

APOLLO

The periodic table: Classification of elements

HL

Chemistry

First assessment 2025

18 questions | questions

14. Germanium has several stable oxidation states. Which row shows these species in order of increasing radius?

A. Ge^{4+} , Ge^{2+} , Ge , Ge^{4-} .

B. Ge^{4-} , Ge^{4+} , Ge^{2+} , Ge .

C. Ge , Ge^{4-} , Ge^{4+} , Ge^{2+} .

D. Ge^{2+} , Ge , Ge^{4-} , Ge^{4+} .

- 15.** Which statement explains the trend in first ionisation energy from sodium, Na, to chlorine, Cl?
- A. Nuclear charge increases.
 - B. Electronegativity decreases.
 - C. Atomic radius increases.
 - D. Shielding decreases.

16. Which elements would react with each other most vigorously?

- A. K(s) and Br₂(g).
- B. K(s) and Cl₂(g).
- C. Na(s) and Br₂(g).
- D. Na(s) and Cl₂(g).

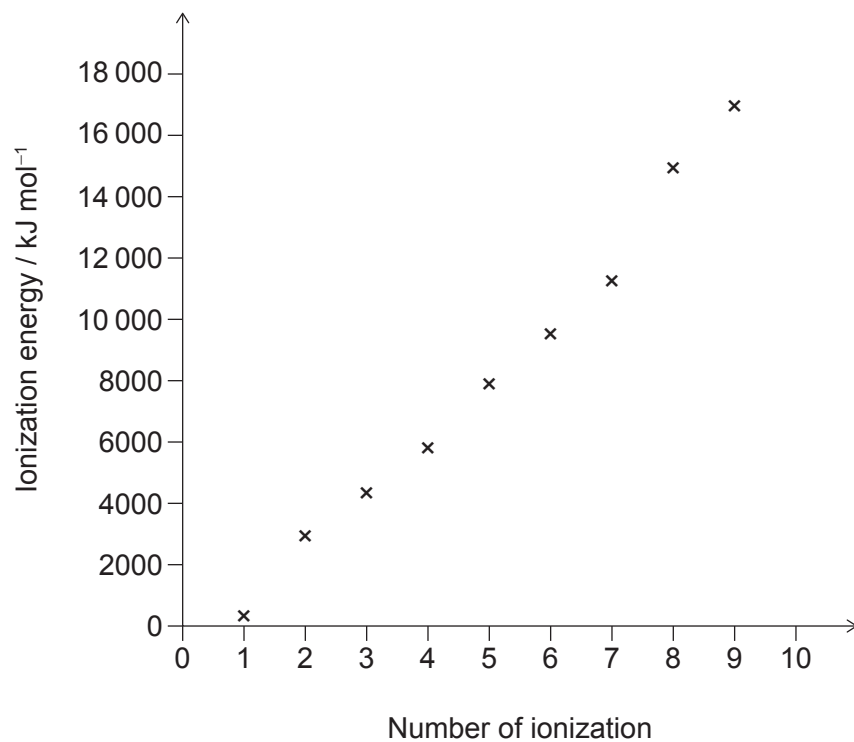
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2225-0201

18. Which statement explains why transition elements have variable oxidation states?

- A. d-Electrons are delocalized.
- B. All have a +2 oxidation state.
- C. They can accept electron pairs from ligands.
- D. Successive ionization energies are close in value.

4. What is the group number of the element whose successive ionization energies are shown?



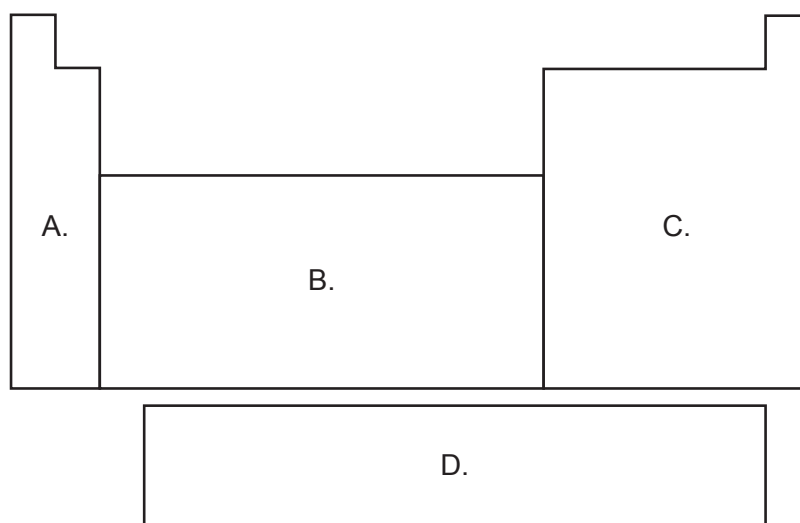
- A. 1
- B. 2
- C. 13
- D. 14

- 12.** Why do group 17 elements have higher first ionization energies than group 1 elements in the same period?
- A. Group 17 elements have more electrons in the valence shell.
 - B. Group 17 elements have more filled energy levels.
 - C. Group 17 elements have more paired electrons.
 - D. Group 17 elements have more protons in the nucleus.

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2225-0213

13. Which part of the periodic table contains elements which are likely to form acidic oxides only?



15. Which properties are typical of transition elements?

- I. Low melting points
 - II. Formation of coloured compounds
 - III. Variable oxidation states
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- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

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Turn over
2225-0213

12. Which of these elements is in the f-block of the periodic table?

- A. Ra
- B. Lu
- C. Rf
- D. Nh

14. Which pair of elements would react with each other the least vigorously?

- A. Lithium and fluorine
- B. Lithium and iodine
- C. Caesium and fluorine
- D. Caesium and iodine

15. Which statement is correct for the group 17 elements from fluorine to iodine?

- A. The elements become more volatile.
- B. The hydrides of the elements become more acidic.
- C. The elements become more reactive.
- D. The bond between the halogen atoms becomes less polar.

