Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4782/01

S16-4782-01

SCIENCE B

UNIT 2: Science and Life in the Modern World
FOUNDATION TIER

P.M. WEDNESDAY, 15 June 2016

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**11**	
3.	**6**	
4.	**6**	
5.	**10**	
6.	**13**	
7.	**8**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and 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 that assessment will take into account the quality of written communication used in your answer to question **7***(b)*.

A periodic table is printed on page 16.

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Answer **all** *questions.*

1. The box below contains the symbols and formulae of some elements and compounds.

O_2	Fe_2O_3	$PbBr_2$
H_2O	$CuSO_4$	Cl

Use the information in the box above to answer *(a).*

(a) Give **one** example of:

(i) a compound [1]

.....

(ii) an element [1]

.....

(b) (i) Name the **elements** present in H_2SO_4. [3]

1. .....

2. .....

3. .....

(ii) State the total number of **atoms** in $CuSO_4$. [1]

.....

6

Turn over.

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2. Recent research has highlighted that obesity and lack of exercise are major causes of death in the UK.

John is overweight and is trying to lose weight to get fit. He is trying a number of exercises and calculates the energy used.

(a) (i) Complete the table below. [2]

Type of exercise	Energy used (kcal/min)	Length of exercise (minutes)	Total energy used (kcal)
cycling	5.0	70	350
jogging	8.5	.....	255
swimming	.....	40	212

(ii) State which exercise uses the most energy per minute. [1]

.....

(b) John is also trying to reduce his weight by cutting down his intake of snack foods.

He collected some information from his favourite snacks.

	Snack foods (per 100 g)		
	Caramel crunch	Cheesy crisps	Fruitex bar
energy (kcal)	510	480	320
salt (g)	0.9	1.3	0.2
fat (g)	24.0	15.0	10.0
protein (g)	6.5	5.5	6.8
fibre (g)	2.1	3.2	16.0

(i) Which snack food would be the best choice to reduce his weight? Give **one** reason for your choice. [2]

Snack .....

Reason .....

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(ii) John's favourite snack is the 'Caramel crunch'. Each bar has a mass of **50 g**. He eats two bars.

Calculate the energy in the two bars of 'Caramel crunch'. [1]

..... kcal

(iii) Calculate the time John would need to jog to use the energy in both bars. [1]

..... min

(c) Obesity and lack of exercise increase the risk of diabetes.

(i) Place a **tick (✓)** in the box to identify the hormone that controls sugar levels in the body. [1]

Oestrogen	☐
Testosterone	☐
Insulin	☐
Adrenalin	☐

(ii) State **two** ways that diabetics can control their blood sugar level. [2]

1. .....

2. .....

(iii) Name **one** other common disease associated with obesity. [1]

.....

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Turn over.

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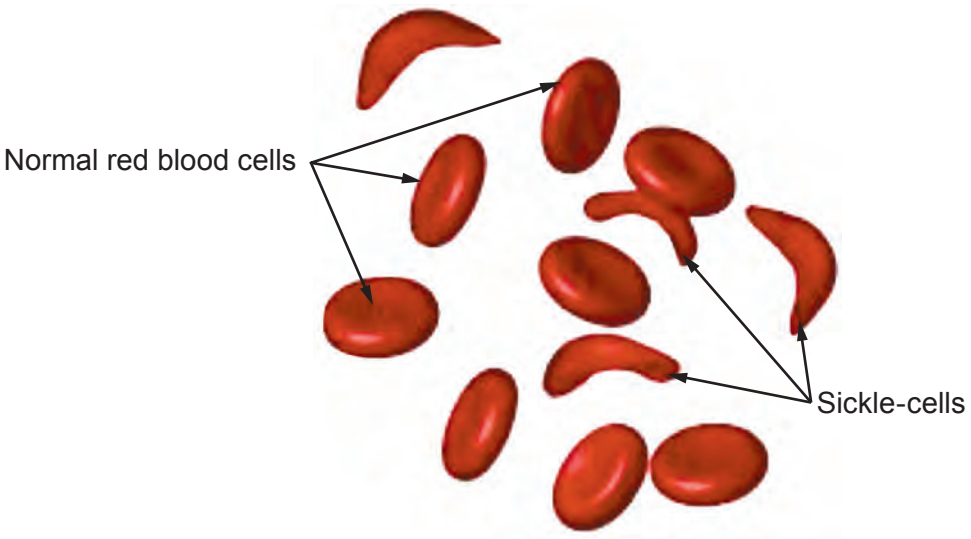
3. Sickle-cell anaemia is an inherited disease caused by a **recessive allele (e)**. James and Chinaza are patients with a family history of sickle-cell anaemia. In a patient with this disease, the red blood cells are not the normal shape. They form sickle shapes.



