11.2 Synoptic Data Handling & Graphical Skills

Question Paper

Course	DP IB Chemistry
Section	11. Measurements & Data Processes
Topic	11.2 Synoptic Data Handling & Graphical Skills
Difficulty	Easy

Time allowed: 40

Score: /28

Percentage: /100

Question 1a

a)
Outline the difference between *quantitative* and *qualitative* data.

[1]

[1 mark]

Question 1b

b)
A student uses a thermometer to measure the temperature of a beaker of water, before and after heating. The smallest thermometer division is 1.0 °C. The initial temperature of the water is 23.0 °C.

How should the temperature change be recorded?

[1]

[1 mark]

Question 1c

c)
Explain how a student over-shooting the end point in a titration affects the final result of the titration calculation.

[2]

[2 marks]

Question 1d

d)
This question is about precision.

i)
Explain what is meant by the term *precision* in recorded data.

[1]

ii)
The table shows a set of titration results:

Initial burette reading/ $\pm$ 0.05 cm^3	0.00
Final burette reading/ $\pm$ 0.05 cm^3	23.40
Volume delivered/ cm^3	

How should the volume delivered be recorded?

[1]

[2 marks]

Question 2a

a)
Outline the difference between a *random* error and a *systematic* error.

[2]

[2 marks]

Question 2b

b)
A student forgets to tare the balance while carrying out an experiment to find the empirical formula of magnesium oxide.

State what type of error this is, and deduce the impact on the student's mass readings.

[2]

[2 marks]

Question 2c

c)
Explain how random errors may be reduced in an experiment.

[1]

[1 mark]

Question 3a

a)
A student carries out a thermal decomposition of copper(II) carbonate. The copper(II) carbonate is placed in a pre-weighed crucible and the crucible is weighed again when cool. The reaction that takes place is:

$$CuCO_3(s) \rightarrow CuO(s) + CO_2(g)$$

The results are recorded in the table.

	Mass/ $\pm$ 0.01 g
Mass of empty crucible	38.52 g
Mass of crucible + copper(II) carbonate	46.73 g
Mass of crucible + copper(II) oxide	43.61 g

Calculate the mass of copper(II) oxide formed and determine the percentage uncertainty in the calculated mass.

[2]

[2 marks]

Question 3b

b)
Determine the theoretical yield of copper(II) oxide in part a)

[3]

[3 marks]

Question 3c

c)
Determine the percentage error in the experiment.

[1]

[1 mark]

Question 3d

d)
The student forgets to turn the Bunsen burner, used to heat the crucible, to a blue flame. The yellow, sooty flame, soon coats the outside of the crucible with a black layer.

Identify the black layer and suggest whether the error will have a major or minor effect on their results.

[2]

[2 marks]

Question 4a

a)
Explain the difference between a *dependent* variable and *independent* variable on a graph.

[1]

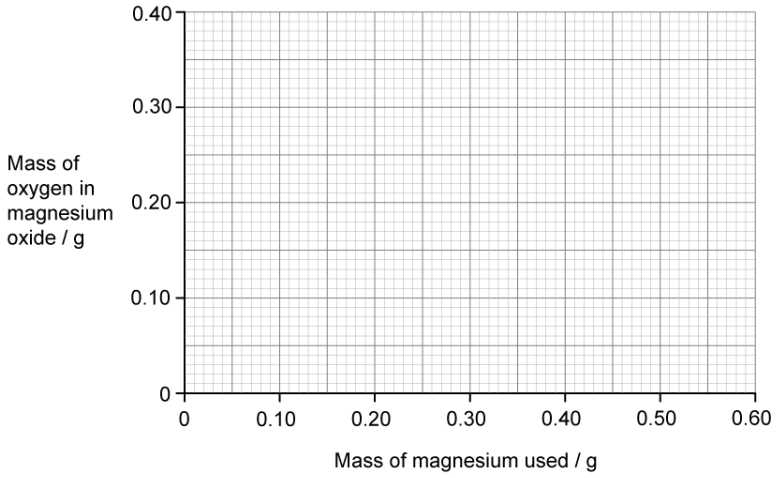
[1 mark]

Question 4b

b)

A student analyses a set of results from the determination of the empirical formula of magnesium oxide by burning magnesium ribbon.