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Turn over
0020-0207

12. Which element is a p-block metal?

- A. Sn
- B. Te
- C. Cd
- D. At

14. Which oxide is the most basic?

- A. MgO
- B. Al_2O_3
- C. SiO_2
- D. SO_3

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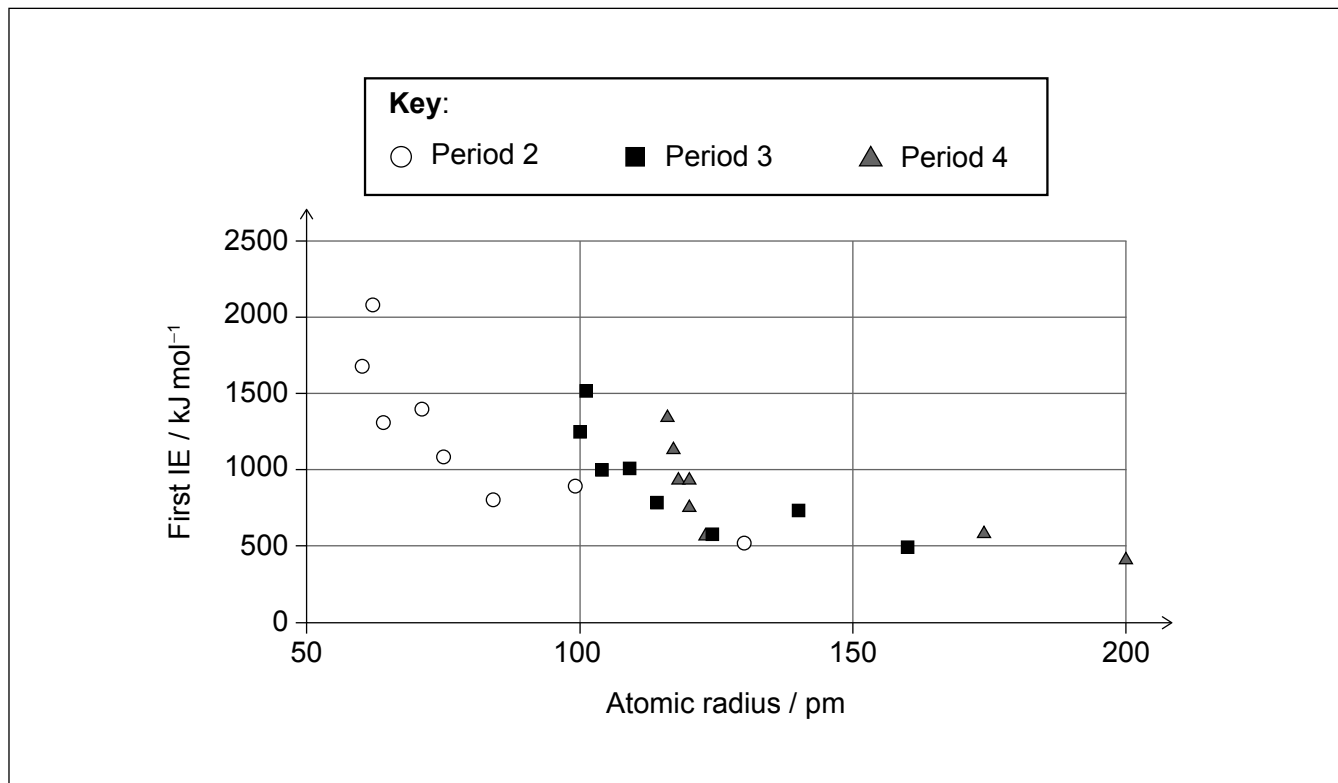
Turn over

0020-0219

Section B

Answer **all** questions. Answers must be written within the answer boxes provided.

1. The graph shows the variation of the first ionization energy with atomic radius for periods 2, 3 and 4 of the periodic table, with the d-block elements omitted.



- (a) Annotate the graph with an additional data point, marked with a cross (X), for scandium. Use sections 9 and 10 of the data booklet. [1]

- (b) Suggest why there might be a link between the two variables in the graph. [1]

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(Question 1 continued)

(c) The graph shows a relationship between first ionization energy and atomic radius.

(i) State the type of relationship between the variables. [1]

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(ii) Compare and contrast the trends shown by the different periods. [2]

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**Turn over**

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3. The table lists successive ionization energies of an element **Z**.

ionization number	1st	2nd	3rd	4th	5th	6th
ionization energy / kJ mol^{-1}	577.54	1816.68	2744.78	11 577.5	14 841.9	18 379.0

Which is the formula of the stable oxide of the element **Z**?

- A. Z_2O
- B. ZO
- C. Z_2O_3
- D. ZO_2

13. Why is copper(II) sulfate blue?

- A. Red light is absorbed when electrons are promoted between the orbitals in the split d-sublevels.
- B. Blue light is emitted when electrons fall between the orbitals in the split d-sublevels.
- C. Red light is absorbed when electrons fall between the orbitals in the split d-sublevels.
- D. Blue light is emitted when electrons are promoted between the orbitals in the split d-sublevels.

15. The block structure of the periodic table groups elements according to which characteristic?

- A. atomic number
- B. atomic mass
- C. electron configuration
- D. reactivity

Turn over

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16. Which d block element has the highest number of different oxidation states?

- A. Ti
- B. Mn
- C. Cu
- D. Zn