(a) State the genotype of a person who suffers from sickle-cell anaemia. [1]

.....

(b) (i) Complete the Punnett square below. [2]

		Mother	
		E	e
Father	E	.....	.....
	e	.....	.....

(ii) **Circle** the percentage chance of these parents producing a baby with sickle-cell anaemia: [1]

25% 50% 75% 100%

(c) A couple with a family history of sickle-cell anaemia are thinking of having children.

Give **two** pieces of advice a genetic counsellor may offer this couple. [2]

1. .....

2. .....

6

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4. The ultrasound image below shows the liver of a patient suffering from gall stones.

(a) Choose the correct terms from the box to complete the sentences below. [2]

high	radiation	X-rays
low	sound waves	light rays

The image of the liver is formed using ultrasound. This technique uses ..... frequency ..... which bounce off the liver walls and back to the probe to form an image.

(b) Explain why ultrasound is used instead of X-rays for this type of scan. [2]

.....

.....

(c) Name **two** other medical uses of ultrasound. [2]

1. .....

2. .....

6

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5. The table below shows some of the physical properties of group 1 metals.

Element	Symbol	Melting point (°C)	Boiling Point (°C)	Density (g/cm^3)	Electrical conductivity
lithium	Li	180	1340	0.53	good
sodium	Na	98	880	0.97	good
potassium	K	63	766	0.86	good
rubidium	Ru	39	686	1.48	good
caesium	Cs		669	1.87	good

(a) Use **only** the information in the table to answer the following.

(i) State **one** property of group 1 metals which is common to **all** metals. [1]

.....

(ii) State **one** property of group 1 metals which is **not** common to all metals. [1]

.....

(iii) Predict the value for the melting point of caesium, giving **one** reason for your answer. [2]

Melting point of caesium ..... °C

Reason

.....

.....

(iv) Describe the general trend in the density of group 1 metals. [1]

.....

.....

(v) A laboratory technician collected $2\,cm^3$ of each of the group 1 metals named in the table. State which metal would have the smallest mass. [1]

.....

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(b) When a freshly cut piece of potassium is exposed to air its surface immediately reacts with oxygen.

(i) Complete the word equation for this reaction. [1]

potassium + oxygen ⟶ .....

(ii) Describe how this reaction is prevented when storing potassium in the laboratory. [2]

.....

.....

.....

(iii) **Circle** the hazard symbol found on a bottle of potassium in the laboratory. [1]

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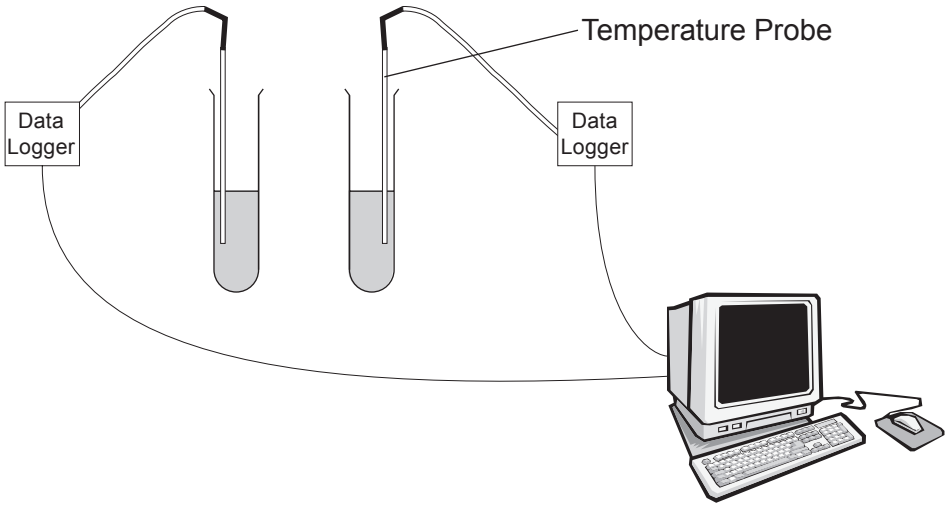
6. A student investigated the reactions of hydrochloric acid with different alkalis.

