

ANSWER QUESTION 1 AND FOUR (4) OTHER QUESTIONS TWO (2) FROM EACH OF THE SECTIONS "A" AND "B". EACH QUESTION CARRIES 20 MARKS

1. (a) Define

(i) Ionization energy.

(ii) Electronegativity.

(iii) Effective nuclear charge

(iv) electron shielding

(v) Inert pair effect

[5 × 2 marks]

(b) Describe why many s-block elements can give characteristic flame colours in the flame test.

[4 marks]

(c) (i) Give the properties that make d-block elements good construction materials.

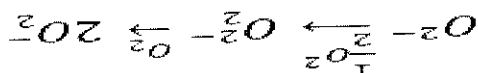
[3 marks]

(iii) Give the property of transition metals that makes alloying common.

[3 marks]

SECTION A: ANSWER TWO QUESTIONS FROM THIS SECTION

2. a) Relationship between three oxides that can be formed by Group 1 elements is given below



(i) Give the names and general formulae of the 3 oxides that Group 1 elements can form

[6 marks]

(ii) Explain why other elements in group 1 can form the other types of oxides.

[2 marks]

(b) Arrange the ions K^+ , Cl^- , Ca^{2+} , and S^{2-} in order of decreasing size, clearly stating your reasons

[5 marks]

(iv) Suggest the colour of BrCl. [1 mark]

(iii) By considering your answers to (a) and (b), predict the physical state of BrCl at room temperature. Explain your answer. [3 marks]

Interhalogen compounds like BrCl have similar properties to the halogens.

(ii) What observations are made in each reaction? [3 marks]

(c) (i) With the aid of equations, explain how concentrated sulphuric acid reacts with NaCl, NaBr and NaI. Explain how the reaction for NaCl differ from that of NaBr and NaI? [5 marks]

(b) Describe the trend in colour and physical state of chlorine, bromine and iodine at ordinary temperature. [4 marks]

(a) Explain the trends in the melting points of the elements shown above. [3 marks]

element	melting point
Chlorine	-101
bromine	-7
iodine	114

4. The elements in Group VII show trends in physical and chemical properties.

3. Hydrogen can be classified as Group 1, 4 and 7. Outline the chemistry of hydrogen that makes it typical and unlike Group 1, 4 and 7 elements. [20 marks]

(d) Fluorine has unusual characteristics compared to Cl₂, Br₂ and I₂. Explain why fluorine can only form one covalent bond in compounds whilst other group members show multiple covalencies and the F-F bond is unexpectedly weak. [5 marks]

(c) Suggest reasons why the reaction of lithium with water is less vigorous than those of sodium and potassium. [2 marks]

(d) Name any application of chlorine. [1 mark]

SECTION B: ANSWER TWO QUESTIONS FROM THIS SECTION

5.(a) Define the term transition element. [2 marks]

(b) State **three** general characteristics of a transition element or its compounds. [3 marks]

(c) Give a brief explanation on the origin of colour in transition elements. [6 marks]

(d) Explain why although zinc is a d-block element, it is not considered to be a transition element. [2 marks]

(e) Write electronic configurations of the Cu and Ni^{2+} . [4 marks]

(f) Explain why transition elements can act as catalysts. [3 marks]

6. (a) Discuss and compare the patterns in oxidation state, oxide acidity, and hydride and halide structures for group 4 and 5. [15marks]

(b) Write down the electronic structure of sulphur. [2 marks]

(c) Explain why the melting point of sulphur is higher than that of chlorine. [2 marks]

(d) Nitrogen dioxide dissolves in water, in the presence of oxygen to produce nitric acid. Write a balanced equation for the reaction. [1 mark]

7. (a) Explain why hydrogen has only one proton, but its 1st IE is much greater than that of lithium, which has three protons. [3 marks]

(b) Explain the metallic character of group 3 elements. [4 marks]

(c) Discuss the trends of Group 6 hydrides using the following subheadings

(i) Reducing character. [3 marks]

(ii) Thermal stability. [3 marks]

(d) Explain why certain elements in the Periodic Table are classified as p-block elements. Illustrate your answer with an example of a p-block element and give its electronic configuration. [3 marks]

(e) The Ne atom and the Mg^{2+} ion have the same number of electrons. Give two reasons why the first ionisation energy of neon is lower than the third ionisation energy of magnesium. [4 marks]

*****END OF EXAMINATION*****