

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	



General Certificate of Secondary Education  
Foundation Tier  
January 2013

**Science B**  
Unit Physics P1

**PHY1F**  
**F**

**Physics**  
Unit Physics P1

**Wednesday 30 January 2013 9.00 am to 9.45 am**

**For this paper you must have:**

- a ruler.

You may use a calculator.

**Time allowed**

- 45 minutes

**Instructions**

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

**Advice**

- In all calculations, show clearly how you work out your answer.



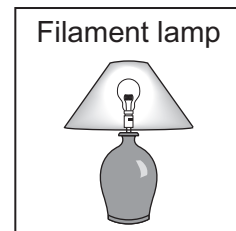
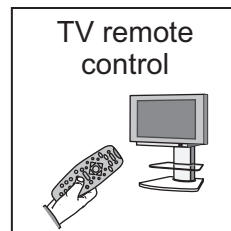
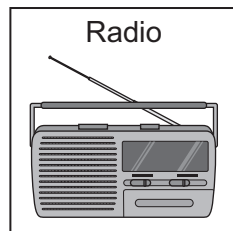
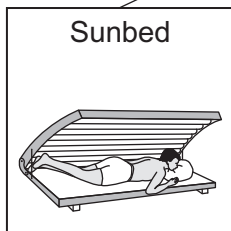
J A N 1 3 P H Y 1 F 0 1

Answer **all** questions in the spaces provided.

- 1 (a)** The diagram shows the electromagnetic spectrum.  
The pictures show four devices that use electromagnetic waves. Each device uses a different type of electromagnetic wave.

Draw a line from each device to the type of electromagnetic wave that it uses.  
One has been done for you.

Gamma rays	X-rays	Ultraviolet rays	Visible light	Infra red rays	Microwaves	Radio waves
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(3 marks)

- 1 (b)** A headline from a recent newspaper article is shown below.



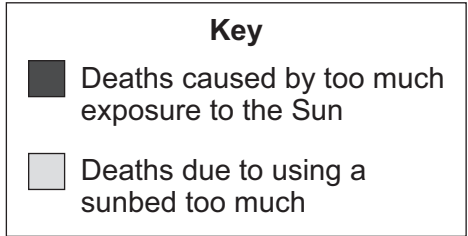
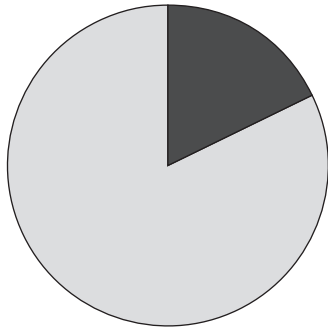
- 1 (b) (i)** What serious health problem may be caused by using a sunbed too much?

.....

(1 mark)



1 (b) (ii) The pie chart compares the number of deaths in Britain each year which may have been caused by using sunbeds too much, with those which may have been caused by too much exposure to the Sun.



It is difficult for a doctor to be certain that a person has died because of using a sunbed too much.

Suggest why.

.....

.....

(1 mark)

1 (b) (iii) A spokesperson for a leading cancer charity said:

<p>'We want people, especially young people, to know the possible dangers of using a sunbed.'</p>
---

Why is it important that you know the possible dangers of using a sunbed?

.....

.....

(1 mark)

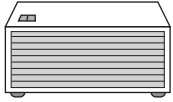
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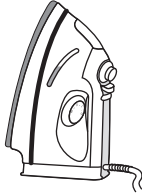


2 The pictures show six different household appliances.

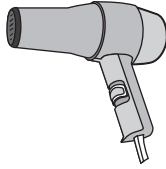
Fan heater



Iron



Hairdryer



Vacuum cleaner

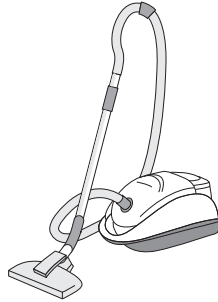
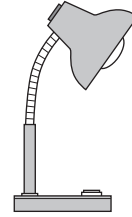
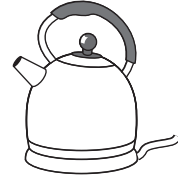


Table lamp



Kettle



2 (a) Four of the appliances, including the fan heater, are designed to transform electrical energy into heat.

