Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2019

Double Award Science: Chemistry

Unit 7 Practical Skills
Booklet B
Higher Tier

MV18

[GDW77]

WEDNESDAY 12 JUNE, MORNING

Time

30 minutes, plus your additional time allowance.

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write on blank pages.
Complete in black ink only.
Answer **all four** questions.

Information for Candidates

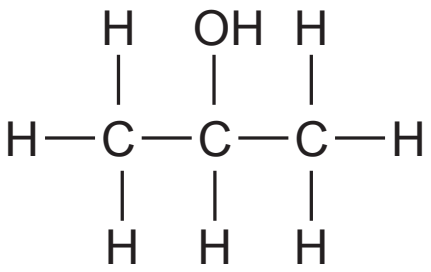
The total mark for this paper is 35.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.
A Data Leaflet including a Periodic Table of the Elements is provided.
Quality of written communication will be assessed in Question **3(a)**.

1 You have been given a bottle containing a liquid alkane and a bottle containing a liquid alkene. The labels have fallen off the bottles.

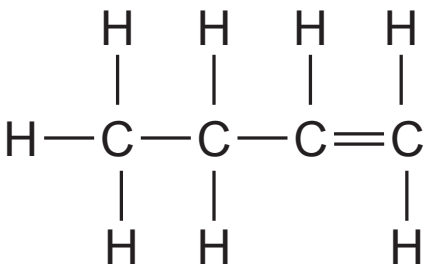
(a) Describe how you would carry out a chemical test on **both** samples to identify which sample was the alkene and which was the alkane. Name any reagents used and describe what you would observe. [4 marks]

(b) The structures of four organic compounds are shown below:

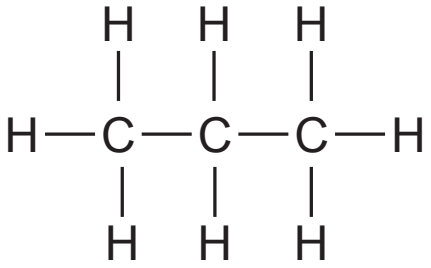
A



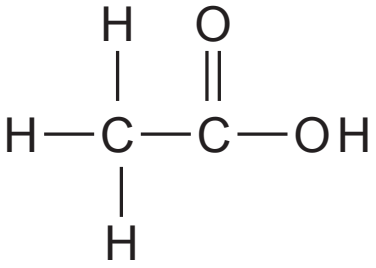
B



C



D



Identify which of the compounds (**A**, **B**, **C** or **D**) would react with sodium carbonate. [1 mark]

_____

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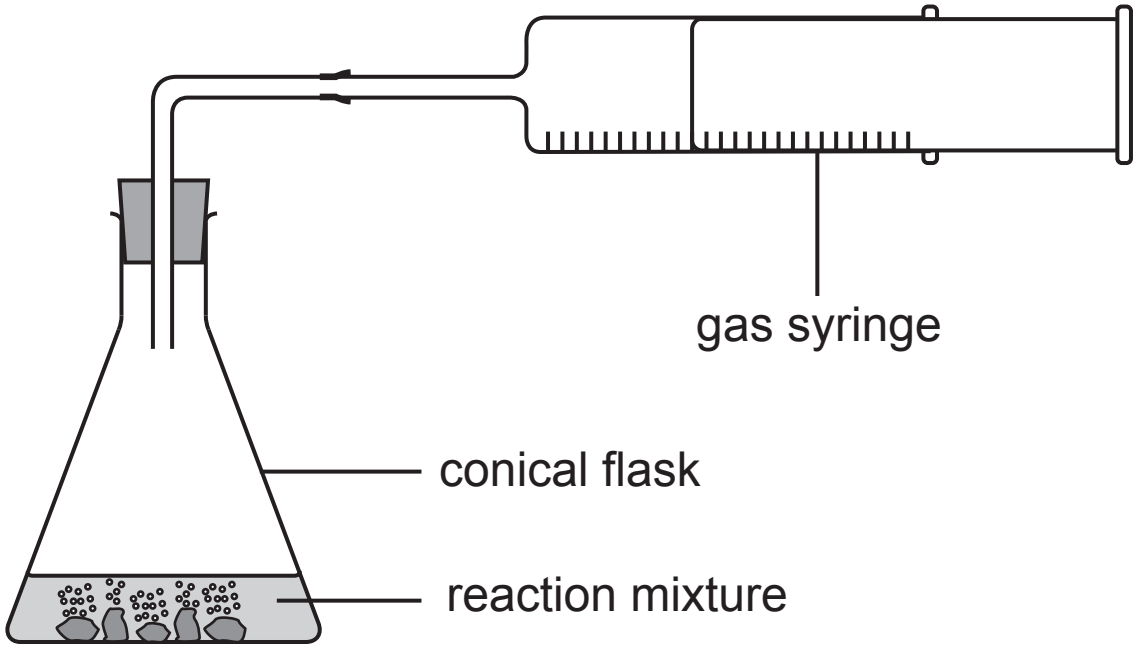
2 When calcium carbonate reacts with hydrochloric acid the following reaction occurs:

calcium carbonate + hydrochloric acid → calcium chloride + water + carbon dioxide

A group of students wanted to measure the rate of reaction between calcium carbonate and hydrochloric acid. They set up the apparatus shown below and measured the volume of gas produced over a period of time.



