Candidate Name	Centre Number	Candidate Number
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WJEC CBAC

GCSE

237/01

SCIENCE
FOUNDATION TIER
PHYSICS 1

A.M. WEDNESDAY, 20 January 2010

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark awarded**
1.	**6**	
2.	**4**	
3.	**4**	
4.	**6**	
5.	**3**	
6.	**4**	
7.	**5**	
8.	**7**	
9.	**5**	
10.	**6**	
Total	**50**	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator.

INSTRUCTIONS TO CANDIDATES

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.

A list of equations is printed on page 2. In calculations you should show all your working.

EQUATIONS

power = voltage × current

energy transfer = power × time

units used (kWh) = power (kW) × time (h)

cost = units used × cost per unit

$$\text{efficiency} = \frac{\text{useful energy transfer}}{\text{total energy input}} \times 100\%$$

wave speed = wavelength × frequency

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

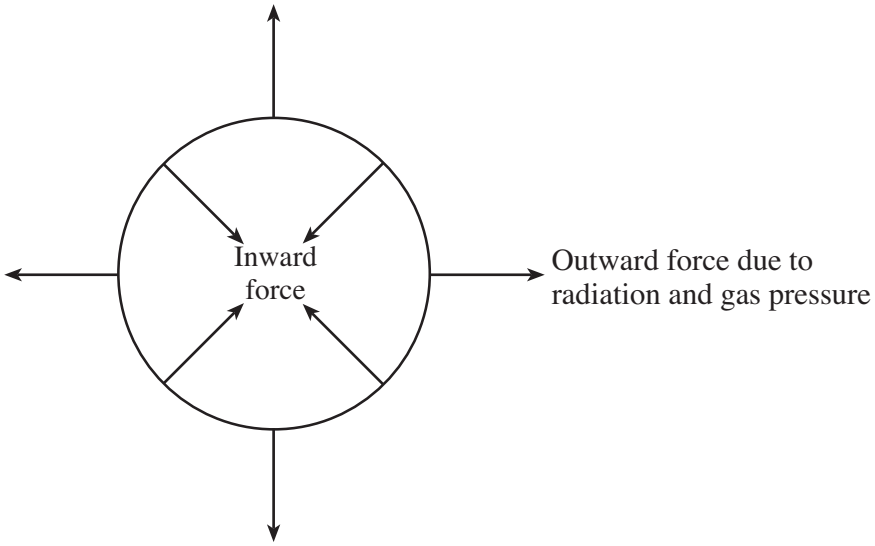
Answer **all** *questions*.

1. *(a)* Complete the sentences below by underlining the correct word(s) in the brackets. [2]

(i) At the beginning of its life, our Sun was made up mainly of (oxygen / carbon dioxide / hydrogen).

(ii) As the Sun gets older, (sulphur dioxide / helium / methane) is produced.

(b) The diagram shows the forces acting on the Sun.



(i) Name the inward force ..... [1]

(ii) Our Sun is in a stable state. What can you say about the forces acting on it? [1]

.....

(iii) **Describe** what will happen to **each** of these forces as the Sun expands to become a Red Giant. [2]

.....

.....

.....

6

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2. The table gives information about some ways of reducing energy costs in a house.

Method used to reduce energy costs	Cost (£)	Saving per year (£)	Savings in 10 years (£)
Fitting thermostats to every radiator	80	20	200
Fitting a new hot water boiler	1600	200	.....
Fitting solar panels for water heating	2700	100	.....
Fitting double glazed windows	3600	90	.....

(i) **Complete the table**. [1]

(ii) Over 10 years which **two** methods save more money than they cost to fit? [2]

The two methods are: 1. .....

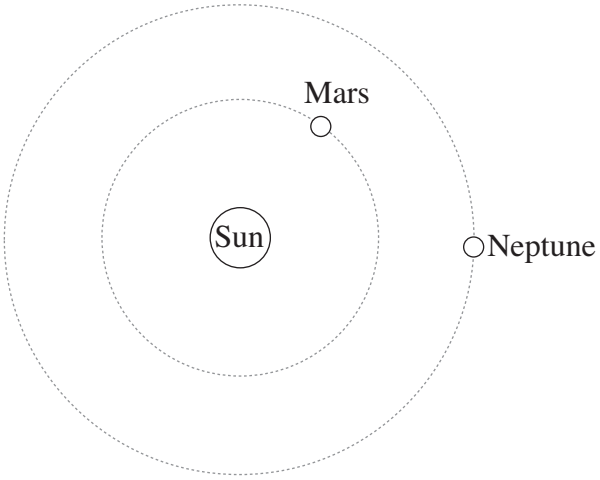
2. .....

