

1 Which of the following ions has the biggest radius?

- A S^{2-}
- B Cl^{-}
- C K^{+}
- D Ca^{2+}

(Total for Question = 1 mark)

2 The first five successive ionization energies for an element J, in kJ mol^{-1} , are

1st	2nd	3rd	4th	5th
738	1450	7733	10543	13630

The formula of the compound of chlorine with element J is

- A JCl
- B JCl_2
- C JCl_3
- D J_2Cl_3

(Total for Question = 1 mark)

3 Which of the following is the correct order of increasing melting temperature of elements of Period 3?

- A Na, Mg, Al, Si
- B Na, Mg, Si, Al
- C Si, Na, Mg, Al
- D Si, Al, Mg, Na

(Total for Question = 1 mark)

4 Which one of the following elements undergoes the change in electronic configuration shown when it forms the stated ion?

Atom $1s^22s^22p^63s^23p^3$

Ion $1s^22s^22p^63s^23p^6$

- A B to B^{3+}
- B Al to Al^{3+}
- C N to N^{3-}
- D P to P^{3-}

(Total for Question = 1 mark)

5 The chemical properties of an element are determined by its

- A electronic structure.
- B number of neutrons.
- C relative atomic mass.
- D number of protons plus neutrons.

(Total for Question = 1 mark)

6 A particle with a **single** positive charge and with the electronic configuration $1s^2 2s^2 2p^6$ is

- A a sodium ion.
- B a fluoride ion.
- C an oxide ion.
- D a potassium ion.

(Total for Question = 1 mark)

7 In which of the following electronic configurations are only two of the electrons unpaired?

- A $1s^2 2s^2$
- B $1s^2 2s^2 2p^3$
- C $1s^2 2s^2 2p^4$
- D $1s^2 2s^2 2p^5$

(Total for Question = 1 mark)

8 Which of the following ions has the **largest** ionic radius?

A F^-

B Mg^{2+}

C Na^+

D O^{2-}

(Total for Question = 1 mark)

9 Which of the following diagrams represents the electrons in the ground state of a boron atom?

	1s	2s	2p _x	2p _y	2p _z
<input type="checkbox"/> A	↑↓	↑↓	↑		
<input type="checkbox"/> B	↑	↑↓	↑	↑	
<input type="checkbox"/> C	↑↓	↑	↑		
<input type="checkbox"/> D	↑	↑			

(Total for Question = 1 mark)

10 Which of the following species contains the same number of electrons as neutrons?

- A ${}^{11}_5\text{B}$
- B ${}^{23}_{11}\text{Na}^+$
- C ${}^{24}_{12}\text{Mg}^{2+}$
- D ${}^{19}_9\text{F}^-$

(Total for Question = 1 mark)

11 For which of the following pairs of elements does the second have a **higher** 1st ionization energy than the first?

	First element	Second element
<input type="checkbox"/> A	Mg	Al
<input type="checkbox"/> B	N	O
<input type="checkbox"/> C	Ne	Na
<input type="checkbox"/> D	K	Na

(Total for Question = 1 mark)

12 In which of the following series of elements is there an **increase** in the melting temperatures from left to right?

- A Na Mg Al
- B Li Na K
- C B C N
- D Si P S

(Total for Question = 1 mark)

13 For barium, the third ionization energy is higher than the second ionization energy because

- A there is an increase in the number of protons.
- B there is an increase in the shielding.
- C the ionic radius is greater.
- D the electron being removed is closer to the nucleus.

(Total for Question = 1 mark)

14 Which pair of ions is isoelectronic?

- A Ca^{2+} and O^{2-}
- B Na^+ and O^{2-}
- C Li^+ and Cl^-
- D Mg^{2+} and Cl^-

(Total for Question = 1 mark)

15 The first five ionization energies of an element, X, are shown in the table.

Ionization energy	1st	2nd	3rd	4th	5th
Value / kJ mol^{-1}	631	1235	2389	7089	8844

What is the mostly likely formula of the oxide that forms when X burns in oxygen?

- A X_2O
- B XO
- C X_2O_3
- D XO_2

(Total for Question = 1 mark)

16 Which of the following has the largest ionic radius?

A S^{2-}

B Cl^{-}

C K^{+}

D Ca^{2+}

(Total for Question = 1 mark)

17 Which of the following represents a pair of isotopes?

- A $^{14}_6\text{C}$ and $^{14}_7\text{N}$
- B $^{32}_{16}\text{S}$ and $^{32}_{16}\text{S}^{2-}$
- C O_2 and O_3
- D $^{206}_{82}\text{Pb}$ and $^{208}_{82}\text{Pb}$

(Total for Question = 1 mark)

18 Which of the following equations represents the **second** ionization energy of chlorine?

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

(Total for Question = 1 mark)

19 For Period 3 of the Periodic Table, from sodium to argon, what is the trend in the melting temperatures of the elements?

