Chemistry Scholarship Paper 2015

Question 1 (14 marks)

The reaction between magnesium powder and powdered copper(I) oxide is extremely violent and is often used in chemistry demonstrations. The word equation for the reaction is shown below:

magnesium + copper(I) oxide \rightarrow copper + magnesium oxide

	Reac	ctivity Series?	
			[1]
(b)	(i)	Which substance is being reduced during the reaction?	
			[1]
	(ii)	Why can this reaction be described as a REDOX reaction?	
			[2]
(c)	In te	erms of the particles involved, explain why the reactants should be in the for	m of powders.
			[2]
(d)		grams of magnesium was used would you expect the mass of magnesium or e greater or less than 10 grams? Explain your answer.	xide produced
			[2]

The chemical equation for the reaction is given below. Because the equation is balanced it shows the **ratio** in which the reactants react and in which the products are produced.

$Mg + Cu_2O \rightarrow 2 Cu + MgO$

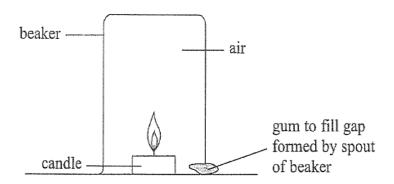
The mass of an atom is measured in atomic mass units (amu). Magnesium atoms have a mass of 24 amu whereas copper atoms have a mass of 64 amu.

(e)	Using the information given above, calculate the mass of copper that would be produced if 2.5 grams of magnesium reacted completely with copper(I) oxide. Show all of your working.				
	[3]				
(f)	When a teacher performed the reaction using 2.5 grams of magnesium she found that the mass of copper produced was less than the value she had calculated. Apart from any error in weighing out the reactants suggest two reasons why the amount of copper produced was less than expected.				
	[2]				
(g)	Although this reaction is extremely exothermic it does not begin until the reactants are at a high enough temperature. Suggest a reason for this.				
	[1]				

Question 2 (16 marks)

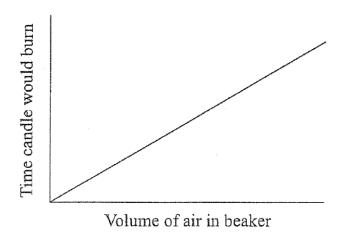
Air contains approximately 20% oxygen. When we burn a fuel in air it reacts with the oxygen.

A student investigated how long a candle would burn when covered by an upturned beaker (see the diagram below).



She repeated the experiment several times using different sizes of beaker.

(a) Before she started the experiment she sketched a graph to show how she thought the length of time the candle would burn would depend on the volume of air in the beaker.



Suggest why she thought the graph was this shape.

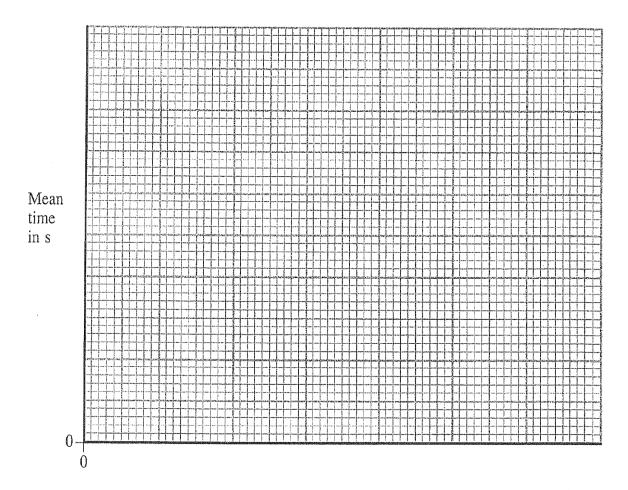
			[2]

	Volume of air	Time for v	vhich candle	hurned (s)	
Beaker	in beaker (cm ³)	Run 1	Run 2	Run 3	Mean time (s)
A	240	14	16	18	16
В	460	27	28	29	28
C	700	59	61	66	62
D	1020	68	69	73	70
E	1250	95	96	91	
Suggest a run.	method she could ι	ise to accurate	ely measure th	e volume of th	e beaker used

(e)	Calculate the mean time for beaker E.	Write your answer in the space in the table.
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(f)	(i)	Draw a graph of the mean time for which the candle burne	ed against volume of air ir
	the bea	ker.	[3]

[1]



Volume of air in beaker in cm³

(ii)	One of the points on your graph is anomalous. Circle this point.	[1]
(iii) anoma	Suggest and explain what may have happened in the experiment to productalous point.	e this
		[2]

	(iv) practi	She was unsure whether or not the graph line went through the origin. What further cal work should she do to help her decide?
(g)		
		[1]
		the student's results, calculate how long a candle would burn in a 550 cm ³ beaker ning pure oxygen .
		[2]

Total marks = 30

END OF PAPER