Rewarding Learning

71

Candidate Number

General Certificate of Secondary Education
2012

Science: Physics

Paper 2
Foundation Tier

[G7603]

G7603

MONDAY 25 JUNE, AFTERNOON

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all five** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Quality of written communication will be assessed in Question **2(c)(i)**.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Details of calculations should be shown.
Units must be stated with numerical answers where appropriate.

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
Total Marks	

Examiner Only	
Marks	Remark

1 (a) (i) Two forces each of 10 N act on a toy car. For each case shown below describe the possible motion of the toy car.

The car is _____

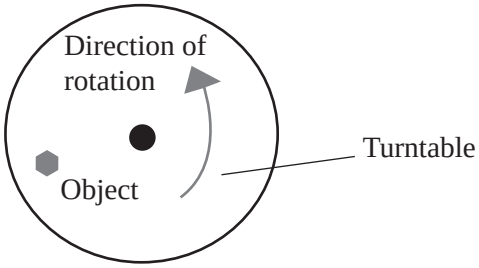
_____

The car is _____

_____

[2]

The diagram below shows a flat object sitting on a turntable. As the turntable rotates in a circle so does the object.



(ii) What provides the centripetal force for the object to move in a circle and in what direction does it act?

The centripetal force is provided by _____

This force acts _____

[2]

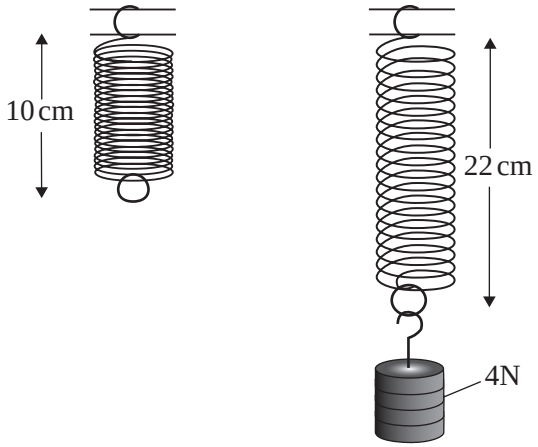
(iii) As the speed of rotation of the turntable is increased the object will eventually fly off the turntable. Explain why this happens and state the direction in which the object flies off.

_____

_____

_____ [2]

(b) A spring has an unstretched length of 10 cm. When a weight of 4 N is attached its length becomes 22 cm.



(i) When an unknown weight is attached to the spring its length becomes 16 cm.
Calculate the value of this unknown weight.
You are advised to show clearly how you get your answer.

Unknown weight = _____ N [3]

(ii) A weight of 100 N is added to spring. Explain why it is unlikely that the extension of the spring can be calculated.

_____

_____

_____ [1]

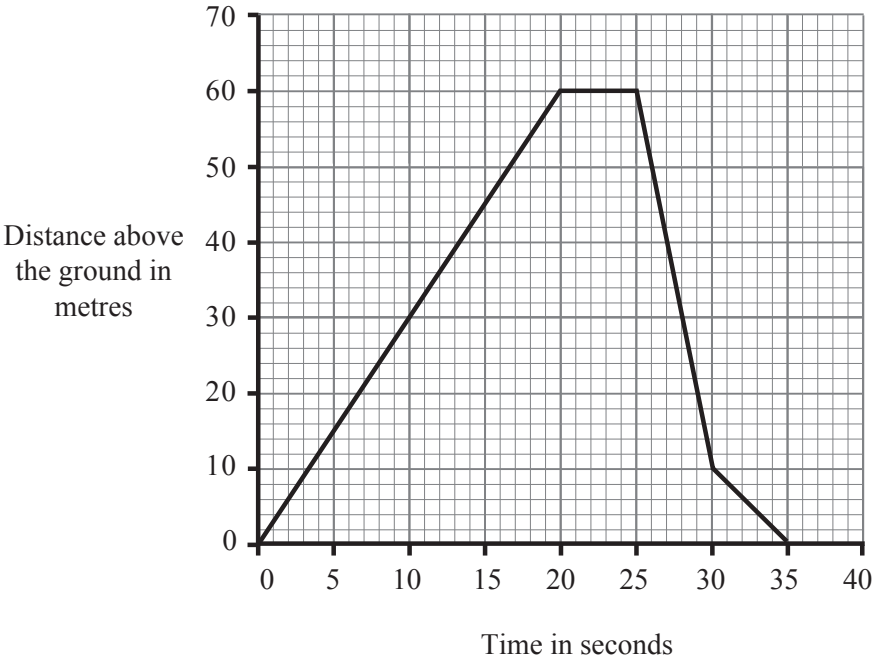
Examiner Only

Marks	Remark

(c) A theme park ride is shown in the picture below.
The passengers are lifted to a height and then dropped.

