3.1 The Periodic Table & Periodic Trends

Question Paper

Course	DP IB Chemistry
Section	3. Periodicity
Topic	3.1 The Periodic Table & Periodic Trends
Difficulty	Easy

Time allowed: 40

Score: /30

Percentage: /100

Question 1a

a)
Define the term *first ionisation energy* and state what is meant by the term *periodicity*.

[1 mark]

Question 1b

b)
Distinguish between the terms *group* and *period*.

[1 mark]

Question 1c

c)
State the property that determines the order in which elements are arranged in the periodic table.

[1 mark]

Question 1d

d)
State the relationship between the electron arrangement of an element and its group and period in the periodic table.

[2 marks]

Question 2a

a)
Explain the following statement.

The first ionisation energy of potassium is smaller than the first ionisation energy of calcium.

[2 marks]

Question 2b

b)
Explain the following statement.

The first ionisation energy of potassium is larger in value than rubidium

[2 marks]

Question 2c

c)
Using section 8 of the data booklet, explain the trend of decreasing electronegativity values of the Group 17 elements from F to I.

[3 marks]

Question 2d

d)
Define the term *electronegativity*.

[1 mark]

Question 3a

a)
Define what is meant by the term *electron affinity.*

[1 mark]

Question 3b

b)
State whether first electron affinity is an exothermic or endothermic process.

[1 mark]

Question 3c

c)
Write an equation, including state symbols, for the first electron affinity of bromine.

[2 marks]

Question 3d

d)
State whether the first electron affinity of I is more or less exothermic than Br.

[1 mark]

Question 4a

a)
An element has the following electron configuration.

$1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^{10}\,4s^2\,4p^4$

i)
State which block of the periodic table the element is in.

ii)
State how many electrons it has in its outer shell.

[2 marks]

Question 4b

b)
Magnesium can be ionised to form a cation, Mg^+.

i)
Write the electron configuration of an Mg^+

ii)
Define the term '*first ionisation energy*' in relation to magnesium.

[3 marks]

Question 4c

c)
The periodic table can be divided into blocks.

State why are silicon, carbon, oxygen and chlorine all classified as p-block elements.

[1 mark]

Question 4d

d)
This question is about the periodicity of period 3 elements.

i)
State the trend in atomic radius across period 3.

ii)
State the general trend in first ionisation energies across period 3.

[2 marks]

Question 5a

a)
Antimony, Sb, has atomic number 51.

Using section 6 of the data booklet, complete the table to show where antimony is found in the periodic table.

Period	Block

[1 mark]

Question 5b

b)
Identify the element that is in the d-block of the periodic table which forms a 3+ ion with the following electron configuration.

$[Ar]\ 3d^3$

[1 mark]

Question 5c

c)
Ionisation energies can provide evidence for electron structure.

Write an equation, including state symbols, for the first ionisation energy of chlorine.

[1 mark]

Question 5d

An element Y has the following six first ionisation energies in kJ mol^{-1}. These are shown in the table below.

	1st	2nd	3rd	4th	5th	6th
Ionisation energy (kJ mol^{-1})	577	1820	2740	11 600	14 800	18 400

d)
State what group of the periodic table this element belongs to.

[1 mark]