Candidate Name	Centre Number	Candidate Number
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GCSE

237/01

SCIENCE
FOUNDATION TIER
PHYSICS 1

P.M. FRIDAY, 18 June 2010

45 minutes

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

Answer **all** *questions.*

1. Our Sun was created and will eventually die over billions of years.
The sentences below describe the stages in its life.

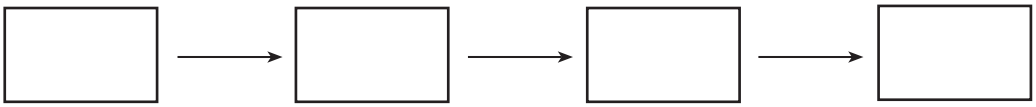
A The Sun goes through a stable state

B The Sun shrinks to become a white dwarf

C Gravity pulls dust and gas together

D The Sun becomes a red giant

(i) Put the letters A, B, C and D in the boxes so the stages in the Sun's life are in the correct order. [3]



(ii) In which stage, A, B, C or D is the Sun at present? ..... [1]

4

2. Use words from the box to complete the sentences that follow. [3]

blue	oxygen	fusion	red	fission	helium

(i) Stars are made up mainly of hydrogen and ..... .

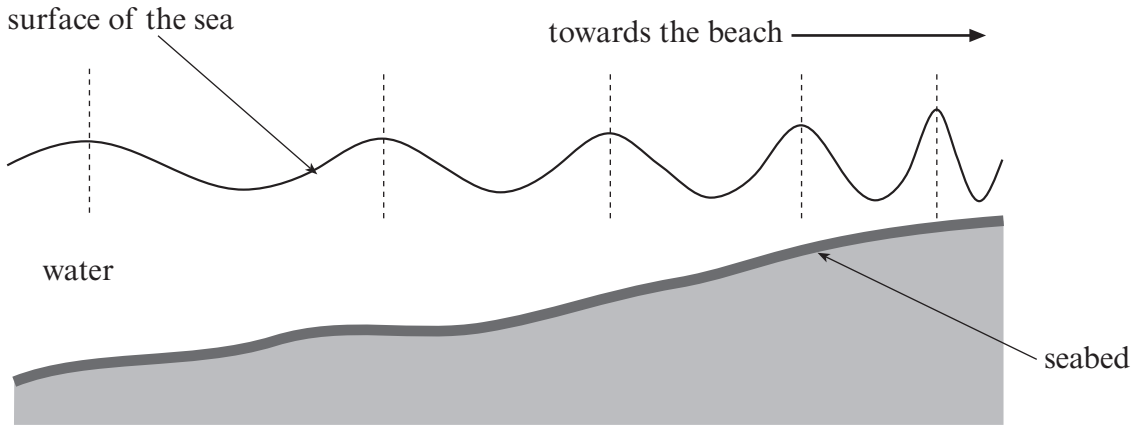
(ii) Stars produce energy by the ..... of hydrogen.

(iii) Light from stars in distant galaxies shows a ..... shift.

3

Examiner only

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



(a) Complete the sentences by underlining the correct word or phase in the brackets.

(i) As the water gets shallower the wavelength of the wave (increases / decreases / stays the same) [1]

(ii) As the water gets shallower the amplitude of the wave (increases / decreases / stays the same) [1]

(b) Use the equation:

wavespeed = wavelength × frequency

to calculate the wave speed of the wave when the wavelength is 3 m and the frequency is 0.2 Hz. [1]

Wavespeed = ... m/s

3

4. A homeowner decided to reduce the heating bill by improving the house insulation. The table shows the cost of the improvements made and the yearly savings.

Insulation method	Cost	Yearly saving
Draught-proofing doors and windows	£80	£30
Fitting a jacket to the hot water tank	£20	£20
Cavity-wall insulation	£1100	£50
Loft insulation	£400	.....
TOTAL	.....	**£200**

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

(ii) The homeowner spent £1200 per year heating his house before insulating it. How much would he expect to spend each year after making the insulation improvements? [1]

.....

(b) (i) Give a reason why heat loss by conduction is reduced by a cavity wall. [1]

.....

.....

(ii) Give a reason why heat loss by convection is reduced by cavity-wall insulation. [1]

.....

.....

(c) Explain why homeowners should reduce their heating costs in addition to saving themselves money. [2]

.....

.....

.....

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5. Read the passage and answer the questions that follow.

40% of all the wind energy in Europe blows over the UK, making it an ideal country for small home wind turbines.

Roof-mounted turbines produce around 1 kW to 2 kW depending on wind speed. To be effective you need an average wind speed bigger than 5 m/s.

