

# 1. Atomic Structure

## 1.1 Particles in the atom and atomic radius

### Paper 1

#### Question Paper

1 Which species contains a different number of electrons from the other three?

- A  $\text{ClO}_4^-$       B  $\text{H}_2\text{SO}_4$       C  $\text{SO}_4^{2-}$       D  $\text{Te}^{2-}$

2 Which statement about  $^{131}_{53}\text{I}$  is correct?

- A A negative ion of  $^{131}_{53}\text{I}$  contains 53 neutrons and 52 electrons.  
 B A negative ion of  $^{131}_{53}\text{I}$  contains 53 neutrons and 54 electrons.  
 C A negative ion of  $^{131}_{53}\text{I}$  contains 78 neutrons and 52 electrons.  
 D A negative ion of  $^{131}_{53}\text{I}$  contains 78 neutrons and 54 electrons.

3 Sodium azide,  $\text{NaN}_3$  is an explosive used to inflate airbags in cars when they crash. It consists of positive sodium ions and negative azide ions.

What are the numbers of electrons in the sodium ion and the azide ion?

	sodium ion	azide ion
A	10	20
B	10	22
C	12	20
D	12	22

4 Which particle contains 8 protons, 9 neutrons and 10 electrons?

- A  $^{16}_8\text{O}^-$       B  $^{16}_8\text{O}^{2-}$       C  $^{17}_8\text{O}^-$       D  $^{17}_8\text{O}^{2-}$

5 In which species are the numbers of protons, neutrons and electrons all different?

- A  $^{27}_{13}\text{Al}$       B  $^{35}_{17}\text{Cl}^-$       C  $^{32}_{16}\text{S}^{2-}$       D  $^{39}_{19}\text{K}^+$

6 Which atom has the same number of electrons as the hydroxide ion,  $\text{OH}^-$ ?

- A F      B Ne      C Na      D Mg

7 This question refers to isolated gaseous atoms in the ground state.

In which atom are all electrons paired?

- A Ba                      B Br                      C S                      D Si

8 Why is the ionic radius of a sulfide ion larger than the ionic radius of a potassium ion?

- A Ionic radius always decreases with increasing atomic number.  
B Positive ions always have smaller radii than negative ions.  
C The potassium ion has more protons in its nucleus than the sulfide ion.  
D The sulfide ion is doubly charged; the potassium ion is singly charged.

9 A single  $^{32}\text{P}$  nucleus can be produced when a single  $^{32}\text{S}$  nucleus joins with particle X. In the process a proton is emitted.

What is particle X?

- A a deuteron,  $^2_1\text{H}^+$   
B an electron  
C a neutron  
D a proton

10 Beams of charged particles are deflected by an electrical field. The angle of deflection of a particle is proportional to its charge/mass ratio.

In an experiment protons are deflected by an angle of  $+15^\circ$ . In another experiment under identical conditions  $^2\text{H}^-$  ions are deflected by an angle of  $Y^\circ$ .

What is the value of Y?

- A  $-30.0$                       B  $-7.5$                       C  $+7.5$                       D  $+30.0$

- 11** Rubidium and bromine form ions that are isoelectronic. Each ion has 36 electrons.

Which row is correct?

	rubidium radii	bromine /bromide radii
<b>A</b>	atomic < ionic	atomic < ionic
<b>B</b>	atomic < ionic	atomic > ionic
<b>C</b>	atomic > ionic	atomic < ionic
<b>D</b>	atomic > ionic	atomic > ionic