**WJEC CBAC**

**GCSE**

**237/01**

**SCIENCE**
**FOUNDATION TIER**
**PHYSICS 1**

P.M. FRIDAY, 17 June 2011

45 minutes

**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

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

wave speed = wavelength × frequency

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

*Answer **all** questions.*

**1.** *(a)* Choose a word from the box that best completes each sentence below. [4]

| coal | nuclear | hydroelectric | wind | sunlight |
| --- | --- | --- | --- | --- |

  (i)  A power station that releases carbon dioxide gas uses ..................................... as its fuel.

  (ii)  A solar panel on the roof of a house gets its energy from .....................................

  (iii)  A ..................................... power station needs water as its source of energy.

  (iv)  A ..................................... power station produces radioactive waste.

*(b)* State one **non-renewable** source of energy for power stations that is not given in the box above. [1]

.......................................................................................................................................

**5**

**2.** *(a)* In each of the sentences that follow, underline the correct word or words from each bracket. [3]

  (i)  Power stations produce electrical power in millions of (watts,  volts,  amps).

  (ii)  A step up transformer is used to increase the (power,  voltage,  current).

  (iii)  The electric current passes to our homes through (wires,  pylons, wires and pylons).

*(b)* What name is given to the arrangement of wires, pylons and transformers that gets the electricity from the power stations to factories, schools and homes? [1]

.......................................................................................................................................

**4**

**Turn over.**

**3.** The table below gives data about 5 of the planets in our solar system that are nearest to the Sun. They are not in any order. The planet Earth has been identified for you.

| Planet | Name | Distance from Sun (millions of km) | Diameter (thousands of km) | Number of moons |
|--------|------|-----------------------------------|---------------------------|-----------------|
| A | | 228 | 6.8 | 2 |
| B | | 780 | 143 | 63 |
| C | | 108 | 12 | 0 |
| D | | 58 | 4.9 | 0 |
| E | Earth | 150 | 12.8 | 1 |

*(a)* Name planet D. ................................................................. [1]

*(b)* Answer the following questions with the letters A, B, C, D or E only:

   (i) Which planet is nearest in size to Earth? ............................ [1]

   (ii) Which planet would you expect to be the coldest? ............................ [1]

   (iii) Which planet is made up of gas? ............................ [1]

**4.** The table below gives information about three household appliances that are used for different lengths of time.

| Appliance | Energy transfer (J) | Time (s) | Power (W) |
|-----------|--------------------|---------|-----------|
| Lamp | 660 | 60 | 11 |
| Phone charger | ................................ | 1800 | 5 |
| Radio | 6 000 | 300 | 20 |

*(a)* Use the equation

$$\text{energy transfer} = \text{power} \times \text{time}$$

to fill the gap in the table. [1]

*(b)* Which appliance uses energy at the highest rate? ................................................................. [1]

*(c)* Give a reason why the phone charger is the cheapest to run. [1]

