Candidate Name	Centre Number	Candidate Number

WJEC CBAC

GCSE

237/01

SCIENCE
FOUNDATION TIER
PHYSICS 1

A.M. FRIDAY, 19 June 2009

45 minutes

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

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

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

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

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

wave speed = wavelength × frequency

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Answer **all** *questions*.

1. Select, from the box below, a word or phrase to correctly complete the sentences that follow.

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

white	shiny black	silvery	matt black

(i) The best absorber of thermal radiation is a ..... surface.

(ii) The best reflector of thermal radiation is a ..... surface.

(iii) The best emitter of thermal radiation is a ..... surface.

3

2. A gas-burning power station uses 3000 J of fuel energy to produce 900 J of electrical energy. The rest of the fuel energy is wasted as heat.

(a) For every 900 J of electrical energy produced, how much fuel energy is wasted? [1]

energy wasted = ... J

(b) Use the equation

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

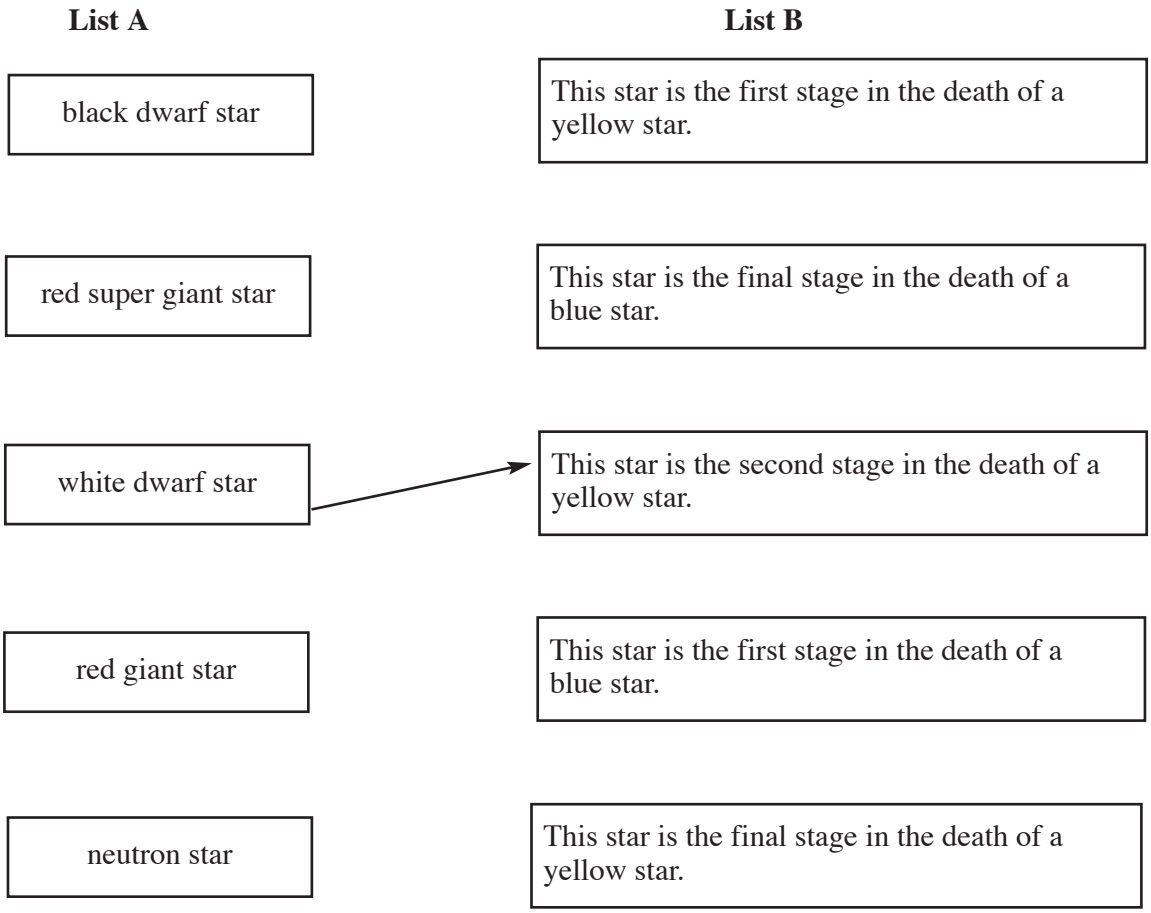
to calculate the efficiency of the power station. [2]

efficiency = ... %

3

3. The universe is made mainly of yellow and blue stars.
The blue stars are more massive than yellow stars.
List A below gives 5 other types of star found in the universe.
List B gives a description of how the 5 types were formed.

