Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0237/02

SCIENCE
HIGHER TIER
PHYSICS 1

P.M. FRIDAY, 15 June 2012

45 minutes

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

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020001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator.

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 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

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

Commonly used prefixes			
Multiplier	Symbol	Meaning	
micro	μ	0.000 001	10^{-6}
milli	m	0.001	10^{-3}
centi	c	0.01	10^{-2}
kilo	k	1 000	10^{3}
mega	M	1 000 000	10^{6}
giga	G	1 000 000 000	10^{9}

Answer **all** *questions.*

1. Microwaves are a type of electromagnetic radiation. They are reflected from metals but can pass through glass, pottery and some plastics.

Most food cooked in a microwave oven has a high water content, which readily absorbs the microwave energy producing a rapid rise in temperature. This results in the food being cooked quickly.

(a) (i) Explain why the choice of container for the food is important in microwave cookery. [2]

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(ii) Give a reason why microwave ovens cook food quicker than a conventional oven. [1]

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(b) X-rays and gamma rays are other types of electromagnetic radiation. State **two** ways in which they differ from microwave radiation. [2]

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5

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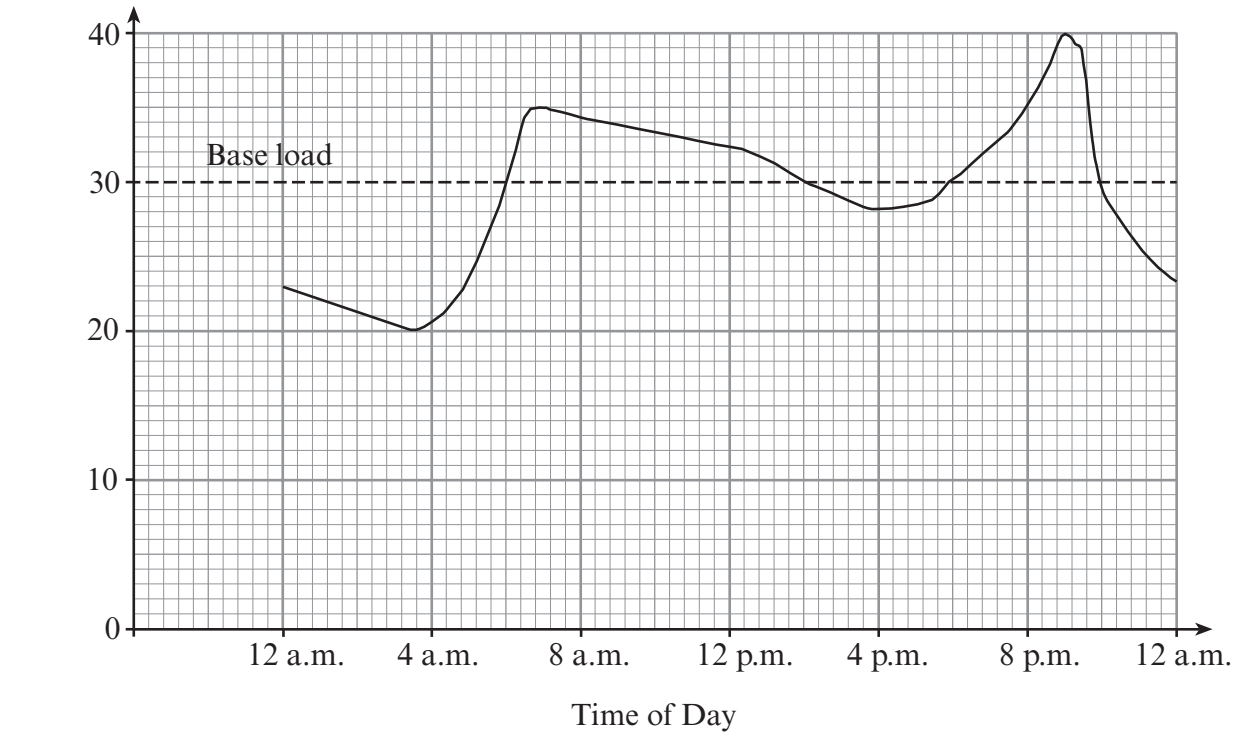
2. The graph shows how the demand for electricity changes over a 24 hour period, in this country, during winter.



Since electrical power cannot be stored in large quantities most fossil fuelled and nuclear power stations are run continuously, to provide a minimum amount of power to the National Grid. This is called the base load. Most hydroelectric power stations only operate at times of peak demand for power because they have a much shorter start-up time than other power stations.

