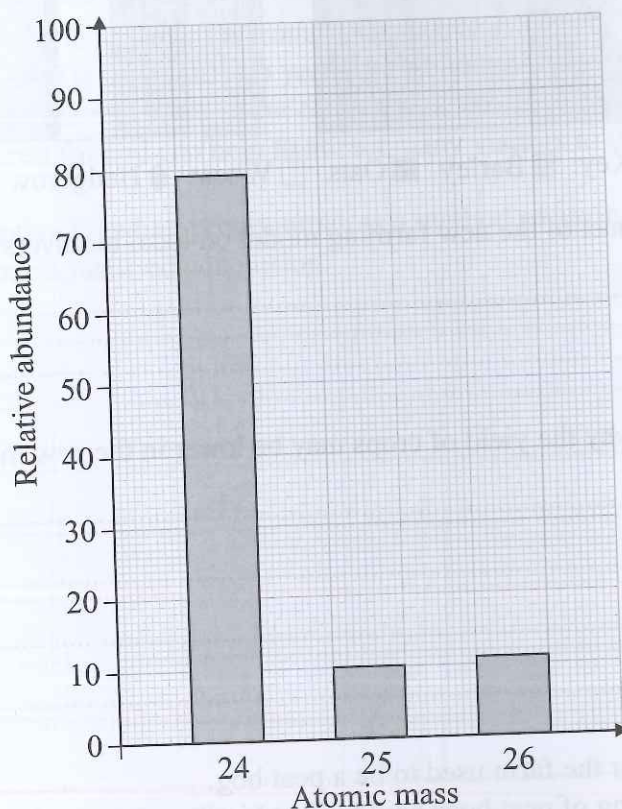


# Atoms, Elements, Compounds and Mixtures

1 This question is about a metallic element, X.

1.1 Figure 1 shows the mass and relative abundance of different isotopes of element X.

Figure 1



Calculate the relative atomic mass of X. Give your answer to one decimal place.  
Give the name of the element.

Relative atomic mass = .....

Name = .....

[5]

1.2 Give the electronic structure of one particle of X present in  $XCl_2$ .

Electronic structure = .....

[2]

1.3 A student is producing a scale model of an atom of X.  
The student is using a ball with a radius of 1.5 cm as the nucleus.  
Which of the following gives the approximate radius of the complete model atom?  
Tick **one** box.

- 0.15 m        $1.5 \times 10^2$  m        $1.5 \times 10^3$  m        $1.5 \times 10^{-2}$  m

[1]  
[Total 8 marks]

2\* In 1911, scientists directed alpha particles towards a very thin sheet of gold. Instruments were used to determine the path of the alpha particles. Describe how and why the model of the atom changed based on these experiments. Your answer should refer to the expected results based on the atomic model at the time.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

[Total 6 marks]

3 Calcium oxide reacts with phosphorus pentoxide,  $P_4O_{10}$ , to form a single product, calcium phosphate(V),  $Ca_3(PO_4)_2$ .

3.1 Calculate the relative formula mass of calcium phosphate(V).  
Relative atomic masses ( $A_r$ ): O = 16, P = 31, Ca = 40

Relative formula mass = .....  
[2]

3.2 Write a balanced symbol equation to show this reaction.

.....  
[2]  
[Total 4 marks]

4 A scientist is separating some mixtures of substances.

4.1 The first mixture is of copper sulfate, silicon dioxide and water.

Copper sulfate is a water soluble substance.

Silicon dioxide is a water insoluble giant covalent substance.

Name **two** techniques that could be used to purify each of the copper sulfate and silicon dioxide. Explain why each technique is suitable.

Technique 1: .....

Explanation: .....

.....

Technique 2: .....

Explanation: .....

.....

[4]

4.2 A second mixture consists of three liquids with boiling points of 50 °C, 65 °C and 80 °C.

Explain why fractional distillation is needed to separate these substances rather than simple distillation.

.....

.....

.....

.....

.....

.....

[4]

4.3 The third mixture contains a complex set of liquids that will react together if heated.

Suggest a suitable separation technique. Explain your reasoning.

Technique: .....

Explanation: .....

.....

.....

[2]

[Total 10 marks]

Score:  / 28

### Exam Practice Tip

Whenever a question includes a value that you need to use in a calculation, always check the units. Even if you knew the relevant facts to answer question 1.3, you wouldn't get the mark if you fell into the unit trap. Always check your answer seems sensible too — this can even help you to eliminate some incorrect options in multiple choice questions.

