Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Science: Single Award

Unit 2 (Chemistry)

Foundation Tier

ML

[GSS21]

THURSDAY 19 MAY 2016, MORNING

TIME

1 hour, 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 outside the boxed area on each page or on blank pages.
Complete in blue or black ink only.
Answer **all eleven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
Quality of written communication will be assessed in Question **7**.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

1 **(a)** Given below are some hazard symbols and their names. Using lines, match each symbol to its name.

One has been done for you.

Symbol	Name
	corrosive
	flammable
	toxic
	explosive

[2]

(b) Given below is information about three household substances. Complete the table.

Choose from:

citric acid : **ethanoic acid** : **sodium hydroxide**

Household substance	Chemical name
cleaning products	ammonia
oven cleaner	
vinegar	

[2]

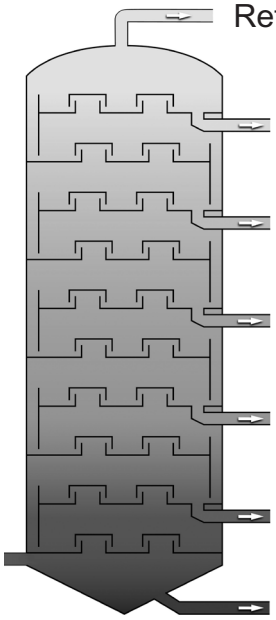
2 **(a)** Complete the following sentences about crude oil.

Crude oil is a fossil fuel. It is formed from plants and animals that died millions of years ago. Crude oil is a _____ of many different hydrocarbons. Hydrocarbons are compounds that contain only the elements _____ and _____. [3]

(b) Crude oil is separated into different chemicals by fractional distillation. Complete the diagram below about the different fractions of crude oil and their uses.

Choose from:

paraffin **bitumen** **petrol**



Refinery gas used for fuel in gas ovens

_____ used as fuel in cars

Naphtha used for making chemicals

_____ used for fuel in jet engines

Diesel used as fuel in cars and lorries

Fuel oil used for central heating

_____ used for road surfaces

[2]

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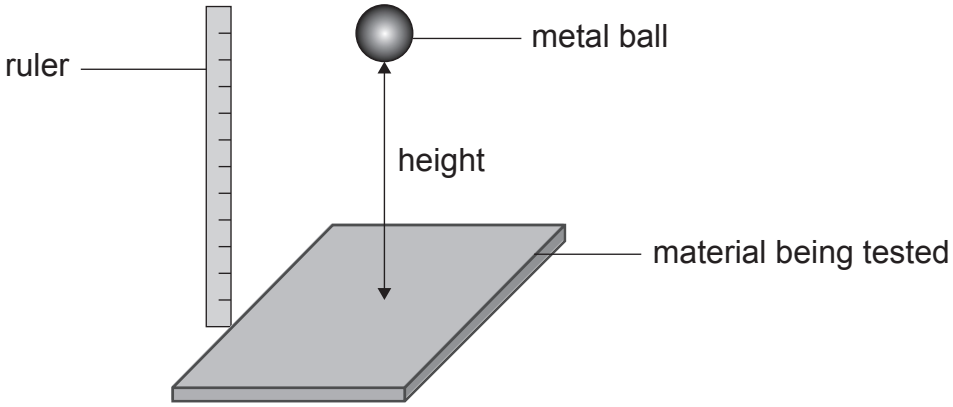
(c) What difference between each fraction allows them to be separated using the method shown above? Circle the correct answer.

melting point : **freezing point** : **boiling point**

[1]

[Turn over

3 A student investigated the strength of four different materials using the apparatus shown below.

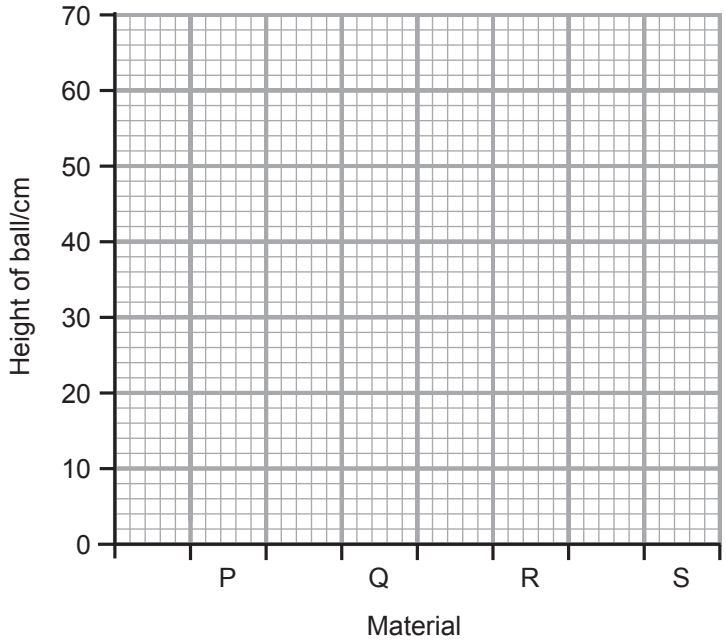


Source: Principal Examiner

The student increased the height of the ball each time it was dropped until the material cracked when the ball hit it.
The results are shown in the table below.