The student followed the method below:

- 20 cm^3 of sodium hydroxide solution was placed in tube 1
- 20 cm^3 of sodium carbonate solution was placed in tube 2
- 20 cm^3 of dilute hydrochloric acid was added in turn to each tube
- The temperature of each of the solutions was then recorded using a data logger



(a) Complete the word equations for the reactions in this investigation. [4]

(i) **Reaction 1**

hydrochloric acid + sodium hydroxide ⟶ ..... + ...

(ii) **Reaction 2**

hydrochloric acid + sodium carbonate ⟶ ..... + ... + water

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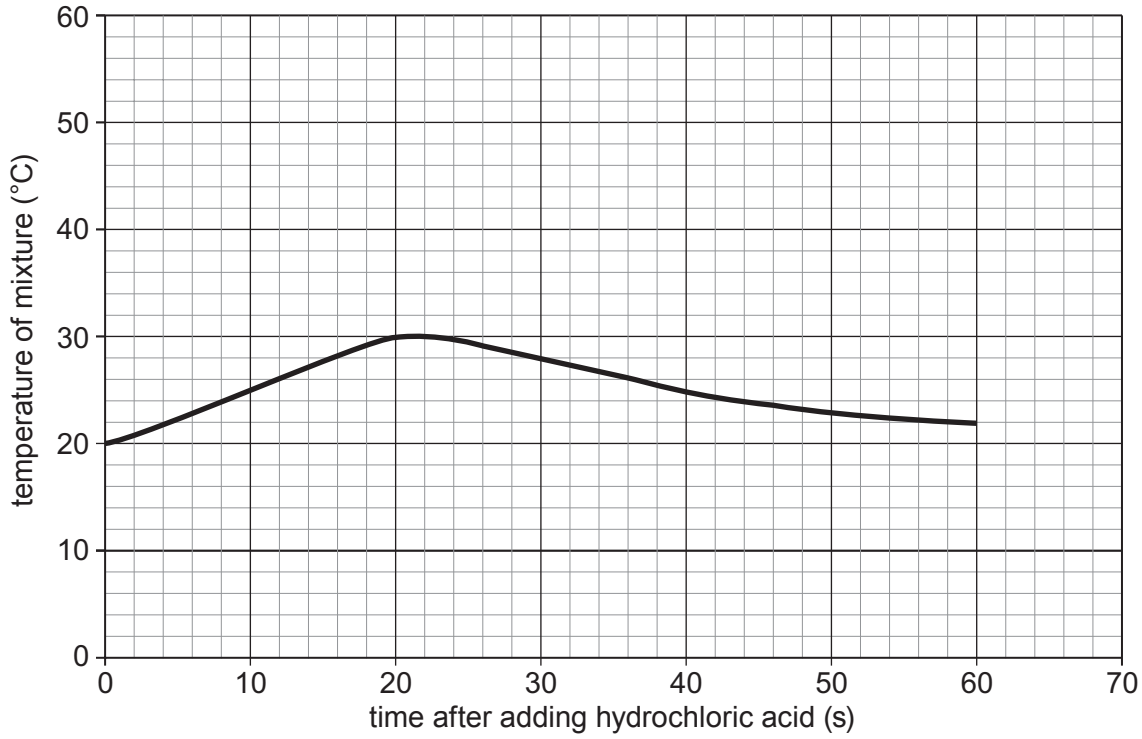
(b) The temperature changes recorded for the reaction between sodium hydroxide and hydrochloric acid **(Reaction 1)** have been plotted for you.



