Candidate Name	Centre Number	Candidate Number
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WJEC CBAC

GCSE

236/02

SCIENCE
HIGHER TIER
CHEMISTRY 1

A.M. MONDAY, 17 January 2011

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**9**	
3.	**4**	
4.	**11**	
5.	**4**	
6.	**3**	
7.	**9**	
8.	**4**	
Total	**50**	

0236
020001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

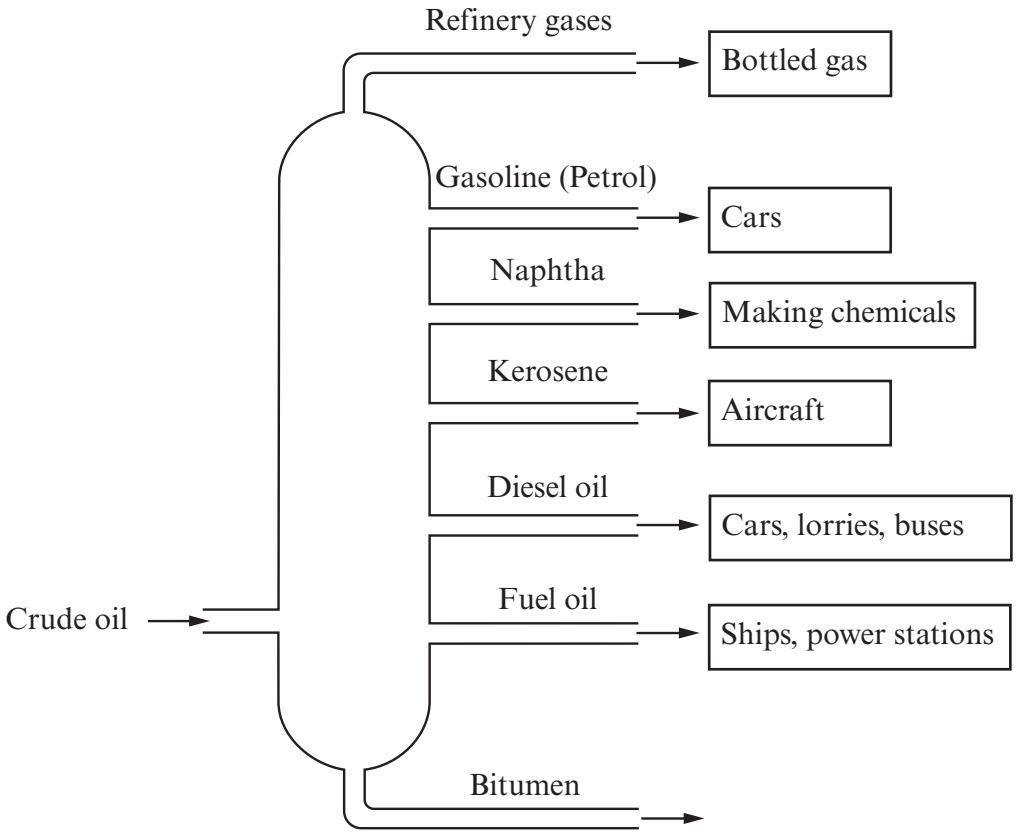
The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

Answer **all** *questions.*

1. *(a)* The following diagram summarises the industrial fractional distillation of crude oil.



Use the diagram above to help you answer the following questions.

(i) State what must happen to the crude oil before it enters the column. [1]

.....

(ii) State how the temperature changes from the bottom to the top of the column. [1]

.....

(iii) At which point in the column are the smallest molecules collected? [1]

.....

(iv) The fractions are collected as liquids. Name the physical process taking place when a gas changes to a liquid. [1]

.....

(v) Differences in which physical property allow the fractions to be collected at different levels in the column? [1]

.....

(b) Many of the fractions are used as fuels and contain sulphur impurities. Name the environmental problem caused by the burning of these sulphur impurities. [1]

.....

2. *(a)* Use the **data** and **key** on the Periodic Table of Elements, shown on the back page of this examination paper, to answer the following questions.

