

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Physics/Science

Unit P1: Universal Physics

Higher Tier

Thursday 7 March 2013 – Morning

Time: 1 hour

Paper Reference

5PH1H/01

You must have:

Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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PEARSON

FORMULAE

You may find the following formulae useful.

wave speed = frequency $\times$ wavelength

$$v = f \times \lambda$$

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

$$v = \frac{x}{t}$$

electrical power = current $\times$ potential difference

$$P = I \times V$$

cost of electricity = power $\times$ time $\times$ cost of 1 kilowatt-hour

$$\text{power} = \frac{\text{energy used}}{\text{time taken}}$$

$$P = \frac{E}{t}$$

$$\text{efficiency} = \frac{(\text{useful energy transferred by the device})}{(\text{total energy supplied to the device})} \times 100\%$$

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

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$



Answer ALL questions.

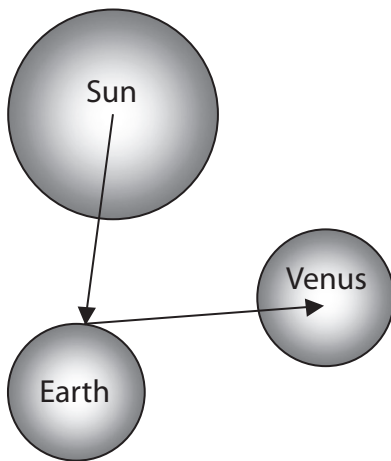
Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Waves and the Solar System

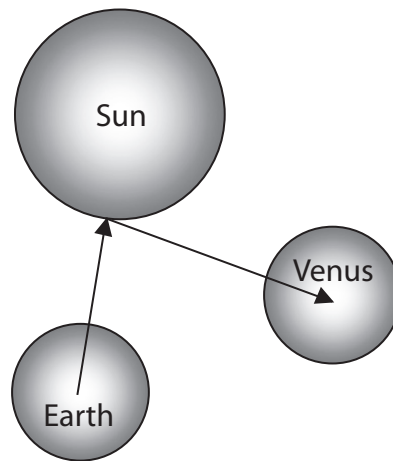
- 1 (a) Galileo was one of the first scientists to use a telescope to study Venus.
- (i) Which of these diagrams best shows how light waves enable us to see Venus?
- Put a cross (☒) in the box next to your answer.

(1)

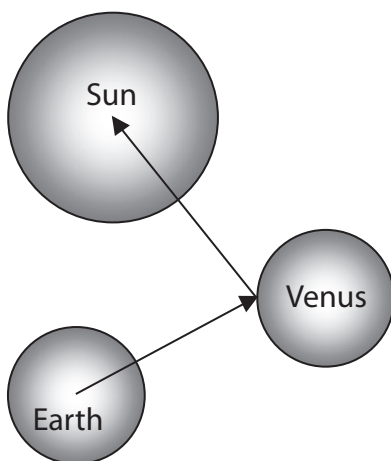
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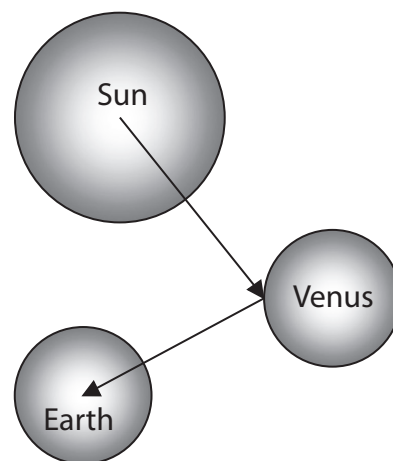
☐ A



☐ B



☐ C



☐ D



P 4 1 9 5 9 A 0 3 1 6

(ii) Use words from the box to complete the sentences.

(2)

asteroids	comets	geocentric	heliocentric
moons	particle	stars	

Galileo also used his telescope to observe the of Jupiter.

His observations provided evidence to support the model of the Solar System.