© iStockphoto / Thinkstock

The graph below shows how the distance above the ground of the passengers changes with time.



Examiner Only

Marks	Remark

(i) Calculate the speed of the passengers as they travel to the top of the rise.
You are advised to show clearly how you get your answer.

Speed = _____ m/s [3]

(ii) How long do the passengers remain at the top?

_____ s [1]

(iii) What total distance do the passengers travel during the complete round trip?

_____ m [1]

(iv) Calculate the average speed for the complete round trip.
You are advised to show clearly how you get your answer.

Average speed = _____ m/s [3]

(v) What is the displacement of the passengers at the end of the ride? Explain your answer.

Displacement = _____ m

Explanation _____

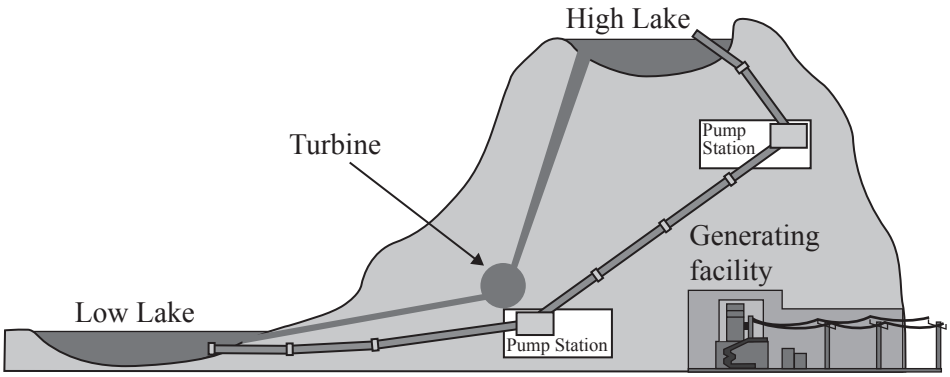
_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

2 **(a)** The Dinorwig power station in Wales is described as a pumped storage scheme. Electricity is used to pump water into a high level lake as shown in the diagram below. This is done during the night when the demand for electricity is much lower than during the day.



(i) A hydroelectric power station uses a renewable source of energy to generate electricity. What is a renewable energy source?

_____

_____ [1]

(ii) Unlike a hydroelectric power station, the Dinorwig scheme **cannot** be described as a renewable energy source. Explain why.