Name the other **three** appliances designed to transform electrical energy into heat.

1 .....

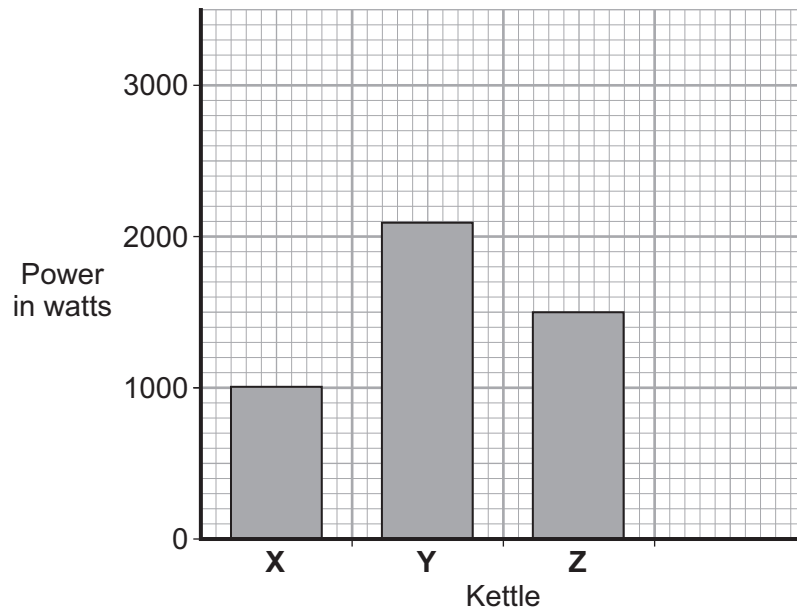
2 .....

3 .....

(3 marks)



**2 (b)** The bar chart shows the power of three electric kettles, **X**, **Y** and **Z**.



**2 (b) (i)** In one week, each kettle is used for a total of 30 minutes.

Which kettle costs the most to use?

Put a tick (✓) next to your answer.

**X**

**Y**

**Z**

(1 mark)

**2 (b) (ii)** A new 'express boil' kettle boils water faster than any other kettle.

Draw a fourth bar on the chart to show the possible power of an 'express boil' kettle.

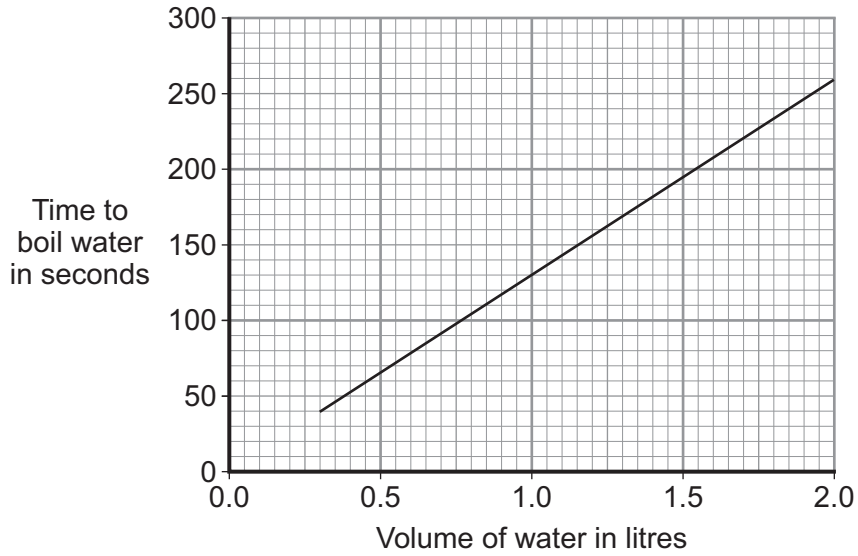
(1 mark)

**Question 2 continues on the next page**

**Turn over ►**



2 (c) The graph shows how the time to boil water in an electric kettle depends on the volume of water in the kettle.



A householder always fills the electric kettle to the top, even when only enough boiling water for one small cup of coffee is wanted.

Explain how the householder is wasting money.