Draw a straight line from each star type to a correct description of how the star was formed.
One line has been drawn for you.
Draw 4 lines only. [3]



3

4. The table gives information about three fuels used in central heating systems. Study the table carefully before answering the questions that follow.

Fuel	Unit	Cost per unit	Number of MJ of energy provided by 1 unit	Number of MJ of energy bought for £1
Gas	1 therm	50 p	110	220
Coal	1 kg	20 p	28	140
Oil	1 litre	80 p	38	48

(a) (i) State which fuel provides the **least** amount of energy per unit. ..... [1]

(ii) Explain why 1 unit of gas gives the best value for money. [1]

.....

.....

.....

(b) A household uses 12 kg of coal per day for central heating.

(i) Calculate how much the coal costs per day.

Cost per day = ... p

(ii) Calculate the number of MJ of energy produced for the household from the coal.

Number of MJ of energy = ...
[2]

4

Examiner only

5. The National Grid is a network of pylons, cables and transformers that connects houses and factories to power stations.
Every power station in the country supplies electrical energy to the National Grid.

(a) (i) What is the job of step-up transformers in the National Grid?

.....

.....

(ii) Where are step-up transformers found in the National Grid?

.....

.....

[2]

(b) State **two** advantages of having all power stations connected to the National Grid. [2]

1. .....

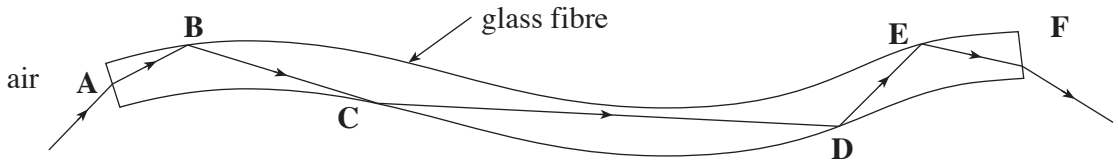
.....

2. .....

.....

4

6. 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 **B** because it .....

.....

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

.....

