

1 Which of these statements is **incorrect**?

- A The atomic radius of metals increases down a Group.
- B The trend in the melting temperature of successive elements across Period 2 is similar to that in Period 3.
- C A metallic structure is held together by attractions between metal atoms and delocalized electrons.
- D Na^+ and O^{2-} ions are isoelectronic.

(Total for Question = 1 mark)

2 The electronegativities of four pairs of elements are given below. Which pair would form the compound with the greatest ionic character?

- A 0.7
- B 0.7
- C 1.0
- D 0.8

(Total for Question = 1 mark)

3 The nucleus of a ${}_{11}^{23}\text{Na}$ atom contains

- A 11 protons and 12 neutrons.
- B 11 protons and 12 electrons.
- C 23 protons and 11 neutrons.
- D 23 protons and 11 electrons.

(Total for Question = 1 mark)

- 4 The first five successive ionization energies of an element, **X**, are shown in the table below.

Ionization energy	first	second	third	fourth	fifth
Value / kJ mol ⁻¹	590	1100	4900	6500	8100

Which ion is **X** most likely to form when it reacts with chlorine?

- A **X**⁺
- B **X**²⁺
- C **X**³⁺
- D **X**⁴⁺

(Total for Question = 1 mark)

- 5 Which pair of atomic numbers represents elements which are both in the p-block of the Periodic Table?

- A 4,
- B 6,
- C 8,
- D 10,

(Total for Question = 1 mark)

6 The electronic structure of an atom of an element in Group 6 of the Periodic Table could be

- A $1s^2 2s^2 2p^2$
- B $1s^2 2s^2 2p^4$
- C $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$
- D $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6$

(Total for Question = 1 mark)

7 Which of the following formulae for compounds of germanium, Ge, is unlikely to be correct, given the position of germanium in the Periodic Table?

- A GeF_3
- B GeS_2
- C GeO_2
- D GeH_4

(Total for Question = 1 mark)

8 The electronic configurations of the atoms of four different elements are given below. For which element would you expect the value of the first ionization energy to be the largest?

- A $1s^1$
- B $1s^2$
- C $1s^2 2s^1$
- D $1s^2 2s^2$

(Total for Question = 1 mark)

9 Which of the following has the smallest ionic radius?

- A F^-
- B Na^+
- C Mg^{2+}
- D O^{2-}

(Total for Question = 1 mark)

10 Which of the following does **not** have exactly 10 electrons?

- A An ion of fluorine, F^-
- B A molecule of methane, CH_4
- C A molecule of nitrogen, N_2
- D An ion of sodium, Na^+

(Total for Question = 1 mark)

11 Which of the following statements is **true**?

- A** Calcium hydroxide is more soluble in water than magnesium hydroxide.
- B** Chlorine is more electronegative than fluorine.
- C** Iodine is a stronger oxidizing agent than bromine.
- D** The first ionization energy of barium is greater than that of strontium.

(Total for Question = 1 mark)

12 An isotope of an element, atomic number z , has mass number $2z + 4$. How many neutrons are in the nucleus of the element?

- A** $z + 4$
- B** $z + 2$
- C** z
- D** 4

(Total for Question = 1 mark)

13 When an Al^{4+} ion is formed from an Al atom, the fourth electron is lost from the

- A** 1s sub-shell.
- B** 2s sub-shell.
- C** 2p sub-shell.
- D** 3s sub-shell.

(Total for Question = 1 mark)

14 A molecule is

- A a group of atoms bonded by ionic bonds.
- B a group of atoms bonded by covalent bonds.
- C a group of ions bonded by covalent bonds.
- D a group of atoms bonded by metallic bonds.

(Total for Question 1 mark)

15 The relative atomic mass is defined as

- A the mass of an atom of an element relative to 1/12 the mass of a carbon-12 atom.
- B the mass of an atom of an element relative to the mass of a hydrogen atom.
- C the average mass of an element relative to 1/12 the mass of a carbon atom.
- D the average mass of an atom of an element relative to 1/12 the mass of a carbon-12 atom.

(Total for Question 1 mark)

16 The definition of the mole is

- A the amount of any substance which occupies a volume of 24 dm^3 at room temperature and pressure.
- B the amount of any substance containing the same number of identical entities as there are in exactly 12 g of the carbon-12 isotope.
- C the number of atoms in exactly 12 g of the carbon-12 isotope.
- D the number of molecules in exactly 2 g of hydrogen at room temperature and pressure.

(Total for Question 1 mark)

17 The first eight ionization energies of an element are (in kJ mol^{-1}):

789, 1577, 3232, 4356, 16091, 19785, 23787, 29253.