(iii) What is the payback time of fitting solar panels? ..... years [1]

4

3. The diagram shows the orbits of Mars and Neptune around the Sun.

NOT TO SCALE



(a) There are three planets between Mars and Neptune.

(i) Of these three, name the planet closest to Mars. ..... [1]

(ii) Of these three, name the planet closest to Neptune. ..... [1]

(b) Neptune is bigger than Mars and further from the Sun.

Give two other differences between Neptune and Mars. [2]

1. .....

2. .....

4

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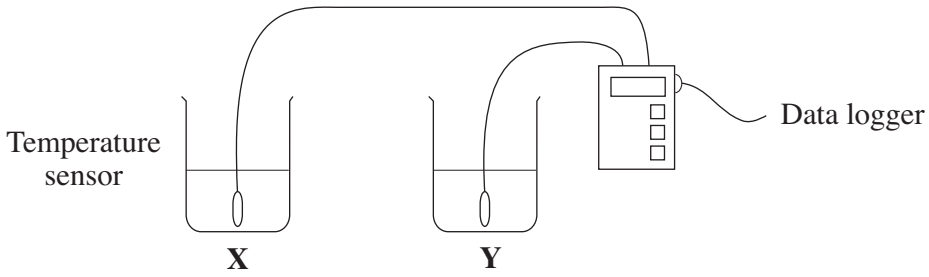
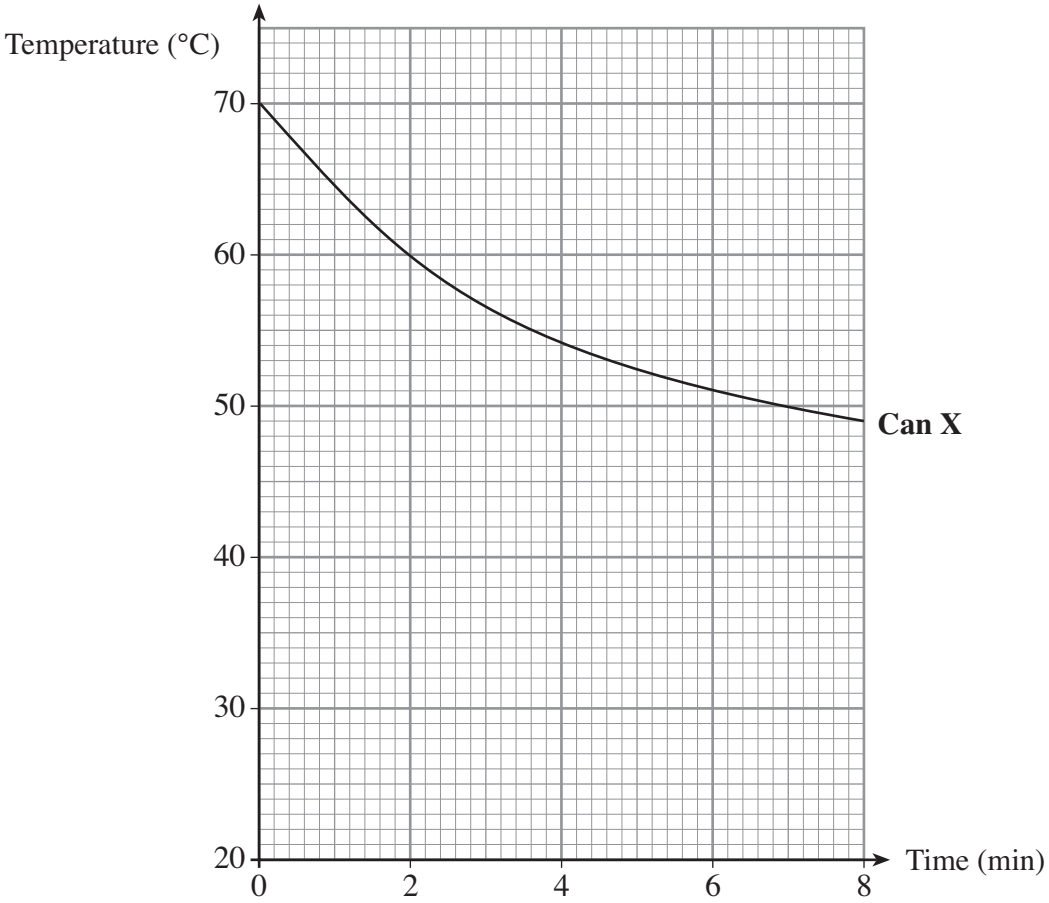
4. Students were investigating the heat loss from two identical metal cans **X** and **Y**.
One can was painted black and the other was white.