_____

_____

_____ [2]

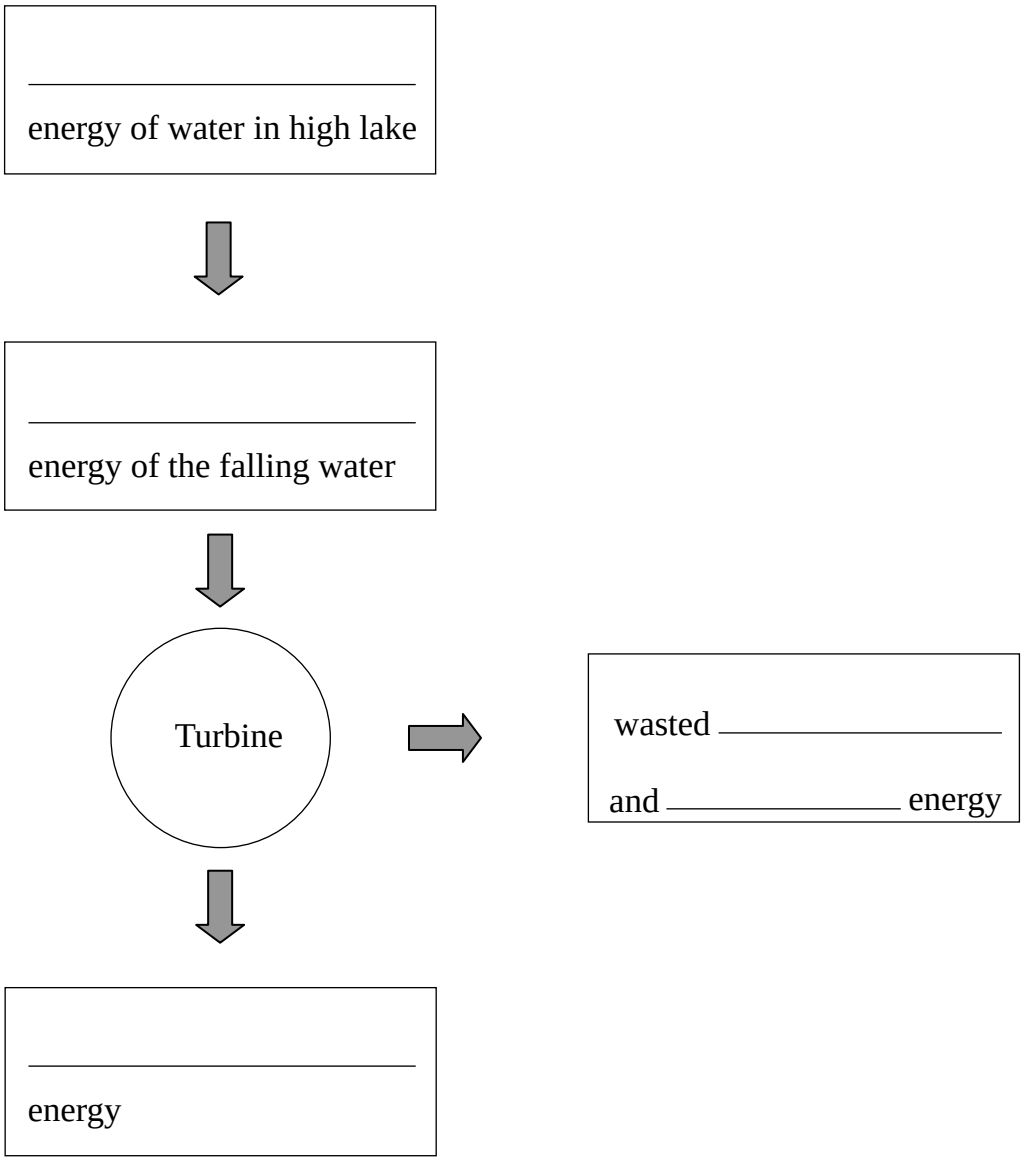
(iii) Does the generation of electricity in the Dinorwig scheme produce atmospheric pollution? Explain your answer.

_____

_____

_____ [1]

(iv) During the day, when the demand for electricity increases, water is allowed to flow from the high lake to the low lake passing through the turbine on its way. Complete the energy flow diagram for this process.



[5]

(v) Describe how the Principle of Conservation of Energy applies to the energy changes shown above.

_____

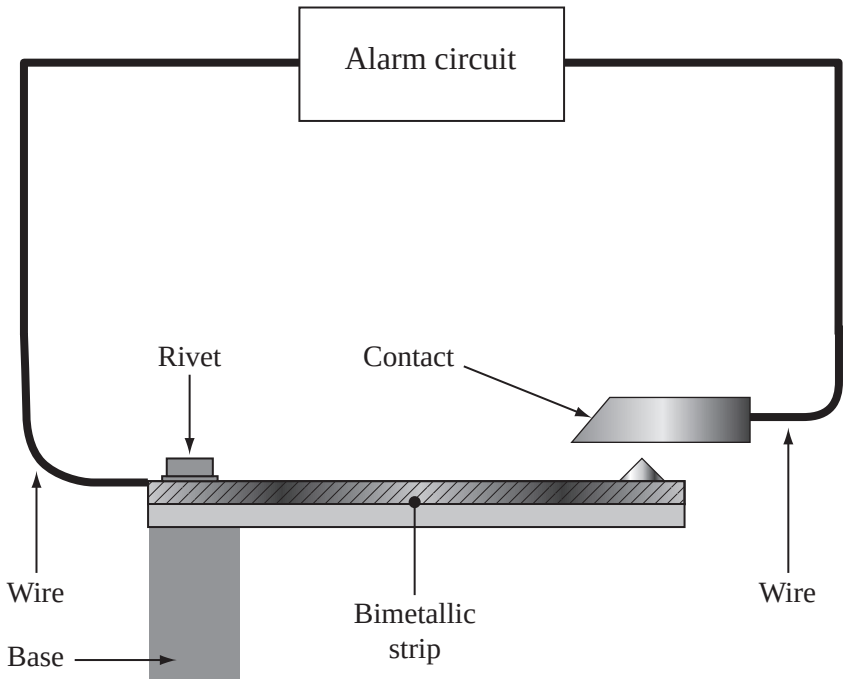
_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