(i) The chemical **symbol** for gold is ..... . [1]

(ii) The element with the atomic number 9 is ..... . [1]

(iii) An element has the electronic structure 2,8,5.

I. State the group and period in which this element is found and explain your answers in terms of its electronic structure. [2]

Group .....

Reason .....

.....

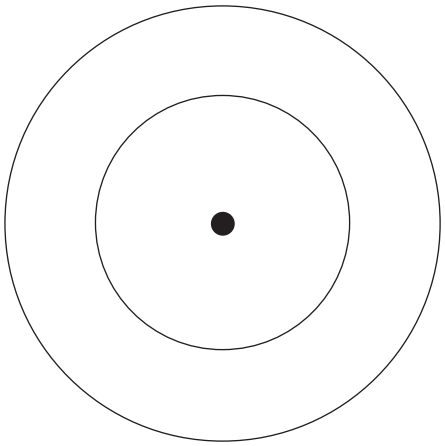
Period .....

Reason .....

.....

II. Identify this element. ..... [1]

(b) Using **X** to represent an electron, complete the following diagram to show the electronic structure of boron. [1]



(c) The following diagram shows the Periodic Table that was published by Mendeleev in 1869.

Group / Period	1	2	3	4	5	6	7	0
1	H							
2	Li	Be	B	C	N	O	F	
3	Na	Mg	Al	Si	P	S	Cl	
4	K Cu	Ca Zn	* *	Ti *	V As	Cr Se	Mn Br	Fe Co Ni
5	Rb Ag	Sr Cd	Y In	Zr Sn	Nb Sb	Mo Te	* I	Ru Rh Pd

(i) Give a reason why Mendeleev used * in some of the boxes. [1]

.....

.....

(ii) Name **two** elements present in Group 1 of Mendeleev's table that are not in Group 1 of the present day Periodic Table. [1]

..... and .....

(iii) Mendeleev arranged the elements in order of increasing atomic mass. State how the elements are arranged in the present day Periodic Table. [1]

.....

Examiner only

3. The following table shows information about some compounds. Complete the table. [4]

You may find the table of common ions on the inside of the back cover of this examination paper useful when answering this question.

Compound	Formula	Metal ion present	Non-metal ion present
sodium chloride	NaCl	Na^+	Cl^-
potassium oxide	.....	K^+	O^{2-}
magnesium carbonate	$MgCO_3$	.....	.....
.....	.....	Ca^{2+}	OH^-

Examiner only

4. *(a)* Hydrogen peroxide, H_2O_2, decomposes very slowly to produce water and oxygen gas.

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

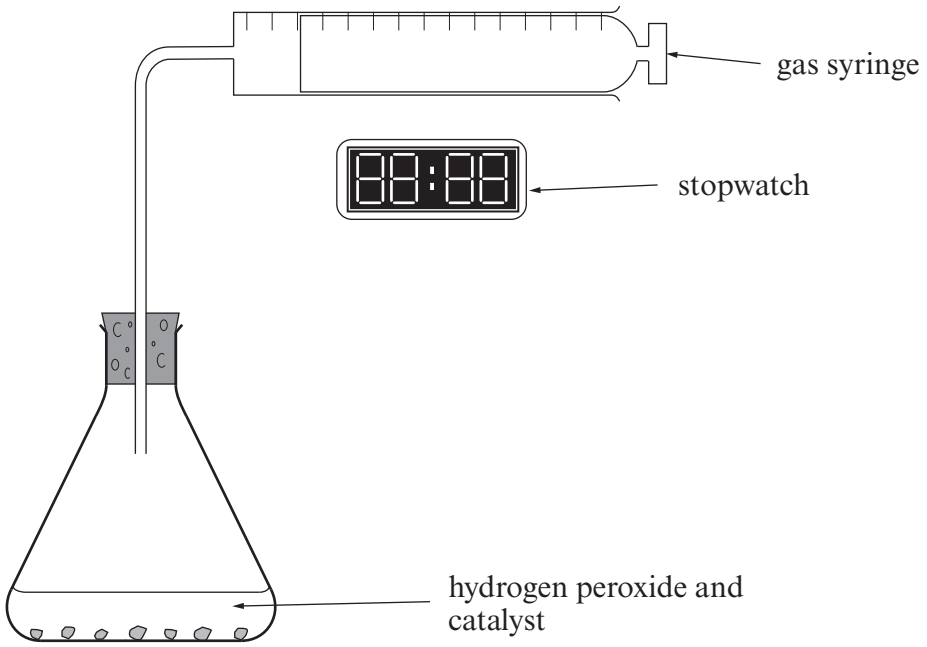
(i) State **one** observation that you would make during this reaction. [1]

.....

