New Specification

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017–2018

Single Award Science
Physics

Unit 3
Foundation Tier

ML

[GSA31]

FRIDAY 23 FEBRUARY 2018, 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.
Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.

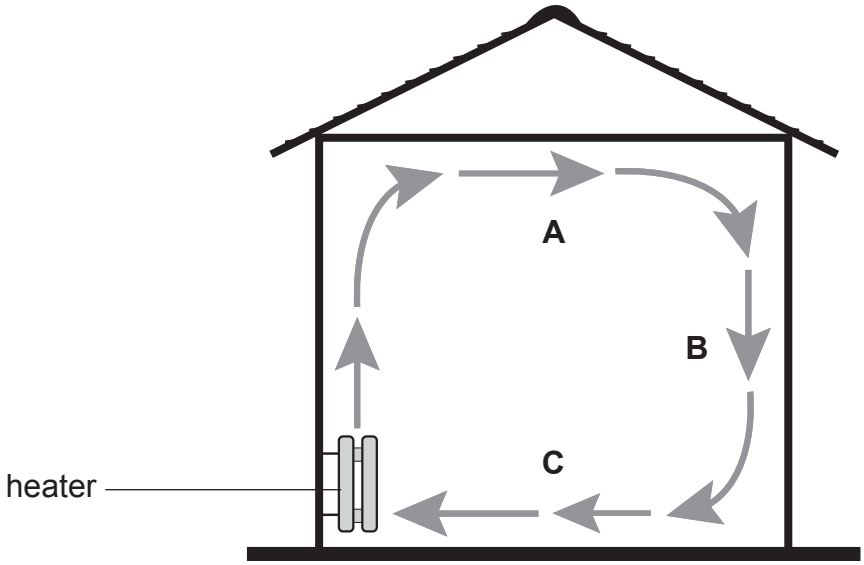
INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **9(a)**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

Examiner Only	
Marks	Remark

1 **(a)** Look at the diagram below. It shows a room being heated. The arrows show the movement of air.



Source: Principal Examiner

(i) Write the name of the method of heat transfer shown in this diagram.

Choose from:

convection **radiation** **conduction**

Answer _____ [1]

(ii) Complete the sentence below.

Choose from:

falls **heavier** **rises** **lighter**

The air above the heater gets warm and _____

because it is _____ than cold air. [2]

(iii) Where in the room (**A**, **B** or **C**) is the air temperature lowest?

Answer _____ [1]

Examiner Only	
Marks	Remark

(b) Write the name of the method that describes how heat travels through metals.

Choose from:

convection **radiation** **conduction**

Answer _____ [1]

Look at the photograph below. It shows a saucepan being heated on a gas cooker.

© Martyn F. Chillmaid / Science Photo Library

(c) Write the name of a suitable material for the handle of the saucepan. Explain your answer.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

2 **(a)** Look at the photograph below. It shows an aeroplane taking off.

© Vladimir_Timofeev / iStock / Thinkstock

Complete the following sentences about the aeroplane taking off.

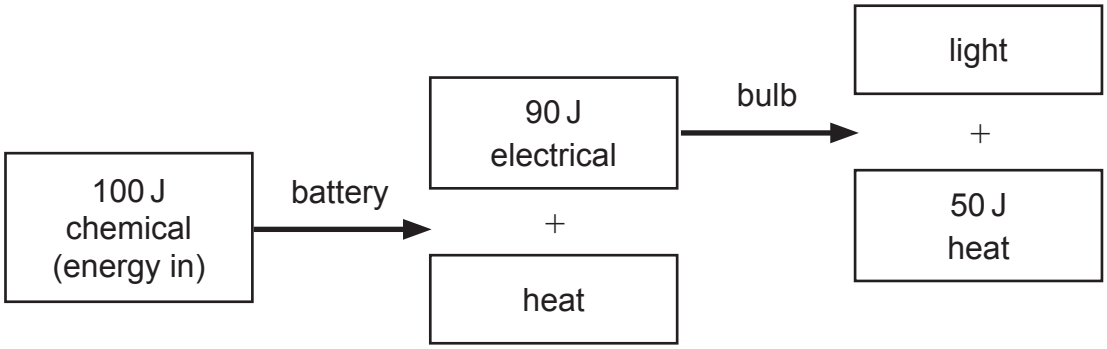
Choose from:

nuclear **kinetic** **light** **potential** **strain**

As the aeroplane speeds along the runway, the chemical energy in its fuel is changed into _____ energy.