(iii) Describe how a reflecting telescope is different from the simple telescope which Galileo used.

(2)

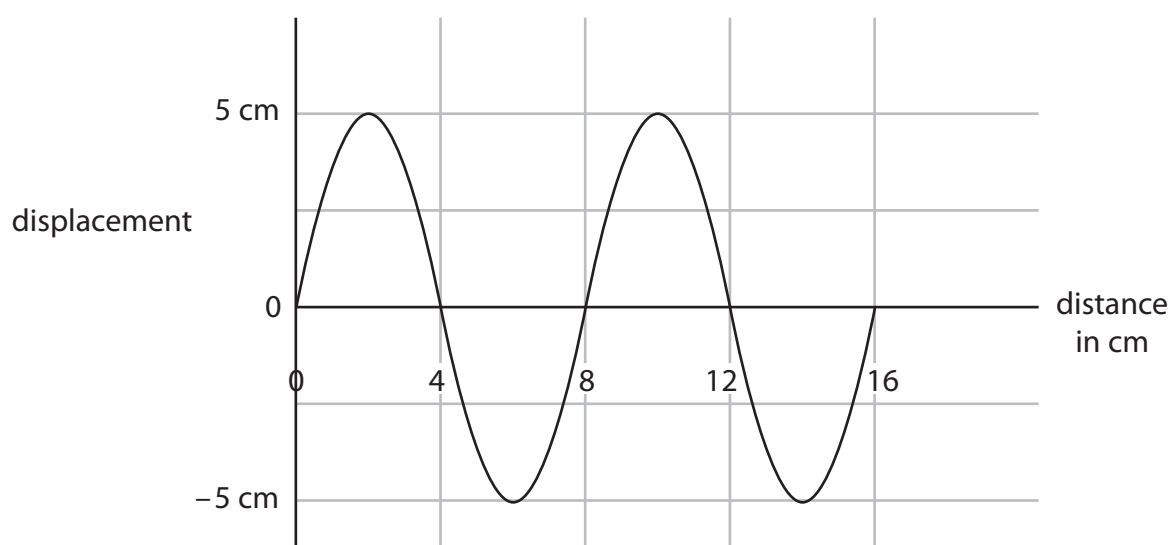
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(b) (i) The diagram represents a wave.



State the amplitude and wavelength of the wave.

(2)

amplitude of the wave = ... cm

wavelength of the wave = ... cm



(ii) 20 waves are sent out in 4 seconds.

Complete this sentence by putting a cross (☒) in the box next to your answer.

The frequency of the wave is

(1)

- ☐ **A** 0.2 Hz
- ☐ **B** 5 Hz
- ☐ **C** 20 Hz
- ☐ **D** 80 Hz

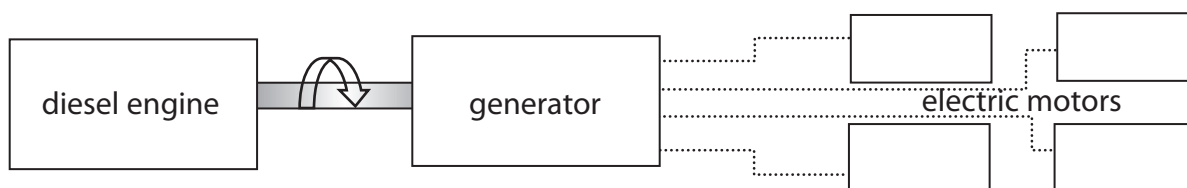
(Total for Question 1 = 8 marks)



P 4 1 9 5 9 A 0 5 1 6

Energy changes

- 2 (a) A train is powered by a diesel engine.
The diesel engine is used to turn a generator.
The generator provides electricity for electric motors which drive the wheels.



- (i) Draw one straight line from each train part to its useful energy transfer.

