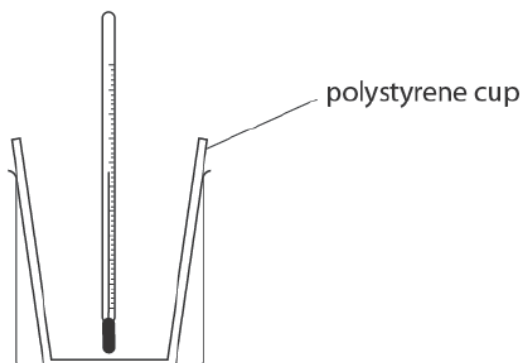


ACTIVITY 9a – AO3 in Exams

Paper 1C, Q12(a)

- 12 A student uses this apparatus to investigate the temperature change that occurs when ammonium nitrate is dissolved in water.



She uses this method.

- put 100cm^3 of water into the polystyrene cup and measure the initial temperature of the water
- add 8.00g of ammonium nitrate and stir
- record the lowest temperature reached by the solution

The table shows her results.

Initial temperature of water in $^{\circ}\text{C}$	20.0
Lowest temperature of solution in $^{\circ}\text{C}$	14.2

- (a) Use the results of the experiment to explain what type of reaction is taking place when ammonium nitrate is added to water.

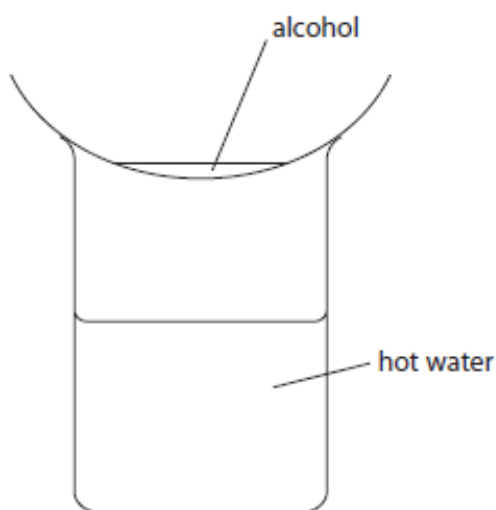
(2)

Question number	Answer	Notes	Marks
12 a	<p>An explanation that links together</p> <p>M1 the reaction is endothermic and either of the following points:</p> <p>M2 as shown by the decrease in temperature (of the reaction mixture)</p> <p>OR</p> <p>M3 it takes in thermal energy/heat (from the surroundings)</p>	<p>REJECT exothermic for both marks</p> <p>ALLOW references to cooling</p> <p>No M2 or M3 if the statements contradict each other</p>	2

Paper 2C, Q3(c)(i)

- 3 Methanol, ethanol, propanol and butanol are alcohols. They are all liquids that evaporate easily when warmed.

A student uses this apparatus to compare the time taken for the four liquids to evaporate.



She uses this method.

- pour some methanol into an evaporating basin
- place the evaporating basin on top of a beaker containing hot water
- measure the time taken for the methanol to evaporate completely
- repeat the experiment with each of the other alcohols, using the same apparatus

(c) The table shows the results of experiments done by four students, A, B, C and D.

Alcohol	Formula of alcohol	Time taken for liquid to evaporate in s				
		Student A	Student B	Student C	Student D	Mean time in s
methanol	CH ₃ OH	20	24	22	26	23
ethanol	C ₂ H ₅ OH	32	34	35	30	33
propanol	C ₃ H ₇ OH	45	47	50	48	48
butanol	C ₄ H ₉ OH	64	63	90	60	

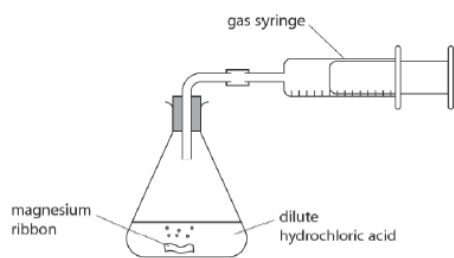
(i) Calculate the mean (average) time for butanol to evaporate.

(2)

Question number	Answer	Additional guidance	Marks
3 (c) (i)	M1 $(64 + 63 + 60) \div 3$ M2 = 62	ALLOW 62.3 62/62.3 with no working scores 2 ALLOW 69/69.25/69.3 for 1 mark	2

Paper 1C, Q13(a) & (b)

13 A student uses this apparatus to investigate the rate of reaction between magnesium and an **excess** of dilute hydrochloric acid.



She uses this method.

- use a graduated beaker to pour 50 cm^3 of dilute hydrochloric acid of concentration 2.00 mol/dm^3 into the conical flask
- add a piece of magnesium ribbon of mass 0.086 g to the acid and put the bung into the neck of the flask
- measure the total volume of gas collected every ten seconds until the reaction stops

The table shows the student's results.

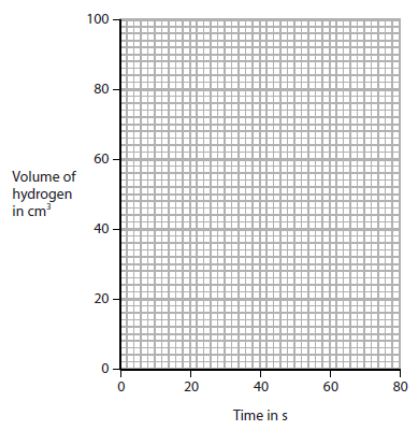
Time in s	Volume of hydrogen in cm^3
0	0
10	29
20	52
30	67
40	76
50	81
60	84
70	84
80	84

(a) (i) Plot the student's results on the grid.

(1)

(ii) Draw a curve of best fit.

(1)



(b) (i) The student repeats the experiment using

- 0.043 g of magnesium ribbon
- 50 cm^3 of 2.00 mol/dm^3 hydrochloric acid

Draw, on the grid in part (a), the curve you would expect in this experiment.

Label this curve Y.

(2)

(ii) The student repeats the experiment again, using

- 0.086 g of magnesium ribbon
- 50 cm^3 of 2.00 mol/dm^3 hydrochloric acid
- a slightly higher temperature than the first experiment

Draw, on the grid in part (a), the curve you would expect in this experiment.

Label this curve Z.

(2)

Question number	Answer	Notes	Marks
13 a (i)		all points plotted correctly to + or - half a square	1
(ii)		curve of best fit drawn for points plotted	1

Question number	Answer	Notes	Marks
13 b i	M1 curve Y starting at origin and below original curve M2 levelling off at 42 cm^3 to + or - half a square		2
ii	M1 curve Z starting at origin and above original curve M2 levelling off at 84 cm^3 to + or - half a square	ACCEPT curves unlabelled If curves labelled incorrectly then deduct 1 mark	2