The aeroplane will then take off changing this energy into gravitational _____ energy as it climbs higher. [2]

(b) Look at the diagram below. It shows how 100 J of chemical energy in a battery is changed into useful light energy in a torch.



(i) Calculate how much heat energy is produced by the battery.

Answer _____ J [1]

(ii) Calculate how much light energy is produced by the bulb.

Answer _____ J [1]

(iii) Use the equation:

$$\textbf{efficiency} = \frac{\textbf{useful energy out (light)}}{\textbf{total energy in}}$$

to calculate the efficiency of this torch.

(Show your working out.)

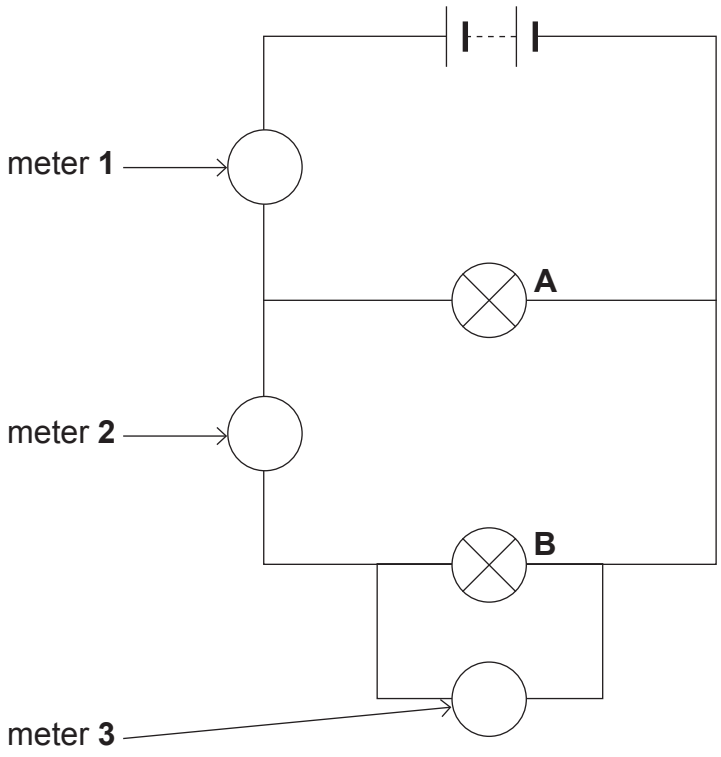
Answer _____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 **(a)** Look at the diagram below. It shows two identical bulbs **A** and **B** in an electrical circuit with three meters.



Source: Principal Examiner

(i) Complete the following sentences.

Meter **2** measures current and is called an _____.

It is connected in _____ with bulb **B**. [2]

(ii) Meter **1** also measures current and shows a reading of 2 A. What will be the reading on meter **2**?

Circle the correct answer.

2 A **4 A** **1 A** **3 A**

[1]

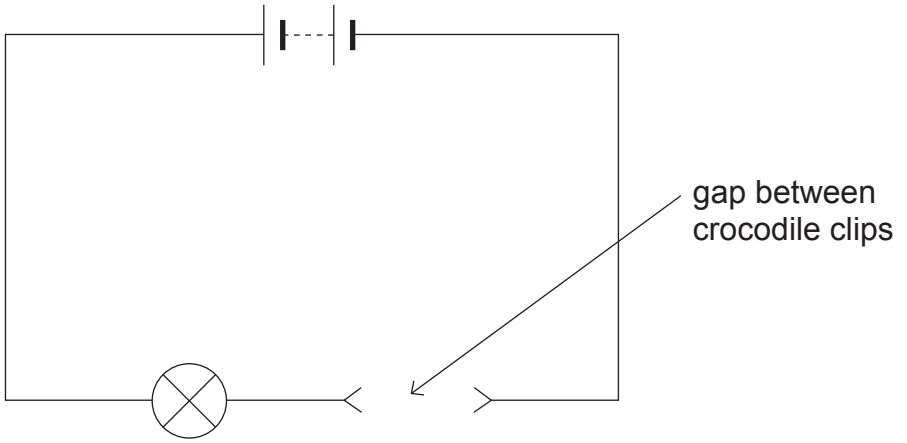
(iii) Meter **3** shows a reading of 4 V. What voltage is produced by the battery?