The students filled the cans with the same amount of hot water.
A data logger was used to record the temperatures.

The graph shows how the temperature changed in can **X**.



(a) Use the data in the table to plot a graph for can **Y** on the same grid. [3]

Time (minutes)	Temperature (°C)
0	70
2	50
4	40
6	34
8	30

(b) (i) Find the temperature drop in the first 2 minutes for can **X**. ..... °C [1]

(ii) State the temperature difference between cans **X** and **Y** at 8 minutes. ..... °C [1]

(iii) Explain how the results show that can **Y** was the one painted black. [1]

.....

.....

6

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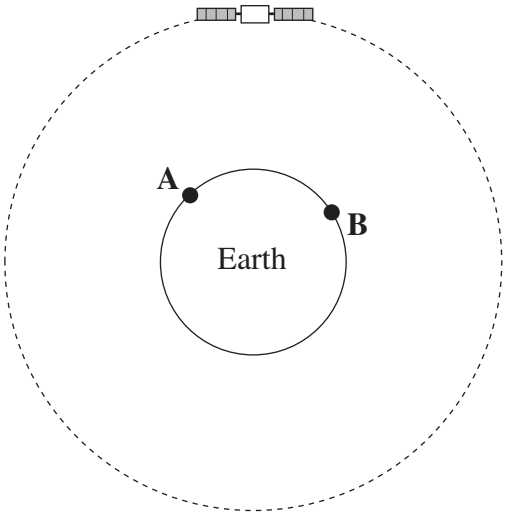
5. A geosynchronous (geostationary) satellite is used to send signals from **A** to **B**.



(i) How long does it take this satellite to orbit the Earth once? [1]

.....

(ii) **Add to the diagram** to show how **A** sends signals to **B** via the satellite. [1]

(iii) Name the electromagnetic wave that is used to send signals to satellites. [1]

.....

3

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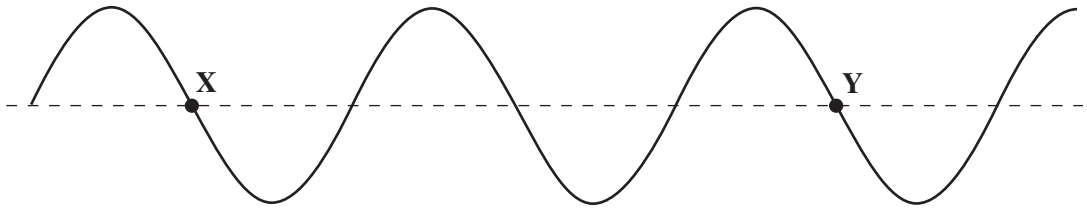
6. The diagram shows a wave travelling across the surface of water.



(a) **Show clearly** with a labelled arrow

(i) the amplitude of the wave [A], [1]

(ii) the wavelength of the wave [W]. [1]

(b) How many complete waves are there between **X** and **Y**? ..... [1]

(c) The frequency of the wave is 5 Hz.
What does this mean? [1]

.....

.....

4

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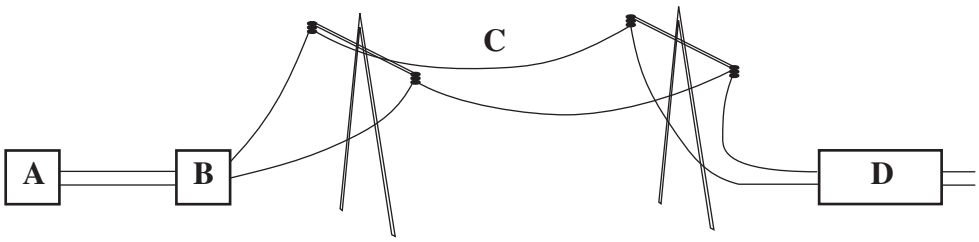
7. *(a)* The diagram shows part of the National Grid.
Electricity is generated at power station **A**.