(3)

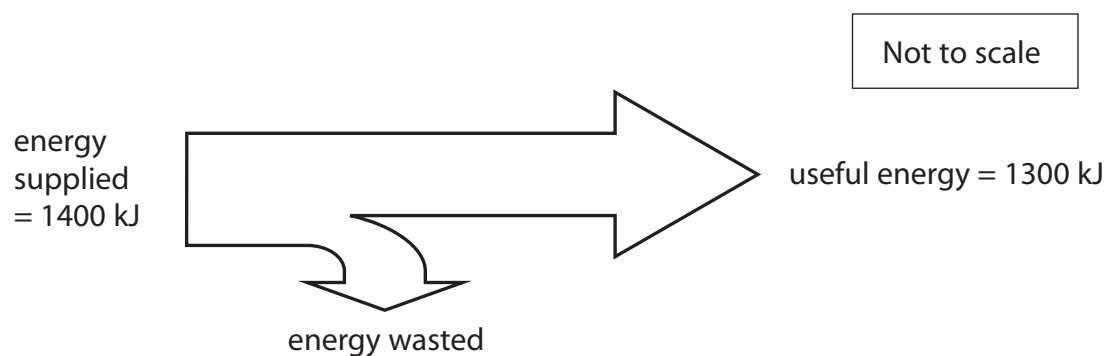
train part	useful energy transfer
diesel engine	chemical to electrical
generator	chemical to kinetic
motor	electrical to kinetic
	kinetic to chemical
	kinetic to electrical

- (ii) State **one** example of a non-useful energy transfer in the motor.

(1)



(b) The diagram represents the energy transfer in one second in the generator.



(i) Calculate the amount of energy wasted in one second in the generator.

(1)

energy wasted = ... kJ

(ii) Calculate the efficiency of the generator.

(2)

efficiency of generator = ...

(c) The electric motors which drive the wheels are painted black.

Suggest why the motors are painted black.

(1)

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(Total for Question 2 = 8 marks)



The Universe

- 3 (a) Which row of the table shows these objects in the correct order of size?

Put a cross (X) in the box next to your answer.

(1)

	smallest	→	biggest
☐ A	Milky Way	Solar System	Universe
☐ B	Milky Way	Universe	Solar System
☐ C	Solar System	Universe	Milky Way
☐ D	Solar System	Milky Way	Universe

- (b) Some visible light telescopes are located in space.

Other visible light telescopes are located on the Earth's surface.

Explain why the images produced by telescopes on Earth are less clear than the images produced by telescopes in space.

(2)

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- (c) This simplified diagram compares spectra of light from the Sun and two galaxies.



The light from galaxy 1 and galaxy 2 both show redshift.

Explain what these redshifts predict about the position and movement of the two galaxies.

(3)

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(d) Scientists have studied stars to discover how stars evolve.

They know that stars form in a nebula when clouds of dust and gas are pulled together by gravity.

Describe how this process continues for stars much more massive than the Sun.

(4)

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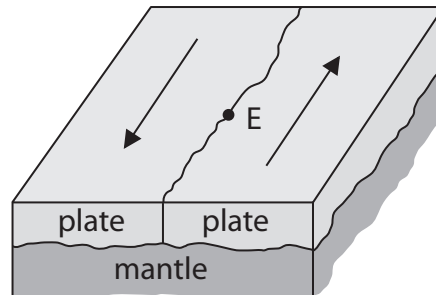
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(Total for Question 3 = 10 marks)



Earthquakes

- 4 (a) The diagram shows part of the boundary between two tectonic plates.



- (i) Complete this sentence by putting a cross (☒) in the box next to your answer.

The plates are being steadily pushed in opposite directions by

(1)

- ☐ **A** convection currents in the mantle
- ☐ **B** reflection of waves from the Earth's core
- ☐ **C** tsunami waves in the ocean
- ☐ **D** volcanic eruptions on the surface

- (ii) An earthquake occurs.

Its epicentre is at the place marked E on the diagram.

Describe what happens at the plate boundary to cause this earthquake.

(2)

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- (b) The earthquake causes seismic waves.

- (i) S waves are one type of seismic wave. They travel at 0.65 km/s.

