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

- A Ar O
- B CI O
- C Mg
- D Na O

(Total 1 mark)

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

- **A** <sup>3</sup>H
- **B** ⁴He ○
- C ⁵He ○
- D 4Li

(Total 1 mark)

Q3. Which change requires the largest amount of energy?

- A  $He^{+}(g) \longrightarrow He^{2+}(g) + e^{-}$
- $B \qquad \text{Li}(g) \qquad \longrightarrow \text{Li}^{\cdot}(g) + e^{-}$
- C  $Mg^{\cdot}(g) \longrightarrow Mg^{2\cdot}(g) + e^{-}$
- $D \qquad N(g) \longrightarrow N^{+}(g) + e^{-}$

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.

$$Cu^{+}(s) + Ag^{+}(s)$$
  $\longrightarrow$   $Cu^{2+}(s) + Ag(s)$  clear glass dark glass

Which one of the following is a correct electron arrangement?

- **A** Cu<sup>+</sup> is [Ar]3d<sup>9</sup>4s<sup>1</sup>
- **B** Cu is  $[Ar]3d^{10}4s^2$
- **C**  $Cu^{2+}$  is [Ar]3d<sup>8</sup>4s<sup>1</sup>
- $\mathbf{D}$  Cu<sup>+</sup> is [Ar]3d<sup>10</sup>

(Total 1 mark)

**Q5.**Chlorine has two isotopes, <sup>35</sup>Cl and <sup>37</sup>Cl. The number of molecular ion peaks in the mass spectrum of a sample of Cl<sub>2</sub> is

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

<b>Q6.</b> Which one of the	following state	ements is <b>not</b>	correct?
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- 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  $[Fe(CN)_6]^{3-}$  is greater than the oxidation state of copper in  $[CuCl_2]^{-}$
- **D** The boiling point of C<sub>3</sub>H<sub>8</sub> is lower than that of CH<sub>3</sub>CH<sub>2</sub>OH

(Total 1 mark)

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

- A 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>5</sup>
- **B** 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup>
- C 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>5</sup>
- $D \qquad 1s^2 \ 2s^2 \ 2p^6 \ 3s^2 \ 3p^6 \ 4s^2$

(Total 1 mark)

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

- **A** 234**U**
- B <sup>6</sup>Li
- C <sup>3</sup>He
- D  $^{2}H$

<b>Q9.</b> 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 $C_4H_6Cl_4$ ?			
	Α	2	
	В	3	
	С	4	
	D	5	
		(Total 1 mark)	
Q10.	Whic state	th one of the following atoms has only two unpaired electrons in its ground (lowest energy) e?	
	Α	helium	
	В	beryllium	
	С	nitrogen	
	D	oxygen (Total 1 mark)	
Q11.Which one of the following does <b>not</b> have a pair of s electrons in its highest filled electron energy sub-level?			
	Α	H <sup>-</sup>	
	В	Mg	
	С	P <sup>3+</sup>	
	D	Ar (Total 1 moule)	
		(Total 1 mark)	

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

$$\mathbf{A} \qquad \mathsf{S}(\mathsf{g}) \to \mathsf{S}^{\scriptscriptstyle +}(\mathsf{g}) + \mathsf{e}^{\scriptscriptstyle -}$$

$$\mathbf{B} \qquad O^{\scriptscriptstyle +}(g) \to O^{\scriptscriptstyle 2+}(g) + e^{\scriptscriptstyle -}$$

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

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 <b>X</b>	electronic configuration of element <b>Y</b>
Α	1s¹	ls²
В	1s² 2s²	ls <sup>2</sup> 2s <sup>2</sup> 2p <sup>1</sup>
C	1s² 2s²2p³	ls²2s²2p⁴
D	1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup>	ls <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>1</sup>

(Total 1 mark)

**Q16.**Which one of the following lists the first ionisation energies (in kJ mol<sup>-1</sup>) of the elements Mg, Al, Si, P and S in this order?

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

- **A** 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>5</sup>
- $\textbf{B} \qquad 1s^2 \, 2s^2 \, 2p^6 \, 3s^2 \, 3p^1$
- C 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>3</sup>