Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0237/02

SCIENCE
HIGHER TIER
PHYSICS 1

P.M. MONDAY, 30 January 2012

45 minutes

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

0237
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 of the examination paper. 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

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

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

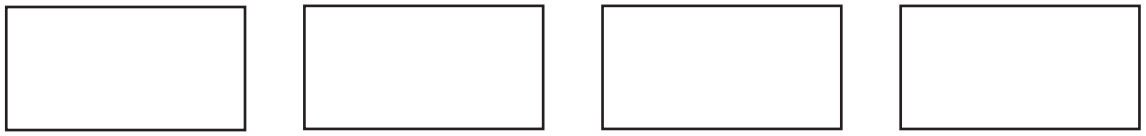
wave speed = wavelength × frequency

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. **Visible light, X-rays, Infra-red radiation and Radio waves** are four members of the electromagnetic spectrum.

(a) Place these four radiations in the boxes below in the order of decreasing wavelength. [2]



Longest wavelength

Shortest wavelength

(b) State **two** practical uses of Infra-red radiation. [2]

1. .....

.....

2. .....

.....

(c) State how large doses of X-rays damage cells in the body. [1]

.....

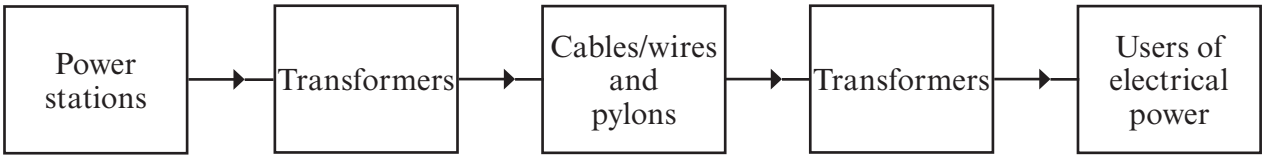
.....

.....

5

Examiner only

2. The National Grid is a network of cables and pylons which connects power stations together and supplies electricity to factories and homes across the country.
The block diagram shows the main parts of the National Grid.



(a) State an advantage of connecting power stations together. [1]

.....

.....

(b) (i) Give a reason why low resistance cables/wires are used for the transmission of electricity in the National Grid. [1]

.....

.....

(ii) Give a reason why the cables/wires that carry the power are held **high** above ground level. [1]

.....

.....

(c) State how and explain why both "step-up" and "step-down" transformers are used throughout the National Grid. [3]

.....

.....

.....

.....

.....

.....

6

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

Serial No. 7JAN300010X
240 V a.c. 50 Hz
0.8 kW
2450 MHz

(a) (i) Write down the power of the microwave oven in W. ..... [1]

(ii) Use the equation

energy transfer = power × time

to find how much energy is transferred by the microwave oven in 60 s. [2]

Energy transferred = ... J

(b) What does the figure 2450 MHz tell you about the microwaves? [1]

.....

.....

(c) Select an equation from page 2 and use it to calculate the wavelength of the microwave radiation used by the oven. The speed of electromagnetic radiation is 3×10^8 m/s.

Equation .....

.....

[1]

Calculation [3]

Wavelength = ... m

Examiner only

4. In a pumped storage power station, water from a reservoir is allowed to fall through a pipe to a reservoir at a lower level.

When the water falls, it turns a turbine which is connected to a generator to produce electricity.

The generator produces an output of 20 000 V at 1000 A. The efficiency of the generation system is 75%.

(a) (i) Use the equation

$$\text{power} = \text{voltage} \times \text{current}$$

to calculate the output power. [1]

Output power = ... W

(ii) Select an equation from page 2 and use it to calculate the input power delivered to the turbine generator by the falling water.

Equation .....

.....

[1]

Calculation [3]

Input power = ... W

(b) At night electricity is used to pump the water from the lower to the upper reservoir.

Explain why:

(i) this is done overnight; [1]

.....

.....

(ii) more electrical energy was needed for pumping than was generated when the station was operated during the day. [1]

.....

.....

Examiner only

(c) Give clear reasons why pumped storage power stations are only used in short periods and at times of peak demand for electricity. [2]

.....

.....

.....

.....

9

5. *(a)* Write a brief account of the "death" of a **high-mass** star. [3]

.....

