

TIME: 1HR 20 MIN

INSTRUCTIONS

- Answer all questions in the spaces provided

- All working must be clearly shown.

1. Explain how you would obtain a pure Ammonium chloride from a mixture of Lead sulphate and Ammonium chloride. (3mks)

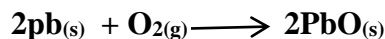
- Place the mixture into a beaker and cover with a watch glass containing cold water.

- Heat the mixture gently. Ammonium chloride will dissociate gently. Ammonium chloride will dissociate into NH_3 and HCl that will recombine to form NH_4Cl .

2. State and explain the changes in mass that occur when the following are heated separately in open crucibles. Write a chemical equation for each reaction.

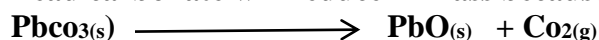
a) Lead metal. (2mks)

- Lead metal will increase in mass because of combines in oxygen from air.



b) Lead carbonate. (3mks)

- Lead carbonate will reduce in mass because of decomposes to lead oxide and carbon(iv) oxide.



3. Explain why a mixture of copper (II) oxide and magnesium reacts when heated while there is no reaction when a mixture of copper and magnesium oxide is heated. (3mks)

- Mg has a higher affinity for combined oxygen than copper hence removes oxygen from the CuO .
Cu is below Mg in the reactivity series hence cannot reduce MgO .

4. An element x has an electronic configuration of 2. 8. 5.

i) State the period and group which the element belongs. (2mks)

- Period 3, group V

ii) Write the formula of the most stable ion formed when element x ionizes. (1mk)

- X^{3-}

iii) Explain the difference between the atomic radius of element x and its ionic radius. (2mks)

-the ionic radius is larger because of the electron- electron repulsion between the existing electrons and the added electron.

5. (i) Explain why the metals such as Magnesium and Aluminum are good conductors. (2mks)

- They have delocalized electrons

(ii) State two reasons why Aluminum is preferred to Magnesium for making cooking pans. (2mks)

- Al has more delocalized electrons than Mg

- Al has a coat of Oxygen

6. Define the following terms:

- (i) Atomic Number (1mk)
 - **The number of protons in the nucleus of an atom**
- (ii) Mass Number (1mk)
Sum of protons and neutrons in an atom of an element.
- (iii) The Isotopes (1mk)

These are atoms of the same element having the same atomic number but different mass number

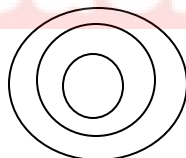
- (iv) Ionization energy (1mk)
Minimum energy required to remove an electron from the outermost energy level of an atom in the gaseous state.
- (v) Electron affinity. (1mk)
Refers to the ability of an atom to gain an electron in a gaseous state.

7. Atoms of element x exist as ${}^{14}_6\text{X}$ and ${}^{12}_6\text{X}$

- (a) What name is given to the two types of atoms. (1mk)

Isotope

- (b) Use dot (.) and (x) diagrams to illustrate the atomic structure of x. (2mks)



x

- (c) Write the electron configuration of the atom in (b) hence write the formula of the compound formed when it combines with oxygen (O=8) (2mks)

X 2.4
X xO₂

8. The following table gives a summary of some properties of elements P, Q, R and S. the letters do not represent the actual symbols of the elements. Study the table and answer the question that follows.

element	Electron arrangement	valency
P	2.2	2
Q	2.7	1
R	2.8.2	2
S	2.8.8.2	2

- | | | |
|--|--|--|
| | | |
|--|--|--|
- a) Which two elements have similar chemical properties? Explain. (2mks)
P R & S. They have some No. of electrons in their outermost energy level.
- b) What is the most likely formula of a carbonate of S ? (1mk)



- c) (i) Identify the element which is a non-metal. (1mk)
Q

(ii) With an explanation, state the family and period to which the element in (i) belong. (3mks)
Halogens, has seven electrons in outermost energy level, period 2 has two occupied energy levels

9. (a) What is meant by chemical family of elements. (1mk)
They are elements in the periodic table with the same number of electrons on the outermost energy level that predicts physical and chemical properties.

(b) Explain the following observations. (2mks)
 (i) Atomic radii generally decrease across a period.
There is an increase in the nuclear charge across the period due to an increase in the no. of protons

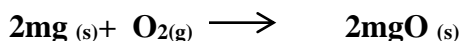
(ii) Melting points increase from sodium to Aluminium in the third period. (2mks)

Aluminium has a small size, the packing of the atoms is closer than in sodium due to an increased nuclear charge attractions

- (iii) Sodium is more reactive than magnesium. (2mks)
 - **Na has low ionization energy than Mg**
 - **Na reacts by losing one electron while Mg reacts by two electrons**
- (iv) Chlorine is more reactive than sulphur (2mks)
 - **Cl reacts by gaining one electron while sulphur reacts by gaining 2 electrons**
 - **Chlorine has a higher electron affinity than sulphur since both are non-metals**

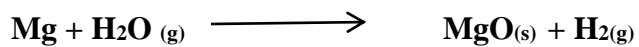
10. Write equations for the following reactions

- a) Burning magnesium in air.

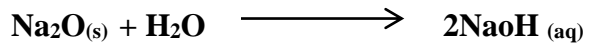


- b) Reaction of

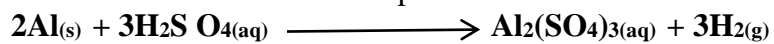
i) Magnesium with steam



ii) Sodium oxide with water M



iii) Aluminium with dilute sulphuric acid



iv) Sulphur with oxygen