Circle the correct answer.

2 V **4 V** **1 V** **3 V**

[1]

(b) Look at the diagram below. It shows a simple test circuit.



Source: Principal Examiner

(i) Describe fully how this circuit can be used to find out if a material is an electrical conductor.

_____

_____

_____ [2]

(ii) Complete the table below by writing the following materials in the correct column.

iron **paper** **copper** **wood**

Conductor	Insulator

[2]

Examiner Only

Marks	Remark

4 Look at the table below. It has information about five electric kettles.

Kettle	Time to boil water/s	Power/ kW	Cost to buy/ £	Cost to run per year/£
A	90	0.8	18	14.0
B	70	1.0	14	13.5
C	55	1.2	14	13.0
D	44	1.5	25	13.0
E	40	2.0	25	15.5

Use information from the table and your knowledge to answer the following questions.

(a) What kettle (**A**, **B**, **C**, **D** or **E**) will boil water the fastest?

Answer _____ [1]

(b) When finding the time that each kettle takes to boil water, state **one** thing that had to be done to get valid results (fair test).

_____

_____ [1]

(c) A cafe needs to buy a new kettle every year. What kettle (**A**, **B**, **C**, **D** or **E**) would be the best value for money? Explain your answer.

_____

_____

_____ [2]

Examiner Only

Marks	Remark

(d) The kettle will be connected to the mains using a 3-pin plug.

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Marks	Remark

(i) Complete the table below about the wires in a 3-pin plug.

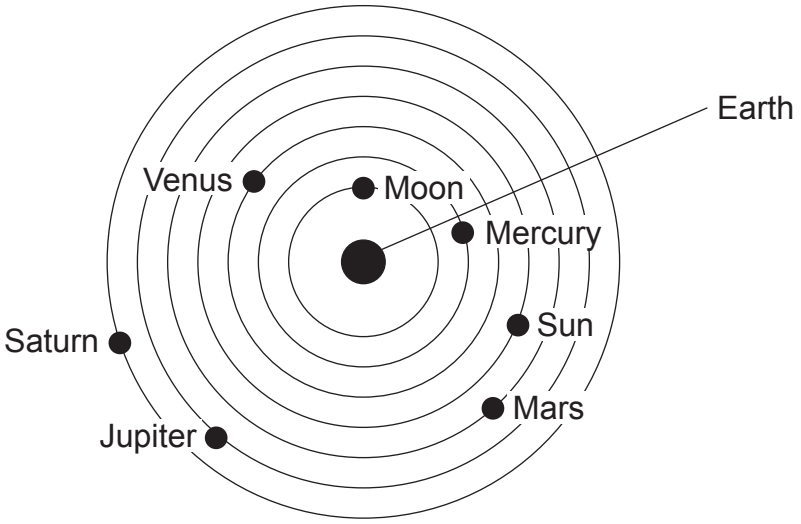
Name	Colour
earth	green/yellow
	blue
live	

[2]

(ii) Write the name of the wire that will **not** be needed if the kettle is double insulated.

Answer _____ [1]

5 Look at the diagram below. It shows a previous model of the Solar System.



Source: Principal Examiner

(a) State **two** differences between this model and the modern day model of the Solar System.

1. _____

_____

2. _____

_____ [2]

(b) Look at the table below. It shows information about the first five planets in our Solar System.

Planet	Distance from Sun/ million km	Average surface temperature/ °C	Time for one orbit/ years	Orbital speed/ million km/ year
Mercury	58	350	0.2	1560
Venus	108	480	0.6	1100
Earth	150	22	1.0	945
Mars	778	–23	1.9	754
Jupiter	1429	–150	12.0	413

Examiner Only

Marks	Remark

Use information from the table to answer parts (i) and (ii) below.

(i) Complete the following sentence.

