

The periodic table [15 marks]

1. [Maximum mark: 1]

Which statements are correct regarding the organization of elements in the periodic table?

I. Elements with atomic numbers 4, 12 and 20 have atoms with the same number of energy levels occupied with electrons.

II. Elements with atomic numbers 9, 17 and 35 have atoms with the same number of electrons in the outer shell.

III. The periodic table is divided into blocks based on the sub-levels occupied by electrons.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

[1]

2. [Maximum mark: 1]

Which configuration is that of a transition metal atom in its ground state?

A. $[\text{Ne}]3s^23p^6$

B. $[\text{Ar}]3d^9$

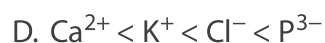
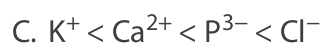
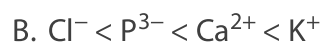
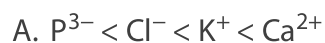
C. $1s^22s^22p^63s^23p^64s^23d^{10}4p^2$

D. $[\text{Ar}]4s^13d^5$

[1]

3. [Maximum mark: 1]

Which set of ions shows **increasing** ionic radii?



[1]

4. [Maximum mark: 1]

Which of the following can be used to determine the group of an element in the periodic table?

I. successive ionization energies

II. electron configuration

III. number of occupied energy levels

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

[1]

5. [Maximum mark: 1]

What is the oxidation state of cobalt in the complex ion $[\text{CoCl}_4(\text{NH}_3)_2]^-$?

- A. +2
- B. +3
- C. +5
- D. +6

[1]

6. [Maximum mark: 1]

Which change represents electron affinity?

- A. $\text{O}_2(\text{g}) \rightarrow 2\text{O}(\text{g})$
- B. $\text{O}(\text{g}) \rightarrow \text{O}^+(\text{g}) + \text{e}^-$
- C. $2\text{O}(\text{g}) + \text{e}^- \rightarrow \text{O}_2(\text{g})$
- D. $\text{O}^-(\text{g}) + \text{e}^- \rightarrow \text{O}^{2-}(\text{g})$

[1]

7. [Maximum mark: 1]

In which species is the oxidation state of chromium different?

- A. $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$
- B. $[\text{Cr}(\text{H}_2\text{O})_3(\text{OH})_3]$
- C. $[\text{Cr}(\text{NH}_3)_6]^{3+}$

D. CrO_3

[1]

8. [Maximum mark: 3]

(a) State the electron configuration of sulfur, S.

[1]

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(b) State a physical property of sulfur which supports its classification as a non-metal element.

[1]

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(c) Suggest a balanced equation for the reaction of an oxide of sulfur with water.

[1]

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9. [Maximum mark: 1]

Which factor generally increases when first ionization energy increases?

A. Atomic radius

B. Electronegativity

C. Metallic character

D. Nuclear charge

[1]

10. [Maximum mark: 1]

The periodic table provided shows 118 elements. Which group of elements would a new element with atomic number 119 be most similar to?

A. Alkali metals

B. Halogens

C. Lanthanoids and actinoids

D. Noble gases

[1]

11. [Maximum mark: 1]

Which group of elements have the most similar atomic radii?

A. Li, Be, B, C

B. Fe, Co, Ni, Cu

C. K, Ca, Br, Kr

D. Ne, Ar, Kr, Xe

[1]

12. [Maximum mark: 1]

Which elements are considered to be metalloids?

I. Gallium

II. Germanium

III. Arsenic

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

[1]

13. [Maximum mark: 1]

Which property of elements increases down a group but decreases across a period?

- A. Atomic radius
- B. Electronegativity
- C. Ionic radius
- D. Ionization energy

[1]