Material	Height of ball/cm
P	44
Q	32
R	65
S	24

(a) Use the information in the table to complete the bar chart below.



[2]

(b) Which material (**P**, **Q**, **R** or **S**) is the strongest?

_____ [1]

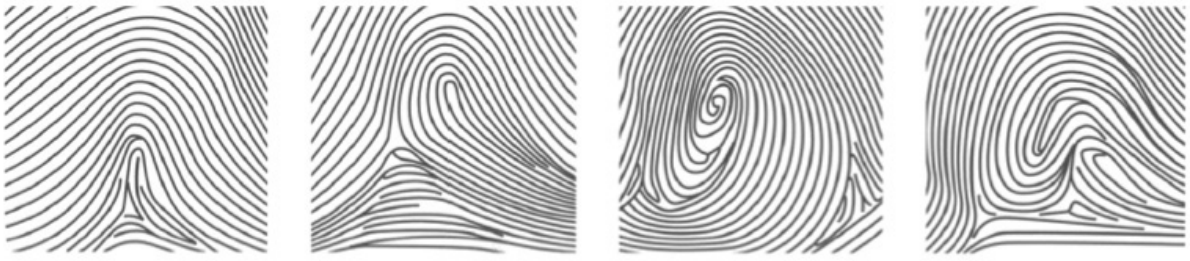
(c) Give **two** things the student needed to do to make this investigation a fair test.

1. _____

2. _____ [2]

[Turn over

4 Look at the diagrams.
Four types of fingerprints used by forensic scientists are shown below.



A **B** **C** **D**

(a) Which of the fingerprints (**A**, **B**, **C** or **D**) is an 'arch' type?

_____

Which of the fingerprints (**A**, **B**, **C** or **D**) is a 'whorl' type?

_____ [2]

(b) Forensic scientists also use flame tests. The steps to carry out a flame test are shown below but they are **not** in the correct order.

W Then dip the flame test rod into the test material and put into the blue Bunsen flame.

X Clean the flame test rod by dipping it into acid and heating it in a blue Bunsen flame.

Y Repeat the cleaning process until there is no colour change.

Z Record the colour of the flame produced.

Give the correct order, using the letters **W**, **X**, **Y** and **Z**.

Order _____ _____ _____ _____ [2]

(c) A flame test is used to identify the metal ion present in a substance by producing a colour in the Bunsen flame.

Complete the table below.

Metal ion	Flame colour
copper	blue-green
potassium	
	orange/yellow

[2]

[Turn over

5 The table below shows some properties of five different plastics.

Plastic	Properties
A	tough, fairly hard, light, good water resistance
B	tough, heavy, not flexible, good electrical insulator
C	tough, not flexible, light, good resistance to chemicals, good electrical insulator
D	shatters easily, hard, light, good resistance to chemicals
E	tough, soft, light, very flexible, good resistance to chemicals, good electrical insulator

Use this information to answer the following questions.

(a) Which plastic (**A**, **B**, **C**, **D** or **E**) would be best for making a toy boat? Give the **most** important reason for your choice.

_____

_____ [2]

(b) Which plastic (**A**, **B**, **C**, **D** or **E**) would be best for making a container for carrying acid? Why is this the best choice?

_____

_____

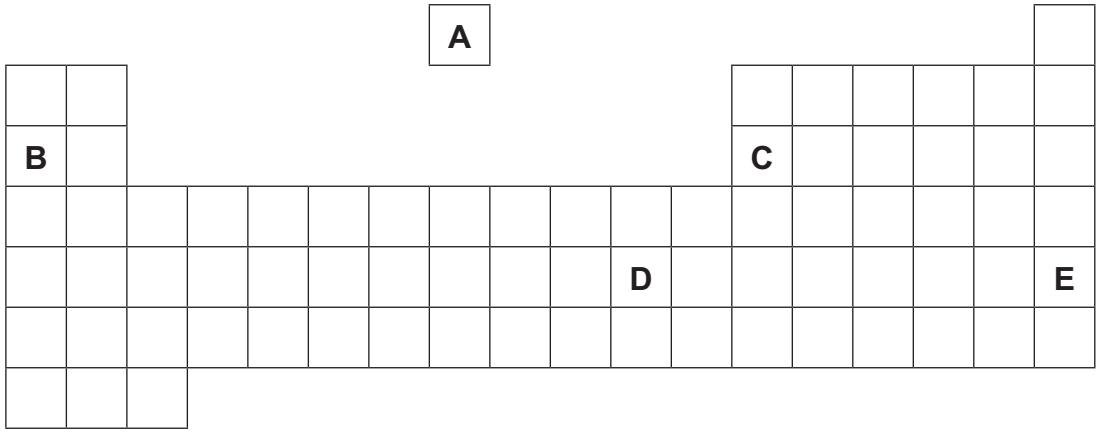
_____ [2]

(c) Low density polythene is used to make plastic shopping bags and to cover electrical cables.
Suggest which of the plastics (**A**, **B**, **C**, **D** or **E**) could be low density polythene.

