Candidate Name	Centre Number	Candidate Number
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WJEC CBAC

GCSE

237/02

SCIENCE
HIGHER TIER
PHYSICS 1

P.M. FRIDAY, 18 June 2010

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark awarded**
1.	**5**	
2.	**7**	
3.	**5**	
4.	**6**	
5.	**8**	
6.	**12**	
7.	**7**	
Total	**50**	

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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 (kWh) × cost per unit

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

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

wave speed = wavelength × frequency

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

Answer **all** *questions.*

1. *(a)* Electromagnetic waves are used in communication to send television (TV) signals.

(i) Name the part of the spectrum that carries TV signals via satellites. [1]

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(ii) Name the part of the spectrum that carries TV signals from transmitters to an aerial. [1]

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(iii) Name the part of the spectrum that carries TV signals through optical fibre cables. [1]

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(b) A householder installs a dish to receive TV signals from a communication satellite. Explain why the householder will not need to move the dish once it is set up. [2]

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5

Examiner only

2. The Solar System consists of the Sun and its planets.

(a) (i) Apart from the Earth, name **one** planet that has a rocky structure. [1]

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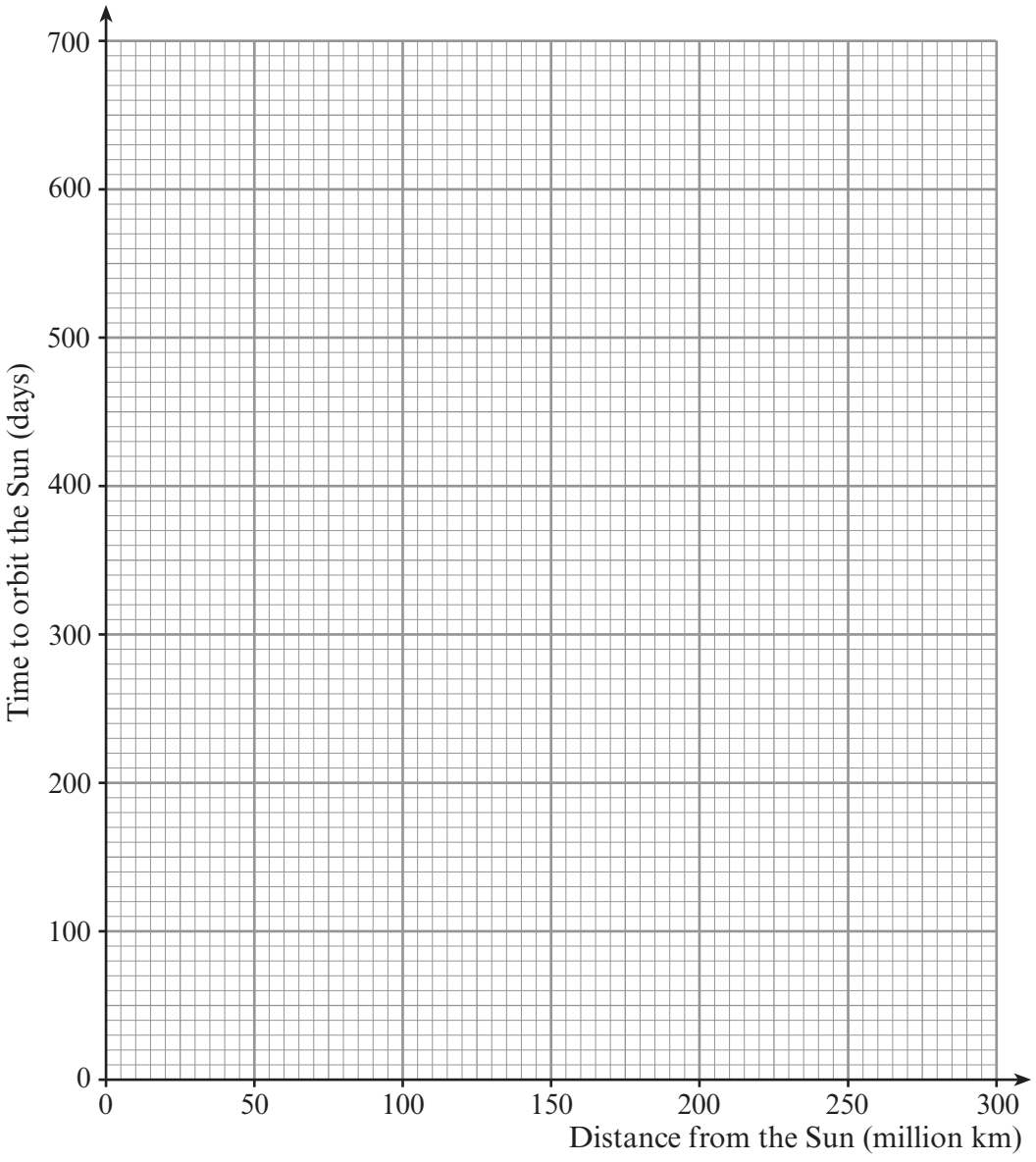
(ii) Name the innermost planet that has a gas structure. ..... [1]