.....

.....

.....

.....

.....

.....

(3 marks)

8



**Turn over for the next question**

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ANSWER IN THE SPACES PROVIDED**

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**3** Wind and tides are energy sources that are used to generate electricity.

**3 (a)** Complete each sentence by putting a tick (✓) in the box next to the correct answer.

**3 (a) (i)** The wind is

a non-renewable energy source.

a constant energy source.

an unreliable energy source.

(1 mark)

**3 (a) (ii)** The tides are

a renewable energy source.

a constant energy source.

an unreliable energy source.

(1 mark)

**3 (b)** If wood is to be used as a renewable energy source, what must be done each time a tree is chopped down?

.....

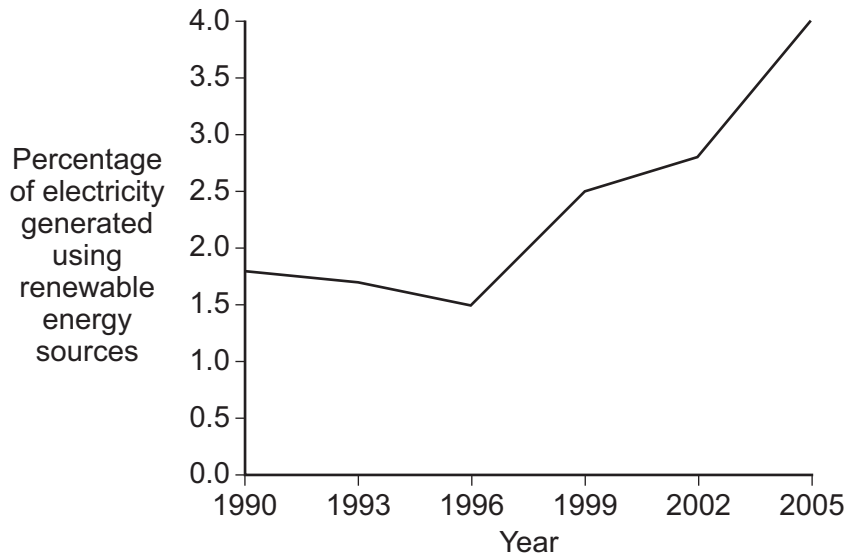
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(1 mark)





- 3 (c)** In the UK, electricity is generated using renewable and non-renewable energy sources. The graph shows the percentage of electricity generated using renewable energy sources between 1990 and 2005.



Complete the following sentence by drawing a ring around the correct answer in the box.

In 2015, the percentage of electricity generated using renewable energy sources

is most likely to be

greater than 4 %.
equal to 4 %.
less than 4 %.

(1 mark)

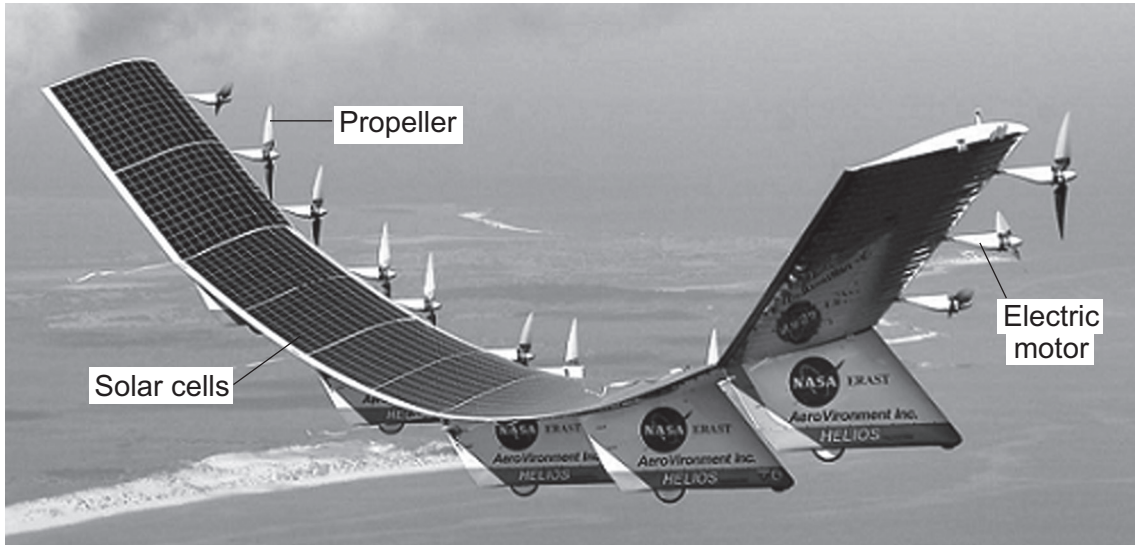
4
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**Turn over for the next question**