.....

.....

.....

.....

.....

.....

.....

(b) Explain how the "death" of stars produces an increase in the fraction of elements heavier than helium in the Universe. [2]

.....

.....

.....

.....

.....

.....

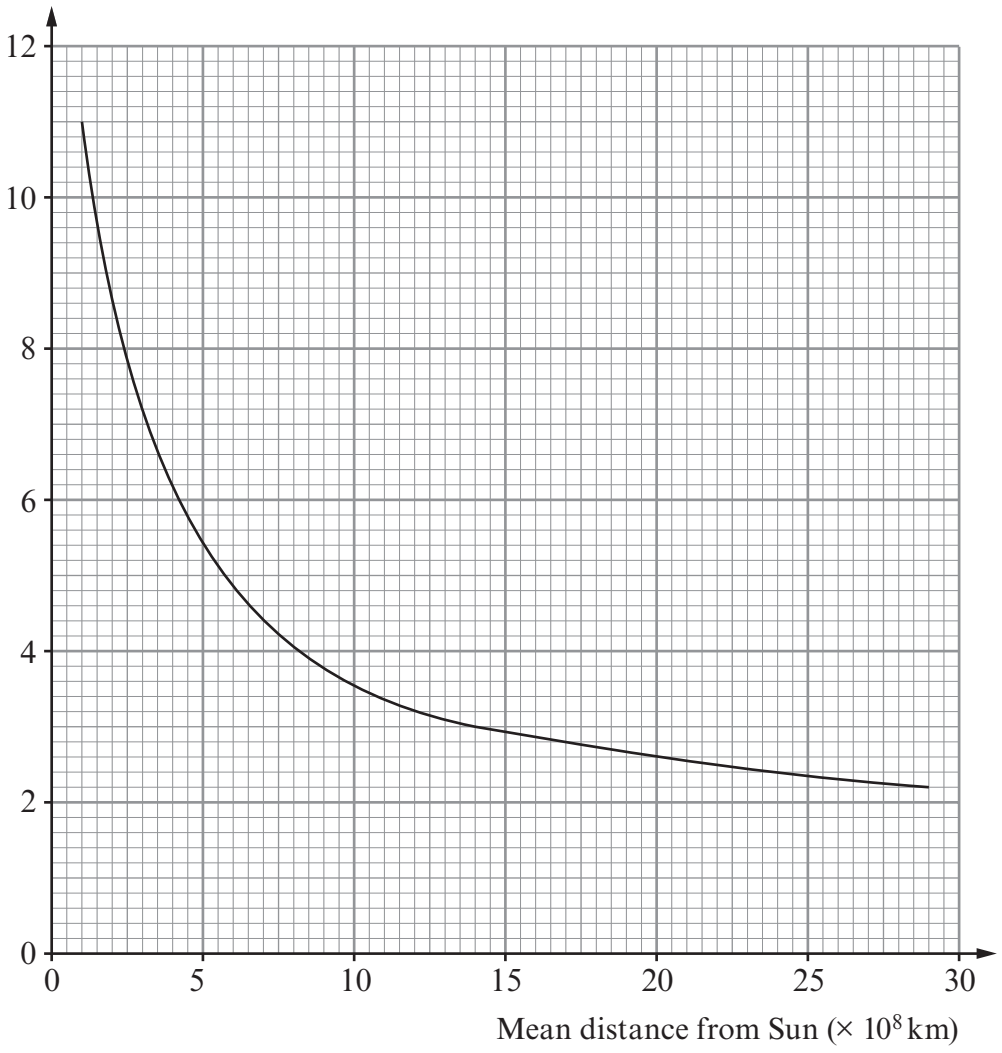
5

Turn over.

6. The table below gives data on six planets in the Solar System.

Planet	Mean distance from the Sun ($\times 10^8$ km)	Mean surface temperature (°C)	Time for 1 orbit (years)
Venus	1.10	480	0.62
Earth	1.50	22	1.00
Mars	2.25	–23	1.88
Jupiter	7.80	–150	11.86
Saturn	14.00	–180	29.46
Uranus	29.00	–210	84.01

The graph shows how the orbital speed of the planets varies with their distance from the Sun.