(a) (i) Between 4 a.m. and 4 p.m. how many hours is the demand above the "base load"? [1]

Number of hours = ...

(ii) How much reserve generating capacity must the electrical industry have available, to meet the peak demand for the 24 hour period shown by the graph? [1]

Reserve capacity = ... GW

(b) Give a reason why electrical power is offered at low cost between 12 a.m. and 5 a.m. [1]

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Examiner only

(c) Why does a hydroelectric power station have a much shorter start-up time than fossil fuelled power stations? [1]

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(d) Suggest how the electrical industry deals with the reduced demand for power during the summer months. [1]

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5

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Turn over.

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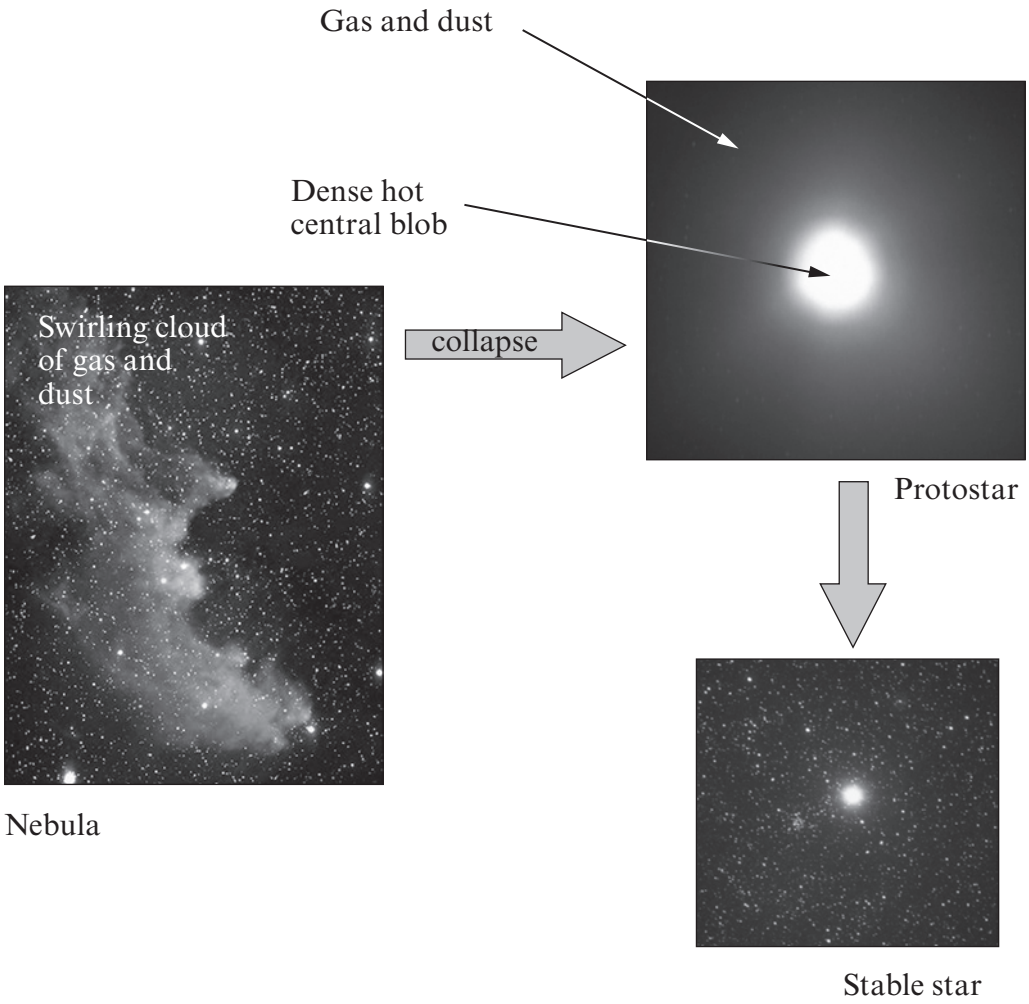
3. The diagram shows the stages in the birth of a star which takes place over many millions of years.