Small domestic wind systems are particularly suitable for use in remote locations where homes are not connected to the national grid.

Costs for a roof-mounted wind system are £1,500. Recent monitoring of a range of small domestic wind systems has shown that a well-sited 2 kW turbine could save around £300 a year off electricity bills.

Adapted from http://www.energysavingtrust.org.uk/Generate-your-own-energy/wind-turbines

(i) Why is the UK ideal for small home wind turbines? [1]

.....

(ii) The average wind speed in one town is 3.5 m/s.
Give a reason why homeowners here would **not** be advised to install wind turbines. [1]

.....

.....

(iii) Why are wind turbines useful for supplying electricity to farms on hilltops well away from towns? [2]

.....

.....

.....

.....

(iv) Calculate the payback time for the roof-mounted wind turbine mentioned in the passage. [1]

Payback time = ... years

5

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6. *(a)* Describe the National Grid system. [2]

.....

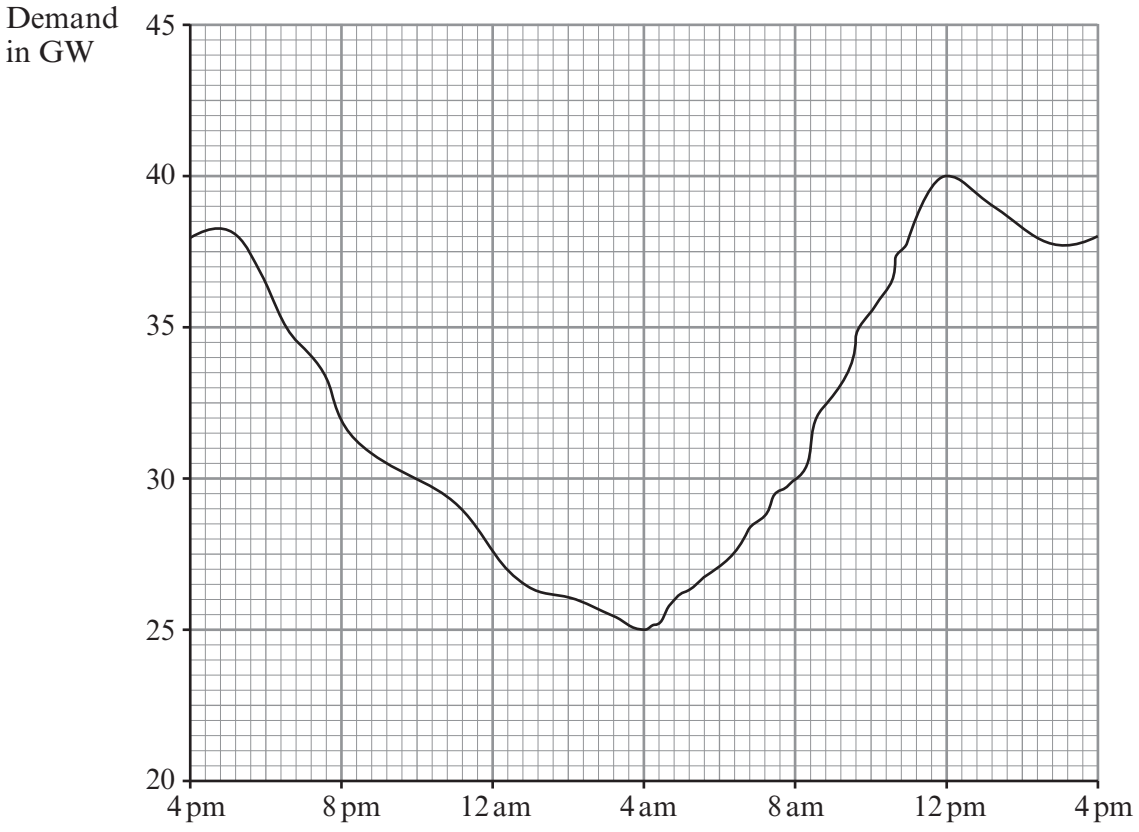
.....

.....

.....

(b) The National Grid is monitored so the supply of electricity meets the demand.