There is a seismometer 80 km away from point E.

Show that it takes about 2 minutes for the S waves from the earthquake to reach the seismometer.

(2)



- (ii) P waves are another type of seismic wave.
They travel about 10 times more quickly than S waves.

Describe how scientists can use seismometer records of P and S waves to locate the epicentre.

(3)

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- (iii) Seismic waves have a frequency of about 15 Hz.
P waves have a much smaller amplitude than S waves.

Some people claim that animals can detect an earthquake before people are aware of it.
Suggest an explanation for this.

(2)

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(Total for Question 4 = 10 marks)



The electromagnetic spectrum

- 5 (a) Skin cancer can be caused by radiation from the Sun.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The radiation that causes skin cancer is

(1)

- ☐ **A** ultraviolet radiation
- ☐ **B** radio waves
- ☐ **C** microwaves
- ☐ **D** infrared radiation

- (b) The word box contains the names of three types of radiation.

gamma rays

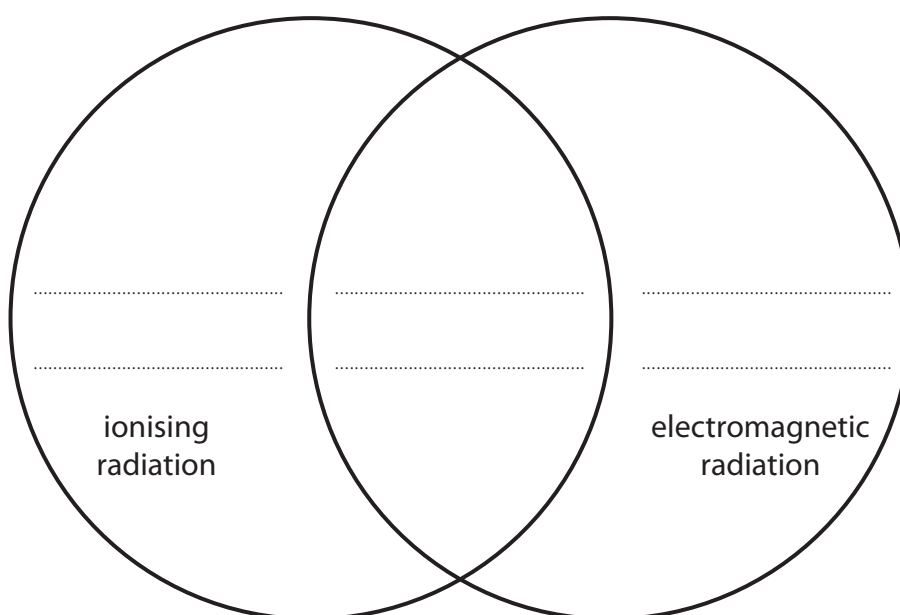
infrared radiation

alpha particles

Use this diagram to classify the three types of radiation given in the word box.

Write the name of the radiation in the correct section of the diagram.

(2)



- (c) Which of these is correct for all electromagnetic waves in a vacuum?

Put a cross (☒) in the box next to your answer.

(1)

- ☐ **A** they have the same frequency
- ☐ **B** they have the same wavelength
- ☐ **C** they are transverse waves
- ☐ **D** they are longitudinal waves



(2)

(6)

