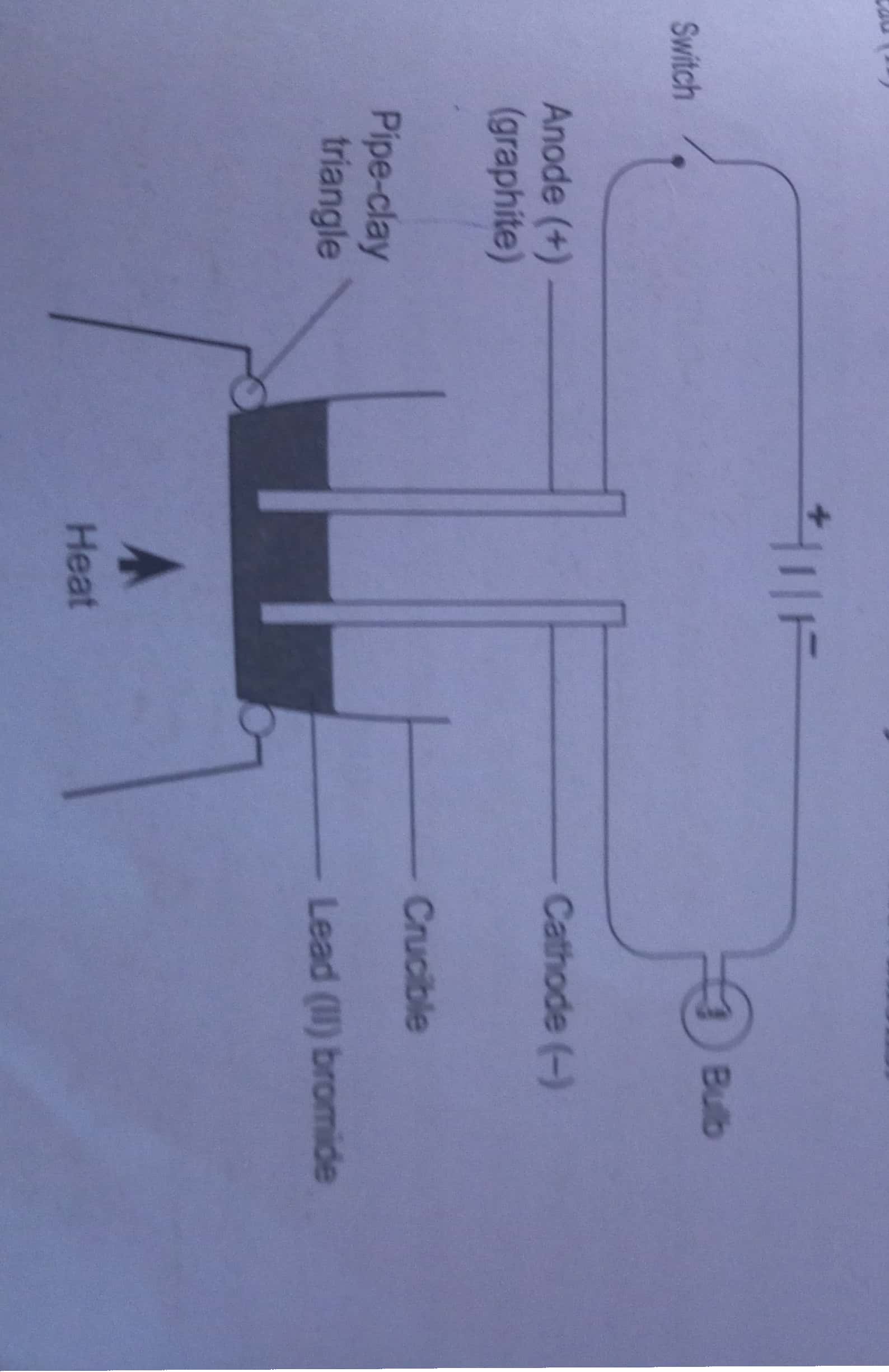
Z

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b.) What is the mass number of atom Z given that it has 20 neutrons (1mrk)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

11. The diagram on the next page shows a set up which was used by a student to investigate the effect of electricity on molten Lead (II) Bromide.



1. Explain the observation at the cathode (2mrks)

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1. Why does solid lead (II) Bromide not allow the passage of electricity (2mrks)

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c.)Write equations to show the reactions taking place