(a) What causes the gas and dust in the nebula to collapse? [1]

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(b) Explain what happens in the core of the protostar to cause it to glow and produce a large outward radiation pressure force. [2]

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(c) Explain what causes the protostar to eventually become a stable or main sequence star. [2]

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(d) (i) Give a brief outline of the 19th century model of the source of the Sun's energy. [2]

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(ii) State the evidence that proved that this model needed to be replaced. [1]

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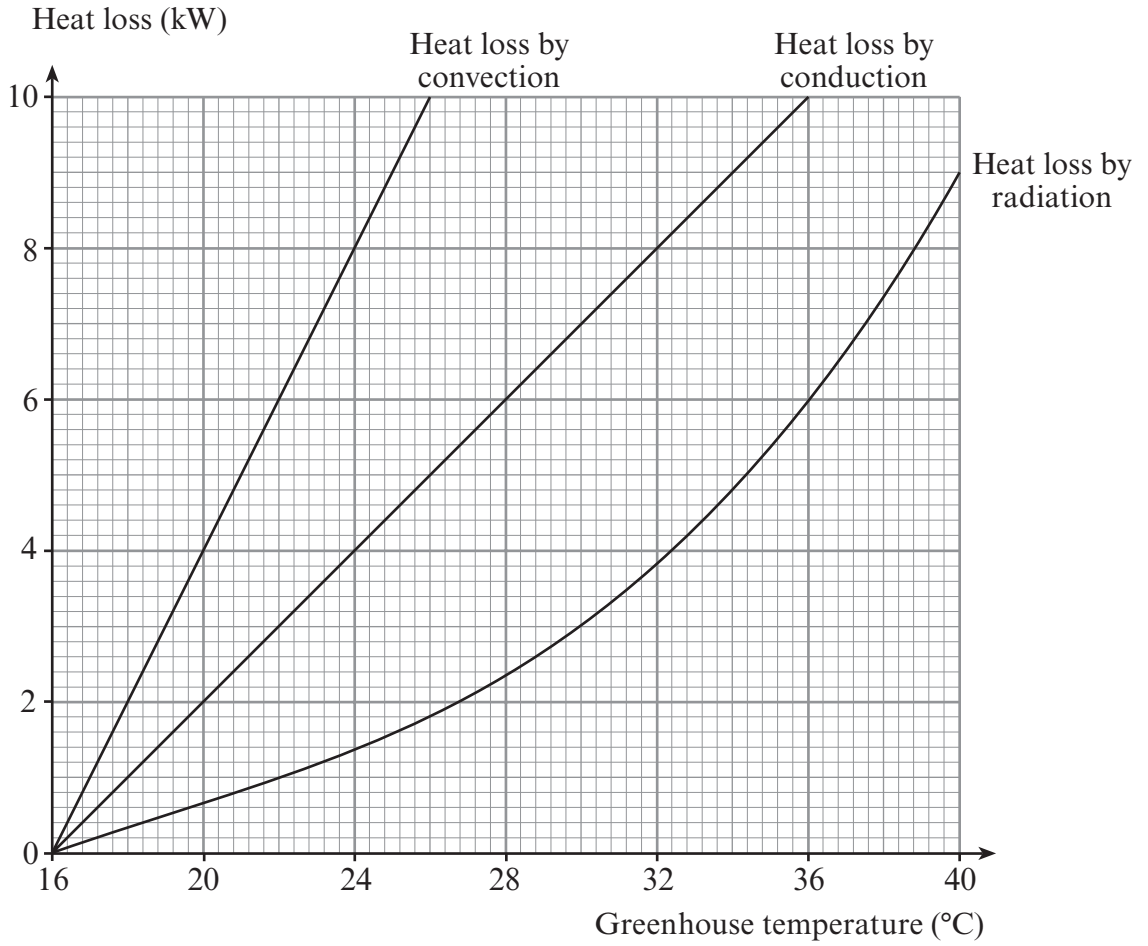
8

Turn over.

Examiner only

4. A greenhouse loses heat by conduction and radiation through the glass and by convection when the windows are opened.
The three graphs show how the heat loss from the greenhouse varies with the temperature inside the greenhouse.
One day the outside temperature was 16 °C and the greenhouse was **absorbing 10 kW of power from the Sun**.



(a) The temperature inside the greenhouse reached 30 °C. Use the graphs to find the heat loss by:

(i) conduction; .....

(ii) radiation. ..... [2]

(b) Use your answers to *(a)* to explain why the temperature remained constant at 30 °C when the windows were closed. [1]

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(c) The greenhouse windows were then opened.

