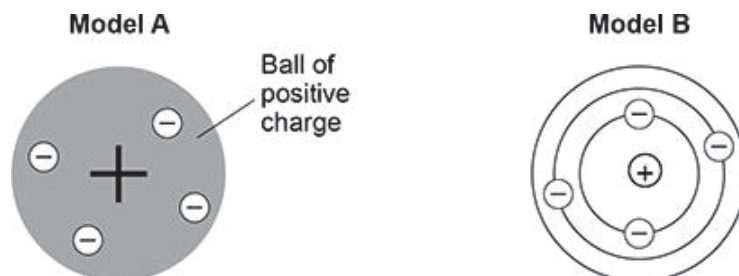


All questions are for both separate science and combined science students

Q1.

This question is about models of the atom.

The figure below shows two early models of the atom.



- (a) Name the models of the atom shown in above figure.

Model **A** _____

Model **B** _____

(2)

- (b) Compare model **A** with the model of the atom used today.

Use the figure above.

(4)

- (c) Chadwick's experiments showed the existence of neutrons in an atom.

This led to an understanding of isotopes.

Define the term 'isotopes'.

Refer to subatomic particles in your answer.

(2)

(Total 8 marks)

Q2.

This question is about atoms.

Atoms contain three types of particle:

- electrons
- neutrons
- protons.

(a) Which particle has no electrical charge?

Tick (✓) **one** box.

Electron

☐

Neutron

☐

Proton

☐

(1)

(b) Which particles have the same relative mass?

Tick (✓) **one** box.

An electron and a neutron

☐

An electron and a proton

☐

A neutron and a proton

☐

(1)

(c) The formula of a compound is N_2O

How many of each type of atom are in one molecule of N_2O ?

Nitrogen _____

Oxygen _____

(2)

An atom of element **Z** contains:

- 3 electrons
- 4 neutrons
- 3 protons.

(d) Give the name of element **Z**.

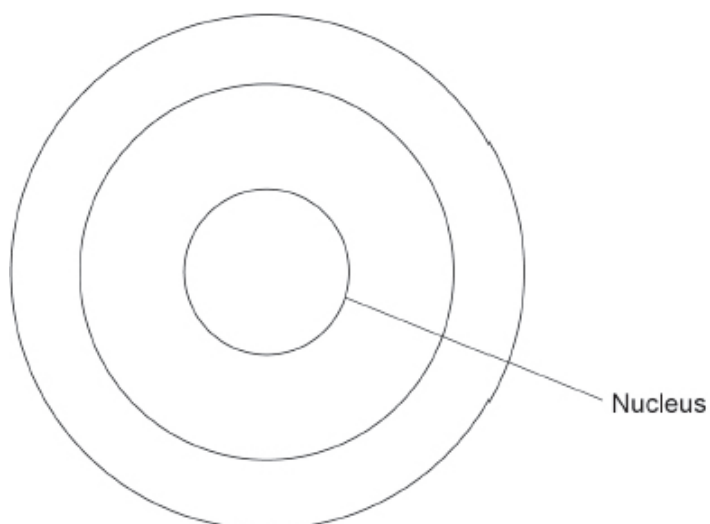
Use the periodic table.

(1)

(e) Complete the figure below to show the position of the particles in an atom of element **Z**.

Use the symbols:

- × = electron
● = neutron
○ = proton



(4)

(Total 9 marks)

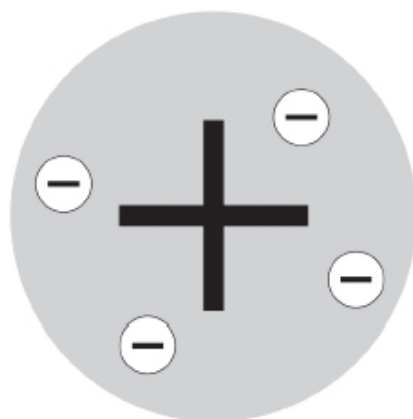
Q3.

Discoveries in chemistry led to a better understanding of atomic structure.

- (a) Atoms were originally thought to be tiny spheres that could not be divided.

The plum pudding model of the atom was then developed.

The figure below represents the plum pudding model of the atom.



Describe the plum pudding model of the atom.

(2)

- (b) Atoms contain electrons, neutrons and protons.

Write these three particles in order of their discovery.

Earliest _____

Latest _____

(1)

Very few atoms of the element tennessine (Ts) have ever been identified.

The atomic number of tennessine is 117

- (c) Predict the number of outer shell electrons in an atom of tennessine.

Give **one** reason for your answer.

Use the periodic table.

Number of outer shell electrons _____

Reason _____

(2)

- (d) Tennessine was first identified by a small group of scientists in 2010.

Suggest **one** reason why tennessine was **not** accepted as a new element by other scientists until 2015.

(1)

- (e) The discovery of isotopes explained why some relative atomic masses are not whole numbers.

Element **R** has two isotopes.

The table below shows the mass numbers and percentage abundances of the isotopes of element **R**.

Mass number	Percentage abundance (%)
6	7.6
7	92.4

Calculate the relative atomic mass (A_r) of element **R**.

Give your answer to 1 decimal place.

