



GCE AS LEVEL CHEMISTRY

S21- B410

Assessment Resource E

Structure of Matter and Simple Reactions

1. Complete the electronic configuration of the Se^{2-} ion. [1]

$1s^2 2s^2$

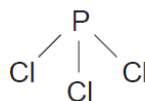
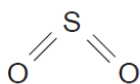
2. A radioactive isotope has a half-life of 4 hours. Calculate the time needed for 4.0 g of the isotope to decay to 0.5 g. [1]

Time = hours

3. (a) State the meaning of the term *electronegativity*. [1]

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- (b) On the diagrams below mark any permanent dipoles. [1]



(c) A line in a spectrum has a wavelength of 550 nm.

Calculate the energy change, in kJ mol^{-1} , that corresponds to this line.

[4]

Energy change = kJ mol^{-1}

(d) The table shows the first ionisation energy for some elements.

Element	First ionisation energy/ kJ mol^{-1}
sodium, Na	496
magnesium, Mg	738
potassium, K	419

(i) Explain the difference in the values for sodium and magnesium.

[2]

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(ii) Explain the difference in the values for sodium and potassium.

[2]

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5. Explain the following statements.

(a) Bromine is a liquid at room temperature and iodine is a solid. [3]

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(b) Graphite conducts electricity but diamond does not. [3]

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(c) The molecular ion peaks are at m/z 158, 160 and 162 in the mass spectrum of bromine, Br_2 . The areas of these peaks are in the ratio of 1 : 2 : 1. [3]

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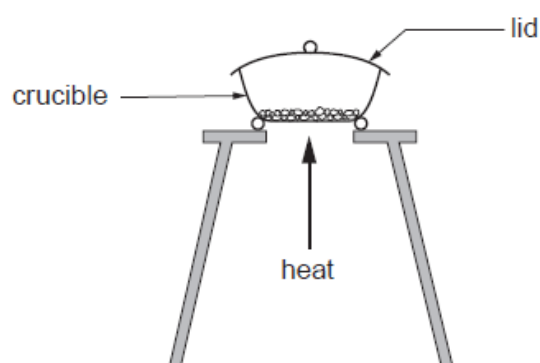
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6. Barium chloride exists as a hydrated salt, $\text{BaCl}_2 \cdot x\text{H}_2\text{O}$, where x is the number of molecules of water of crystallisation. To determine the value of x , the hydrated salt is heated to remove the water of crystallisation.

The following method was carried out.

- Weigh an empty crucible with its lid.
- Place about 2.00 g of hydrated barium chloride in the crucible and re-weigh, with its lid.
- Place the lid on the crucible and heat gently at first, then remove the lid and heat strongly for about 2 minutes.



- Place the lid on the crucible and allow it to cool.
- Weigh the cooled crucible with its lid and residue.

The following results were recorded.

Mass of crucible + lid = 10.24 g

Mass of crucible + lid + hydrated barium chloride = 12.25 g

Mass of crucible + lid + residue after heating = 11.97 g

- (a) Calculate the mass of hydrated barium chloride and the mass of residue. Hence determine the value of x . [5]

$x =$

- (b) (i) Suggest why the crucible was heated initially with the lid in place. [1]

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- (ii) Suggest why the lid was placed on the crucible when it was left to cool. [1]

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- (c) (i) When this experiment is carried out the value of x obtained is often less than the theoretical value. Suggest a reason for this, assuming that the compound contains no impurities. [1]

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- (ii) State an improvement that could be made to the practical procedure to overcome the problem you have identified in (c)(i). [1]

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- (d) If the error in each balance reading is ± 0.05 g, calculate the percentage error in the mass of hydrated barium chloride used in the experiment. [1]

Percentage error = %

- (e) Apart from the improvement you identified in (c)(ii), suggest another change that could be made to improve the accuracy of the experiment. [1]

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