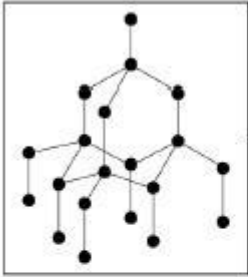





## Mark schemes

### Q1.

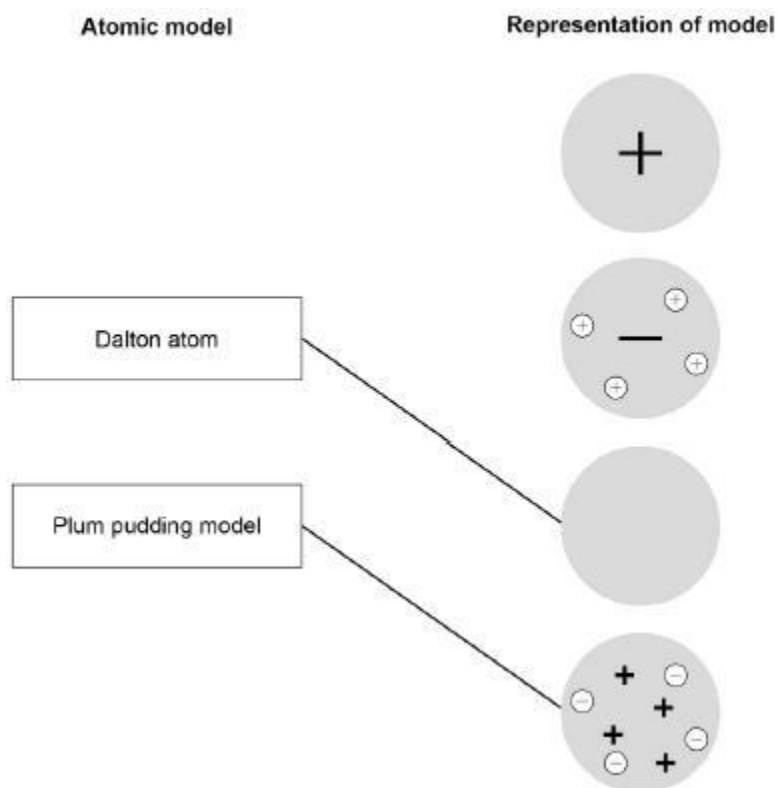
- (a) 0.1 nm 1
- (b) 6 protons 1
- 8 neutrons 1
- 6 electrons 1  
*allow electron (structure) 2,4*
- protons in nucleus 1
- neutrons in nucleus 1
- electrons (around nucleus) in energy levels / shells 1
- (c) 3 1
- (d) covalent 1
- (e) layers slide (over each other) 1  
*allow atoms slide over each other*
- (f)

Structure	Form of carbon
	<input type="checkbox"/> Buckminsterfullerene
	<input type="checkbox"/> Diamond
	<input type="checkbox"/> Graphene
	<input type="checkbox"/> Nanotube

do **not** accept more than **one** line from a box on the left

**Q2.**

(a)



do **not** accept more than one line from a box on the left

(b) a helium nucleus

(c) 
$$\frac{8\,288\,000}{700}$$

**or**

8 288 000 : 700

11 840 (:1)

(d) most of the (alpha) particles pass straight through  
*allow most of the (alpha) particles are **not** deflected / repelled / bounced back*

(e) some of the (alpha) particles bounce back  
**or**  
some of the (alpha) particles are deflected

1  
1

1

1

1

1

1

(because the charged) alpha particles were repelled (by the charged nucleus)

1

(f) 79 protons **and** 79 electrons

1

118 neutrons

1

protons in the nucleus

1

neutrons in the nucleus

1

electrons are arranged in energy levels (around the nucleus)

*allow electrons are arranged in shells (around the nucleus)*

1

[13]

### Q3.

(a) allow both have 10 electrons **and** 10 protons

1

neon-21 has 1 more neutron

**or**

neon-20 has 1 less neutron

*allow neon-20 has 10 neutrons **and** neon-21 has 11 neutrons*

*if no other mark awarded allow 1 mark for describing the number of particles in each of the isotopes*

*for max marks comparisons must be made*

1

(b) (calculation of percentage of neon atoms in air)

$$\left(\frac{18 \times 100}{1\,000\,000}\right) = 0.0018$$

1

(calculation of isotope percentage)

$$\frac{0.27}{100} = 0.0000049 (\%)$$

*allow 0.00000486 (%)*

**or**  $4.86 \times 10^{-6} (\%)$

**or**  $4.9 \times 10^{-6} (\%)$

*allow correct calculation using incorrect calculation for percentage of neon in air*

1

(c) (when the supply is switched on)

electron(s) (in neon) gain energy

1

(which) moves (electrons) to higher energy level 1

(then) electrons drop back to lower levels releasing energy 1

(that energy is) in the visible region of the spectrum 1

[8]

**Q4.**

(a) giant structure of ions 1

with strong electrostatic forces of attraction

*if no other mark awarded allow 1 mark for ionic bonding*

1

(b) (moles bromine =  $\frac{1}{160}$ )  
0.00625 1

(molecules of bromine =)  
 $0.00625 \times 6.02 \times 10^{23}$

*allow correct use of an incorrectly calculated value for moles of bromine*

1

(molecules of bromine =)  
 $3.76 \times 10^{21}$  (molecules)

*allow  $3.7625 \times 10^{21}$  (molecules)*

1

*allow converse*

(c) boiling point decreases up the group  
*allow boiling point decreases down the table* 1

(because) the relative formula / molecular mass decreases  
**or**

(because) the size of the molecule decreases 1

(so) the intermolecular forces decrease (in strength)

*allow (so) the forces between molecules decrease (in strength)*

1

(so) less energy is needed to overcome the intermolecular forces

*allow (so) less energy is needed to separate the molecules*

*do **not** accept a reference to breaking bonds unless specifically between molecules*

