Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0237/01

SCIENCE
FOUNDATION TIER
PHYSICS 1

A.M. WEDNESDAY, 30 January 2013

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**4**	
3.	**3**	
4.	**3**	
5.	**3**	
6.	**4**	
7.	**4**	
8.	**5**	
9.	**5**	
10.	**5**	
11.	**5**	
12.	**5**	
Total	**50**	

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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 (kWh) × cost per unit

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

wave speed = wavelength × frequency

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

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Answer **all** *questions.*

1. The information plate below was found on the back of a microwave oven.

Serial No 1277993
230 V 50 Hz
0.8 kW
2450 MHz

Use the information on the rating plate to complete the following sentences.

The appliance should be connected to a mains voltage of ..... .

The appliance uses microwave radiation of frequency ..... .

The power of the appliance is ..... which means it transfers

..... joules of energy every second. [4]

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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 (£)	Saving in 10 years (£)
Fitting solar panels for water heating	2400	150	1500
Replacing lamps with energy saving lamps	100	25	.....
Fitting a new hot water boiler	1400	.....	1000

(a) Complete the table. [2]

(b) Calculate the payback time for the solar panels.
(This is the number of years it takes for the savings made to pay the cost of installation.)
[2]

Payback time = ... years

4

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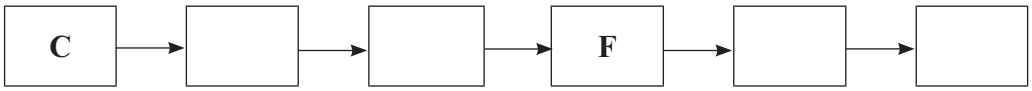
3. Stars are created and eventually die over billions of years.
The sentences **A** to **F** describe the stages of the evolution of a high mass star.
The sentences are in the wrong order.

A	Temperature and pressure build up to start fusion.
B	Expansion and cooling to form a red supergiant star.
C	Massive clouds of gas and dust are pulled together by gravity.
D	The gas and dust cloud becomes more compressed and heats up.
E	A supernova occurs leaving a black hole or a neutron star.
F	A large stable blue star exists.

Arrange the sentences in the right order in the boxes below.
Two boxes have been completed for you. [3]



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4. A £1 coin, inserted into a pre-payment electric meter, buys 4 units (kWh) of electricity.

(i) Use the equation

$$\text{cost per unit} = \frac{\text{cost}}{\text{units used (kWh)}}$$

to calculate the cost of 1 unit in pence. [1]

Cost of 1 unit = ... p

(ii) Use the equation

$$\text{time (h)} = \frac{\text{units used (kWh)}}{\text{power (kW)}}$$

to calculate how long a 1·6 kW electric fire can be used before the £1 coin runs out. [2]

Time = ... h

3

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5. The electromagnetic spectrum is the name given to a family of waves that includes light, infra red and ultra violet radiations. All members of the family can travel through a vacuum with the same high velocity.

Electromagnetic waves are produced when the energy of electrically charged particles is changed in some way. The greater the change in energy, the shorter the wavelength of the electromagnetic wave produced. Radio waves, with a wavelength of up to 10 km and gamma (γ) rays with wavelengths of a thousand millionths of a millimetre are found at opposite ends of the electromagnetic spectrum.

(a) (i) Name **one** part of the electromagnetic spectrum that is **not** mentioned in the above passage. [1]

.....

(ii) Name **one** part of the electromagnetic spectrum that has a frequency greater than that of visible light. [1]

.....

(b) Give **one** reason why radio waves have a longer wavelength than gamma (γ) rays. [1]

.....

.....

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3

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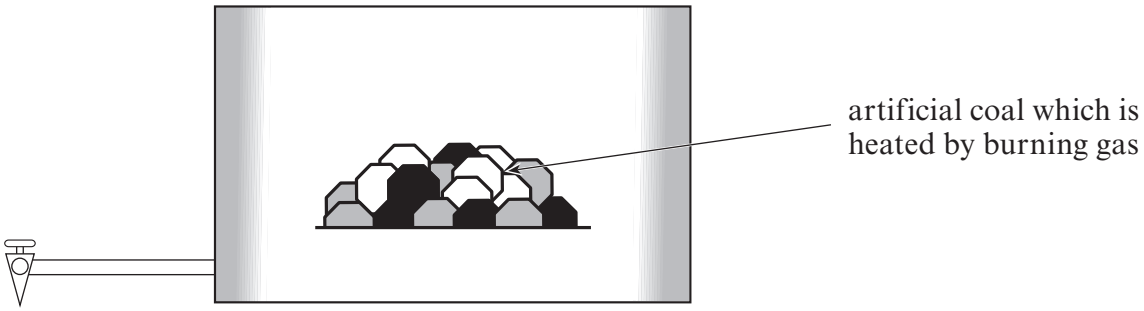
6. The diagram shows a 'coal-effect' gas fire.