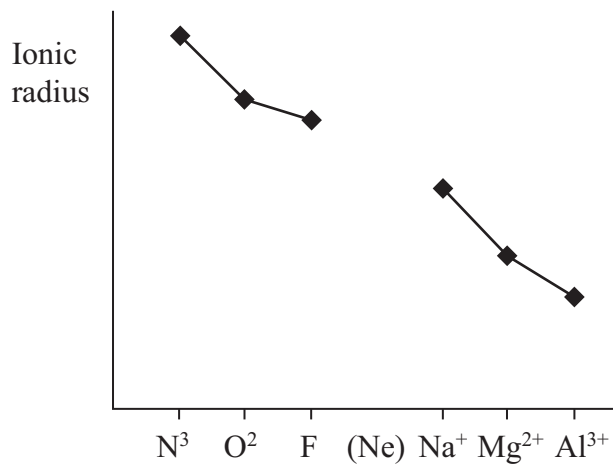
The element is in

- A Group 1
- B Group 2
- C Group 3
- D Group 4

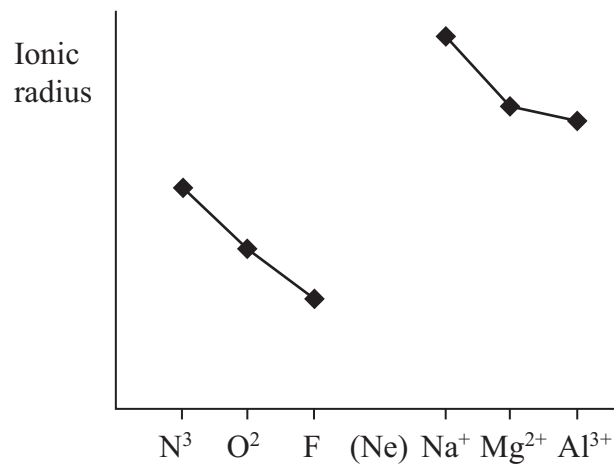
(Total for Question 1 mark)

18 Which of the graphs shows (from left to right) the trend in the ionic radius of the isoelectronic ions N^{3-} , O^{2-} , F^{-} , Na^{+} , Mg^{2+} , Al^{3+} ?

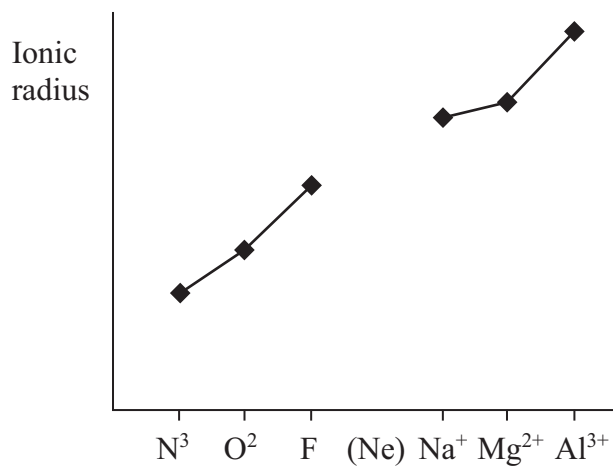
A



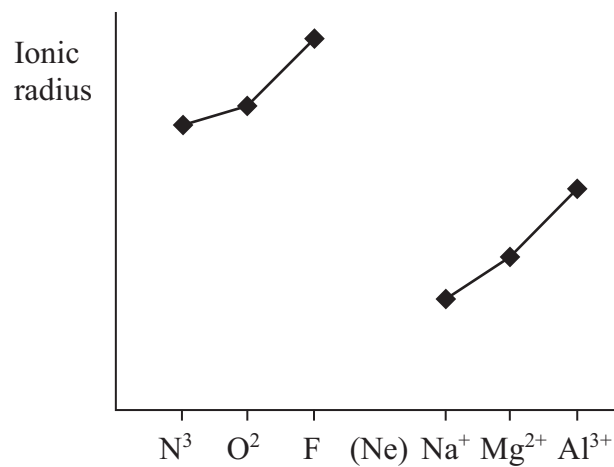
B



C



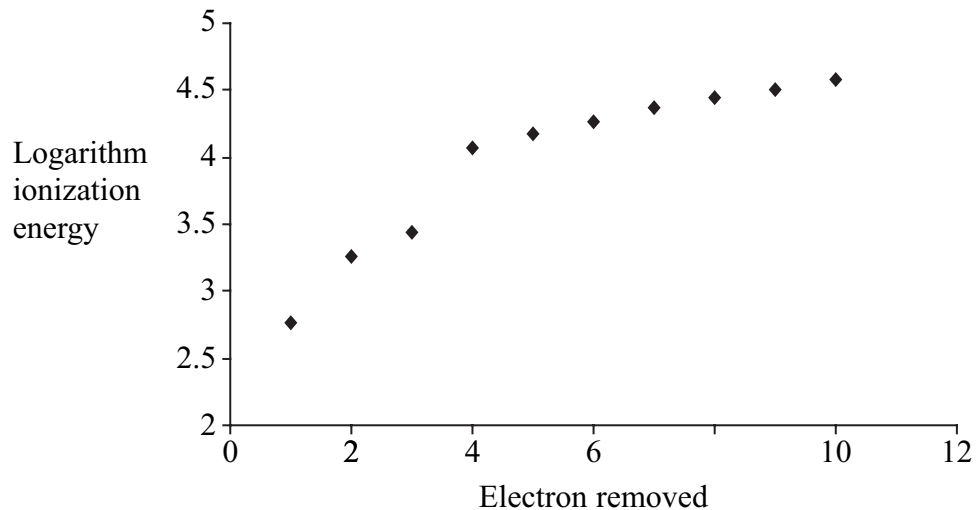
D



(Total for Question 1 mark)

19 The graph below represents the successive ionization energies of an element **X** plotted

against the number of the electron removed. **X** is not the symbol for the element.



(a) From this graph it is possible to deduce the group in the Periodic Table to which **X** belongs. **X** is in

(1)

- A** Group 1
- B** Group 3
- C** Group 5
- D** Group 7

(b) From the graph it is possible to deduce that the most stable ion of **X** will be

(1)

- A** X^{3+}
- B** X^+
- C** X
- D** X^3

(Total for Question 2 marks)