Relative atomic mass (1 decimal place) = _____

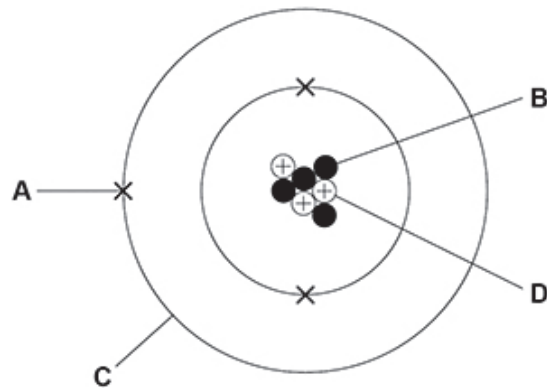
(3)

(Total 9 marks)

Q4.

This question is about atoms.

- (a) The figure below represents an atom of an element.



Draw **one** line from each name to the correct label.

Name	Label
Neutron	A
	B
Proton	C
	D

(2)

- (b) An atom of element **Y** has:
- an atomic number of 9
 - a mass number of 19.

Give the number of electrons and the number of neutrons in this atom.

Choose answers from the box.

1	9	10	19	28
---	---	----	----	----

Number of electrons _____

Number of neutrons _____

(2)

The table below shows information about two isotopes of element **Z**.

	Mass number	Percentage abundance (%)
Isotope A	39	93.3
Isotope B	41	6.7

- (c) Calculate the relative atomic mass (A_r) of element **Z**.

Use the table above and the equation:

$$A_r = \frac{(\text{mass number} \times \text{percentage}) \text{ of isotope A} + (\text{mass number} \times \text{percentage}) \text{ of isotope B}}{100}$$

Give your answer to 3 significant figures.

A_r (3 significant figures) = _____

(3)

- (d) Suggest the identity of element **Z**.

Use the periodic table.

Element **Z** _____

(1)

- (e) Complete the sentence.

Choose the answer from the box.

electrons	neutrons	protons
------------------	-----------------	----------------

Isotopes of the same element have different mass numbers because the isotopes have different numbers of _____.

(1)

(Total 9 marks)

Q5.

This question is about elements, compounds and mixtures.

(a) Which type of substance is hydrogen?

Tick (✓) **one** box.

Element

☐

Compound

☐

Mixture

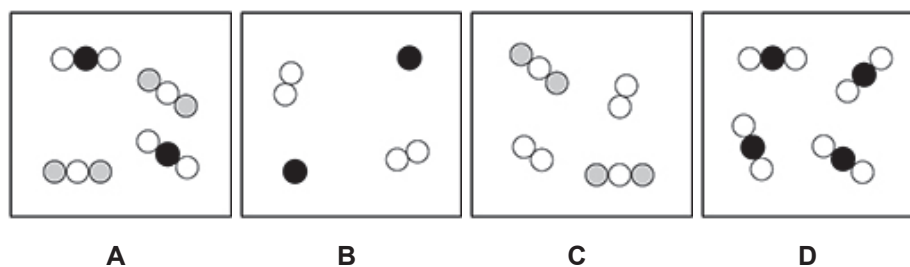
☐

(1)

The diagrams in **Figure 1** represent different substances.

● ● and ○ represent atoms of three different elements.

Figure 1



Use **Figure 1** to answer parts (b) and (c).

(b) Which diagram represents a mixture of compounds?

A ☐

B ☐

C ☐

D ☐

(1)

(c) Which diagram represents a mixture of elements?

A ☐

B ☐

C ☐

D ☐

(1)

Substances can be separated from mixtures by using different methods.

(d) Complete the sentence.

Sand can be separated from a mixture of sand and water by

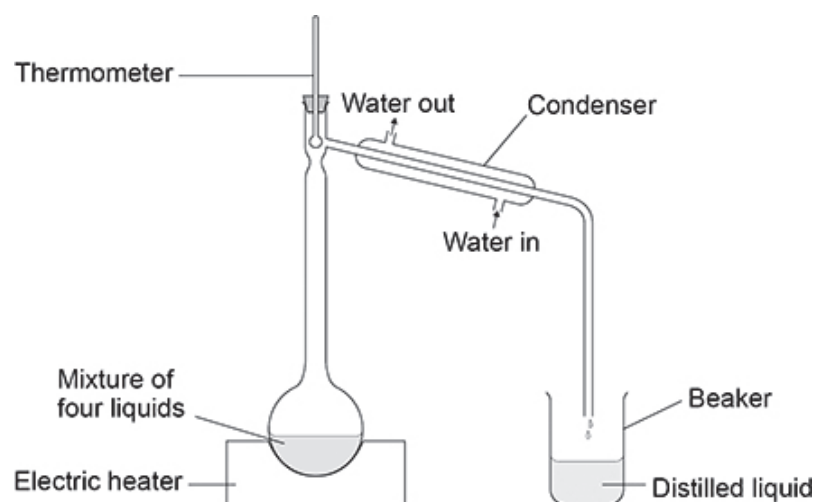
_____.

(1)

A mixture of four liquids was fractionally distilled.

Figure 2 shows the apparatus used.

Figure 2



The table below shows the boiling points of the four liquids in the mixture.

Liquid	Boiling point in °C
A	97
B	138
C	78
D	118

(e) Which liquid in the table would distil and be collected in the beaker first?

Liquid _____

(1)

(f) Suggest what would happen to the temperature of the water as the water flows through the condenser.

(1)

- (g) Describe how to obtain sodium chloride crystals from sodium chloride solution by crystallisation.

(2)

(Total 8 marks)