

# 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  $^{151}\text{Eu}$  **different** from an atom of  $^{153}\text{Eu}$ ?

.....  
.....

[1]

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

.....  
.....

[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 (%)
$^{151}\text{Eu}$	151.0	47.77
$^{153}\text{Eu}$	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  $^{12}\text{C}$  and  $^{13}\text{C}$ .

(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  $^{24}\text{Mg}$ ,  $^{25}\text{Mg}$  and  $^{26}\text{Mg}$ .

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

	protons	neutrons	electrons
$^{24}\text{Mg}$			
$^{25}\text{Mg}$			

[2]

(ii) A sample of magnesium contained  $^{24}\text{Mg}$ : 78.60%;  $^{25}\text{Mg}$ : 10.11%;  $^{26}\text{Mg}$ : 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,  $^{79}\text{Br}$  and  $^{81}\text{Br}$ .

(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
$^{79}\text{Br}$			
$^{81}\text{Br}$			

[2]

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

$1\text{s}^2$  .....

[1]

[Total 4 marks]

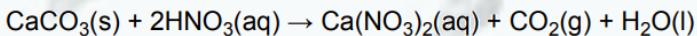
## Question: 6

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

Calcium carbonate,  $\text{CaCO}_3$ , reacts with acids such as nitric acid.

A student neutralised 2.68 g of  $\text{CaCO}_3$  with 2.50 mol  $\text{dm}^{-3}$  nitric acid,  $\text{HNO}_3$ .

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  $\text{H}_2\text{O}$ , by mass.

Calculate the formula of the hydrated calcium nitrate.

[Total 3 marks]