(b) The table shows data about some of the planets.

Planet	Distance from Sun (million km)	Time to orbit the Sun (days)	Length of a day (hours)
Mercury	60	90	1420
Venus	110	220	5930
Earth	150	365	24
Mars	230	690	24.5
Jupiter	780	4380	

(i) Use the grid to plot a graph to show how the time a planet takes to orbit the Sun depends on the distance from the Sun **for the first four planets only**. [3]



(ii) Explain how the graph shows that the time for the orbit is not proportional to its distance from the Sun. [1]

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(iii) Is there enough information in the **table** to estimate the length of a day on Jupiter?

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Give a reason for your answer. [1]

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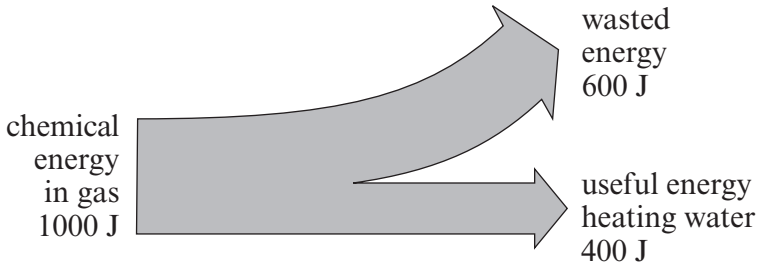
7

3. *(a)* Water can be boiled using a saucepan on a gas cooker ring.
The energy transfers are shown below.



Write down an equation as it appears on page 2 and use it to find the efficiency of heating water in this way.

Equation: .....

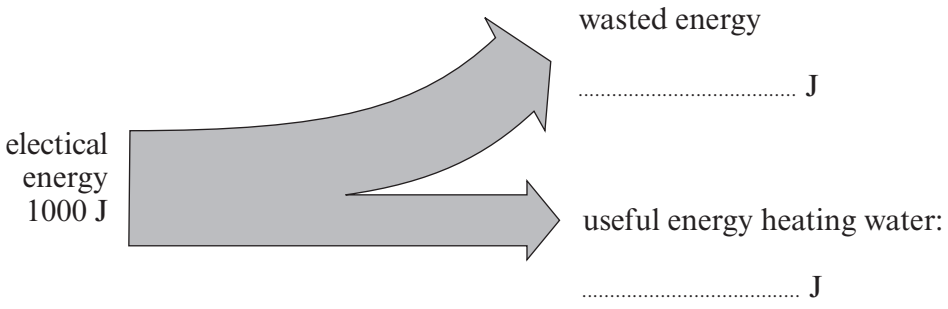
..... [1]

Calculation: [2]

Efficiency = ... %

Examiner only

(b) An electric kettle is 90% efficient at boiling water. Complete the energy transfer diagram below. The diagram is not to scale. [2]