**Turn over ►**



4 The picture shows a solar-powered aircraft. The aircraft has no pilot.



4 (a) Use words from the box to complete the following sentence.

**electrical                  heat                  light                  sound**

Solar cells are designed to transform ..... energy into  
 ..... energy.

(2 marks)

4 (b) On a summer day, 175 000 joules of energy are supplied to the aircraft's solar cells every second. The useful energy transferred by the solar cells is 35 000 joules every second.

Use the equation in the box to calculate the efficiency of the solar cells.

$$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$$

Show clearly how you work out your answer.

.....  
 .....

Efficiency = .....  
 (2 marks)



**4 (c)** The aircraft propellers are driven by electric motors.

Give **one** environmental advantage of using electric motors to drive the aircraft propellers rather than motors that burn a fuel.

.....

.....

(1 mark)

5

**Turn over for the next question**

**Turn over ►**



- 5 A householder was out shopping when her electricity meter reading should have been taken. The electricity company estimated the reading and sent the following bill. Unfortunately, the bill was damaged in the post.

**AQA electricity**

Customer reference: 2634724983  
Date sent out: 18 September 2012

**Your electricity bill**

Present reading: 53600 (e) 13 September  
Previous reading: 53490 12 June

---

Used: 110 kWh

Cost per kWh = 15p (e) = estimated reading  
Cost of electricity used = \_\_\_\_\_

- 5 (a) Use the equation in the box to calculate the cost of the electricity used between 12 June and 13 September.

$$\text{total cost} = \text{number of kilowatt-hours} \times \text{cost per kilowatt-hour}$$

Show clearly how you work out your answer.

.....

.....

Total cost = .....  
(2 marks)

- 5 (b) The estimated reading shown on the bill was not very accurate. The correct reading was 53782.

How many kilowatt-hours of electricity had the householder actually used between 12 June and 13 September?

.....

.....

(2 marks)

4



6 Using an optical telescope to look at stars is not always easy because:

- too many street lights often make it too light to see faint stars
- clouds reduce the light getting to the telescope
- atmospheric pollution often distorts the images.

Large optical telescopes are often positioned high up a mountain.

Describe the advantages of positioning a telescope high up a mountain.

.....

.....

.....

.....

.....

.....

(3 marks)

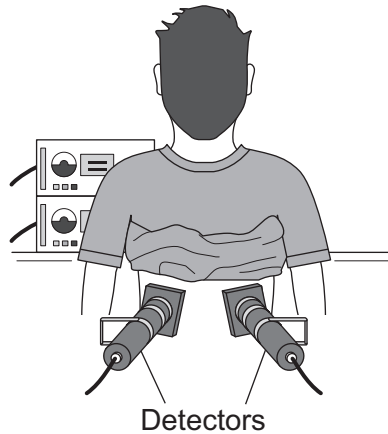
3

**Turn over for the next question**

**Turn over ►**



- 7 A doctor uses the radioactive isotope technetium-99 to find out if a patient's kidneys are working correctly.

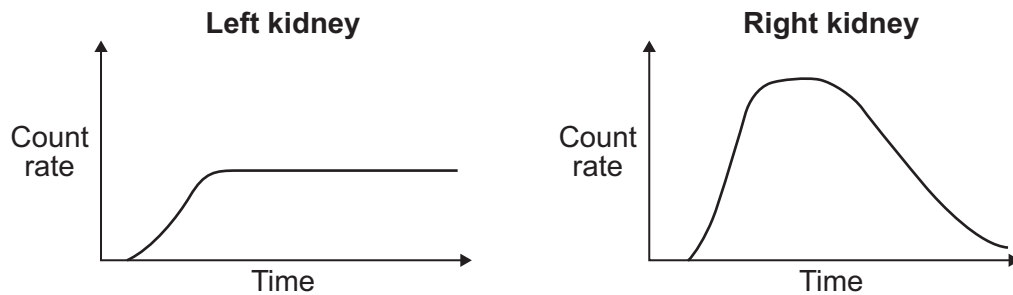


The doctor injects a small amount of technetium-99 into the patient's bloodstream. Technetium-99 emits gamma radiation.