(a) Complete the following sentences by **underlining one word** from each bracket.

(i) Heat is transferred directly to a person sitting in front of the fire by

[**conduction / convection / radiation**]. [1]

(ii) Heat is transferred to the person by the movement of hot air in the room, caused by

[**conduction / convection / radiation**]. [1]

(b) The 'coal-effect' fire requires 5 kW of power to provide 2·5 kW to the room.
Use the equation

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

to calculate the efficiency of the fire. [2]

Efficiency = ... %

4

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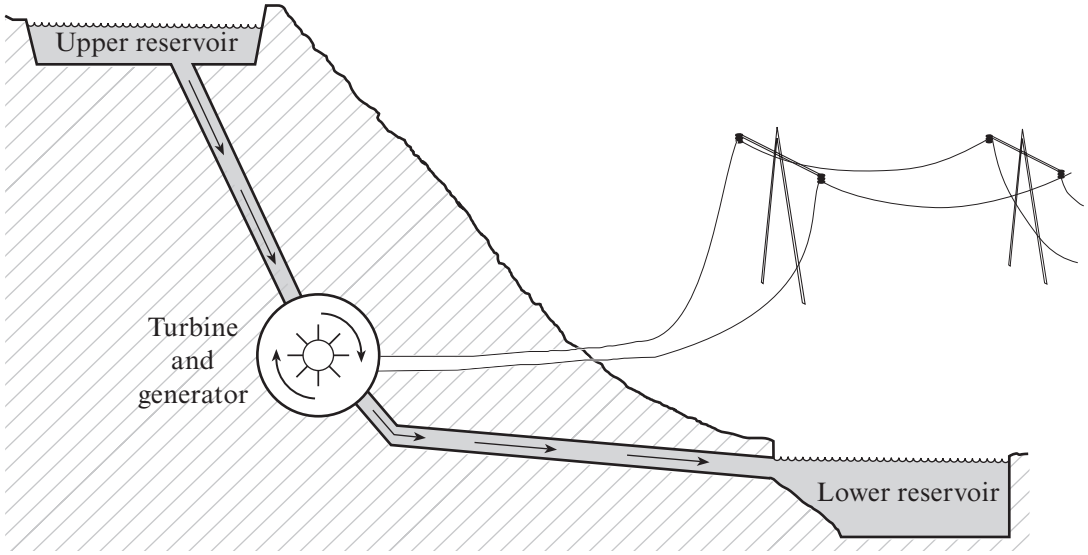
7. The diagram shows how electricity is generated in a hydroelectric power station that is in a National Park – an area of outstanding natural beauty.



The electricity that is generated is passed to a transformer. It is then sent along wires that are underground for the first few kilometres and along wires supported by pylons after that.

The power station is only used when we need more electricity than the rest of the power stations around the country can supply.

(a) State **one** advantage of generating electricity in a hydroelectric power station. [1]

.....

.....

(b) (i) Give a reason why the electrical wires are taken underground for the first few kilometres. [1]

.....

.....

(ii) The transformer is used before the electricity is sent along the wires. Explain **what** the transformer does to the electricity and **why** it is used. [2]

.....

.....

.....

4

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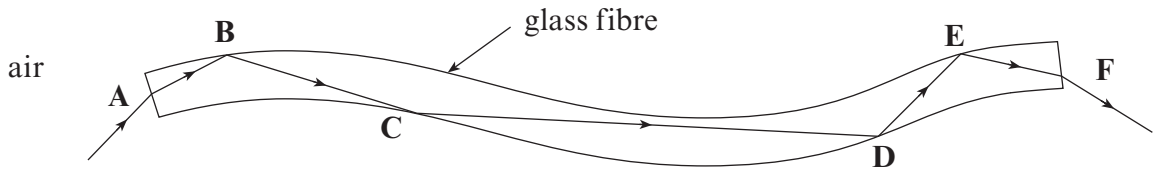
8. The diagram shows a signal passing from air, through a glass fibre and back out into the air.



(a) Select from the boxes a phrase that correctly completes the sentences that follow.

Each phrase may be used **once**, **more than once** or **not at all**. [3]

is passing into a less dense medium	is passing into a more dense medium	hits at an angle greater than the critical angle	hits at an angle less than the critical angle

(i) The signal changes direction at **A** because it .....

.....

(ii) The signal changes direction at **D** because it .....

.....

(iii) The signal changes direction at **F** because it .....

.....

(b) State **two** ways in which optical fibres have improved long-distance communication. [2]

1. .....

2. .....