As the time for one orbit _____, the

orbital speed _____. [1]

(ii) Calculate the number of orbits that Mercury makes around the Sun when the Earth completes **one** orbit.

Answer _____ [1]

(iii) Write the name of **one** other object found in our Solar System. Do not include a star and planets in your answer.

_____ [1]

(c) Look at the table below. It shows information about an astronaut as he travels from the Earth to the Moon.

	Mass/ kg	**Gravity/ N/kg**	**Weight/ N**
Earth	80	10	
Space		0	0
Moon	80	1.7	136

Use the equation:

weight = mass × gravity

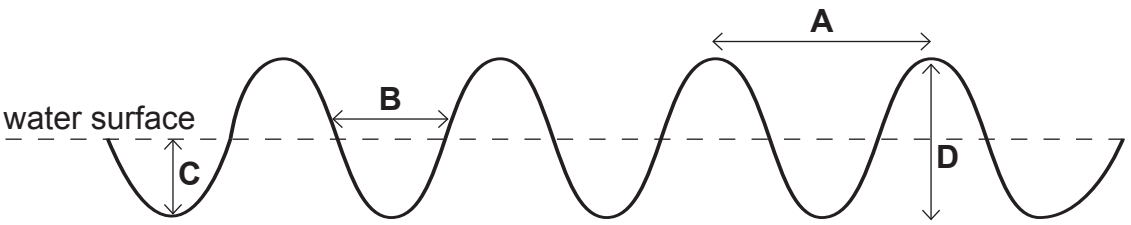
to complete the table. [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

6 Look at the diagram below. It represents a water wave.



Source: Principal Examiner

(a) What letter (**A**, **B**, **C** or **D**) represents:

(i) the amplitude?

Answer _____ [1]

What letter (**A**, **B**, **C** or **D**) represents:

(ii) the wavelength?

Answer _____ [1]

(b) Water waves are transverse waves.

(i) What statement below describes how the particles vibrate in a transverse wave?

Circle the correct answer.

in the same direction as wave travel

at right angles to wave travel

in the opposite direction to wave travel

[1]

(ii) Transverse waves are one type of wave. Write down the name of the other type.

_____ [1]

(c) Look at the table below. It shows how the speed of sound changes with air temperature.

Examiner Only

Marks	Remark

Air temperature/°C	Speed of sound/ m/s
–1	330.0
10	336.9
21	343.6
33	350.3
45	358.0

(i) Describe the trend shown by this information.

_____

_____

_____ [1]

(ii) Use the equation:

$$\textbf{frequency} = \frac{\textbf{wave speed}}{\textbf{wavelength}}$$

to calculate the frequency of a sound wave that has a wavelength of 0.02 m travelling through air which has a temperature of –1 °C.

(Show your working out.)

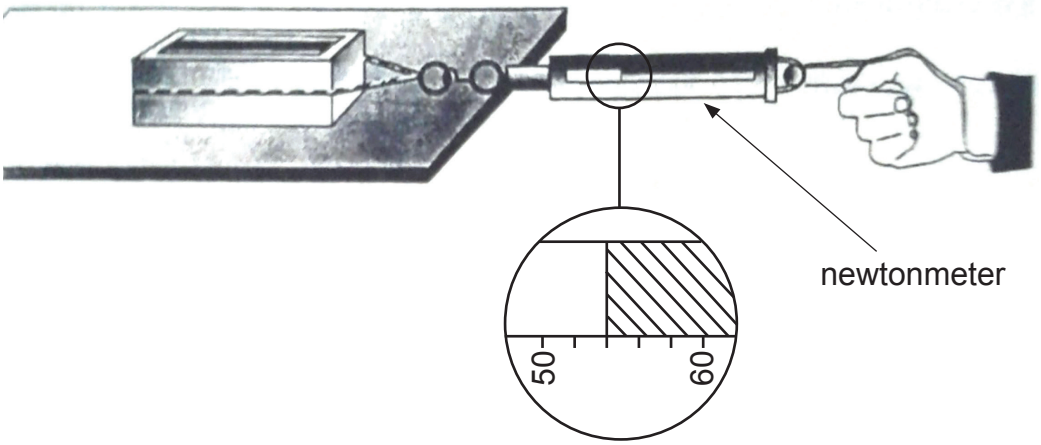
Answer _____ [2]

(iii) State the unit of frequency.

