THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

F

Thursday 24 January 2013 – Morning

GCSE TWENTY FIRST CENTURY SCIENCE PHYSICS A

A181/01 Modules P1 P2 P3 (Foundation Tier)

A131490113

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm//mm)

Duration: 1 hour

A181101

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- A list of physics equations is printed on page **2**.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **12** pages. Any blank pages are indicated.

TWENTY FIRST CENTURY SCIENCE EQUATIONS

Useful relationships

The Earth in the Universe

distance = wave speed × time

wave speed = frequency × wavelength

Sustainable energy

energy transferred = power × time

power = voltage × current

$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

Explaining motion

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

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

momentum = mass × velocity

change of momentum = resultant force × time for which it acts

work done by a force = force × distance moved in the direction of the force

amount of energy transferred = work done

change in gravitational potential energy = weight × vertical height difference

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times [\text{velocity}]^2$$

Electric circuits

power = voltage × current

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$$

Radioactive materials

energy = mass × [speed of light in a vacuum]^2

Answer **all** the questions.

1 **(a)** Complete the sentences about galaxies.

Galaxies are made up of thousands of millions of ..... .

Thousands of millions of galaxies make up the ..... .

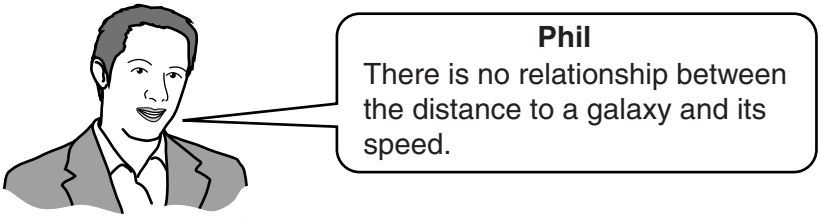
The Sun is in the ..... galaxy. **[3]**

(b) Scientists have measured the distance to many galaxies and the speeds of the galaxies as they move away from the Earth.

The table shows the location, distance and speed of some galaxies.

Galaxy location	Distance in millions of light years	Speed in km/s
Corona Borealis	1440	21 600
Bootes	2740	39 300
Hydra	3960	61 200
Ursa Major	1000	15 000

Phil draws a conclusion from the data.



Is Phil correct? Justify your answer using data from the table.

.....

.....

.....

.....

.....

..... **[3]**

(c) How long did it take the light from the galaxy in Ursa Major to reach the Earth?

answer = ... years **[2]**

[Total: 8]

2 In 1912 Alfred Wegener proposed a theory of continental drift to explain some observations about continents, fossils and mountains.

At the time his idea of continental drift was rejected by geologists for various reasons.

By considering the evidence **at the time**, explain if the geologists were right to reject the idea of continental drift.

The quality of written communication will be assessed in your answer.

.....

.....

.....

.....

.....

.....

.....

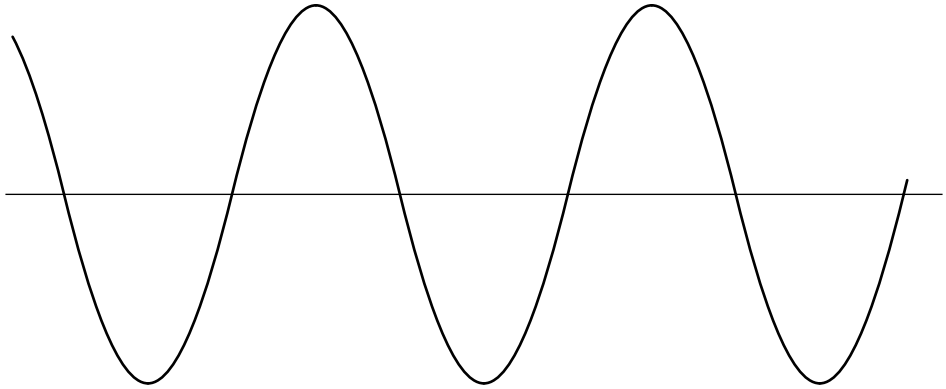
.....

.....

..... **[6]**

[Total: 6]

3 **(a)** The diagram shows the side view of a wave.



(i) On the diagram clearly label the **wavelength** and the **amplitude**. **[2]**

(ii) An earthquake wave passes through the Earth's **core**.

What type of wave is it?

Put a tick (✓) in the box next to the correct answer.

electromagnetic	☐
P-wave	☐
S-wave	☐

[1]

(b) An earthquake wave travels at a speed of 5 km/s for 110 seconds.

A scientist estimates that the earthquake was 500 km away from the detector.

Is the scientist correct?

Justify your answer.

.....

.....

..... **[2]**

[Total: 5]

4 The properties of radio waves, microwaves and infrared radiation allow them to be used to transmit information.

Television, the internet and mobile phones use these types of radiation.

Explain why these types of radiation are used to transmit information.

The quality of written communication will be assessed in your answer.

.....

.....

.....

.....

.....

.....

.....