NOT TO SCALE



Use a word from the box to complete the sentences that follow.
Each word may be used once, more than once or not at all.

transformer	pylon	generator	power	current

(i) At **B**, a ..... increases the voltage. [1]

(ii) Electricity is sent at a high voltage along **C**, so the .....
is smaller. [1]

(iii) At **D**, the voltage is decreased using a ..... [1]

(b) The power input to **B** is 100 MW.
Heat is produced in **B** at a rate of 1 MW.

(i) Find the useful power output from **B**. ..... [1]

(ii) Use the equation

$$\text{Efficiency} = \frac{\text{Useful power output}}{\text{Total power input}} \times 100$$

to find the efficiency of **B**. [1]

Efficency = ... %

5

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8. **Read** the passage below and answer the questions that follow.

In 1895, W.C. Röntgen discovered rays capable of passing through the human body. Because of their unknown nature, he called them X-rays.

He noticed whenever he made electrical sparks in a vacuum tube, a fluorescent screen at the other end of the laboratory table glowed. Invisible rays were being produced in the vacuum tube, crossing the room and striking the screen, producing the glow. He tried to block the rays with thin metal sheets but they were transparent to the rays.

He moved a piece of lead near to the screen, and dropped it in surprise when he saw the skeleton pattern of the bones in his hand on the screen.

Adapted from http://nobelprize.org/educational_games/physics/x-rays/how-1.html

(a) (i) How did Röntgen produce the rays in the tube? [1]

.....

(ii) How did Röntgen know that these rays were being produced? [1]

.....

.....

(iii) Give **one** reason why thin sheets of metal did not produce a shadow when placed in front of the tube. [1]

.....

(b) Until 1955, children's feet were X-rayed in shoe shops to check that their shoes fitted properly.
Explain why it was decided that this was unsafe. [2]

.....

.....

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(c) The passage describes how X-rays were discovered. The list gives the steps in making scientific discoveries. They are not in the correct order.

1. A scientist makes an observation
2. Other scientists repeat the experiments
3. New ideas are accepted
4. The scientist carries out more experiments
5. The scientist tells other scientists

Complete the boxes to show the steps in the correct order. Two have been done for you. [2]

.....	4	.....	.....	3

7

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9. The table shows some of the information planners use to help them decide on the type of power station they will allow to be built.

How they compare		
	Wind	Nuclear
Overall cost of generating electricity (p / kWh)	5.4p	2.8p
Maximum power output (MW)	3.5	3600
Lifetime	15 years	50 years
Waste produced	none	Radioactive substances, some remain dangerous for thousands of years
Lifetime carbon footprint (g of CO_2 / kWh)	4.64 g / 5.25 g (onshore/offshore)	5 g

Adapted from *www.guardian.co.uk*

Use the information in the table to answer the questions.

(i) Give **one** reason why the information in the table does **not** agree with the idea that wind power will be a cheaper method of producing electricity. [1]

.....

.....

(ii) Supporters of wind power argue that it will reduce global warming more than nuclear power.
Explain whether this is supported by information in the table. [2]

.....

.....

.....

(iii) Supporters of nuclear power argue that it will meet a greater demand for electricity in the future than wind power.
Give **two** ways in which this is supported by information in the table. [2]

.....

.....

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10. Electrical stores sell different types of ovens.
Two types are shown below together with their power ratings.

Conventional oven 3 kW	Combination microwave and grill oven 2 kW

A chicken is cooked in the combination microwave and grill oven.
It takes 0.75 hours to cook.

(i) Write down an equation as it appears on page 2 and use it to calculate the units used by this combination oven in kilowatt hours.

Equation: .....

..... [1]

Calculation: [2]

Units used = ... kWh

(ii) 1 unit of electricity costs 12 p.
Use the equation

$$\text{Cost} = \text{units used} \times \text{cost per unit}$$

to find the cost of using the combination oven to cook the chicken. [1]

cost = ... p

(iii) The same chicken could have been cooked in the conventional oven in 1.5 hours.
Explain why this would cost more. [2]

.....

.....

.....

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