(b) A bimetallic strip consists of two different metals. For the same increase in temperature one metal expands more than the other. The diagram below shows how a bimetallic strip might be used to operate an alarm should the temperature in a storeroom become too high. When the circuit is completed the alarm will sound.



(i) Describe how the bimetallic strip should behave to set the alarm off.

_____ [1]

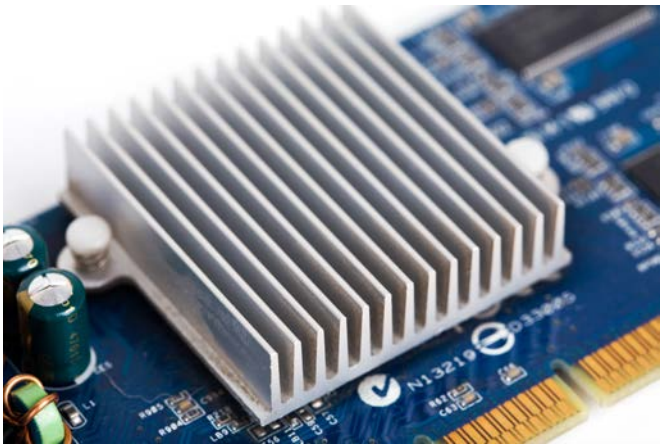
(ii) Describe how the metals should be arranged on this bimetallic strip so that the alarm will work correctly.
Remember one metal expands more than the other.

_____

_____

_____ [1]

(c) The processor in a computer generates a lot of heat. This heat must be removed otherwise the processor may fail to work properly.
The processor is placed in contact with a metal structure similar to the one shown below.



© iStockphoto / Thinkstock

(i) Describe how the three processes of heat transfer remove heat from the processor.

_____

_____

_____

_____ [3]

Quality of written communication [2]

(ii) Explain why painting the metal structure black makes it more efficient at removing heat from the processor.

_____

_____

_____ [1]

Examiner Only

Marks	Remark

(d) Water in a saucepan is heated as shown in the diagram below.

Examiner Only	
Marks	Remark

© Erich Schrempp / Science Photo Library

(i) On the diagram above show the path taken by convection currents in the water as it is heated. [2]

The body of the saucepan is made of metal and the handle is made of plastic.

(ii) Explain, in terms of heat transfer, the choice of material for each of the two parts of the saucepan.

The body of the saucepan _____

_____

The handle _____

_____ [2]

(iii) In terms of the movement of particles, describe fully the process of heat conduction in insulators.

_____

_____

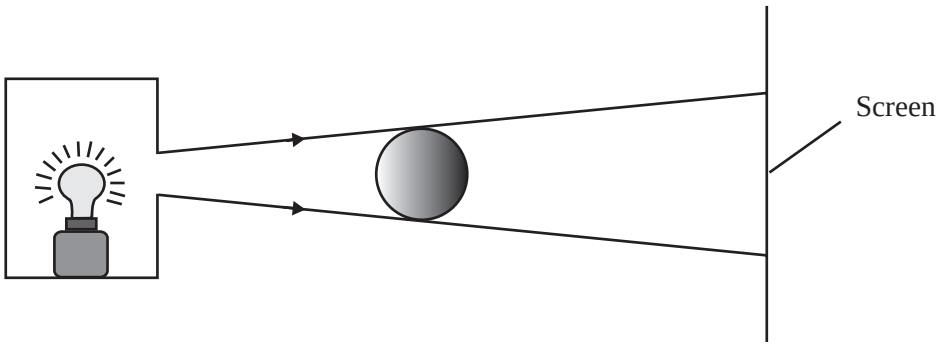
_____ [3]

Examiner Only	
Marks	Remark

3 **(a)** Below are listed four objects. Ring those that are luminous.

planet **candle flame** **star** **pencil** [2]

(b) A light source produces a shadow of a ball on a screen as shown. Two rays are shown to indicate the region of total shadow on the screen.