(ii) When a catalyst is added to hydrogen peroxide, the reaction speeds up. If 1 g of catalyst was used, how much catalyst would remain at the end of the experiment? [1]

.....

(iii) A student investigated this reaction using the apparatus shown below.

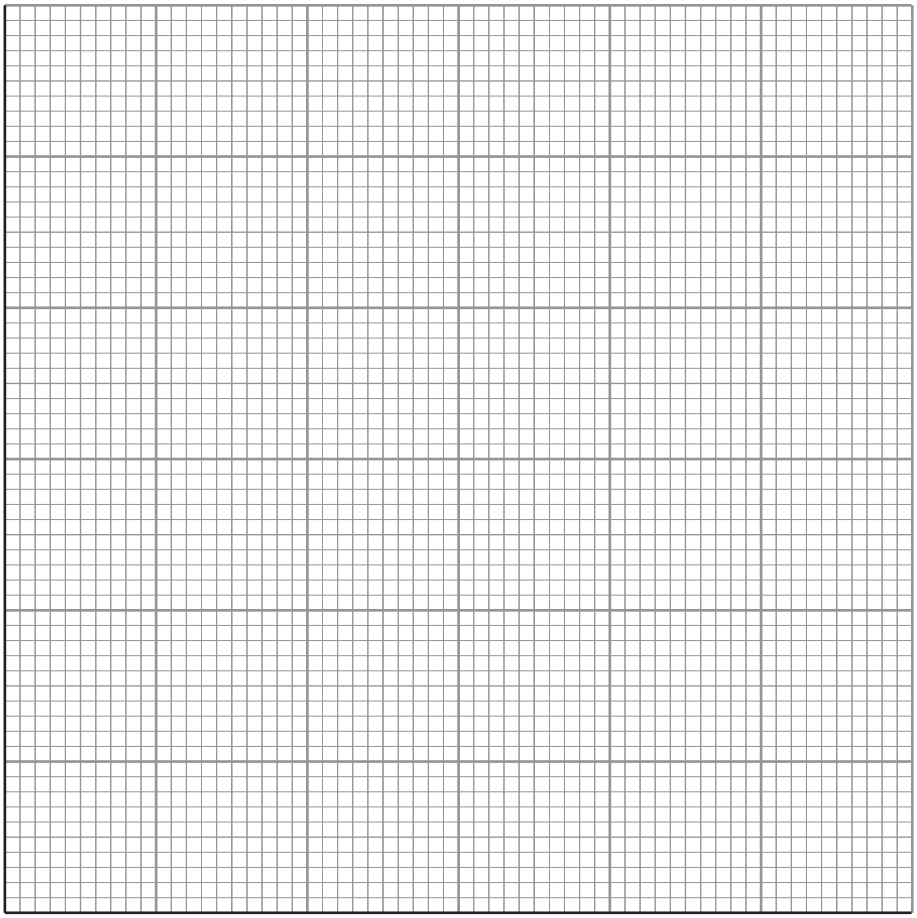


He added 1 g of catalyst to 100 cm^3 of hydrogen peroxide solution.
The volume of oxygen produced was recorded every 10 seconds.

The results are shown in the table below.

Time / s	0	10	20	30	40	50	60
Volume of oxygen produced / cm^3	0	40	66	82	94	100	100

Plot the results from the table on the grid below and draw a smooth curve of best fit through the points. [4]



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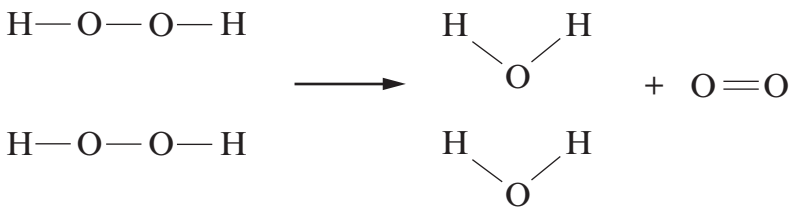
(b) The reaction taking place is shown by the following equation.



