

Atomic Structure

Question Paper

Level	A Level
Subject	Chemistry
Exam Board	AQA
Topic	Physical Chemistry
Sub Topic	Atomic Structure
Booklet	Question Paper
Paper type	Multiple choice

Time Allowed: 17 minutes

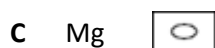
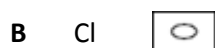
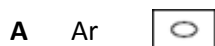
Score: /17

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

Q1. Which of these atoms has the largest atomic radius?



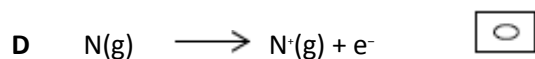
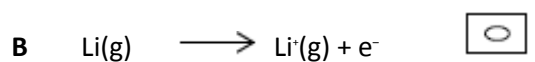
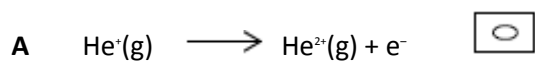
(Total 1 mark)

Q2. Which of these atoms has the smallest number of neutrons?



(Total 1 mark)

Q3. Which change requires the largest amount of energy?

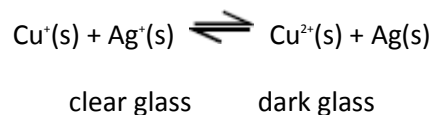


(Total 1 mark)

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Q4. Photochromic glass contains silver ions and copper ions. A simplified version of a redox equilibrium is shown below. In bright sunlight the high energy u.v. light causes silver atoms to form and the glass darkens. When the intensity of the light is reduced the reaction is reversed and the glass lightens.



Which one of the following is a correct electron arrangement?

- A Cu⁺ is [Ar]3d⁹4s¹
- B Cu is [Ar]3d¹⁰4s²
- C Cu²⁺ is [Ar]3d⁸4s¹
- D Cu⁺ is [Ar]3d¹⁰

(Total 1 mark)

Q5. Chlorine has two isotopes, ³⁵Cl and ³⁷Cl. The number of molecular ion peaks in the mass spectrum of a sample of Cl₂ is

- A 2
- B 3
- C 4
- D 5

(Total 1 mark)

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Q6. Which one of the following statements is **not** correct?

- A** The first ionisation energy of iron is greater than its second ionisation energy.
- B** The magnitude of the lattice enthalpy of magnesium oxide is greater than that of barium oxide.
- C** The oxidation state of iron in $[\text{Fe}(\text{CN})_6]^{3-}$ is greater than the oxidation state of copper in $[\text{CuCl}_2]^-$.
- D** The boiling point of C_3H_8 is lower than that of $\text{CH}_3\text{CH}_2\text{OH}$.

(Total 1 mark)

Q7. Which one of the following is the electronic configuration of the strongest reducing agent?

- A** $1s^2 2s^2 2p^5$
- B** $1s^2 2s^2 2p^6 3s^2$
- C** $1s^2 2s^2 2p^6 3s^2 3p^5$
- D** $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

(Total 1 mark)

Q8. An atom in which the number of protons is greater than the number of neutrons is

- A** ^{234}U
- B** ^6Li
- C** ^3He
- D** ^2H

(Total 1 mark)

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Q9. Assuming that chlorine exists as two isotopes, and that hydrogen and carbon exist as one isotope each, how many molecular ion peaks will be shown in the mass spectrum of $C_4H_6Cl_4$?

- A 2
- B 3
- C 4
- D 5

(Total 1 mark)

Q10. Which one of the following atoms has only two unpaired electrons in its ground (lowest energy) state?

- A helium
- B beryllium
- C nitrogen
- D oxygen

(Total 1 mark)

Q11. Which one of the following does **not** have a pair of s electrons in its highest filled electron energy sub-level?

- A H^-
- B Mg
- C P^{3+}
- D Ar

(Total 1 mark)

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Q12. Which one of the following explains why boron has a lower first ionisation energy than beryllium?

- A A boron atom is smaller than a beryllium atom.
- B In beryllium all the electrons are paired in full sub-shells.
- C A beryllium atom has fewer protons than a boron atom.
- D In boron the $2p$ electron occupies a higher energy level than a $2s$ electron.

(Total 1 mark)

Q13. Which one of the following ionisations requires less energy than the first ionisation energy of oxygen?

- A $S(g) \rightarrow S^+(g) + e^-$
- B $O^+(g) \rightarrow O^{2+}(g) + e^-$
- C $N(g) \rightarrow N^+(g) + e^-$
- D $F(g) \rightarrow F^+(g) + e^-$

(Total 1 mark)

Q14. Which atom has an incomplete sub-shell?

- A Be
- B Ca
- C Ge
- D Zn

(Total 1 mark)

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Q15. In which one of the following pairs is the first ionisation energy of element Y greater than that of element X?

	electronic configuration of element X	electronic configuration of element Y
A	$1s^1$	$1s^2$
B	$1s^2 2s^2$	$1s^2 2s^2 2p^1$
C	$1s^2 2s^2 2p^3$	$1s^2 2s^2 2p^4$
D	$1s^2 2s^2 2p^6$	$1s^2 2s^2 2p^6 3s^1$

(Total 1 mark)

Q16. Which one of the following lists the first ionisation energies (in kJ mol^{-1}) of the elements Mg, Al, Si, P and S in this order?

A	577	786	1060	1000	1260
B	736	577	786	1060	1000
C	786	1060	1000	1260	1520
D	1060	1000	1260	1520	418

(Total 1 mark)

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Q17. Which one of the following is the electronic configuration of an element with a maximum oxidation state of +5?

- A** $1s^2 2s^2 2p^5$
- B** $1s^2 2s^2 2p^6 3s^2 3p^1$
- C** $1s^2 2s^2 2p^6 3s^2 3p^3$
- D** $1s^2 2s^2 2p^6 3s^2 3p^6 3d^7 4s^2$

(Total 1 mark)