The following results for the experiment were obtained:

Time/s	0	10	20	30	40	50	60	70	80
Volume of CO_2 produced/cm^3	0	22	41	53	61	63	64	65	65

(a) On the grid opposite: [4 marks]

- label the x-axis;
- plot a graph to show how the volume of carbon dioxide gas produced changes with time when calcium carbonate reacts with hydrochloric acid.

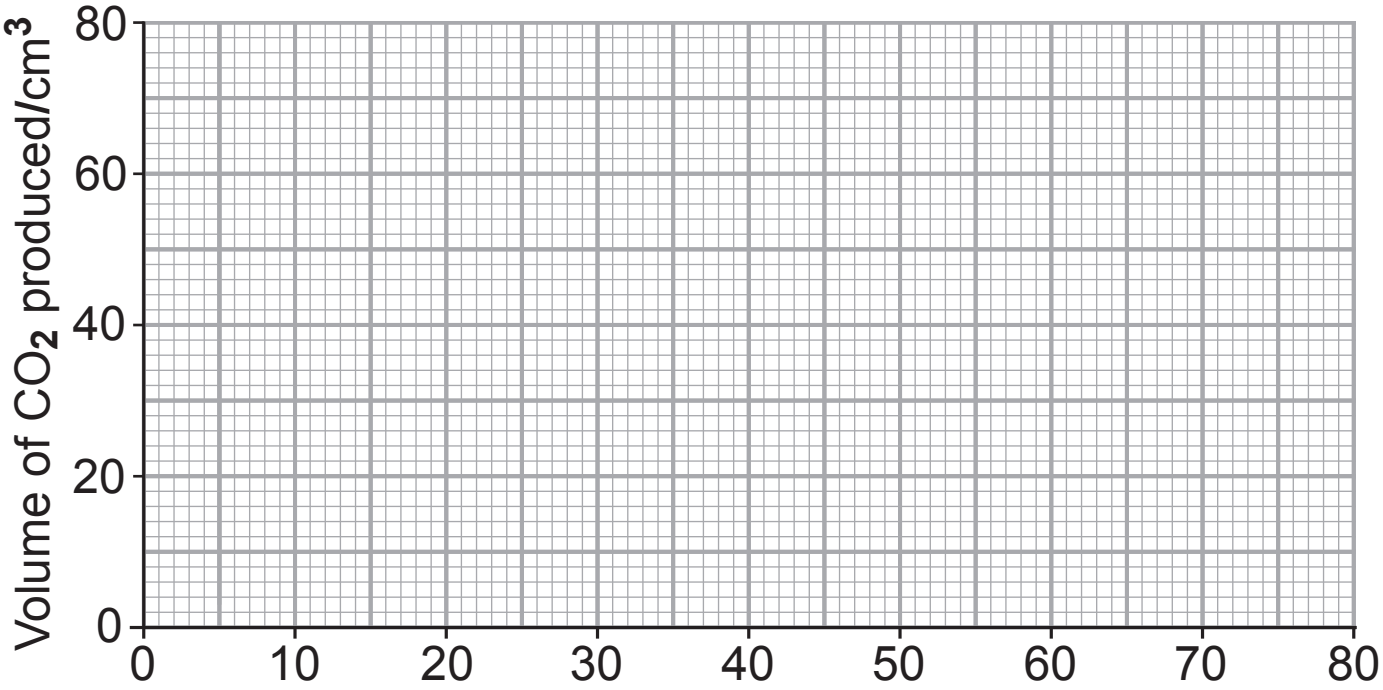
(b) From your graph, how long did it take to produce 48 cm^3 of the gas? [1 mark]

_____ s

(c) During what period of time (A, B, C or D) was the reaction rate the fastest? [1 mark]

A 0–20 seconds
B 21–40 seconds
C 41–60 seconds
D 61–80 seconds

_____



The average rate of this reaction can be calculated using the following equation:

$$\textbf{Average rate} = \frac{\textbf{Volume of gas produced}}{\textbf{Time}}$$

(d) Calculate the average rate of the reaction for the first 20 seconds. [2 marks]

_____ cm^3/s

(e) The student repeated the experiment at a higher temperature and found that the reaction was faster. Explain, in terms of collision theory, the effect of increasing the temperature on the rate of reaction. [3 marks]

3 Hydrogen gas can be prepared in the laboratory by reacting zinc metal and dilute hydrochloric acid. This gas can be collected over water.

