

Atoms, Isotopes and Relative Atomic Masses

Total mark – 17

Question: 1

1. Isotopes of europium have differences and similarities.

- (i) In terms of protons, neutrons and electrons, how is an atom of ^{151}Eu **different** from an atom of ^{153}Eu ?

.....
.....

[1]

- (ii) In terms of protons, neutrons and electrons, how is an atom of ^{151}Eu **similar** to an atom of ^{153}Eu ?

.....
.....

[1]

[Total 2 marks]

Question: 2

2. Europium, atomic number 63, is used in some television screens to highlight colours. A chemist analysed a sample of europium using mass spectrometry. The results are shown in the table below.

isotope	relative isotopic mass	abundance (%)
^{151}Eu	151.0	47.77
^{153}Eu	153.0	52.23

- (a) Define the term *relative isotopic mass*.

.....

.....

.....

.....

[2]

- (b) Using the table above, calculate the relative atomic mass of the europium sample.
Give your answer to **two** decimal places.

answer =

[2]

[Total 4 marks]

Question: 3

3. Carbon occurs in a wide range of compounds and is essential to living systems.

Two isotopes of carbon are ^{12}C and ^{13}C .

- (i) State what is meant by the term *isotopes*.

.....
.....

[1]

- (ii) Isotopes of carbon have the same chemical properties.

Explain why.

.....
.....

[1]

Question: 4

4. The Group 2 element magnesium was first isolated by Sir Humphry Davy in 1808.

Magnesium has three stable isotopes, which are ^{24}Mg , ^{25}Mg and ^{26}Mg .

- (i) Complete the table below to show the atomic structures of ^{24}Mg and ^{25}Mg .

	protons	neutrons	electrons
^{24}Mg			
^{25}Mg			

[2]

- (ii) A sample of magnesium contained ^{24}Mg : 78.60%; ^{25}Mg : 10.11%; ^{26}Mg : 11.29%.

Calculate the relative atomic mass of this sample of Mg.

Give your answer to **four** significant figures.

answer =

[2]

Question: 5

5. The Group 7 element bromine was discovered by Balard in 1826. Bromine gets its name from the Greek *bromos* meaning stench.

Bromine consists of a mixture of two isotopes, ^{79}Br and ^{81}Br .

- (i) What is meant by the term *isotopes*?

.....

.....

[1]

- (ii) Complete the table below to show the atomic structures of the bromine isotopes.

	protons	neutrons	electrons
^{79}Br			
^{81}Br			

[2]

- (iii) Write the full electronic configuration of a bromine atom.

$1s^2$

[1]

[Total 4 marks]

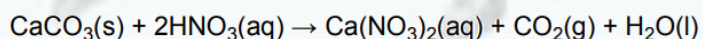
Question: 6

6. Calcium and its compounds, have properties typical of Group 2 in the Periodic Table.

Calcium carbonate, CaCO_3 , reacts with acids such as nitric acid.

A student neutralised 2.68 g of CaCO_3 with 2.50 mol dm^{-3} nitric acid, HNO_3 .

The equation for this reaction is shown below.



The student left the solution of calcium nitrate formed to crystallise. Crystals of hydrated calcium nitrate formed containing 30.50% of H_2O , by mass.

Calculate the formula of the hydrated calcium nitrate.

[Total 3 marks]