(i) What name is given to this type of light source?

_____ [1]

(ii) What is the shape of the shadow on the screen?

_____ [1]

(iii) Using a ruler, draw two further rays on the diagram above which will allow you to indicate the regions of partial shadow (penumbra). [2]

(iv) Label a region of partial shadow on your diagram with the letter P. [1]

(v) What is the effect, if any, of the following changes on the size of the complete shadow on the screen? Indicate your response by ticking (✓) the appropriate box.

	Shadow's size decreases	**No change in size of shadow**	**Shadow's size increases**
Using a larger screen			
Moving the screen away from the ball			
Moving the light source away from the ball			

[3]

(c) (i) What is the focal length of a converging lens?

Examiner Only

Marks	Remark

_____

_____ [1]

(ii) Describe an experiment to measure the focal length of a converging lens using a distant object. You should

- list the apparatus you need (other than the lens and the distant object)
- describe carefully what you would do
- state the measurement you must make to find the focal length.

You may find it helpful to draw a diagram of the apparatus below.

_____

_____

_____

_____

_____

_____

_____

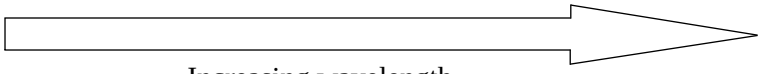
_____

_____ [5]

Examiner Only	
Marks	Remark

(d) (i) Below is an incomplete table which shows the electromagnetic spectrum in order of increasing wavelength.
Complete the diagram by writing the names of the missing electromagnetic waves in the boxes provided.

		Ultraviolet	**Visible**	**Infrared**		



Increasing wavelength

[2]

(ii) State one property that **only** electromagnetic waves have.

_____

_____ [1]

(iii) What particular danger is there when working with infrared radiation?

_____ [1]

Examiner Only	
Marks	Remark

4 **(a)** Electromagnets are used with cranes in scrapyards to move steel objects.

© Brainerd Dispatch

Give a reason why permanent magnets are **not** suitable for this use.

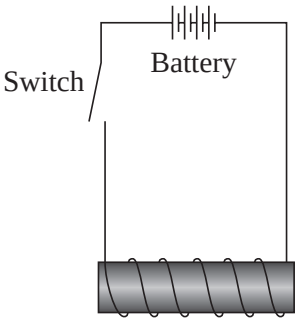
_____

_____

_____

_____ [1]

(b) Insulated copper wire is wound around a cardboard tube to make a simple electromagnet. The ends of the wire are joined to a battery and an iron rod is placed in the coil as shown below.



(i) How do you turn on this electromagnet?

_____ [1]

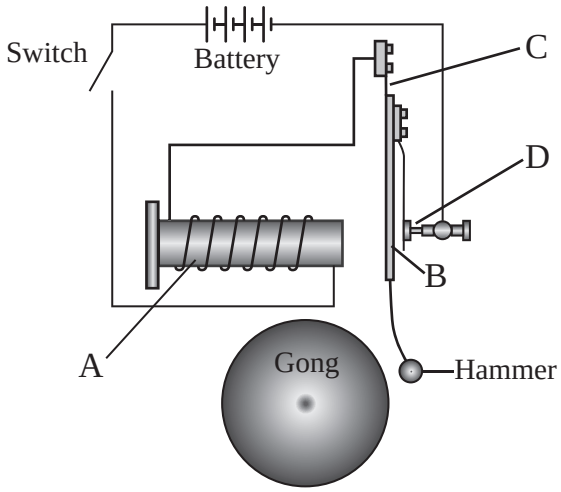
(ii) State three different ways to make the electromagnet **weaker**.