Answer _____ [1]

Examiner Only	
Marks	Remark

7 **(a)** Look at the diagram below. It shows a newtonmeter being used to pull a brick across a flat table.



Source: CCEA Artwork

(i) What size of force is shown on the newtonmeter?

Answer _____ N [1]

(ii) As the brick moves across the surface of the table a force is produced that opposes motion. Write the name of this force.

_____ [1]

(iii) Write down **one** way that the size of this force could be reduced.

_____

_____ [1]

(b) Look at the table below. It shows the recommended safe distance between vehicles moving at different speeds, in order to avoid an accident.

Speed/ mph	Safe distance for good road conditions/metres	Safe distance for poor road conditions/metres
25	34	42
35	51	61
45	61	73
55	73	
65	89	105
75	102	120

(i) Complete the table by suggesting a value for the safe distance at 55 mph. [1]

(ii) Suggest **one** example of poor road conditions.

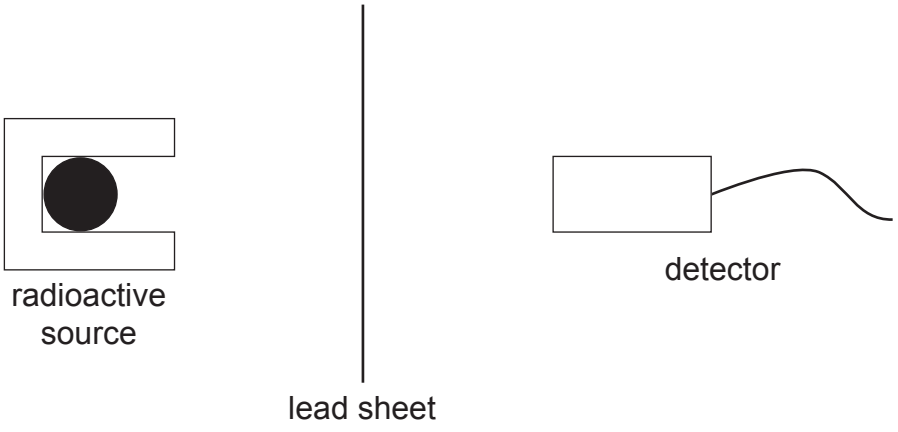
_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

8 Look at the diagram below. It shows the apparatus used to investigate how the thickness of lead affects the amount of radiation that can pass through to reach the detector.



Source: Principal Examiner

(a) There are three types of radiation. However, gamma is the only type suitable for this investigation.

(i) Write the names of the other **two** types of radiation.

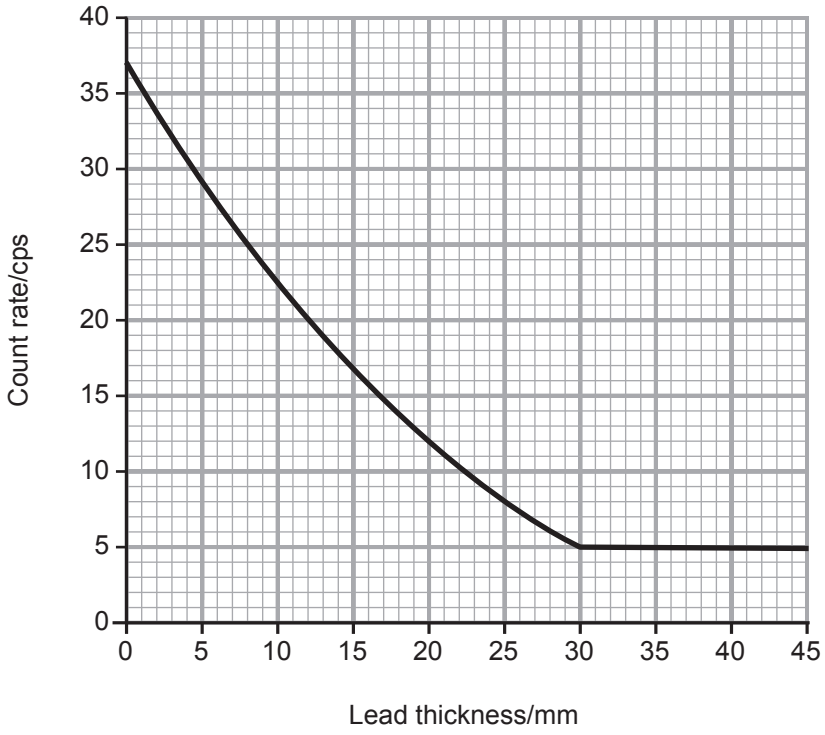
_____ and _____ [1]