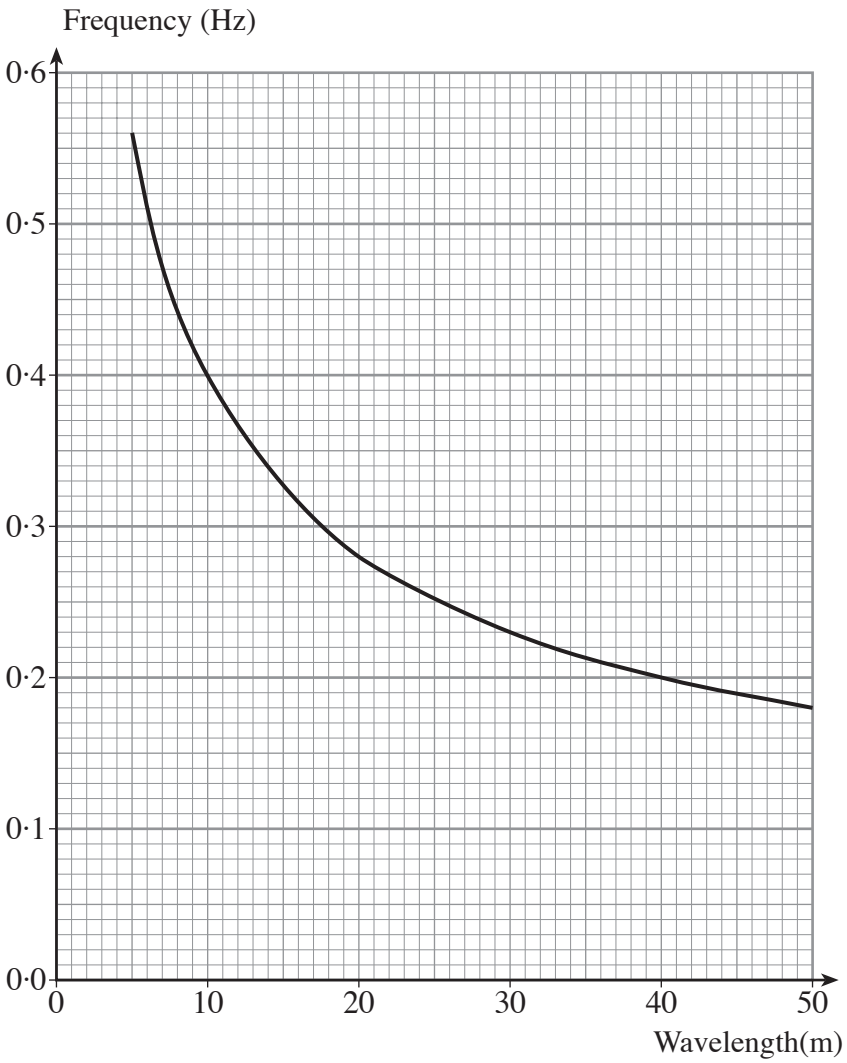
(b) State **one** reason why optical fibres have improved long-distance communication. [1]

.....

.....

4

7. The graph shows how the frequency of deep ocean waves depends upon the wavelength of the waves.



(i) Use the graph to find the frequency of the waves with a 40 m wavelength. [1]

frequency = ... Hz

(ii) Use the equation

wave speed = frequency × wavelength

to calculate the speed of these 40 m waves. [1]

wave speed = ... m/s

(iii) Use the equation

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

to calculate how long it would take the 40 m waves to arrive at an island 5600 m away. [1]

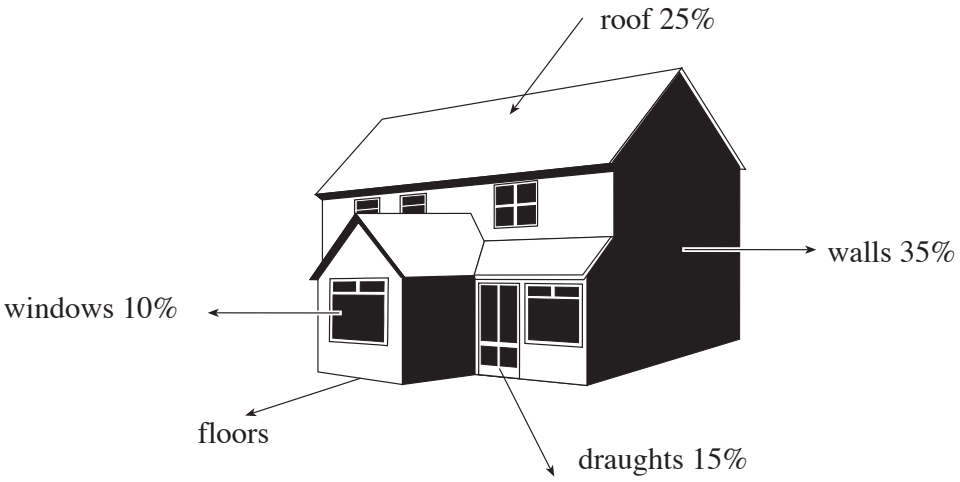
time = ... s

(iv) Complete the following sentence about deep ocean waves with a frequency of 0·4 Hz.

Deep ocean waves with a frequency of 0·4 Hz have a wavelength of ..... m, travel with a speed of 4 m/s and take ..... s to reach the island 5600 m away. [2]

5

8. The diagram shows how energy is lost from a house.



(a) (i) Calculate the % loss through the floors.

Loss through floors = ... %

(ii) State how the energy loss through the floors could be reduced.

.....

.....