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**5.** The diagrams show four different waves, **A**, **B**, **C** and **D** drawn on a 1 cm grid.
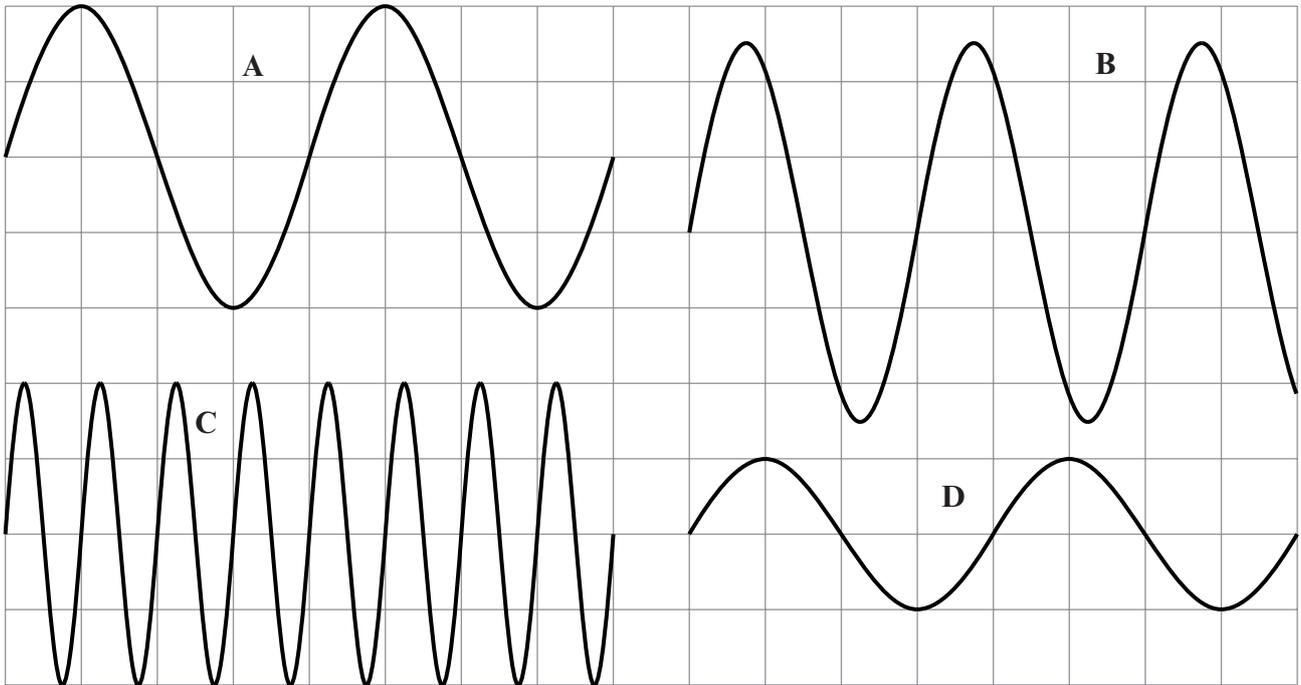


*(a)* (i) Which two waves have the same amplitude? ............................. and .............................

(ii) Which two waves have the same wavelength? ............................. and ............................. [2]

*(b)* (i) Write down the wavelength of wave **B**. ............................. cm [1]

(ii) This wave travels 48 cm in 4 seconds along the water.
Use the equation

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

to calculate the speed of wave **B**. [2]

Speed = ............................. cm/s

(iii) If all of the waves travel at the same speed, which **one** has the highest frequency? [1]

.............................

6

**Turn over.**

**6.** In a school laboratory, a group of pupils set up the following experiment.
They took four equal sized pieces of black plastic tube, filled them with water and closed the ends.
The four were placed under identical lamps for 10 minutes.