_____ [1]

[Turn over

6 Below is an outline of the Periodic Table showing the position of some elements.



You may find your Data Leaflet helpful to answer the questions below.

(a) Place an **X** in any position where you would find an alkaline earth metal. [1]

(b) Which element (**A**, **B**, **C**, **D** or **E**) is:

1. sodium? _____
2. a noble gas? _____
3. in the same Group as boron? _____ [3]

(c) Complete the following sentence to describe a **trend** in the Periodic Table.

The metallic character of the elements _____ from left to right across the Periodic Table. [1]

7 Describe why and how earthquakes occur.

Your answer should include:

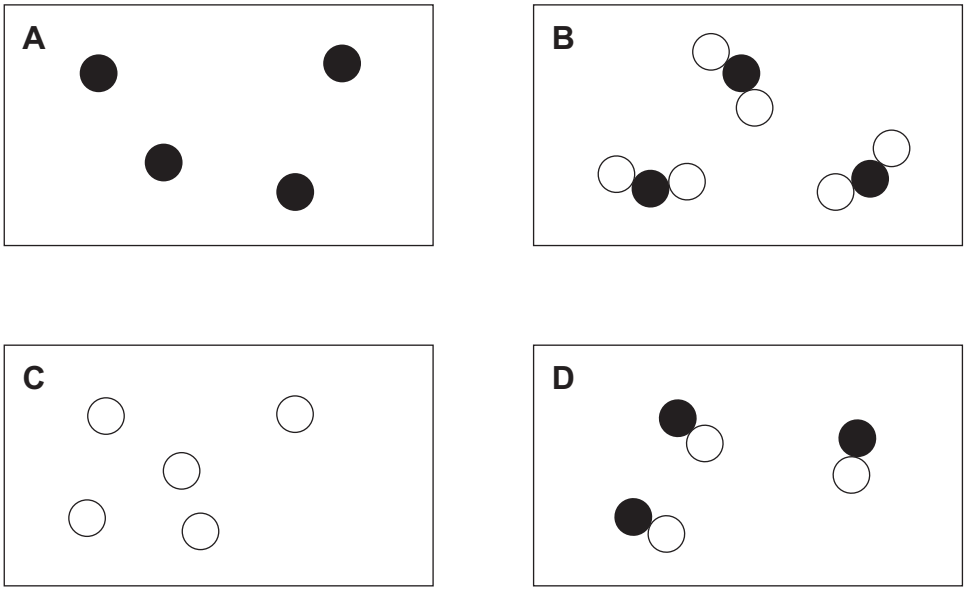
- an explanation of the process;
- the name of the scale used to measure earthquakes and what the readings tell us about earthquakes.

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

[6]

[Turn over

8 Below are some particle diagrams. They represent elements or compounds.



(a) Which of the diagram(s) (**A**, **B**, **C** or **D**) show elements? Explain your answer.

Diagram(s) _____

_____

_____ [2]

(b) Suggest which diagram (**A**, **B**, **C** or **D**) could represent the compound carbon monoxide (CO).

_____ [1]

9 **(a)** The table below gives information about five hydrocarbon molecules.

Molecule	Number of carbon atoms	Melting point/°C	Boiling point/°C	Energy released per gram when burned/kJ
methane	1	– 182	– 162	56
ethane	2	– 183	– 89	52
propane	3	– 188	– 42	51
butane	4	– 138	0	50
pentane	5	– 130	36	49

(i) Calculate the energy released when 100 grams of propane is burned.

_____ kJ [1]

(ii) Calculate the difference between the melting points of the molecules with the most and least carbon atoms.

_____ °C [1]

(iii) Describe the relationship between the number of carbon atoms and a molecule's boiling point.

_____

_____ [1]

(b) Complete the word equation below for the burning of propane.

propane + [ ] → carbon dioxide + water [1]

[Turn over

10 The table below gives information about three different indicators and their colours at different pH values.

Indicator \ pH	1	2	3	4	5	6	7	8	9	10	11	12	13	14
methyl purple	P	P	P	P	G	G	G	G	G	G	G	G	G	G
thymol blue	Y	Y	Y	Y	Y	Y	Y	Y	B	B	B	B	B	B
indigo carmine	B	B	B	B	B	B	B	B	B	B	B	Y	Y	Y

Key: B = blue G = green P = purple Y = yellow

Use the information in the table to answer the following questions.