If the patient's kidneys are working correctly, the technetium-99 will pass from the bloodstream into the kidneys and then into the patient's urine.

Detectors are used to measure the radiation emitted from the kidneys.

The level of radiation emitted from each kidney is recorded on a graph.



- 7 (a) How do the graphs show that technetium-99 is passing from the bloodstream into each kidney?

.....

.....

(1 mark)



**7 (b)** By looking at the graphs, the doctor is able to tell if there is a problem with the patient's kidneys.

Which **one** of the following statements is correct?

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

Only the right kidney is working correctly.

Only the left kidney is working correctly.

Both kidneys are working correctly.

Explain the reason for your answer.

.....

.....

.....

.....

(3 marks)

4

**Turn over for the next question**

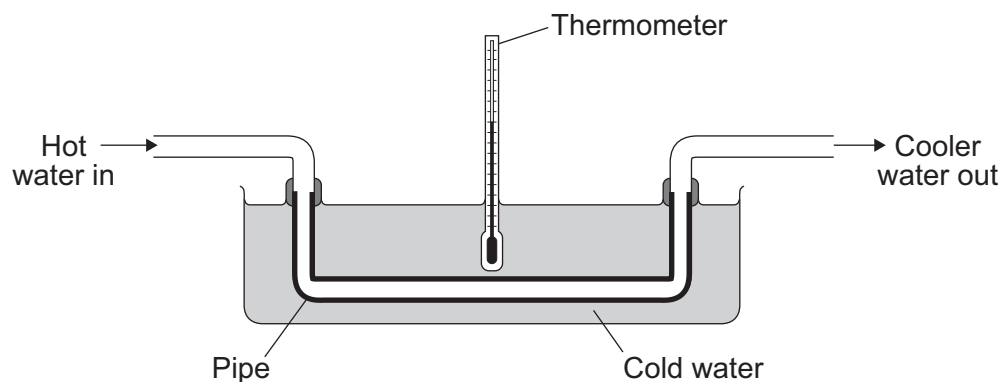
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**8** Heat exchangers are devices used to transfer heat from one place to another.

The diagram shows a pipe being used as a simple heat exchanger by a student in an investigation.

Heat is transferred from the hot water inside the pipe to the cold water outside the pipe.



**8 (a)** Complete the following sentence by drawing a ring around the correct word in the box.

Heat is transferred from the hot water inside the pipe

to the cold water outside the pipe by

conduction.

convection.

radiation.

(1 mark)

**8 (b)** The student wanted to find out if the efficiency of a heat exchanger depends on the material used to make the pipe. The student tested three different materials. For each material, the rate of flow of hot water through the pipe was kept the same.

The student's results are recorded in the table.

Material	Temperature of the cold water at the start in °C	Temperature of the cold water after 10 minutes in °C
Copper	20	36
Glass	20	23
Plastic	20	21





8 (b) (i) The rate of flow of hot water through the pipe was one of the control variables in the investigation.

Give **one** other control variable in the investigation.

.....  
(1 mark)

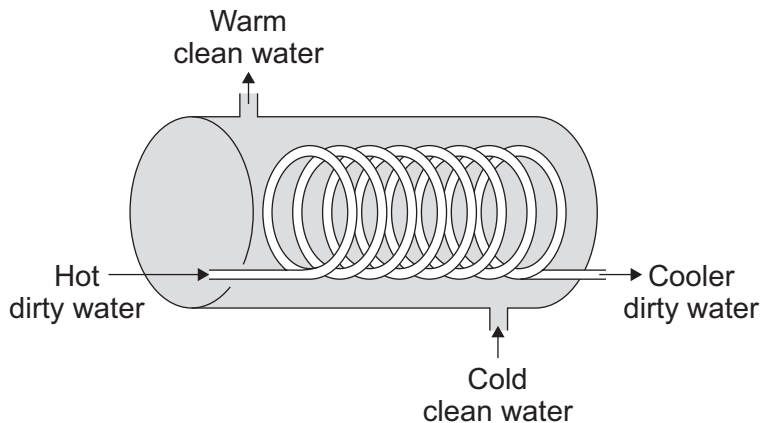
8 (b) (ii) Which **one** of the three materials made the best heat exchanger?