| A | B | C | D |
|---|---|---|---|
| shiny metal plate | black metal plate | shiny metal plate in polystyrene box | black metal plate in polystyrene box |
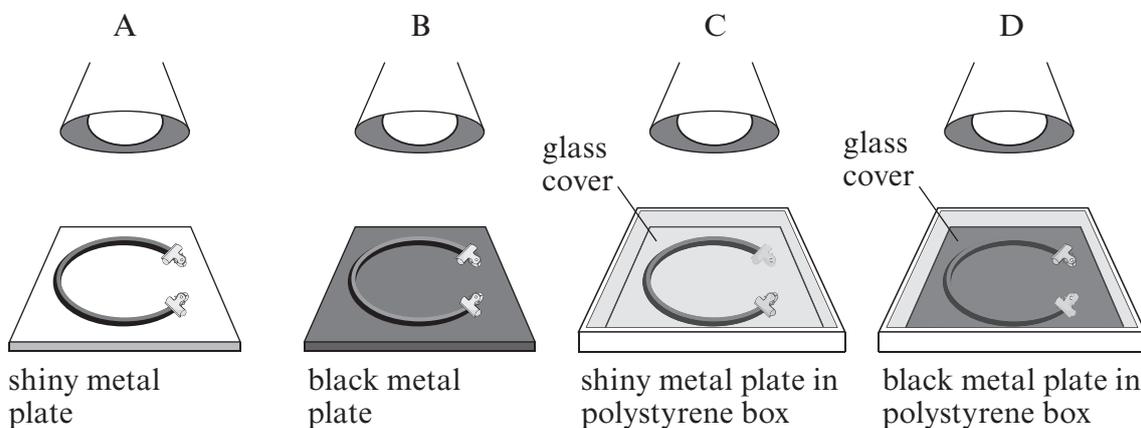
A graph of their results is shown below.
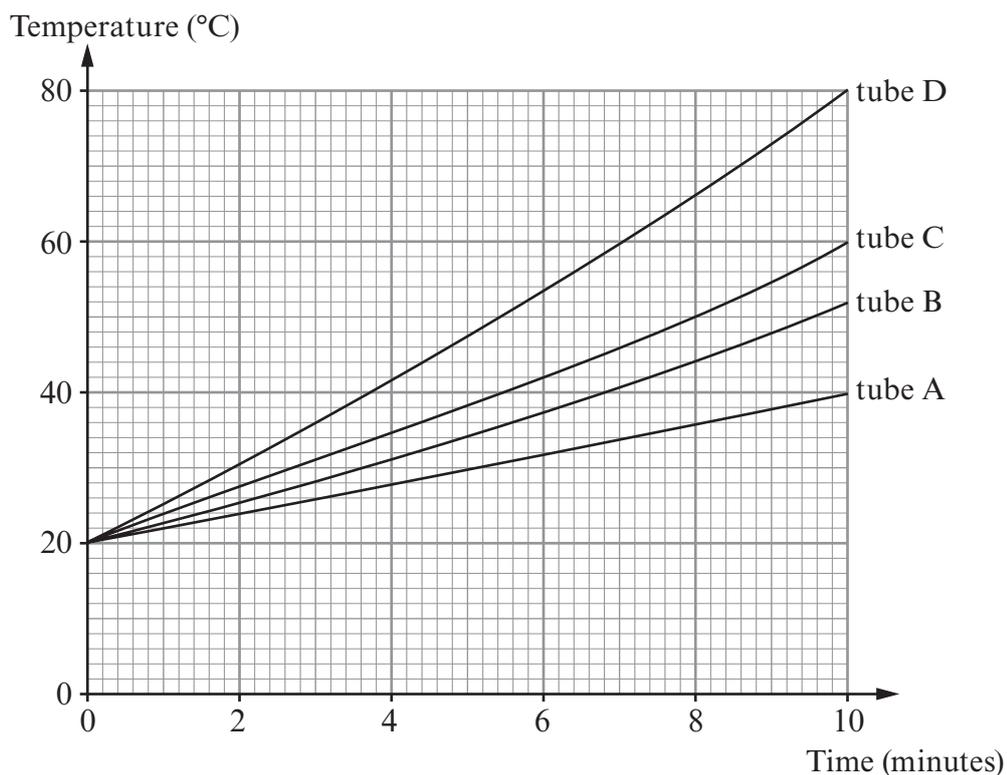


*(a)* (i) What was the starting temperature of the water? ............................ °C [1]

(ii) How long did the water temperature in tube C take to rise to 30°C?

............................ min [1]

(iii) How much hotter was tube C than tube A at the end of the experiment?

............................ °C [1]

*(b)* (i) Give a reason why all 4 tubes were made of black plastic rather than clear plastic.
[1]

.............................................................................................................................................

(ii) Give a reason why tube D had a greater rise in temperature than tube B. [1]

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*(c)* The temperature of the water in tube D increased by 60°C in 10 minutes.
State how the graph shows that the temperature did not rise steadily by 6°C per minute.
[1]

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.............................................................................................................................................

6

**Turn over.**

**7.** When stars reach the end of their 'lives', the stages that they go through depend on their size. Choose phrases from the box to complete the diagram below. [4]

| | | | | | |
|---|---|---|---|---|---|
| red super giant | white dwarf | black hole | red giant | black dwarf | neutron star |

Stars the size
of our Sun

STAR

Stars much larger
than our Sun

Star expands and cools to produce a

.................................................

Star expands and cools to produce a

.................................................

Contracts and gets hotter to produce a

.................................................