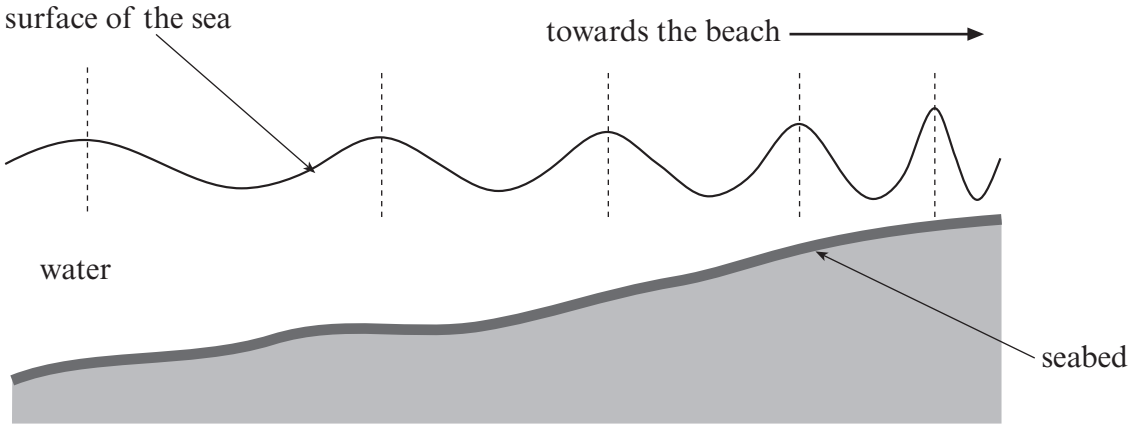


Space for working:

5

Examiner only

4. The diagram shows water waves arriving on a beach.



(a) Use the diagram to describe how the wavelength and amplitude of the waves change as the water gets shallower. [2]

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(b) (i) The frequency of the water waves is 0.2 Hz. Explain what this means. [1]

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(ii) Write down an equation as it appears on page 2 and use it to find the wavelength of the water waves when their speed is 0.6 m/s.

Equation: .....

..... [1]

Calculation: [2]

Wavelength = ... m

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Examiner only

5. *(a)* Discuss the factors that are involved in making decisions about the type of commercial power station that could be built in an area. [3]

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(b) Read the passage below about a domestic wind-powered generator.

> One type of domestic wind turbine supplies up to 6 kW.
>
> A householder installs a wind turbine. When it is operating, it delivers a mean power of 2.5 kW. This saves, on average, £384 per year on electricity bills.
>
> Adapted from *http://www.energysavingtrust.org.uk/Generate-your-own-energy/Wind-turbines*

(i) Give a reason why the power supplied by the wind turbines varies. [1]

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(ii) Use the equations

$$\text{Units used} = \text{power (kW)} \times \text{time (h)}$$

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

to calculate the time the turbine provided electricity to the house to save £384 in a year. [4]
(One unit of electricity costs 12p)

Time = ... h

Examiner only

6. *(a)* (i) Explain why step-up transformers reduce energy losses in the National Grid system. [2]

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(ii) The power output of a step-up transformer is 1.9×10^4 kW. The output voltage of the transformer is 3.8×10^5 V.

Use the equation

Power = voltage × current

to calculate the output current of the transformer. [3]

Current = ... A

(b) (i) The picture of one type of transformer shows the steel fins which are used as part of the cooling system.

Explain how the steel fins shown in the picture cool the transformer effectively. [3]

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Examiner only

(ii) The power input to a transformer is 2.0×10^4 kW. The power output of the transformer is 1.9×10^4 kW.

Write down an equation as it appears on page 2 and use it to find the energy loss every minute in the transformer.

Equation: .....

..... [1]

Calculation: [3]

Energy loss = ... J

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QUESTION 7 IS ON PAGE 12

Examiner only

7. *(a)* In the 19th century, it was discovered that the Earth was millions of years old. Why did this cause difficulties for the existing theory about the source of the Sun's energy? [2]

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(b) Processes in stars cause the chemical composition of the universe to change.
State how and **explain** why the chemical composition of the universe changes over time. [3]

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(c) Explain how the study of spectra from distant galaxies has led to a model of an expanding universe. [2]

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7