(i) Give a reason why the temperature inside the greenhouse dropped. [2]

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(ii) Calculate the total heat loss from the greenhouse when the inside temperature was 24 °C. [2]

Total heat loss at 24 °C = ... W

(iii) Use the three graphs to find the new steady value of the temperature in the greenhouse. [1]

New steady value of temperature = ... °C

8

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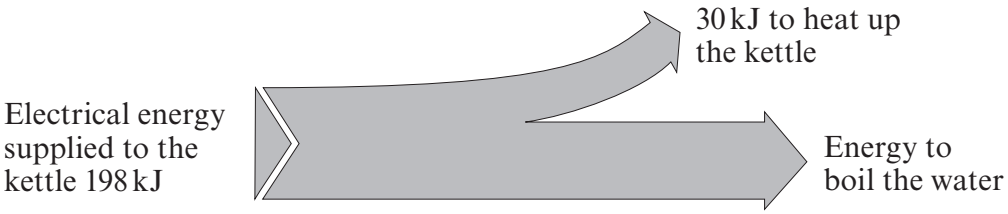
5. The energy flow diagram shows how the energy supplied to a 2200 W kettle is used to boil 0.5 kg of water.



(a) Use the equation

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

to calculate the efficiency of the kettle in boiling the 0.5 kg of water. [3]

Efficiency = ... %

(b) Select an equation from page 2 and use it to find how long it took to boil the water.

Equation:

.....

[1]

Calculation: [3]

Time taken = ... s

7

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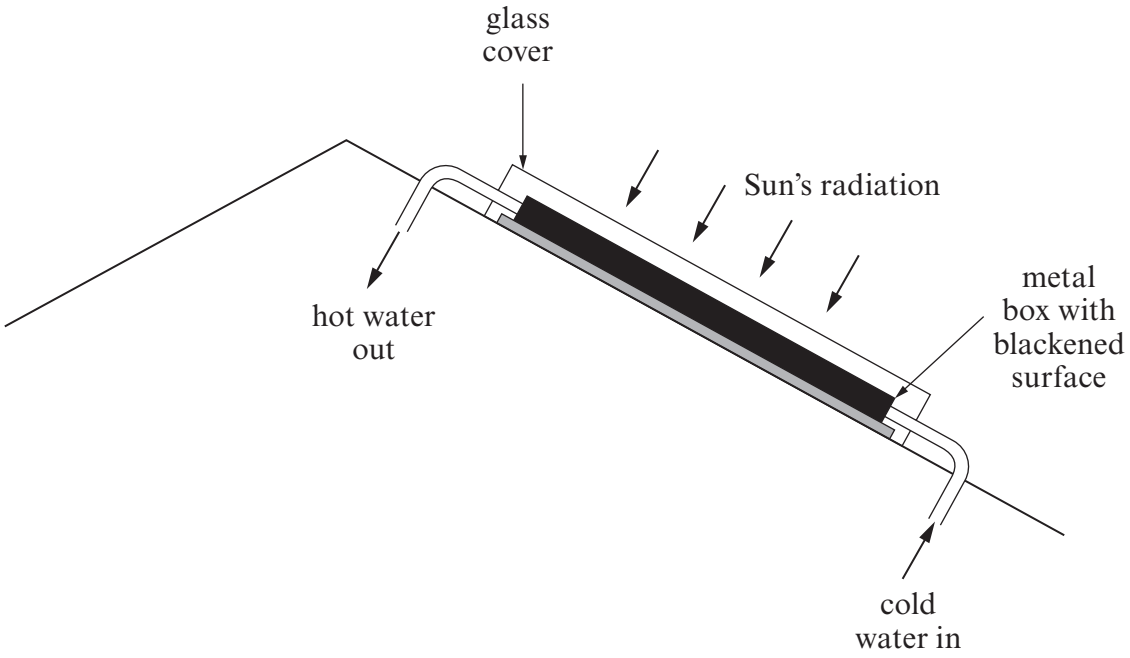
6. The diagram shows a solar panel that can be roof mounted and used to provide hot water. The water is circulated through the panel's metal box by a pump. The water becomes heated by absorbing some of the Sun's radiation.



(a) Explain why the output temperature of the water is increased by:

(i) putting a glass cover over the metal box; [1]

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.....

(ii) blackening the upper surface of the metal box. [1]

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(b) In the U.K. on a typical summer's day the power of sunlight falling on a 4.8 m^2 solar panel varies between 1000 W/m^2 and 400 W/m^2 over a 10 hour period.