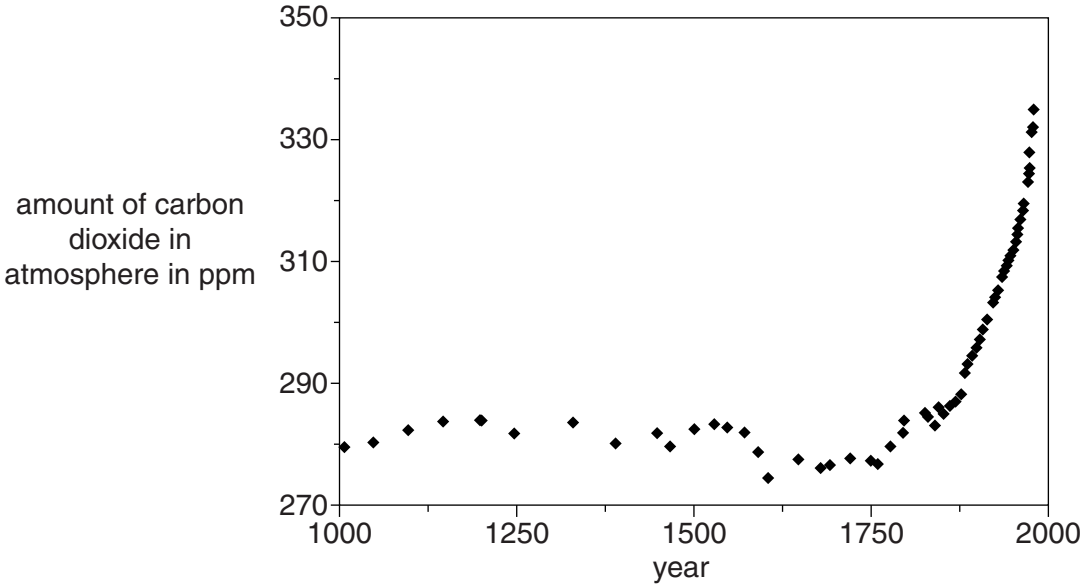
.....

.....

..... **[6]**

[Total: 6]

5 This graph shows the amount of carbon dioxide in the atmosphere over a 1000 year period.



(a) Many scientists think this is evidence that human activity has had an effect on the amount of carbon dioxide in the atmosphere.

Explain how the graph supports this idea.

.....

.....

.....

.....

.....

..... **[4]**

(b) One of the effects of increasing carbon dioxide in the atmosphere is global warming and climate change.

Suggest some groups of people who are most at risk from global warming. For each group describe the risk.

group .....

risk .....

.....

group .....

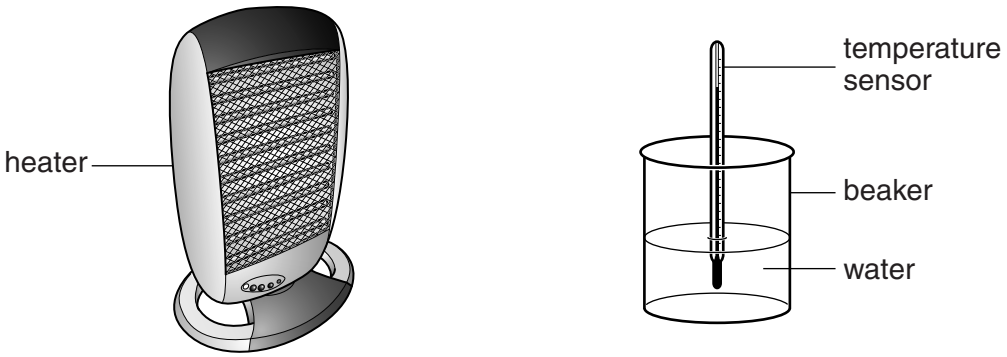
risk .....

.....

[4]

[Total: 8]

6 Rachel does an experiment to investigate the heating effect of electromagnetic radiation.



She measures the temperature change of the water in the beaker.

(a) Complete the sentences to explain what is happening to the electromagnetic radiation.

Use words from the list.

absorbed **emitted** **ionised** **transmitted**

The electromagnetic radiation is ..... by the heater.

It is then ..... through the atmosphere and finally .....

by the water. **[3]**

(b) For each of the following changes predict whether the intensity of the radiation reaching the water will increase, decrease or stay the same.

Put one tick (✓) in each row.

	Intensity		
	Decrease	**Stay the same**	**Increase**
use lower energy photons			
use higher frequency radiation			
use a smaller distance between heater and water			
use more water			

[3]

[Total: 6]

7 The demand for energy keeps increasing: in the home, in the workplace and nationally.

Many people think that we should be reducing energy demands.

How can energy demand be reduced in the UK?