1. _____

2. _____

3. _____ [3]

(c) The diagram below shows an electric bell and its circuit.



(i) What material(s) are the following parts made of ?

A _____

B _____ [2]

(ii) What two particular properties must part C have to allow the bell to work?

1. _____

2. _____ [2]

(iii) When the bell is ringing what is continuously happening at the part marked D?

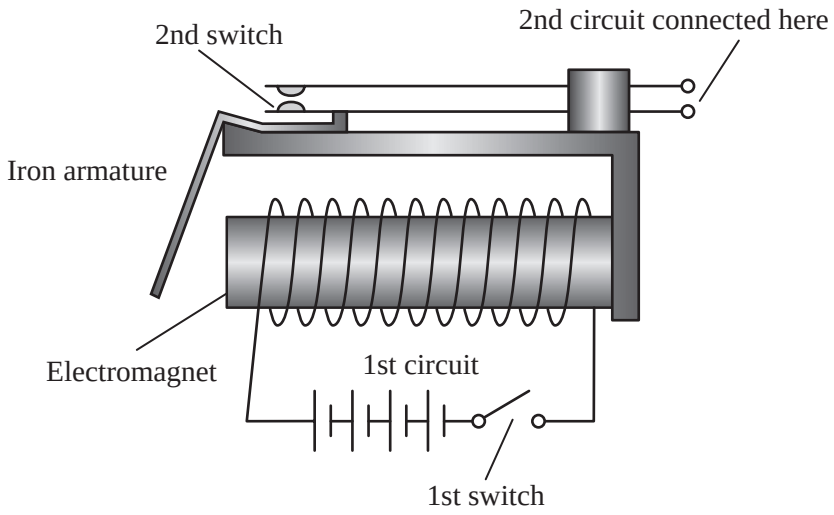
_____

_____ [1]

Examiner Only

Marks	Remark

(d) The diagram below shows an electromagnetic relay.



Explain how closing the 1st switch of the 1st circuit allows the 2nd switch to turn on an electrical appliance, such as a motor.

_____

_____

_____

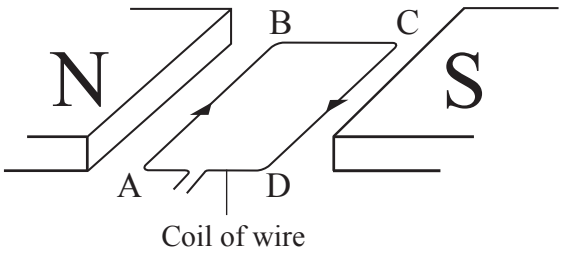
_____

_____

_____ [3]

Examiner Only	
Marks	Remark

(e) The diagram below shows a loop of wire placed between the north (N) and south (S) poles of a magnet. The direction of the magnetic field is from north to south.
An electric current flows in the loop in the direction shown.
As a result of this some parts of the loop will experience a force.



(i) Complete the table below to show which of the sections of the wire loop experience a force. Some information is already shown in the table.

Section of the loop	Force acting? Yes or No	Direction of the force if any
AB	Yes	Down
BC		
CD		

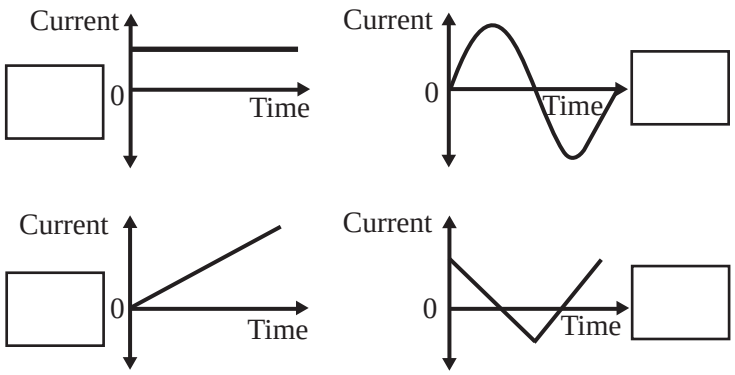
[2]

(ii) What electrical device is based on the arrangement of coil and magnet shown above?

