## SL Paper 2

c.	The relative atomic mass of naturally occurring copper is 63.55. Calculate the abundances of $^{63}Cu$ and $^{65}Cu$ in naturally occurring copper.	[2]
d.	The isotopes of some elements are radioactive. State a radioisotope used in medicine.	[1]
e.	State a balanced equation for the reaction of sodium with water. Include state symbols.	[2]
f.	With reference to electronic arrangements, suggest why the reaction between rubidium and water is more vigorous than that between sodium	[2]
	and water.	
g.	Describe and explain what you will see if chlorine gas is bubbled through a solution of	[3]

- (i) potassium iodide.
- (ii) potassium fluoride.

## Markscheme

c. 63x + 65(1 - x) = 63.55;

(or some other mathematical expression).  $^{63}Cu = 72.5\%$  and  $^{65}Cu = 27.5\%$ ; Allow  $^{63}Cu = 0.725$  and  $^{65}Cu = 0.275$ . Award [2] for correct final answer.

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d. <sup>60</sup>Co /<sup>131</sup>I /<sup>125</sup>I;
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Must contain correct mass numbers. Allow other formats such as cobalt-60, Co-60 etc. Award no marks if a correct radioisotope is given with an incorrect radioisotope. Allow any other radioisotope if you can verify its use.

e.  $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g) / Na(s) + H_2O(l) \rightarrow NaOH(aq) + \frac{1}{2}H_2(g)$ 

Award [1] for correct balanced equation.

Award [1] for correct state symbols for sodium, water, sodium hydroxide and hydrogen.

Second mark is not dependent on equation being correctly balanced.

f. (Rb more reactive because) electron lost further from nucleus so less tightly held;

Rb electron is in 5th energy level **and** (Na less reactive) as electron lost in 3rd energy level / *OWTTE*; Allow **[1 max]** for electron arrangements of Na (e.g. 2,8,1) and Rb if second mark is not scored.

g. (i) solution becomes yellow/orange/brown/darker;

chlorine is more reactive than iodine (and displaces it from solution) / OWTTE;

Allow correct equation (KI +  $CI_2 \rightarrow KCI + I_2$ ) for second mark or stating that iodine/ $I_2$  is formed.

(ii) no colour change/nothing happens as fluorine is more reactive than chlorine / OWTTE;

## **Examiners report**

- c. Candidates who knew how to calculate the abundances of Cu-63 and Cu-65 generally scored full marks, but many had no idea at all on how to approach the question in (c).
- d. Surprisingly very few candidates were able to state a radioisotope used in medicine. C-13 and C-14 were often given and sometimes elements were suggested but with no specified mass number.
- e. Approximately 25% of candidates got the equation mark, but many gave incorrect state symbols. A significant number of candidates wrote equations with the formation of Na<sub>2</sub>O or even atomic H.
- f. Some of the weaker candidates explained the reactivity by referring to the change in reactivity down group 1 with no further explanation. Many referred to the increased number of shells in Rb or the increased distance the valence electron is from the nucleus, but some did not go on to explain that this affected its attraction/ease of loss. Very few candidates scored the marks for reference to valence electrons being in the third and fifth shells respectively.
- g. The colour change in (i) was usually known. There was rarely any explanation in (ii) as to why there is no observable reaction with the fluoride.