The relative amounts of energy needed to break the bonds in the above reaction are shown in the table below.

Bond	Amount of energy needed to break the bond / kJ
H — O	464
O = O	498
O — O	144

Note: The amount of energy **released** *in making a bond is equal and opposite to that* **needed** *to break the bond.*

Use the bond energy values in the table to show that the overall energy change for the reaction is –210 kJ. [5]

Examiner only

5. Nano-sized particles of titanium dioxide are used in suncreams.

(i) Give the size range of nanoparticles. [1]

.....

(ii) A magazine article contained the following quotes about the use of nanoparticles.

Quote 1:	People are concerned that nanoparticles used in cosmetics are not safe.
Quote 2:	There will be no ill effects as larger particles of the same substance are perfectly safe.

Give a reason why quote 2 is considered incorrect by many. [1]

.....

.....

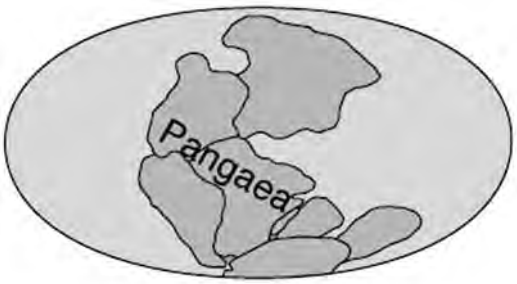
(iii) Explain why some people are concerned about using cosmetic products that contain nanoparticles. [2]

.....

.....

Examiner only

6. Alfred Wegener's theory of continental drift suggested that the Earth's continents were once joined and moved apart to their present positions.



(i) Give the reason why other scientists did not believe his theory. [1]

.....

.....

(ii) In the 1960s, scientists found new evidence that suggested that the Earth's surface was made up of a number of plates that were constantly moving.

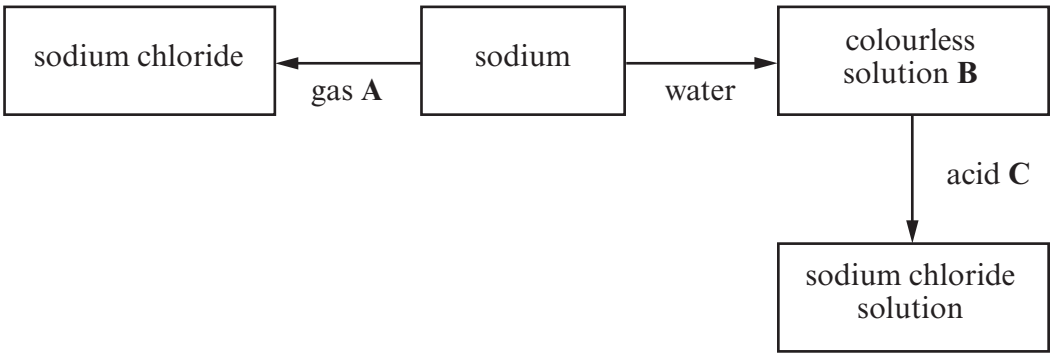
State what they believed to be the cause of this movement. [2]

.....

.....

Examiner only

7. *(a)* The following diagram shows two ways in which sodium metal can be changed into sodium chloride.



Give the name for

(i) gas **A**, ... [1]

(ii) colourless solution **B**, ... [1]

(iii) acid **C**. ..... [1]

(b) A pupil carried out a reaction between sodium and iodine.

(i) Complete and balance the following **symbol** equation for the reaction between sodium and iodine. [2]

..... Na + I_2 → .....

(ii) The pupil was asked to test the product to prove that it contained sodium ions and iodide ions. Describe the test used for each ion and give the expected results. [4]

.....

.....

.....