.....

Give a reason for your answer.

.....  
.....  
.....  
(2 marks)

8 (c) The student finds a picture of a heat exchanger used in an industrial laundry. The heat exchanger uses hot, dirty water to heat cold, clean water.



This heat exchanger transfers heat faster than the heat exchanger the student used in the investigation.

Explain why.

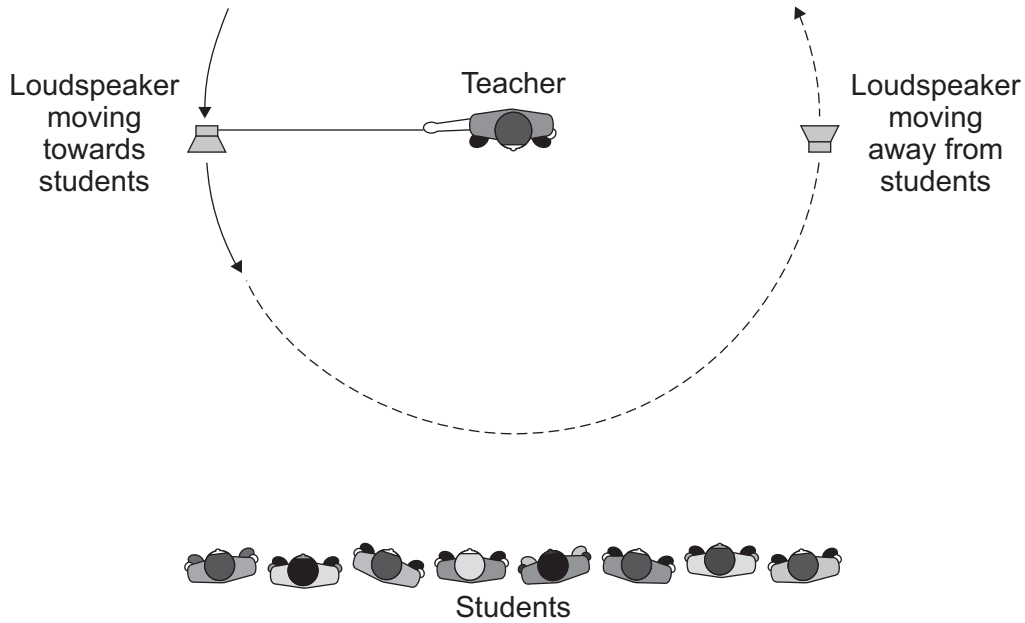
.....  
.....  
.....  
.....  
(2 marks)

6

Turn over ►



- 9** The diagram shows a teacher using a loudspeaker to demonstrate an important effect. The loudspeaker produces a note of constant frequency and is swung around in a circle.



- 9 (a)** As the loudspeaker moves towards the students, the frequency of the note heard by the students increases.

What happens to the note heard by the students as the loudspeaker moves away from them?

.....  
 .....

(1 mark)

- 9 (b)** The teacher is using the demonstration to model the red-shift in light observed from most distant galaxies.

- 9 (b) (i)** Which part of the demonstration:  
 represents a moving galaxy?

.....

is like the red-shift?

.....

(2 marks)



**9 (b) (ii)** Which **one** of the following statements gives the main reason why models are used in science?

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

Models can help to explain an effect or theory.

Models can prove that a theory is correct.

Models can prove that a theory is wrong.

(1 mark)

**9 (c)** Red-shift provides evidence to support the theory that the Universe began from a very small initial point.

What name is given to this theory?

.....

(1 mark)

5

**END OF QUESTIONS**



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