(i) Plot the following results for **Reaction 2** on the graph above. [3]

Time after adding the hydrochloric acid (s)	Temperature of solution (°C)
0	20
10	30
20	55
30	48
40	45
50	42
60	40

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(ii) Complete the table to show the increase in temperature for the reactions. [2]

Reaction	Initial temperature (°C)	Maximum temperature (°C)	Maximum rise in temperature (°C)
1	.....	.....	.....
2	.....	.....	.....

(c) Describe the changes that occur in **Reaction 1** and **Reaction 2**. [4]

.....

.....

.....

.....

.....

.....

.....

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7. Plastic technology is advancing rapidly with new plastics being made all the time.

(a) Plastic production relies on the formation of a polymer.
Describe the main **structural** differences between ethene and polyethene. [2]

.....

.....

.....

(b) The table below compares the production of 1 kg of a bioplastic called polylactic acid (PLA) with two traditional plastics.

	Polylactic (PLA) plastic	Polyethene	Polystyrene
energy consumption (kWh)	10.74	20.56	22.56
water consumption (dm^3)	74.61	67.05	184.86
CO_2 emissions (units)	2.60	5.62	5.02
solid waste (g)	0.84	1.74	2.22
source of raw materials	corn plants	crude oil	crude oil
biodegradable	yes	no	no

Use your knowledge and the information in the table to discuss the **advantages and disadvantages** of the production of bioplastics such as polylactic (PLA) compared to traditional plastics. [6 QWC]

Your answer should include:

- The data in the table
- Advantages of using bioplastics
- Disadvantages of using bioplastics

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END OF PAPER

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Turn over.

Periodic Table of the Elements

element name
atomic number
symbol

	1	2											3	4	5	6	7	0
1									hydrogen 1 **H**									helium 2 **He**
2	lithium 3 **Li**	beryllium 4 **Be**											boron 5 **B**	carbon 6 **C**	nitrogen 7 **N**	oxygen 8 **O**	fluorine 9 **F**	neon 10 **Ne**
3	sodium 11 **Na**	magnesium 12 **Mg**											aluminium 13 **Al**	silicon 14 **Si**	phosphorus 15 **P**	sulfur 16 **S**	chlorine 17 **Cl**	argon 18 **Ar**
4	potassium 19 **K**	calcium 20 **Ca**	scandium 21 **Sc**	titanium 22 **Ti**	vanadium 23 **V**	chromium 24 **Cr**	manganese 25 **Mn**	iron 26 **Fe**	cobalt 27 **Co**	nickel 28 **Ni**	copper 29 **Cu**	zinc 30 **Zn**	gallium 31 **Ga**	germanium 32 **Ge**	arsenic 33 **As**	selenium 34 **Se**	bromine 35 **Br**	krypton 36 **Kr**
5	rubidium 37 **Rb**	strontium 38 **Sr**	yttrium 39 **Y**	zirconium 40 **Zr**	niobium 41 **Nb**	molybdenum 42 **Mo**	technetium 43 **Tc**	ruthenium 44 **Ru**	rhodium 45 **Rh**	palladium 46 **Pd**	silver 47 **Ag**	Cadmium 48 **Cd**	Indium 49 **In**	tin 50 **Sn**	antimony 51 **Sb**	tellurium 52 **Te**	iodine 53 **I**	xenon 54 **Xe**
6	caesium 55 **Cs**	barium 56 **Ba**	lutetium 71 **Lu**	hafnium 72 **Hf**	tantalum 73 **Ta**	tungsten 74 **W**	rhenium 75 **Re**	osmium 76 **Os**	iridium 77 **Ir**	platinum 78 **Pt**	gold 79 **Au**	mercury 80 **Hg**	thallium 81 **Tl**	lead 82 **Pb**	bismuth 83 **Bi**	polonium 84 **Po**	astatine 85 **At**	radon 86 **Rn**
7	francium 87 **Fr**	radium 88 **Ra**																