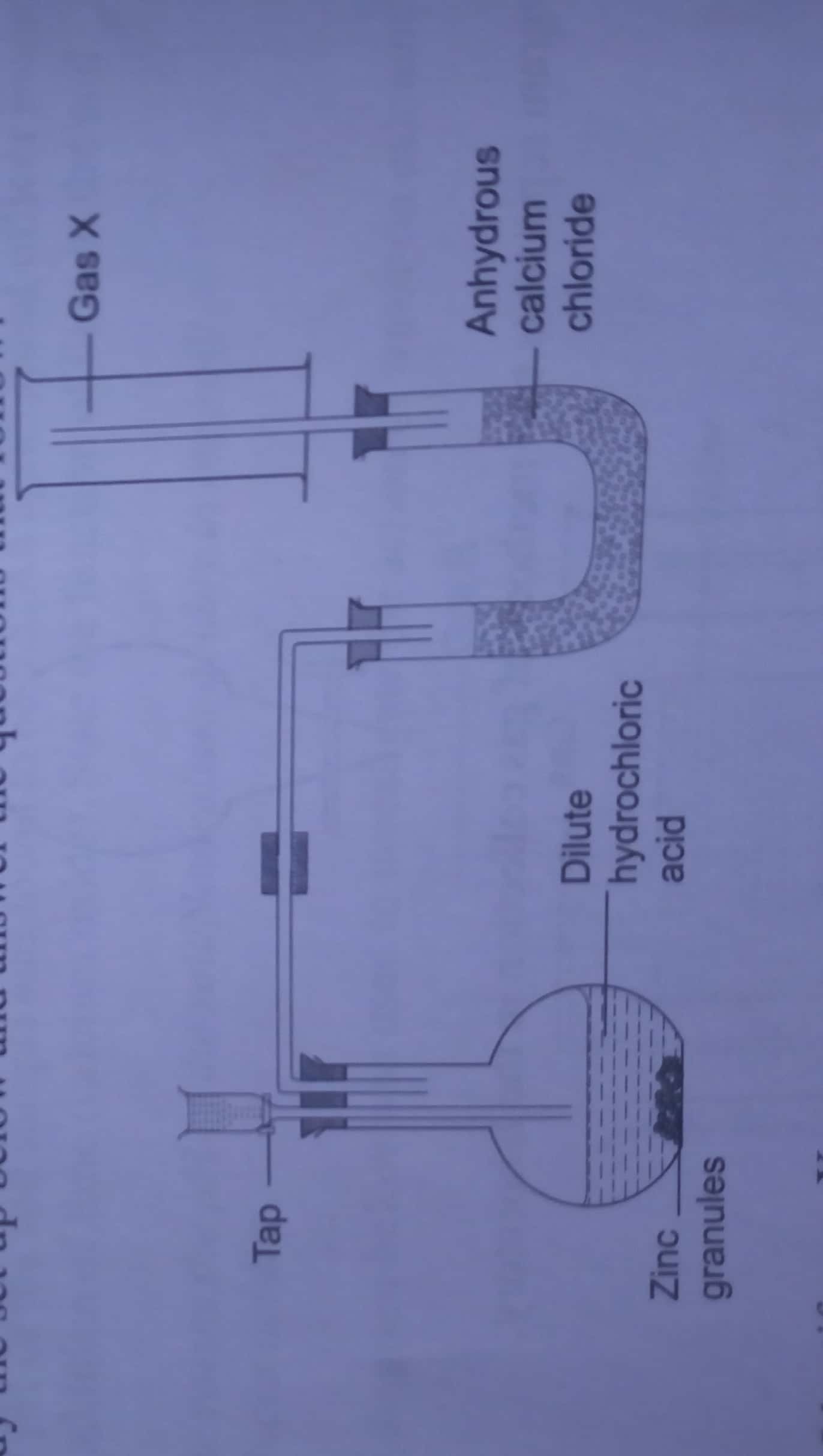
1. At the cathode (1mrk)

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1. At the anode (1mrk)

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12. Study the set up below and answer the questions that follow



1. Identify gas X (1mrk)

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1. Write a chemical equation for the reaction liberating gas X (1mrk)

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1. Why is it not advisable to use calcium in this method of preparing gas X? (2mrks)

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1. Give the use of anhydrous calcium chloride in the U-tube (1mrk)

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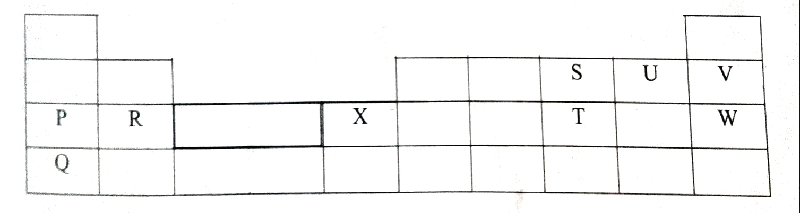
1. Name another substance that could serve the same purpose as anhydrous calcium chloride (1mrk)

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1. Name the method used to collect gas X (1mrk)

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13. The grid below shows part of the periodic table. Use it to answer the questions that follow.



1. Which of the elements has the largest atomic radius? Explain (2mrks)

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1. Identify the most reactive metal. Explain (2mrks)

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1. Name the chemical family to which P and Q belong. (1mrk)

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1. Compare the atomic radius of S and U. Explain (2mrks)

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1. Select an element that does not form an ion. Explain (2mrks)

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1. Give the formula of one stable cation with an electron arrangement of 2.8.8 (1mrk)

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14.a) Define the term isotope (1mrk)

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b.)Chlorine gas has a relative atomic mass of 35.5. It is made up of two isotopes 3517CL and 3717CL. Determine the relative abundance of each isotope in the chlorine gas. (3mrks)

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15. Write a balanced equation for the decomposition of the following solids (3mrks)

1. PbCO3(s) HEAT

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1. Na2CO3. 10H2O(s) HEAT

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1. KNO3(s) HEAT

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16. Though Sodium and aluminium are in the same period and are both metals, aluminium is a better conductor of electricity. Explain (2mrks)

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17.(a) List any three uses of oxygen gas` (3mrks)

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(b) State the conditions necessary for rusting. (2Mrks)

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