- A A steady decrease
- B A steady increase
- C A decrease to silicon then an increase
- D An increase to silicon then a decrease

(Total for Question = 1 mark)

20 In which of the following cases would a cation be most polarizing?

	Radius	Charge
<input type="checkbox"/> A	small	small
<input type="checkbox"/> B	small	large
<input type="checkbox"/> C	large	small
<input type="checkbox"/> D	large	large

(Total for Question 1 mark)

21 In which of the following series does the melting temperature of the element **increase** from left to right?

- A** Li, Na, K
- B** Al, Si, P
- C** Si, P, S
- D** Na, Mg, Al

(Total for Question 1 mark)

22 If **X** represents the element of atomic number 9 and **Y** the element of atomic number 20, the compound formed between these two elements is

- A** covalent, **YX₂**.
- B** ionic, **YX₂**.
- C** covalent, **YX**.
- D** ionic, **YX**.

(Total for Question 1 mark)

23 Which of the following represents the electronic structure of a nitrogen atom?

	$1s$	$2s$	$2p$		
<input type="checkbox"/> A	↑↓	↑	↑↓	↑	↑
<input type="checkbox"/> B	↑↓	↑	↑↓	↑↓	
<input type="checkbox"/> C	↑↓	↑↓	↑	↑	↑
<input type="checkbox"/> D	↑↓	↑↓	↑↓	↑	

(Total for Question 1 mark)

24 The electronic structures of four elements are given below. Which of these elements has the highest first ionization energy?

	$1s$	$2s$	$2p$		
<input type="checkbox"/> A	↑↓	↑↓	↑	↑	
<input type="checkbox"/> B	↑↓	↑↓	↑	↑	↑
<input type="checkbox"/> C	↑↓	↑↓	↑↓	↑↓	↑
<input type="checkbox"/> D	↑↓	↑↓	↑↓	↑↓	↑↓

(Total for Question 1 mark)

25 In the following outline of the Periodic Table, the letters A to D are **not** the symbols of the elements.

Select from **A to D** the element which

(a) is a non-metal with a high melting temperature and boiling temperature.

(1)

- A
- B
- C
- D

(b) is in the d block of the Periodic Table.

(1)

- A
- B
- C
- D

(c) has a very stable electronic structure.

(1)

- A
- B
- C
- D

(d) is a metal with a high melting temperature and boiling temperature.

(1)

A

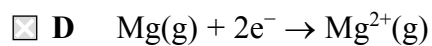
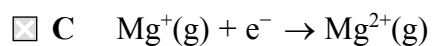
B

C

D

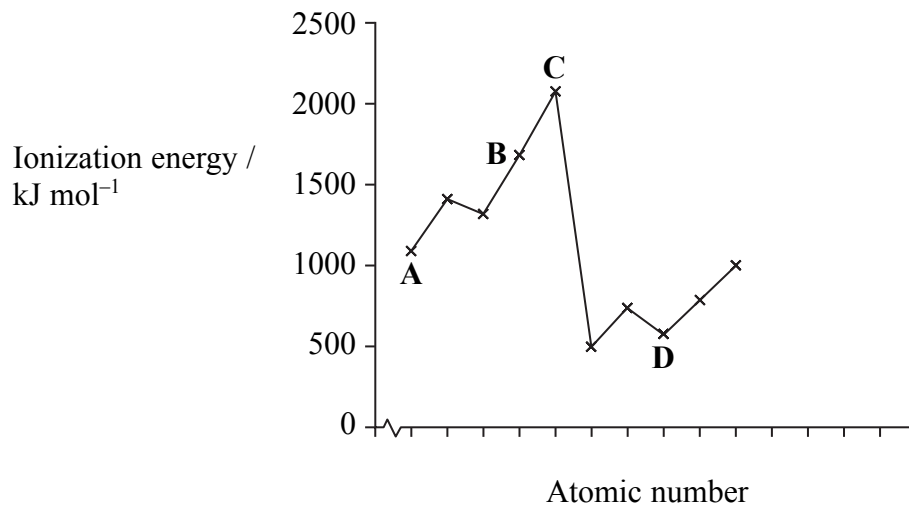
(Total for Question 4 marks)

26 Which of these equations represents the second ionization of magnesium?



(Total for Question = 1 mark)

27 The sketch graph below shows the trend in first ionization energies for some elements in Periods two and three.



Select, from the elements **A to D**, the one that

(a) has atoms with five p electrons.

- A
- B
- C
- D

(1)

(b) is a member of Group 3.

(1)

A

B

C

D

(c) is likely to be very unreactive.

(1)

A

B

C

D

(d) normally forms four covalent bonds per atom.

(1)

A

B

C

D

(Total for Question = 4 marks)