(ii) Explain why these types of radiation are **not** suitable for this investigation.

_____

_____ [1]

(b) Look at the graph below. It shows the results of this investigation.



Source: Principal Examiner

Describe fully the conclusion that can be made from these results.

_____

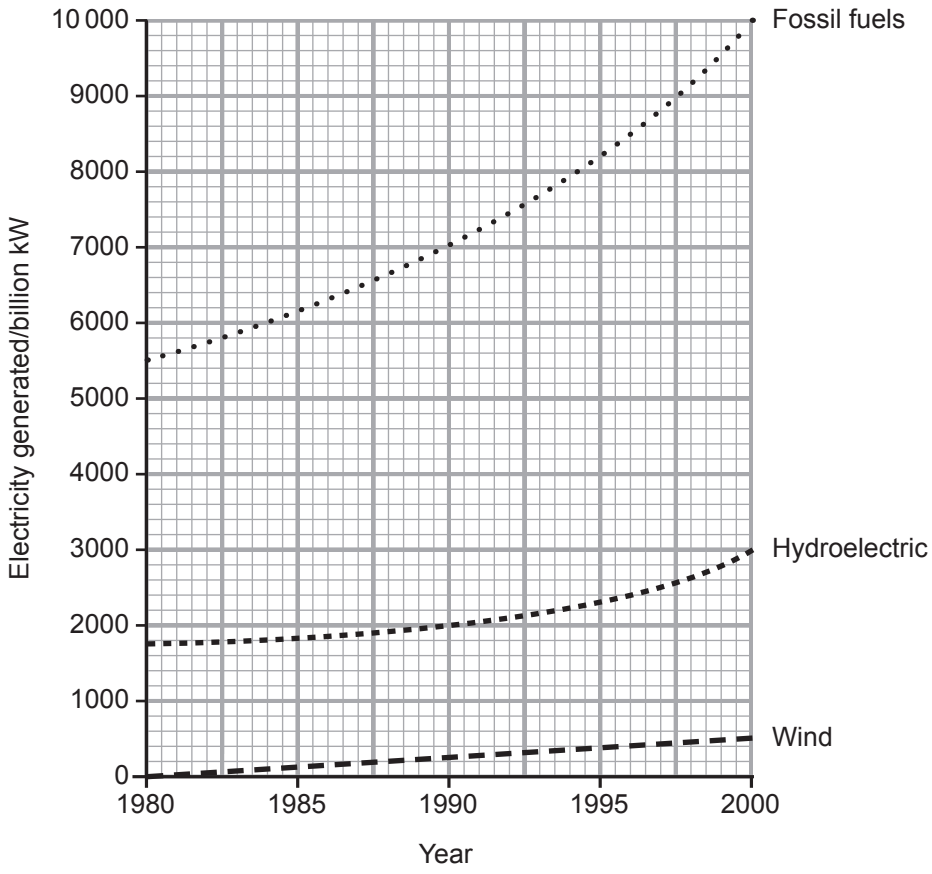
_____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

9 **(a)** Look at the graph below. It shows how much electricity was generated worldwide from three different energy sources over 20 years.



Source: Principal Examiner

Compare the use of renewable and non-renewable energy sources during this 20-year period.

Your answer should include:

- the names of the renewable and non-renewable sources shown;
- the definition of a renewable energy source;
- one environmental disadvantage of each source.

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

Examiner Only	
Marks	Remark

[6]

(b) In a power station, electricity is produced when a turbine drives a generator. Describe fully how electricity is made in the **generator**.

[2]

THIS IS THE END OF THE QUESTION PAPER