

**AS Level Chemistry A**  
**H032/01** Breadth in chemistry

**Question Set 13**

1. This question is about elements from the p-block of the periodic table.

(a) Silicon exists as a mixture of three isotopes,  $^{28}\text{Si}$ ,  $^{29}\text{Si}$  and  $^{30}\text{Si}$ .

(i) Complete the table to show the atomic structure of  $^{30}\text{Si}$ .

	Protons	Neutrons	Electrons
$^{30}\text{Si}$	14	16	14

[1]

(ii) A sample of silicon is analysed by mass spectrometry.

The mass spectrum shows peaks with the relative abundances below.

• $^{28}\text{Si}$	92.23%	$A_r = \frac{(92.23 \times 28) + (4.68 \times 29) + (3.09 \times 30)}{100}$
• $^{29}\text{Si}$	4.68%	
• $^{30}\text{Si}$	3.09%	

$$A_r = 28.11$$

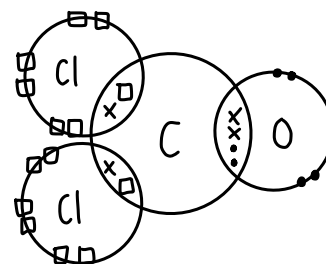
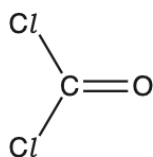
Calculate the relative atomic mass of silicon in the sample.

Give your answer to **two** decimal places.

[2]

(b) Phosgene,  $\text{COCl}_2$ , exists as simple molecules.

The displayed formula of a phosgene molecule is shown below.



(i) Draw a 'dot-and-cross' diagram of a phosgene molecule.

Show outer electrons only.

[1]

(ii) Name the shape of a phosgene molecule and explain why it has this shape.

[3]

b)ii) trigonal planar - the bonding pairs of electrons repel to be as far apart as possible, making the bond angles  $120^\circ$

(c) Why are silicon, carbon, oxygen and chlorine all classified as p-block elements?

[1]

c) their outer electron is in the p sub-shell

**Total Marks for Question Set 13: 8**

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