Examiner only

8. The following table shows some facts about greenhouse gases found in the atmosphere.

Greenhouse gas	% of all greenhouse gases	% naturally produced	% man-made
water vapour	95.000	94.999	0.001
carbon dioxide	3.618	3.502	0.116
methane	0.360	0.294	.....
nitrous oxide	0.950	0.903	0.047
others e.g. CFCs	0.072	0.025	0.047

(i) Complete the table to show the percentage of man-made methane. [1]

(ii) 'One possible solution to global warming is to reduce our carbon dioxide emissions by burning less fossil fuel.'
Use the figures in the table to explain why this statement could be considered to be correct on one hand but incorrect on the other. [2]

Correct .....

.....

Incorrect .....

.....

(iii) Apart from combustion, give **one** *natural* process that produces carbon dioxide. [1]

.....

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^{+}	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		

Turn over.

PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
								$^{1}_{1}$H Hydrogen									$^{4}_{2}$He Helium
$^{7}_{3}$Li Lithium	$^{9}_{4}$Be Beryllium											$^{11}_{5}$B Boron	$^{12}_{6}$C Carbon	$^{14}_{7}$N Nitrogen	$^{16}_{8}$O Oxygen	$^{19}_{9}$F Fluorine	$^{20}_{10}$Ne Neon
$^{23}_{11}$Na Sodium	$^{24}_{12}$Mg Magnesium											$^{27}_{13}$Al Aluminium	$^{28}_{14}$Si Silicon	$^{31}_{15}$P Phosphorus	$^{32}_{16}$S Sulphur	$^{35}_{17}$Cl Chlorine	$^{40}_{18}$Ar Argon
$^{39}_{19}$K Potassium	$^{40}_{20}$Ca Calcium	$^{45}_{21}$Sc Scandium	$^{48}_{22}$Ti Titanium	$^{51}_{23}$V Vanadium	$^{52}_{24}$Cr Chromium	$^{55}_{25}$Mn Manganese	$^{56}_{26}$Fe Iron	$^{59}_{27}$Co Cobalt	$^{59}_{28}$Ni Nickel	$^{64}_{29}$Cu Copper	$^{65}_{30}$Zn Zinc	$^{70}_{31}$Ga Gallium	$^{73}_{32}$Ge Germanium	$^{75}_{33}$As Arsenic	$^{79}_{34}$Se Selenium	$^{80}_{35}$Br Bromine	$^{84}_{36}$Kr Krypton
$^{86}_{37}$Rb Rubidium	$^{88}_{38}$Sr Strontium	$^{89}_{39}$Y Yttrium	$^{91}_{40}$Zr Zirconium	$^{93}_{41}$Nb Niobium	$^{96}_{42}$Mo Molybdenum	$^{99}_{43}$Tc Technetium	$^{101}_{44}$Ru Ruthenium	$^{103}_{45}$Rh Rhodium	$^{106}_{46}$Pd Palladium	$^{108}_{47}$Ag Silver	$^{112}_{48}$Cd Cadmium	$^{115}_{49}$In Indium	$^{119}_{50}$Sn Tin	$^{122}_{51}$Sb Antimony	$^{128}_{52}$Te Tellurium	$^{127}_{53}$I Iodine	$^{131}_{54}$Xe Xenon
$^{133}_{55}$Cs Caesium	$^{137}_{56}$Ba Barium	$^{139}_{57}$La Lanthanum	$^{179}_{72}$Hf Hafnium	$^{181}_{73}$Ta Tantalum	$^{184}_{74}$W Tungsten	$^{186}_{75}$Re Rhenium	$^{190}_{76}$Os Osmium	$^{192}_{77}$Ir Iridium	$^{195}_{78}$Pt Platinum	$^{197}_{79}$Au Gold	$^{201}_{80}$Hg Mercury	$^{204}_{81}$Tl Thallium	$^{207}_{82}$Pb Lead	$^{209}_{83}$Bi Bismuth	$^{210}_{84}$Po Polonium	$^{210}_{85}$At Astatine	$^{222}_{86}$Rn Radon
$^{223}_{87}$Fr Francium	$^{226}_{88}$Ra Radium	$^{227}_{89}$Ac Actinium															

Key: