



IB Chemistry – HL

Topic 2 Questions

1. What is the electron configuration for an atom with $Z = 22$?

- A. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4$
- B. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4p^2$
- C. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4p^2$
- D. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$

(Total 1 mark)

2. What is the total number of p orbitals containing one or more electrons in germanium (atomic number 32)?

- A. 2
- B. 3
- C. 5
- D. 8

(Total 1 mark)

3. How many electrons are there in **all** the d orbitals in an atom of xenon?

- A. 10
- B. 18
- C. 20
- D. 36

(Total 1 mark)

4. Which is correct about the element tin (Sn) ($Z = 50$)?

Number of electrons in highest main energy level	Number of main energy levels containing electrons
4	4
14	4
4	5
14	5

- A.
- B.
- C.
- D.

(Total 1 mark)



5. What is the total number of electrons in p orbitals in an atom of iodine?

- A. 5
- B. 7
- C. 17
- D. 23

(Total 1 mark)

6. A transition metal ion X^{2+} has the electronic configuration $[\text{Ar}]3d^9$. What is the atomic number of the element?

- A. 27
- B. 28
- C. 29
- D. 30

(Total 1 mark)

7. How many orbitals are there in the $n = 3$ level of an atom?

- A. 3
- B. 5
- C. 7
- D. 9

(Total 1 mark)

8. What is the electron configuration for the copper(I) ion, ($Z = 29$)?

- A. $[\text{Ar}]4s^23d^9$
- B. $[\text{Ar}]4s^13d^{10}$
- C. $[\text{Ar}]4s^13d^9$
- D. $[\text{Ar}]3d^{10}$

(Total 1 mark)

9. (i) State the full electron configuration for argon.

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(1)

(ii) Give the formulas of **two** oppositely charged ions which have the same electron configuration as argon.



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(2)

(Total 3 marks)

10. (a) Use the Aufbau principle to write the electron configuration of an atom of germanium.

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(1)

- (b) The successive ionization energies of germanium are shown in the following table:

5 th	4th	3rd	2nd	1 st	
8950	4390	3300	1540	760	Ionization energy / kJ mol ⁻¹

- (i) Identify the sub-level from which the electron is removed when the first ionization energy of germanium is measured.

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(1)

- (ii) Write an equation, including state symbols, for the process occurring when measuring the second ionization energy of germanium.

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(1)

- (iii) Explain why the difference between the 4th and 5th ionization energies is much greater than the difference between any two other successive values.

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(2)

(Total 5 marks)

11. (i) Explain why successive ionization energies of an element increase.

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(1)

- (ii) Explain how successive ionization energies account for the existence of three main energy levels in the sodium atom.

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(3)
(Total 4 marks)