(a) Describe how you would set up and use the apparatus needed to prepare and collect hydrogen gas over water using zinc and hydrochloric acid. Describe how you would test the gas to show that it is hydrogen.
[6 marks]

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

Preparation and collection of hydrogen gas:

Test for hydrogen gas:

(b) Identify a precaution, other than wearing safety goggles, which you would take to ensure that the reaction between zinc and hydrochloric acid was carried out safely and explain why you would take this precaution. [2 marks]

Precaution: _____

Explanation: _____

_____

(c) The reaction of zinc with hydrochloric acid can also be carried out with the addition of a catalyst. What is meant by the term catalyst? [2 marks]

_____

_____

_____

(d) Name one metal, other than zinc, which could be used with hydrochloric acid to safely prepare hydrogen. [1 mark]

_____

4 This question is about the identification of ions and compounds using chemical analysis.

(a) **T** is a white solid which is slightly soluble in water.
When a solution of **T** reacts with **sulfuric acid** it forms a white solid, **U** and no gas is given off.
A flame test on **U** produced a brick-red flame.

(i) Name the metal ion present in **U**. [1 mark]

_____

(ii) Suggest the formula for **U**. [1 mark]

_____

(iii) Suggest a chemical name for **T**. [1 mark]

_____

(iv) If **T** had been added to dilute nitric acid instead of dilute sulfuric acid what different observation would have been made? [1 mark]

_____

(b) **V** is a black solid which does not dissolve in water.
V can be reduced, using hydrogen to give the metal element **W**.
V also reacts with sulfuric acid to form a blue solution.
When this blue solution is evaporated a blue solid **X** remains.
When **X** is heated to constant mass a white solid, **Y** is formed.

From the information provided deduce:

(i) the chemical name for **V**. [1 mark]

_____

(ii) the name of the metal element **W** formed when **V** is reduced using hydrogen. [1 mark]

_____

(iii) the full chemical name for **X**. [1 mark]

_____

(iv) the formula for **Y**. [1 mark]

_____

This is the end of the question paper

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
Total Marks	

Examiner Number

SYMBOLS OF SELECTED IONS

Positive ions

Name	Symbol
Ammonium	NH_4^+
Chromium(III)	Cr^{3+}
Copper(II)	Cu^{2+}
Iron(II)	Fe^{2+}
Iron(III)	Fe^{3+}
Lead(II)	Pb^{2+}
Silver	Ag^+
Zinc	Zn^{2+}

Negative ions

Name	Symbol
Butanoate	$C_3H_7COO^-$
Carbonate	CO_3^{2-}
Dichromate	$Cr_2O_7^{2-}$
Ethanoate	CH_3COO^-
Hydrogencarbonate	HCO_3^-
Hydroxide	OH^-
Methanoate	$HCOO^-$
Nitrate	NO_3^-
Propanoate	$C_2H_5COO^-$
Sulfate	SO_4^{2-}
Sulfite	SO_3^{2-}

SOLUBILITY IN COLD WATER OF COMMON SALTS, HYDROXIDES AND OXIDES

Soluble
All sodium, potassium and ammonium salts
All nitrates
Most chlorides, bromides and iodides EXCEPT silver and lead chlorides, bromides and iodides
Most sulfates EXCEPT lead and barium sulfates Calcium sulfate is slightly soluble

Insoluble
Most carbonates EXCEPT sodium, potassium and ammonium carbonates
Most hydroxides EXCEPT sodium, potassium and ammonium hydroxides
Most oxides EXCEPT sodium, potassium and calcium oxides which react with water

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Rewarding Learning

New Specification

Rewarding Learning

Data Leaflet

Including the Periodic Table of the Elements

For the use of candidates taking
Science: Chemistry,
Science: Double Award
or Science: Single Award

Copies must be free from notes or additions of any kind. No other type of data booklet or information sheet is authorised for use in the examinations

gcse examinations

chemistry

For first teaching from September 2017

THE PERIODIC TABLE OF ELEMENTS

Group

1	2											3	4	5	6	7	0
							1 H Hydrogen 1										4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	98 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La* Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
223 Fr Francium 87	226 Ra Radium 88	227 Ac† Actinium 89	261 Rf Rutherfordium 104	262 Db Dubnium 105	266 Sg Seaborgium 106	264 Bh Bohrium 107	277 Hs Hassium 108	268 Mt Meitnerium 109	271 Ds Darmstadtium 110	272 Rg Roentgenium 111	285 Cn Copernicium 112						

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	145 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	242 Pu Plutonium 94	243 Am Americium 95	247 Cm Curium 96	245 Bk Berkelium 97	251 Cf Californium 98	254 Es Einsteinium 99	253 Fm Fermium 100	256 Md Mendelevium 101	254 No Nobelium 102	257 Lr Lawrencium 103

* 58 – 71 Lanthanum series
† 90 – 103 Actinium series

a
X
b

a = relative atomic mass (approx)
x = atomic symbol
b = atomic number