_____ [1]

(f) The graphs below show how different electric currents vary with time. The currents are either alternating (a.c.) or direct current (d.c.).

Identify the current shown in each case by writing a.c. or d.c. in the boxes provided.



[4]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

5 **(a)** The Universe is made up of millions of very large systems of objects, one of which is shown below.

Source – Courtesy: NASA/JPL-Caltech/Harvard-Smithsonian CfA

(i) Name these very large systems of objects.

_____ [1]

(ii) What is this large system a collection of?

_____ [1]

(iii) What force holds this system of smaller objects together?

_____ [1]

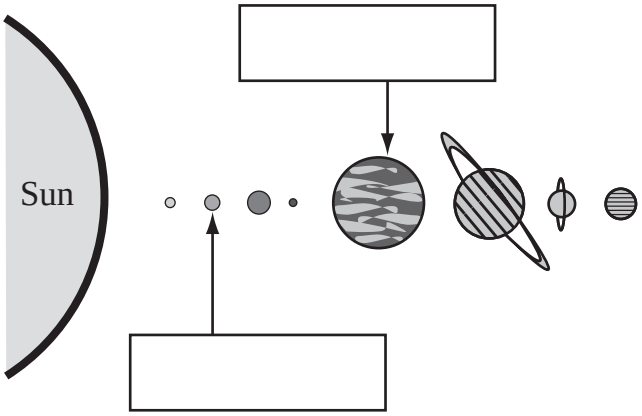
(iv) The light emitting objects in the collection emit large amounts of energy.
What is the process that produces these large amounts of energy?

_____ [1]

(v) What two elements make up most of these light-emitting objects?

1. _____ 2. _____ [2]

(b) The diagram below shows some of the planets in our solar system.



(i) What is a solar system?

_____

_____ [2]

(ii) On the diagram above write the names of the marked planets in the boxes. [2]

(iii) The modern model of our solar system is called the Heliocentric Model. The model in use about 500 years ago was called the Geocentric Model.

Complete the two sentences below to describe the **major** difference between these two models.

In the Heliocentric Model, _____

_____

_____

In the Geocentric Model, _____

_____

_____ [2]

Examiner Only

Marks	Remark

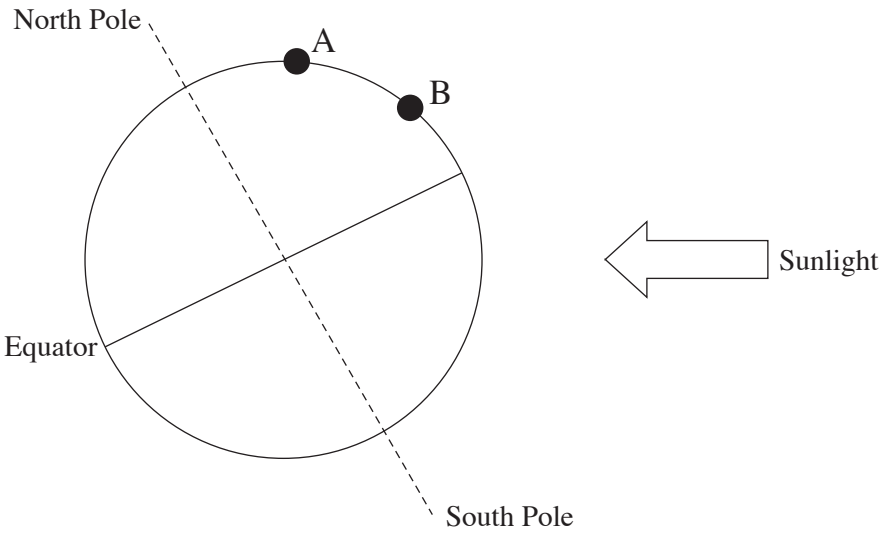
Examiner Only	
Marks	Remark

(iv) Give one scientific observation which can be explained well by the Heliocentric Model and cannot be satisfactorily explained by the Geocentric Model.

_____

_____ [1]

(c) The diagram below shows the Earth illuminated by sunlight.



(i) Shade the part of the Earth that is in night. [1]

(ii) A and B are two cities. Which has the greater number of hours of daylight?

_____ [1]

THIS IS THE END OF THE QUESTION PAPER