The quality of written communication will be assessed in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

[Total: 6]

8 Here are some data about kettles.

Kettle	Maximum volume in litres	Power rating in kilowatts
A	2	2.5
B	1	2
C	2	3
D	1.5	1.5

(a) Use data from the table to suggest which kettle will boil 1 litre of water the fastest.

answer = ... **[1]**

(b) How many seconds will it take kettle **B** to transfer 6 kilojoules of energy?

answer = ... seconds **[1]**

(c) When kettle **C** is full, it takes about 0.1 hours to boil.

The cost of 1 kilowatt hour of electricity is 25p.

How much does it cost to boil the water?

cost = ... p **[3]**

(d) The mains voltage is 230 V.

One of the kettles has a current of 6.5 A when it is heating water.

Which kettle is it?

Justify your answer.

kettle .....

because .....

.....

..... **[2]**

[Total: 7]

9 Complete the following sentences about different types of energy sources which are used to produce electricity.

gas **hydroelectric** **nuclear** **oil** **wave**

Use words from the list.

Fossil fuel power stations use ..... and ..... as energy sources.

Power stations that do **not** use a boiler use ..... and ..... energy sources.

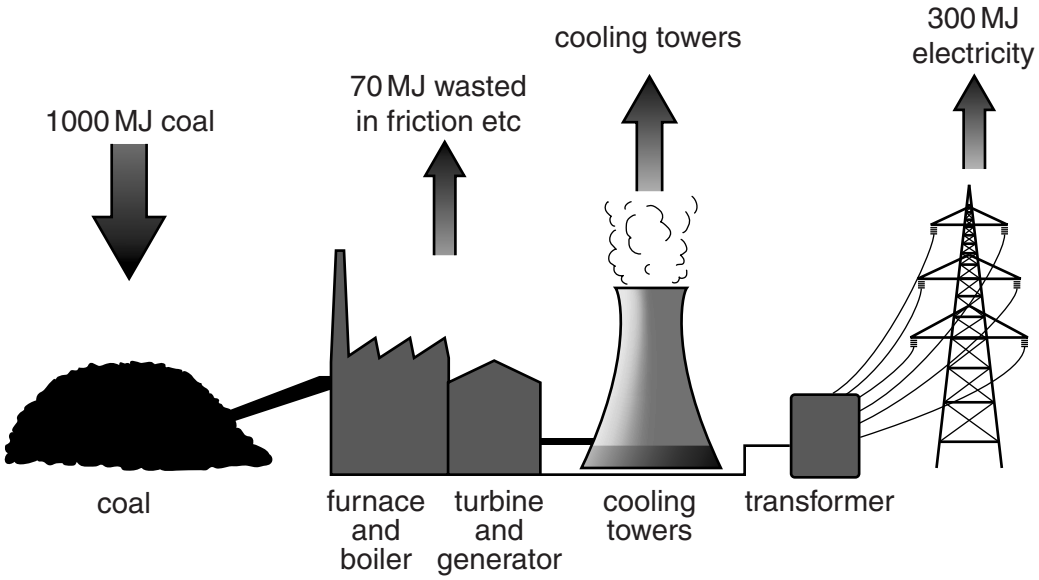
Two renewable energy sources are ..... and ..... .

The government makes regulations to control the risks of radioactive waste from ..... power stations. **[4]**

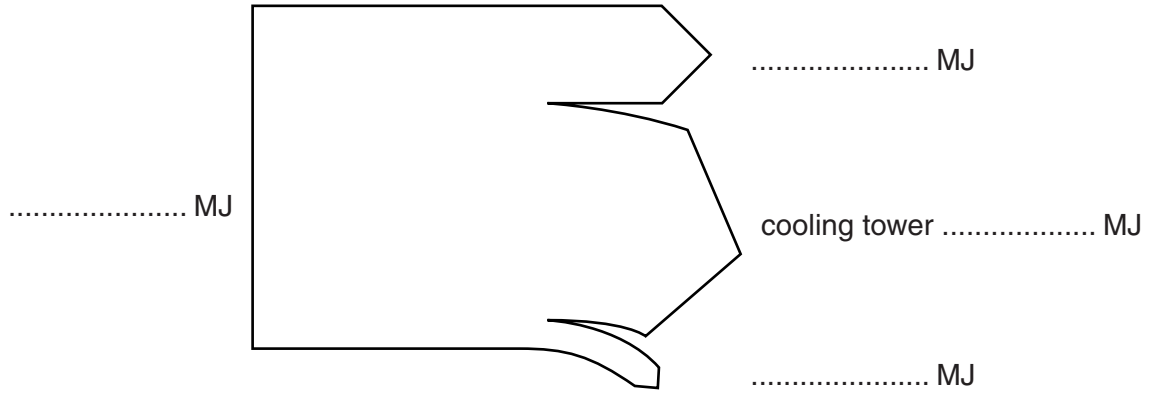
[Total: 4]

Question 10 begins on page 12

10 The diagram shows the energy flow through a coal-burning power station each second.



(a) Complete the Sankey diagram to show this energy flow.



[3]

(b) What is the efficiency of the coal-burning power station?

efficiency = ... % **[1]**

[Total: 4]

END OF QUESTION PAPER