Goes through supernova, leaving behind a

.................................................
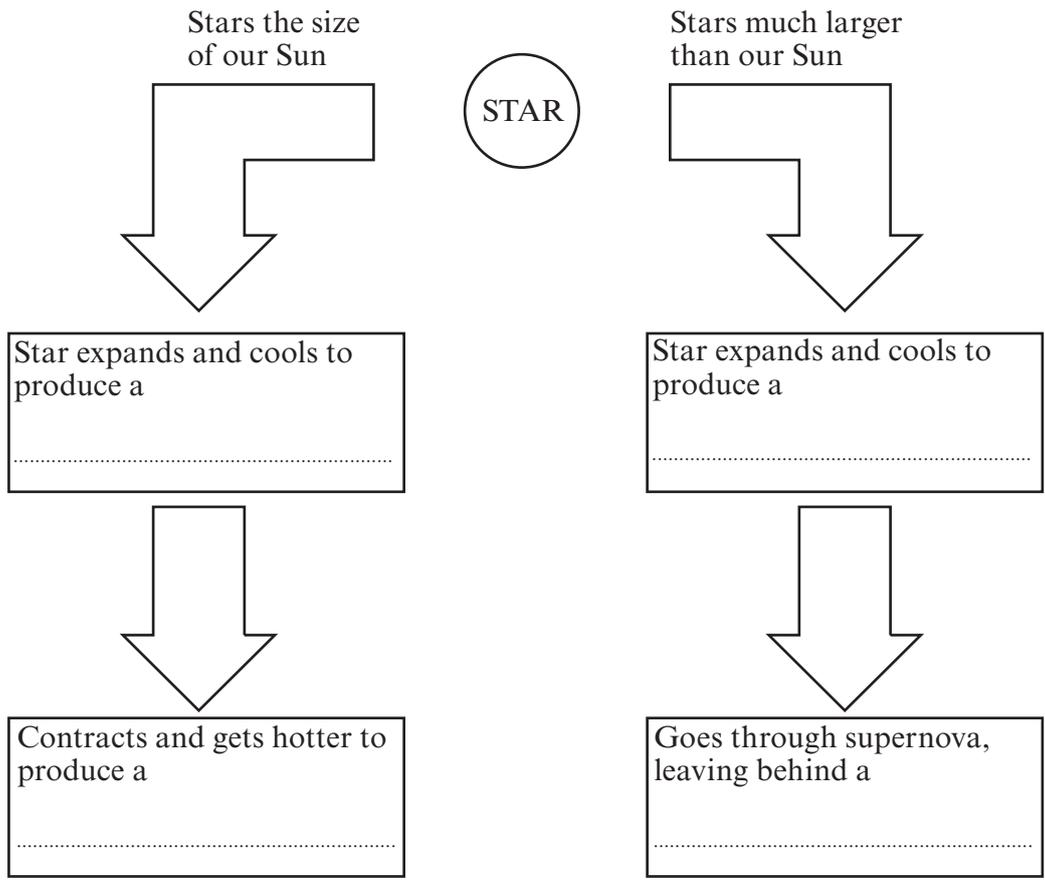
4

**8.**

> Mobile phone firms have been accused of not giving clear warnings about the health risks of using their handsets.
>
> Manuals that are provided with new mobile phones give warnings about keeping the phones away from the body when used but the warnings are in small print deep inside the manuals.
>
> The radio waves from mobiles are transmitted from their aerials that are positioned near the back of the phones. This puts them further away from the head but some phones are so thin that there is little protection for the user. For all phones, there are better ways of keeping them away from the body during use.

*(Extract adapted from an article in a national newspaper)*

*(a)* How can the possible dangers from mobile phones be made more obvious to people who buy them? [1]

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*(b)* The extract states that mobile phones give out radio waves. Using your knowledge of the electromagnetic spectrum, correct this statement. [1]

...................................................................................................................................................

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*(c)* State **one** way in which mobile phones can be kept well away from the body when they are being used. [1]

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3

**Turn over.**

**9.** *(a)* A wind turbine that is designed to produce 2 000 kW only produces on average 600 kW. Give a reason why. [1]

..................................................................................................................................................