Examiner only

(a) What is the orbital speed of Saturn? ..... km /year [1]

(b) An asteroid Ceres is 700 km in diameter and has an orbital speed of 5.8×10^8 km/year. It travels 2.67×10^9 km in making one orbit of the Sun.

(i) Use the graph to find the distance of Ceres from the Sun. [1]

Distance = ... km

(ii) Use the equation

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

to find the orbital time of Ceres. [2]

Orbital time = ... yr

(c) Estimate the mean temperature on Ceres, showing your working or explaining how you arrived at your answer. [2]

Average temperature = ... °C

(d) Ceres is further from the Sun than Earth.
State **two** other reasons why it takes Ceres longer than Earth to complete one orbit of the Sun. [2]

1. .....

.....

2. .....

.....

8

Turn over.

Examiner only

7. An uninsulated house has gas central heating and the energy cost for heating this house for a year was £940.

After installing double glazing, loft and cavity wall insulation, at a total cost of £5000, the heating bill for the following year was £640.

(a) (i) Calculate the payback time for the cost of the energy saving improvements. [2]

Payback time = ... years

(ii) Explain why the actual payback time may be shorter. [1]

.....

.....

.....

.....

(b) Give **two** environmental reasons why it is important to reduce heat losses from our homes. [2]

1. .....

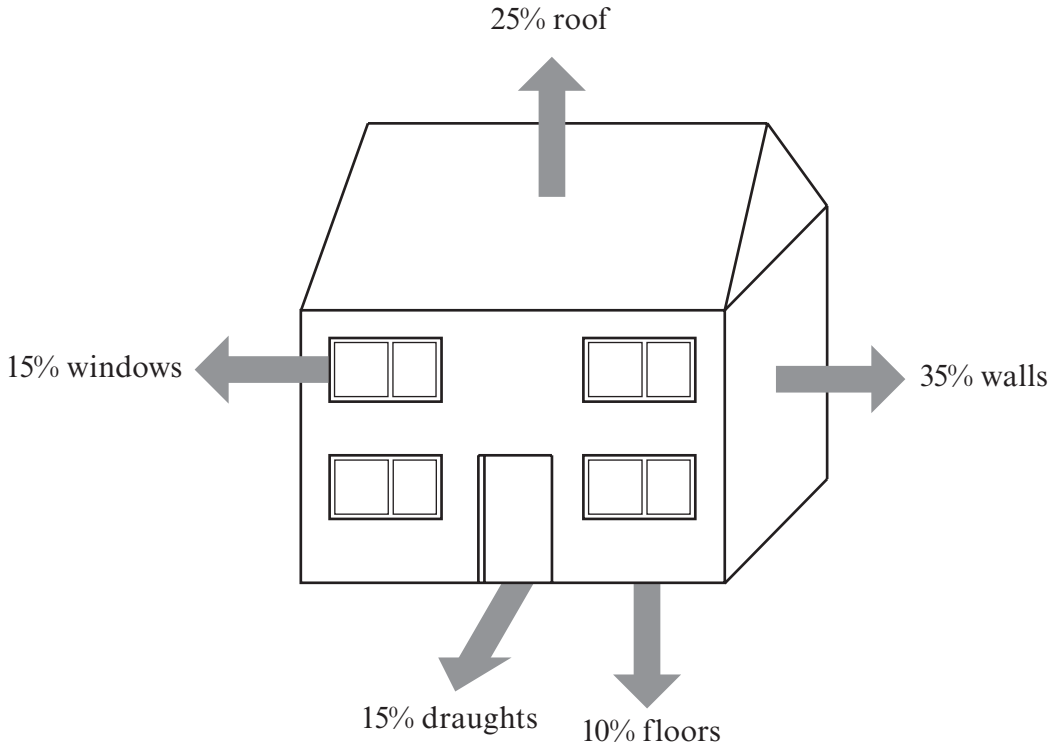
.....

2. .....

.....

Examiner only

(c) The diagram shows the percentage of energy lost through various places from the house **after** the energy saving improvements.



How many units of energy per year were **still** lost through the **insulated** cavity walls? You may assume that the cost of one unit of gas remained constant at 40p. [4]

Units = ...

9

THERE ARE NO MORE QUESTIONS IN THE EXAMINATION.