The graph shows the demand for electricity over a 24 hour period.



http://www.nationalgrid.com/uk/Electricity/Data/Realtime/Demand/demand24.htm

(i) Use the graph to find the minimum demand on the National Grid. [1]

..... GW

(ii) Use the graph to find the increase in demand between 4am and 12pm. [1]

..... GW

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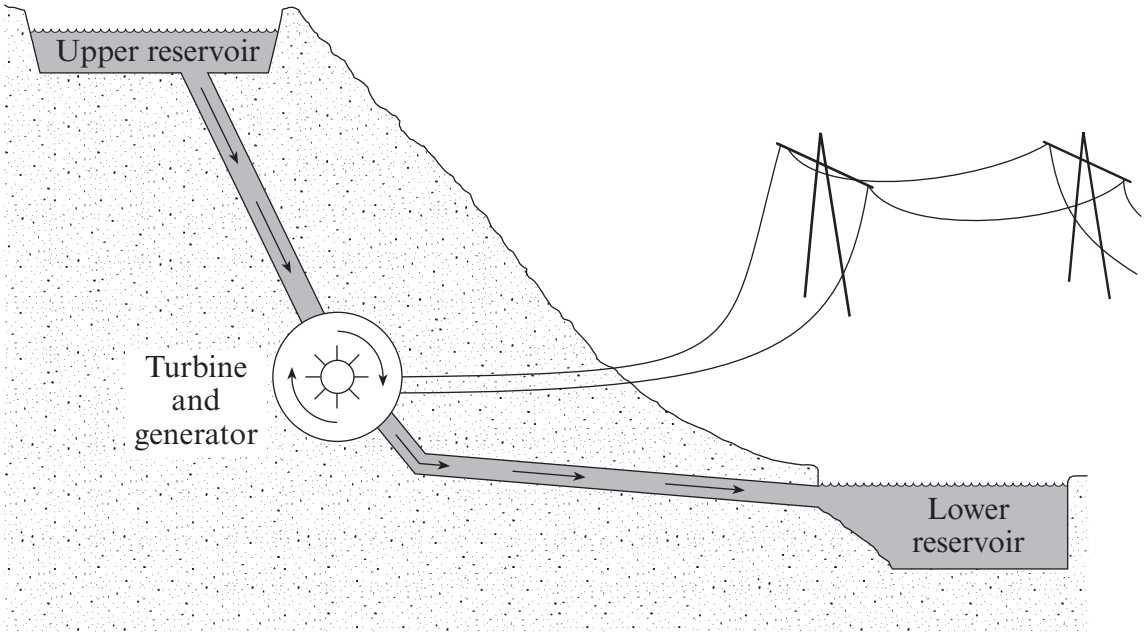
(c) The diagram shows one type of hydroelectric power station.



(i) At certain times, electricity from the National Grid is used to pump water from the lower to the upper reservoir.

Use the graph to suggest when this should be done. ..... [1]

Give a reason for your answer [1]

.....

.....

(ii) Give a reason why this power station can supply electricity to the grid without a time delay. [1]

.....

.....

7

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7. The readings of a household electricity meter at the start and end of a month are shown below.

Start	0	8	3	4	5

End	0	8	6	6	5

(a) (i) How many units of electricity were used during the month? [1]

No. of units used = ... kWh

(ii) Each unit of electricity costs 12p.

Use the equation

Cost = units used × cost per unit

to find the cost of using electricity for that month. [2]

Cost = ...

(b) A 3 kW electric kettle full of water is used 6 times a day for 5 minutes each time.

(i) Use the equation

Units used = power (kW) × time (h)

to find the number of units used each day. [2]

Units used each day = ... kWh

(ii) State one way that the kettle could still be used 6 times a day but would use fewer units of electricity. [1]

.....

.....

6

Examiner only

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

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

.....

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

.....

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

.....

(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]

.....

.....

.....

.....