..................................................................................................................................................

*(b)* On a particular day the wind power input to a wind turbine is 1 500 kW. The turbine produces 900 kW of electrical power.

Select an equation from page 2 and use it to calculate the efficiency of the wind turbine.

Equation: ..........................................................................................................................

.......................................................................................................................... [1]

Calculation: [2]

Efficiency = ...........................................

*(c)* Fossil-fuelled power stations release 430 grams of carbon dioxide ($CO_2$) for each unit (kWh) of electricity produced, but wind turbines release none whilst they are working.

(i) Give a reason why it is important to try to reduce the amount of $CO_2$ produced when generating electrical power. [1]

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..................................................................................................................................................

(ii) Calculate the number of grams of $CO_2$ saved by generating 900 kW for one hour from wind rather than coal. [2]

Mass of $CO_2$ saved = ........................................... g

7

**10.** The table shows the heat energy lost per second through parts of a house.

| Part of house | Insulated or not | Heat energy (J) lost per second |
|---|---|---|
| ATTIC | Non insulated | 3 000 |
| | Fibre glass laid on floor of attic | 400 |
| CAVITY WALL | Non insulated | 2 000 |
| | Insulated with foam | 700 |
| WINDOWS | Single glazed | 2 000 |
| | Double glazed | 1 200 |

*(a)* (i) Find the total energy lost per second from the house if the attic and cavity wall are **not** insulated and it has single glazed windows. [1]

Energy lost = ............................................... J/s

(ii) How much energy is saved per second by fitting double glazing? [1]

Energy saved = ............................................... J/s

*(b)* Explain why insulating the attic benefits the environment more than the other **two** insulating measures. [2]

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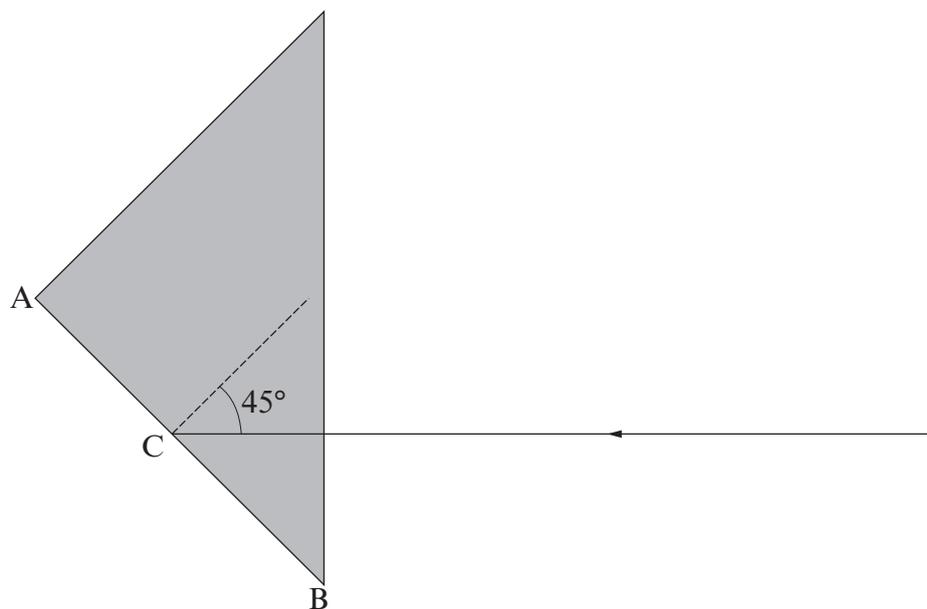
4

**Turn over.**

**11.** A reflector on the back of a bicycle is made up of many glass prisms, one of which is shown in the diagram.
A ray of light strikes the back surface of the prism at point C at an angle of 45°.

The critical angle for glass is 42°.



*(a)* (i) Explain why the light does **not** leave the prism at point C. [1]

.........................................................................................................................................................

(ii) What is the name given to this effect? [1]

.........................................................................................................................................................

.........................................................................................................................................................

*(b)* **Draw on the diagram** the path taken by the ray of light through the glass and into the air. [2]

4