5

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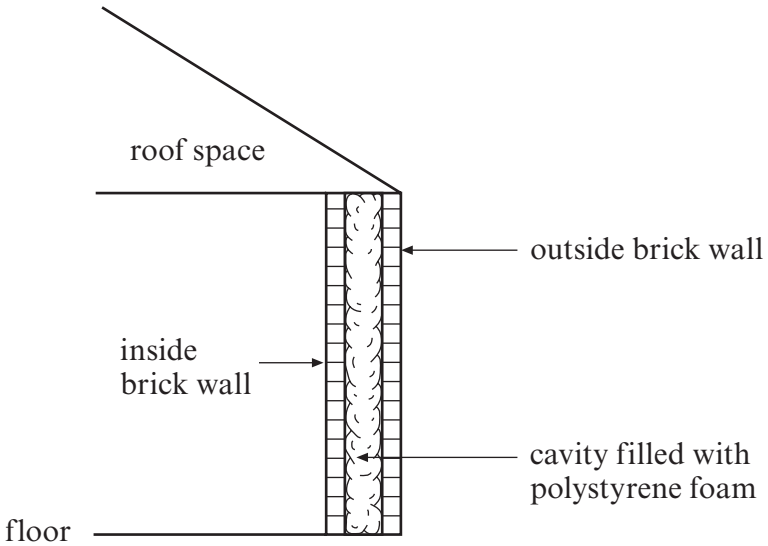
9. The diagram represents a section through part of a building and it shows the side cavity wall, filled with polystyrene foam to reduce heat loss.



(a) State **two** *other* ways of reducing heat loss from buildings. [2]

(i) .....

.....

(ii) .....

.....

(b) (i) Explain how heat loss by **conduction** through the wall is reduced by the foam. [2]

.....

.....

.....

(ii) Explain how heat loss by **convection** in the wall cavity is reduced by the foam. [1]

.....

.....

5

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10. A gas customer had double glazing installed on 1st February.
The table shows the gas meter readings 3 months before installation and 3 months after.

Date	1st November	1st February	1st May
Readings (units)	5 100	6 325	7 335

(a) Calculate:

(i) the number of units used in the 3 months **before** the double glazing was installed; [1]

Number of units = ...

(ii) the number of units used in the 3 months **after** the double glazing was installed. [1]

Number of units = ...

(b) If each gas unit cost 43 p, calculate how much money **was saved** on the gas bill after installing double glazing. [2]

Money saved = ... p

(c) The gas customer claimed that the money saved was entirely due to the installation of the double glazing.
Give a reason why this claim is not scientifically correct. [1]

.....

.....

.....

5

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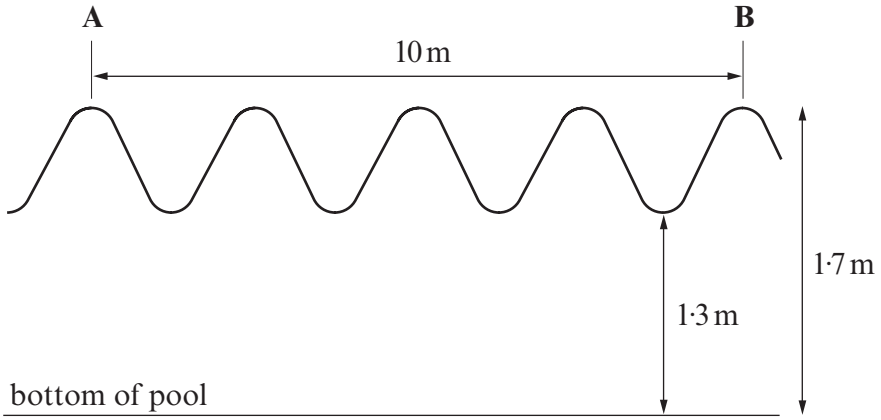
11. The diagram shows a side view of the water waves, produced in a swimming pool by a wave machine.



(a) Use information given on the diagram to find:

(i) the amplitude of the waves; [2]

Amplitude = ... m

(ii) the number of complete waves between **A** and **B**; ..... [1]

(iii) the wavelength of the water waves. [1]

Wavelength = ... m

(b) State what happens to the wavelength of the water wave when the frequency of the wave machine is increased. [1]

.....

.....

5

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

The table gives data on four planets in the Solar System.

Planet	Distance from the Sun (million km)	Time for one orbit (years)	Average surface temperature
Earth	150	1·0	15 °C
Mars	228	1·9	–23 °C
Jupiter	778	11·9	–120 °C
Saturn	1 427	29·5	–180 °C

Ceres is a large asteroid which orbits the Sun in the asteroid belt.

(a) What is the asteroid belt? [1]

.....

.....

(b) Use the data in the table to make a reasonable estimate of: [2]

(i) the distance of Ceres from the Sun; ..... million km

(ii) the temperature on the surface of Ceres. ..... °C

(c) Astronomers believe that, after the Sun formed 4·5 billion years ago, the remaining gas, dust and ice collected together to form the planets.
The 4 inner planets have a different make up (structure) from the 4 outer planets (excluding Pluto).

(i) State how the inner planets are structurally different from the outer planets. [1]

.....

.....

(ii) Explain how the structural difference between the planets was influenced by the energy from the newly-formed Sun. [1]

.....

.....

.....

.....

END OF PAPER