5

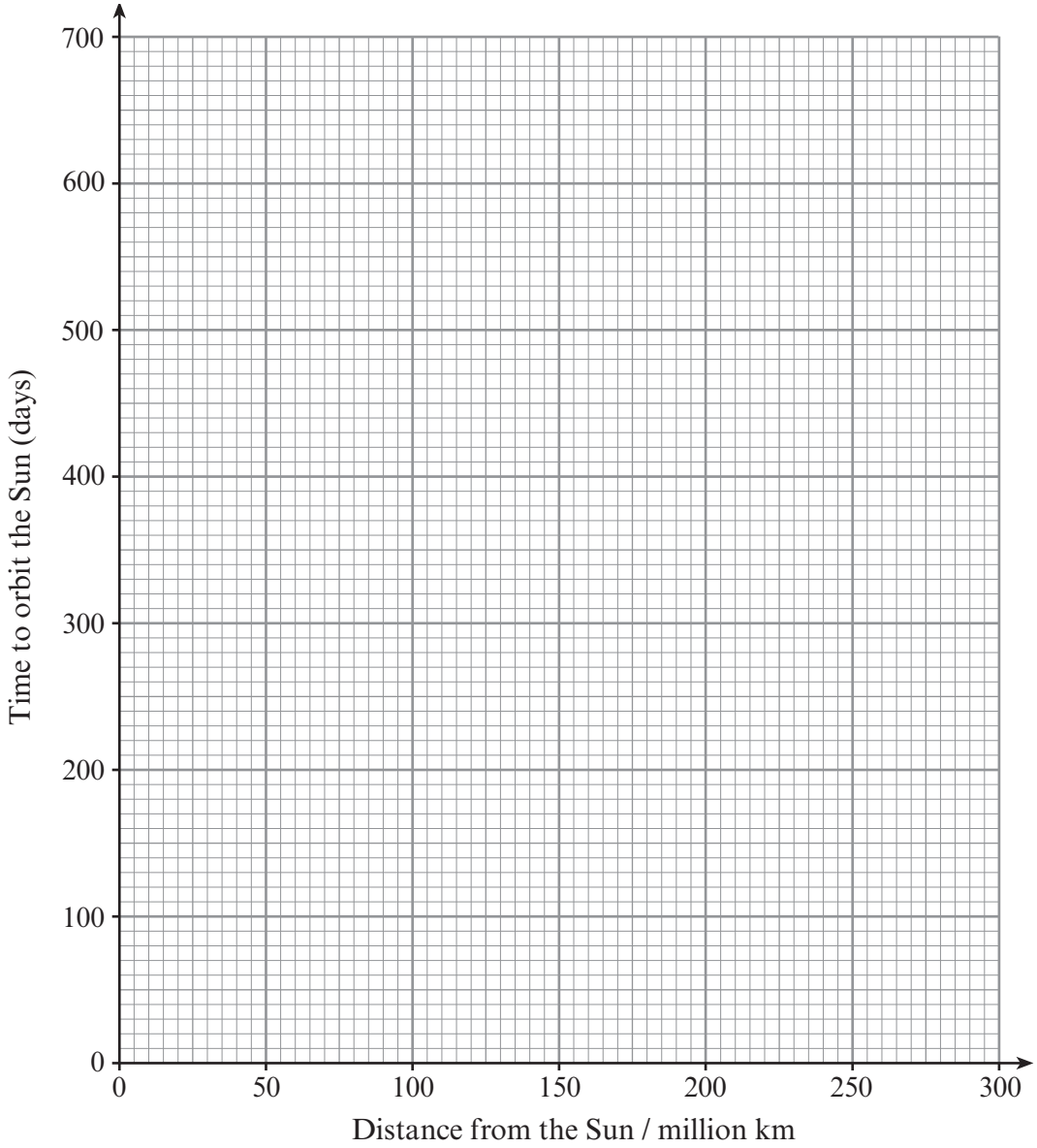
Examiner only

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

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]



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

.....

.....

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

.....

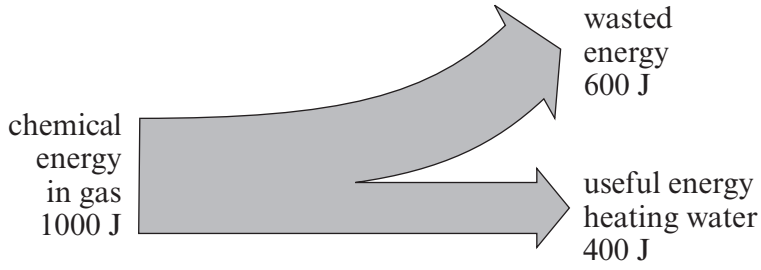
Give a reason for your answer. [1]

.....

.....

5

10. *(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.

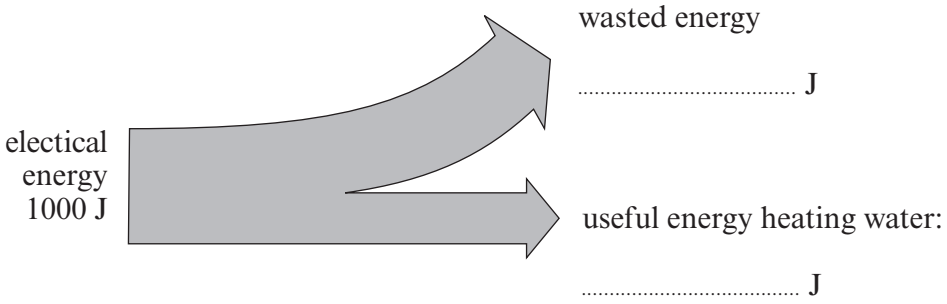
Equation: .....

..... [1]

Calculation: [2]

Efficiency = ... %

(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