Mark schemes

Q1.

(a) (model **A**) plum pudding

allow Thomson (model)

1

(model **B**) Bohr

allow nuclear (model)

allow planetary (model)

allow Rutherford-Bohr (model)

1

(b) **Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.

3–4

Level 1: Relevant features are identified and differences noted.

1–2

No relevant content

0

Indicative content

Similarities

- both contain electrons
- both are neutral overall

Differences

- model **A** has no nucleus
  or
  the model used today has a nucleus
- model **A** has no protons
  or
  the model used today has protons
- model **A** has no neutrons
  or
  the model used today has neutrons
- model **A** has positive charge spread throughout the atom
  or
  model **A** is a ball of positive charge
- the model used today has the positive charge in the centre
- model **A** the electrons are distributed randomly
- the model used today has electrons in shells / energy levels
- the mass was spread throughout model **A**
- the mass is concentrated at the centre of the model used today
- model **A** does not have empty space

- model used today is mostly empty space

(c) atoms with the same number of protons

allow atoms of the same element
allow atoms with the same atomic number

1

with different numbers of neutrons

ignore references to electrons

1

[8]

Q2.

(a) neutron

1

(b) a neutron and a proton

1

(c) (nitrogen) 2 / two

1

(oxygen) 1 / one

1

(d) lithium

allow Li

1

(e) 3 x protons (○) in the nucleus

1

4 x neutrons (●) in the nucleus

1

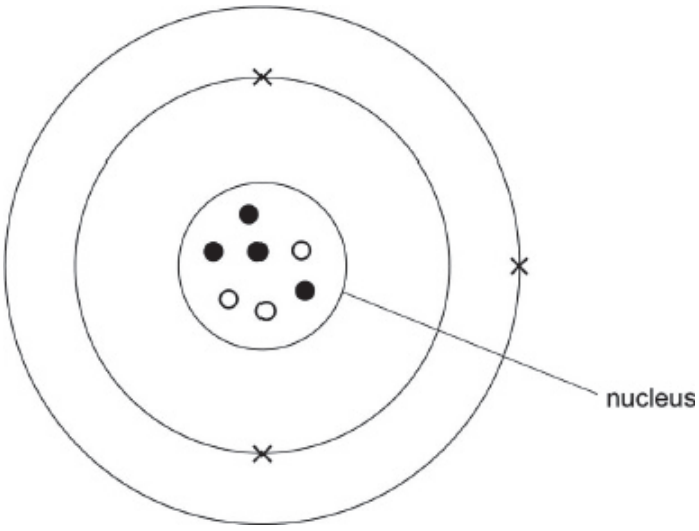
3 x electrons (×) in the shells

1

electrons (×) arranged 2, 1

1

an answer of



scores **4** marks

[9]

Q3.

(a) a ball of positive charge

*do **not** accept references to protons, nuclei, neutrons*

1

with (negative) electrons embedded

1

(b) (earliest) electrons
protons
(latest) neutrons

1

(c) (number of outer shell electrons) 7

1

(reason) (tennessine is in) Group 7

allow the number of outer electrons is the same as the group number

allow tennessine is a halogen

1

MP2 is dependent on MP1 being awarded

(d) (time needed for) peer review

allow the idea that other scientists had to check the results

1

(e) (A_r =)

$$\frac{(6 \times 7.6) + (7 \times 92.4)}{100}$$

allow $\frac{45.6 + 646.8}{100}$

allow (6 × 0.076) + (7 × 0.924)

allow 0.456 + 6.468

1

= 6.924

1

= 6.9

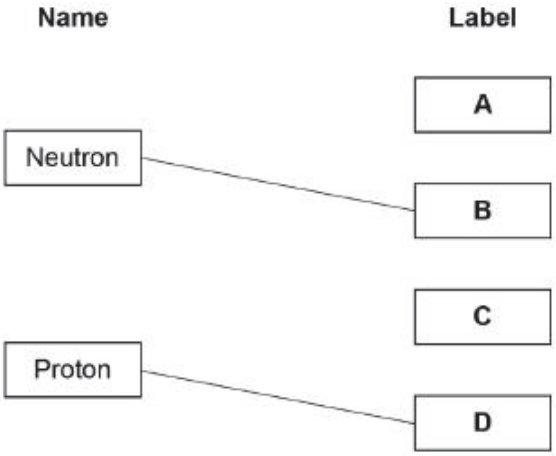
allow an answer correctly rounded to 1 decimal place from an incorrect calculation which uses all the data in the table

1

[9]

Q4.

(a)



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

2

(b) (number of electrons) 9

1

(number of neutrons) 10

1

(c) **Mark with part (d)**

(relative atomic mass =) $\frac{(39 \times 93.3) + (41 \times 6.7)}{100}$

allow (relative atomic mass =) $\frac{(3638.7) + (274.7)}{100}$

allow (relative atomic mass =) 36.387 + 2.747

1

= 39.134

1

= 39.1

allow an answer correctly calculated to 3 significant figures from an incorrect calculation which uses the values in the table

1

(d) **Mark with part (c)**

potassium / K

*allow ecf from part **(c)***

1

(e) neutrons

1

[9]

Q5.

(a) element

1

(b) **A**

1

(c) **B**

1

(d) filtration

allow filtering

allow a description of filtration

1

(e) **C**

allow 78 (°C)

1

(f) increases

allow becomes warmer / hotter

1

(g) heat (the solution) until crystallisation point is reached

allow heat (the solution) until crystals start to form

allow heat (the solution) to reduce the volume

allow heat (the solution) to evaporate (some of the water)

1

leave the solution (to cool / crystallise)

1

*if no other mark is awarded allow **1** mark for heat the solution to dryness*

[8]