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VCE Chemistry ½
Trends in the Periodic Table [1.2]
Homework

Homework Outline:

Compulsory Questions	Pg 2 – Pg 9
Supplementary Questions	Pg 10 – Pg 18

Section A: Compulsory Questions (45 Marks)

Sub-Section: Explain why the Periodic Table is arranged the way it is, with respect to Blocks, Periods and Groups

Question 1 (5 marks)

Fill in the following information about the periodic table.

a. What are the rows called? (1 mark)

_____

b. What are the columns called? (1 mark)

_____

c. For the following elements, state the block that they are in.

i. Fe. (1 mark)

_____

ii. Cl. (1 mark)

_____

iii. Be. (1 mark)

_____

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Question 2 (2 marks)

Explain why the periodic table includes the following, with references to shells and subshells:

a. Eight elements in the second period. (1 mark)

_____

_____

b. Two elements in the first period. (1 mark)

_____

_____

Question 3 (4 marks)

a. Explain why Helium isn't considered a group 2 element given the amount of valence electrons it has. (2 marks)

_____

_____

b. Explain the Octet Rule. (2 marks)

_____

_____

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Sub-Section: Explain what the terms 'Electronegativity', 'Atomic Radius', 'First Ionisation Energy', 'Metallic Character', and 'Non-Metallic Character' mean, and explain how they Vary across a Period and down a Group

Question 4 (4 marks)

For each of the following sets, rank them in terms of increasing the first ionisation energy.

a. Rb, I, Sn. (1 mark)

_____

b. Si, Na, Cl. (1 mark)

_____

c. Ca, Br, As. (1 mark)

_____

d. F, Li, B. (1 mark)

_____

Question 5 (4 marks)

a. Explain what First Ionisation Energy is. (1 mark)

_____

_____

b. State whether Silicon or Sulfur is more likely to have a higher first ionisation energy. (1 mark)

_____

_____

c. Explain whether lithium or oxygen is more likely to have a lower first ionisation energy. (2 marks)

Question 6 (3 marks)

Explain why noble gases have the highest first ionisation energy out of any element in a period.

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Sub-Section: Find the Effective Nuclear/Core Charge of an Element, explain how it Varies Across a Period and Down a Group, and Apply it to other Trends Observed in the Periodic Table

Question 7 (5 marks)

a. Define effective nuclear charge. (1 mark)

_____

b. For the following, state their effective nuclear charges:

i. Phosphorus. (1 mark)

_____

ii. Strontium. (1 mark)

_____

iii. Selenium. (1 mark)

_____

c. Now, rank these elements in terms of decreasing first ionisation energy. (1 mark)

_____

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Question 8 (3 marks)

Explain whether Calcium or Arsenic is more likely to have a lower first ionisation energy, making sure to include an effective nuclear charge.

Question 9 (4 marks)

a. Going across the periodic table, the numbers of protons and electrons increase. What happens to the relative size of the atoms? (2 marks)

b. Going down a group, explain what happens to the effective nuclear charge and the atomic radius of the elements. (2 marks)

Sub-Section: Final Boss

Question 10 (11 marks)

Our understanding of how elements behave and their properties have led us to classify them systematically into what we refer to as the periodic table.

a. Explain how the periodic table is divided into blocks. (2 marks)

_____

_____

b. How does the effective nuclear charge of an atom change when we go:

i. Across the period. (1 mark)

_____

ii. Down a group. (1 mark)

_____

c. Explain how first ionisation energy is related to the effective nuclear charge. (2 marks)

_____

_____

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_____

d. Thus, compare the first ionisation energies between an atom of Magnesium and Fluorine. (3 marks)

_____

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e. Why do noble gases tend to have the highest first ionisation energies? (2 marks)

_____

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Section B: Supplementary Questions (45 Marks)

Sub-Section: Explain why the Periodic Table is arranged the way it is, with respect to Blocks, Periods and Groups

Question 11 (2 marks)

State how valence electrons of an atom of nitrogen can be found by using the periodic table only.

_____

_____

Question 12 (3 marks)

Consider the element of Rubidium.

a. State what block it is in and why. (2 marks)

_____

_____

_____

b. Write its condensed Schrödinger electronic configuration. (1 mark)

_____

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Question 13 (3 marks)

Consider the element of Potassium, by only using the location of the following elements on the periodic table, state the following:

a. Number of electron shells it has. (1 mark)

_____

b. Number of valence electrons it has. (1 mark)

_____

c. Subshell of highest energy it has. (1 mark)

_____

Question 14 (4 marks)

The periodic table is required for a fundamental understanding of how elements work because their arrangement is intentional.

a. Briefly explain why the noble gases are the way they are. (2 marks)

_____

_____

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_____

b. Based on your answer to the above, what groups should be the most unstable in the periodic table? (2 marks)

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Sub-Section: Explain what the terms 'Electronegativity', 'Atomic Radius', 'First Ionisation Energy', 'Metallic Character', and 'Non-Metallic Character' mean, and explain how they Vary Across a Period and Down a Group

Question 15 (3 marks)

For each of the following sets, rank them in terms of increasing atomic radius.

a. Mg, S, Si. (1 mark)

_____

b. K, Al, P. (1 mark)

_____

c. Cl, Br, F. (1 mark)

_____

Question 16 (3 marks)

a. Define electronegativity. (1 mark)

_____

_____

b. Compare the electronegativity of oxygen and nitrogen. (2 marks)

_____

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Question 17 (4 marks)

a. Explain what is meant by the term 'metallic character'. (2 marks)

_____

_____

b. Explain why elements on the left side of the periodic table tend to have higher metallic character on the right side. (2 marks)

_____

_____

_____

_____

Question 18 (5 marks)

Comparing the different properties that each landlord has important step toward becoming an adult.

a. Define atomic radius. (1 mark)

_____

_____

b. Explain what happens to the atomic radius of an atom as we go:

i. Across the period. (2 marks)

_____

_____

_____

ii. Down the group. (2 marks)

_____

_____

_____

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Sub-Section: Find the Effective Nuclear/Core Charge of an Element, explain how it Varies Across a Period and Down a Group, and Apply it to other Trends Observed in the Periodic Table

Question 19 (3 marks)

a. Define 'core charge'. (1 mark)

_____

b. For the following, state their effective nuclear charges:

i. Aluminium. (1 mark)

_____

ii. Chlorine. (1 mark)

_____

Question 20 (3 marks)

Explain how the concept of effective nuclear charge for the trend in electronegativity across a period.

_____

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Question 21 (5 marks)

a. Compare the effective nuclear charge of sodium and sulfur. Which one has a higher value? (1 mark)

_____

b. Explain why sulfur has a smaller atomic number than sodium, even though sulfur has more electrons. (2 marks)

_____

_____

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_____

c. Based on the above, predict which element, sodium or sulfur, has higher electronegativity and explain your answer. (2 marks)

_____

_____

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_____

Question 22 (6 marks)

The effective nuclear charge provides the essential understanding of why elements are more stable than others, in relation to their properties.

a. Explain shielding and why elements in the same groups have similar effective nuclear charge. (2 marks)

_____

_____

_____

_____

b. Explain why effective nuclear charge doesn't increase a lot down a group, even though a whole new shell is added. (2 marks)

_____

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c. Discuss how effective nuclear charge influences the trend in the first ionisation as you move through the period or the group. (2 marks)

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