(iii) Explain **how** your answer to *(a)*(ii) reduces energy loss through the floors.

.....

.....

[3]

(b) The table gives information about reducing energy loss from a house.

Method	Cost	Savings per year	Payback time in years
Double glazed windows	£2000	£100	20
Roof insulation	£300	£75	4
Wall insulation	£500	£100	5

Give **two** reasons why the householder should install wall or roof insulation before double glazing. [2]

1. .....

.....

2. .....

.....

5

Examiner only

9. The table shows the electricity meter readings for a household between 1 January and 1 October.

Date	1 January	1 April	1 July	1 October
Meter reading (kWh)	6005	6840	7340	7685

(a) Calculate the number of kWh of electricity used between 1 April and 1 July. [1]

Number of kWh used = ... kWh

(b) The electricity bill for the period 1 April to 1 July was £45.

Write down an equation as it appears on page 2 and use it to find the cost of 1 kWh of electricity.

Equation: .....

.....

[1]

Calculation: [2]

Cost per kWh = ... p

(c) Apart from changing to a different electricity supplier, suggest **one** thing that the householder could do to reduce electricity bills. [1]

.....

.....

5

Turn over.

10. The table gives information about planets in the Solar System.

Look carefully at the table before attempting the questions that follow.

Planet	Surface description	Surface temperature (°C)	Atmosphere
Mercury	Rocky, craters	350	No Atmosphere
Venus	Rocky, craters Volcanic mountains	480	Thick carbon dioxide layer, sulphuric acid
Earth	Rocky, mountains, volcanoes	20	Nitrogen, Oxygen
Mars	Rocky, craters, Volcanic mountains	-25	Thin carbon dioxide layer
Jupiter	Gaseous	-120	Hydrogen, helium, ammonia, methane
Saturn	Gaseous	-180	Hydrogen, helium, ammonia, methane
Uranus	Gaseous	-210	Hydrogen, helium, ammonia, methane
Neptune	Gaseous	-220	Hydrogen, helium, methane
Pluto (Dwarf planet)	Rocky, covered in frozen water	-230	Methane

Use the information in the table to answer the questions that follow.

(a) Give a reason why Venus is hotter than Mercury, even though Mercury is nearer the Sun. [1]

.....

.....

(b) Make an estimate of the temperature in the region of the Asteroid belt. .....°C [1]

(c) State **two** reasons why life, as we know it, developed on Earth and not on any other planet of the Solar System. [2]

1. .....

.....

2. .....

.....

Examiner only

(d) What evidence is there **in the table**, to suggest that the dwarf planet, Pluto

(i) is the outermost of these planets?

.....

.....

(ii) could possibly have been captured from outside the Solar System?

.....

.....

[2]

6

11. Read the passage carefully before answering the questions that follow.

Tetra (terrestrial trunk radio) is the private mobile radio system used only by emergency services.

Tetra uses masts to transmit more powerful microwave signals than those used in the mobile phone system. Microwaves belong to the lower energy end of the e.m. spectrum. They produce heating when absorbed by the cells of the body.

Some research into the use of mobile phones has found evidence of cell damage, changes in brain function and some cases of cancer. These studies are not conclusive, as they involved small numbers of users and they have not been repeated.

In spite of this, the government Health Protection Agency has provided strict guidelines to Local Planning Authorities, covering the size and siting of masts.

Opponents of Tetra masts remain unhappy and want installations to stop.

(a) (i) What does the abbreviation *e.m.* stand for? .....

(ii) Name **one** member of the e.m. spectrum that is found at the higher energy end of the spectrum.

..... [2]

(b) Give **two** reasons why the results of the studies into mobile phone masts are not accepted.[2]

1. .....

.....

2. .....

.....

(c) State **two** differences between the Tetra system and the system used by the majority of mobile phone users. [2]

1. .....

.....

2. .....

.....

Examiner only

(d) What is the job of the Local Planning Authority regarding the installation of the Tetra masts? [1]

.....

.....

(e) Use the information contained in the passage to give **one** reason why opponents of Tetra masts want installations to stop. [1]

.....

.....

8