They plot a graph on the following grid:



Identify the dependent and independent variables.

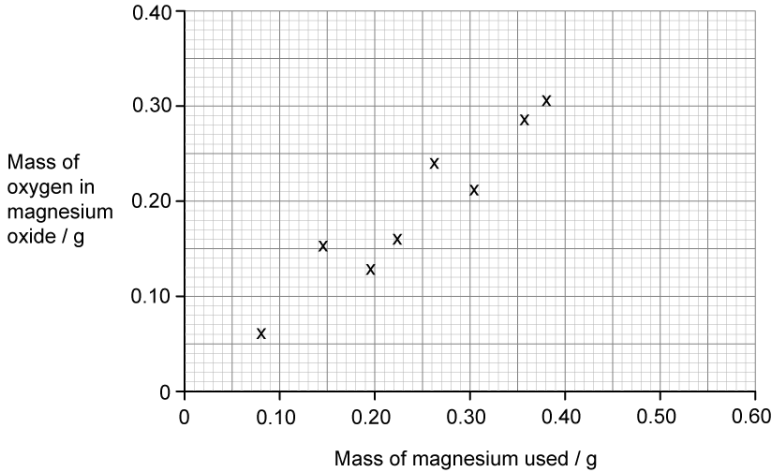
[1]

[1 mark]

Question 4c

c)

The student plots the result an obtains the following graph.



Justify whether a best fit straight line on this graph can or cannot be considered.

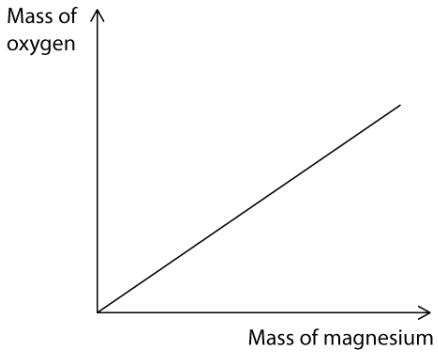
[2]

[2 marks]

Question 5a

a)

The sketch graph below shows the variation of the mass of magnesium with the mass of oxygen, from the results of an empirical formula investigation.



Describe the relationship between the two variables.

[1]

[1 mark]

Question 5b

b)

Using the graph in part a), show how the gradient maybe calculated and explain it's significance for magnesium and oxygen.

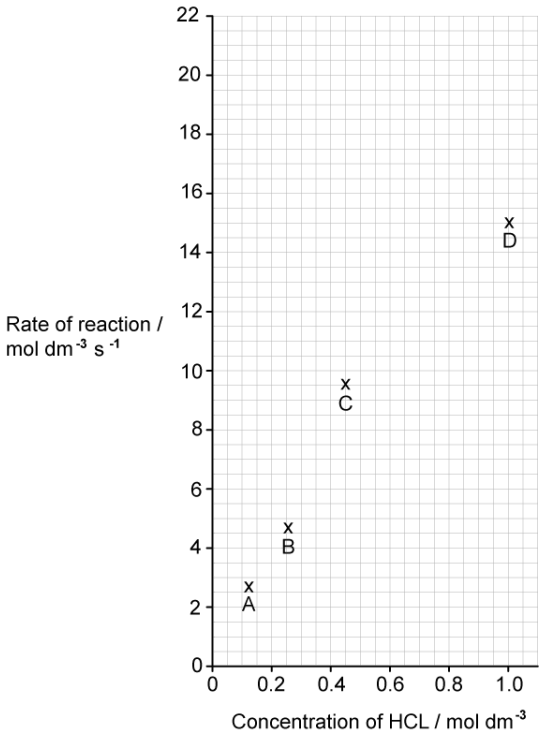
[2]

[2 marks]

Question 5c

c)

The rate of reaction between magnesium and hydrochloric acid was investigated. The concentration of acid was varied and the results plotted on a graph.



Draw a best fit line and calculate the gradient.

[2]

[2 marks]