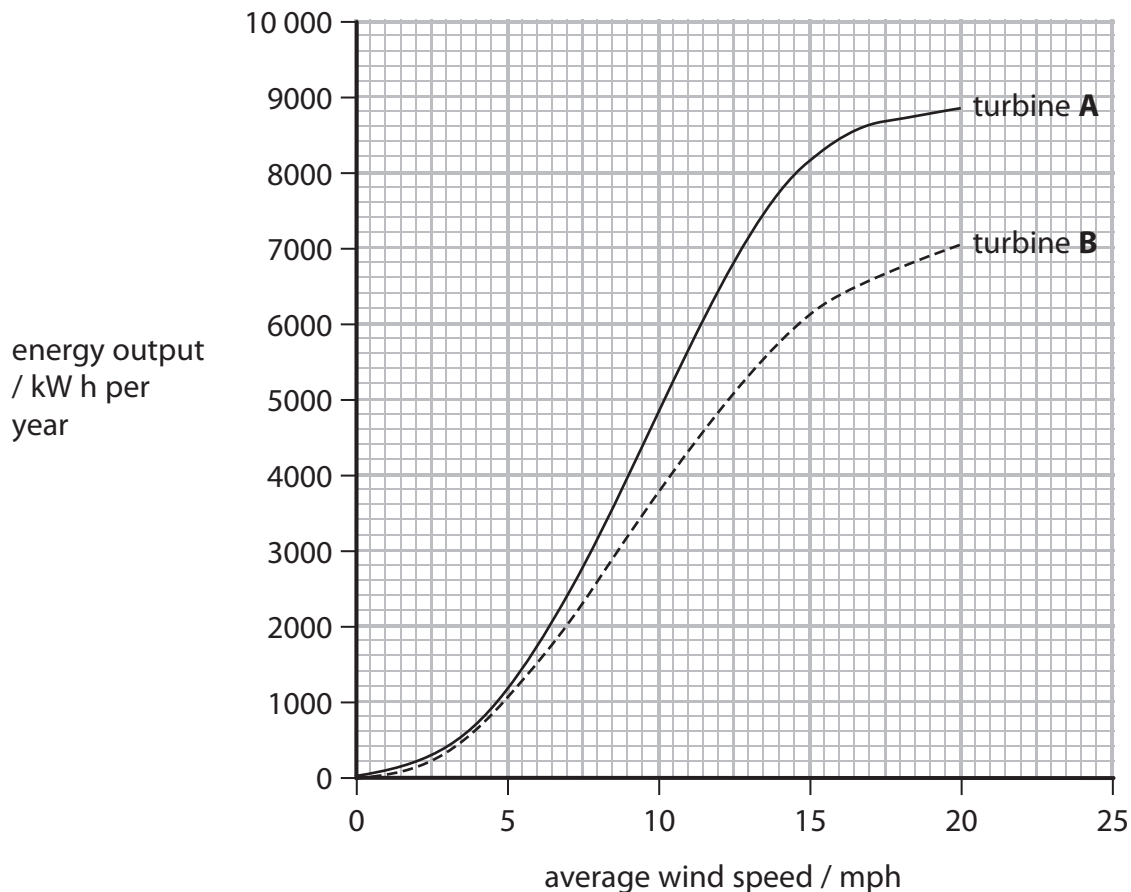
P 4 1 9 5 9 A 0 1 3 1 6

Generating electrical energy

- 6 (a) Eric owns a small farm where chicks are hatched from eggs.

He is considering generating his own electricity to heat and light a barn rather than using electricity from the National Grid.

This graph shows how the energy output varies with wind speed for two different wind turbines, **A** and **B**.



The average wind speed at Eric's farm is 13 mph.

The total heating and lighting in the barn requires 6000 kWh of electrical energy each year.

- (i) Use the data in the graph to recommend the best turbine for Eric's barn.

(1)

The best turbine is because.....

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- (ii) Eric pays 14p per kW h for electrical energy supplied by the National Grid.
Calculate how much he could expect to save each year by using the energy
from this wind turbine to heat and light the barn.

(2)

annual saving = £.....

- (iii) Eric looks at the cost of installing the turbine.

State how he should work out the payback time.

(1)

- (iv) The chicks need to be kept warm at all times.

Eric uses halogen lamps to provide heat and light for most of the day.

Eric thinks about changing his halogen lamps for energy saving lamps.

Suggest why this might not actually be a benefit.

(2)



*(b) There are several large-scale energy resources which are suitable alternatives to fossil fuels in some situations.

Two of these alternatives are hydro-electric power and solar power.

Compare hydro-electric power with solar power as energy resources for the large-scale generation of electricity.

(6)

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(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