(i) If only half the power of the sunlight is delivered to heat the water, calculate the maximum and minimum power produced by the panel. [2]

Maximum power = ... kW Minimum power = ... kW

(ii) Estimate the energy, in kWh, given to the water on this day. State clearly any assumptions you make. [2]

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(c) Give **two** reasons why an alternative source of energy may be required to heat the water for the household in winter. [2]

1. .....

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2. .....

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8

Turn over.

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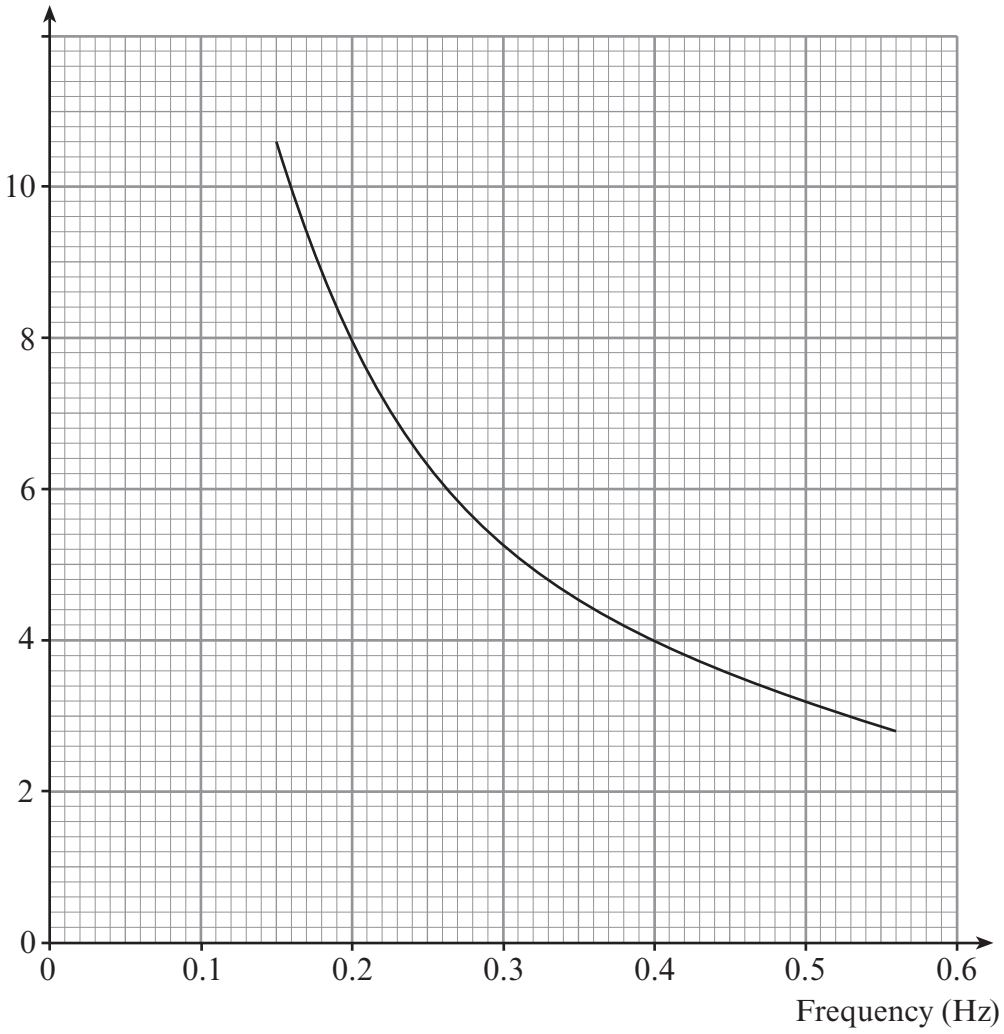
7. The graph shows how the wave speed of deep ocean waves varies with the frequency of the waves.



(a) Describe the relationship between wave speed and frequency of deep ocean waves. [2]

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(b) A tropical storm produced waves with long wavelengths. The storm occurred at sea, 311 000 m from the mainland.

Use the equations

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

and

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

together with the graph to calculate the wave speed and wavelength of the waves that arrive at the mainland in 12 hours. [7]

Wave speed = ... m/s

Wavelength = ... m

9

THERE ARE NO MORE QUESTIONS IN THE EXAMINATION.