(a) 1. What colour is methyl purple indicator in a strong acid?

_____

2. What colour is indigo carmine indicator in sodium hydroxide?

_____ [2]

(b) A scientist is going to add an acid to an alkali. He needs to stop adding the acid when the pH value is 7.

(i) What name is given to this **type** of reaction?

_____ [1]

(ii) Explain fully why the scientist would **not** find any of the indicators in the table useful for his experiment.

_____

_____

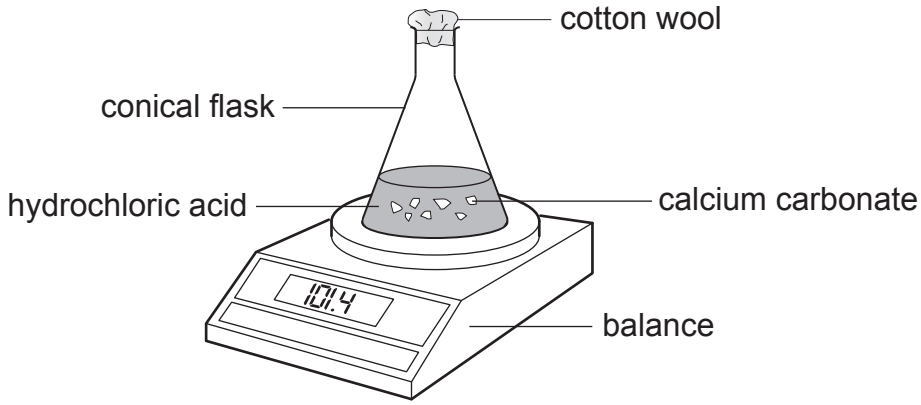
_____ [2]

(c) Most indicators are made from plants. Describe how you would obtain an indicator from red cabbage.

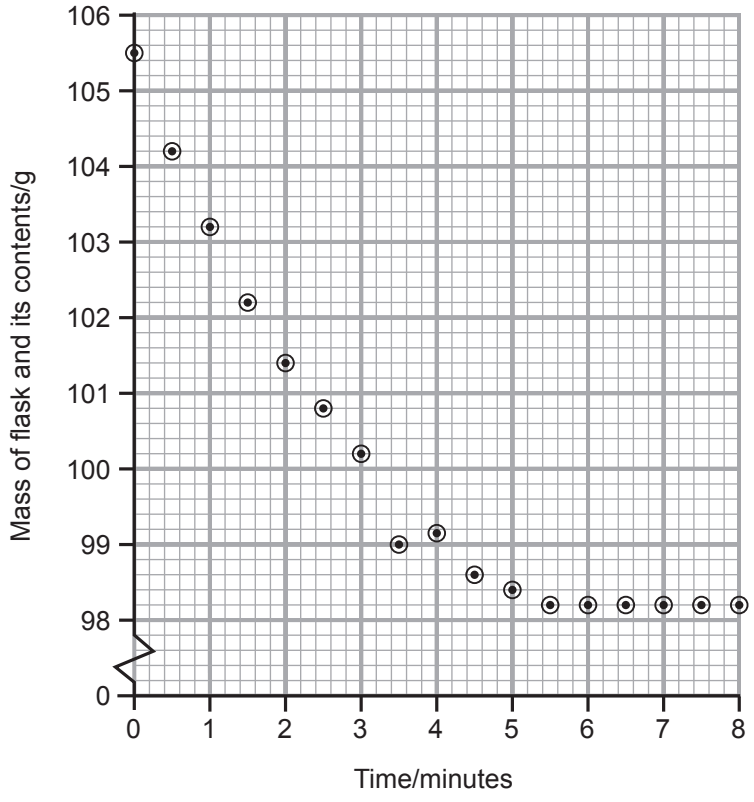
[3]

[Turn over

11 A student investigated the amount of carbon dioxide released during the reaction between hydrochloric acid and calcium carbonate. He used the apparatus shown below.



The student measured the mass of the flask and its contents for 8 minutes. The results are shown in the graph below.



(a) Complete the graph opposite by adding a curve of best fit and ignoring any anomalous results. [1]

(b) Describe fully the trend shown in the graph.

_____

_____

_____ [2]

(c) Complete the word equation for this reaction.

hydrochloric acid + calcium carbonate → [ ] + [ ] + carbon dioxide

[2]

(d) **(i)** Name the chemical used to test for carbon dioxide.

_____ [1]

(ii) Describe the colour change during this test for carbon dioxide.

_____

_____ [2]

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For Examiner's use only	
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