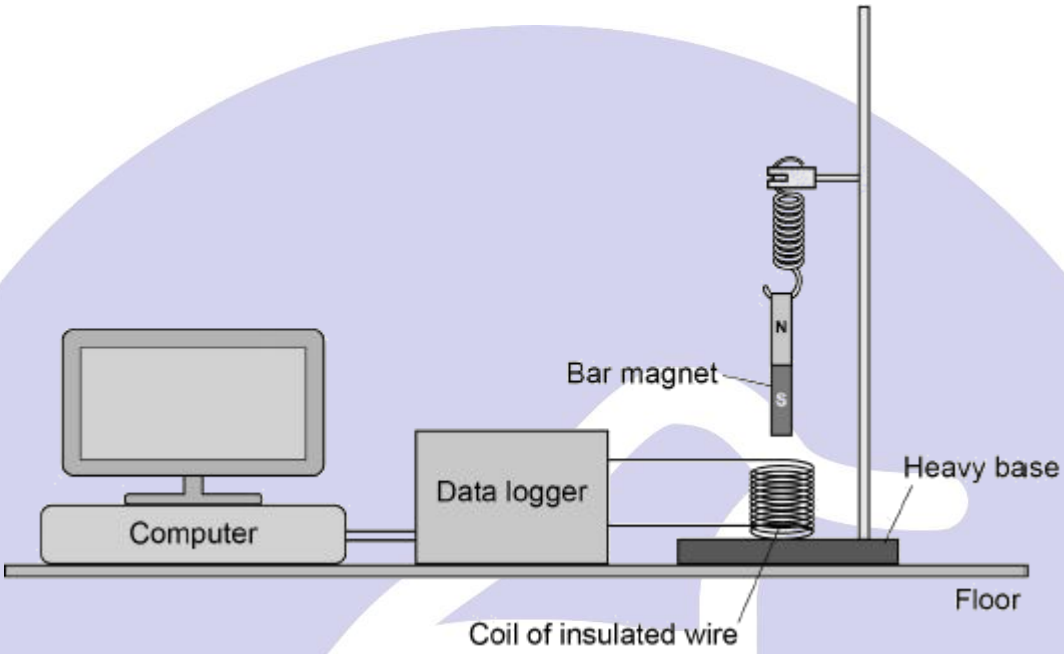
Q1.

Figure 2 shows a simple seismometer made by a student.

Figure 2



To test that the seismometer works, the student pushes the bar magnet into the coil and then releases the bar magnet.

(a) Why does the movement of the bar magnet induce a potential difference across the coil?

_____

_____

(1)

(b) Why is the induced potential difference across the coil alternating?

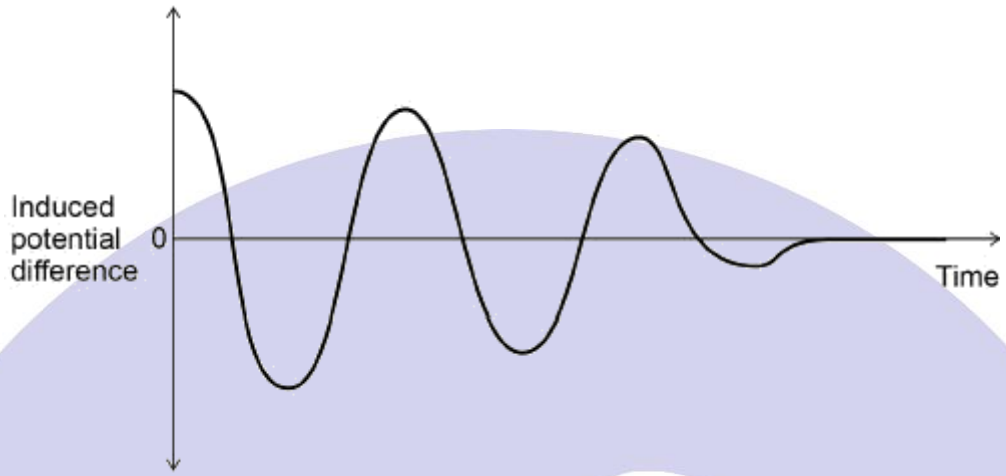
_____

_____

(1)

(c) **Figure 3** shows how the potential difference induced across the coil varies after the bar magnet has been released.

Figure 3



Which statement describes the movement of the magnet when the induced potential difference is zero?

Tick **one** box.

Accelerating upwards. ☐

Constant speed upwards. ☐

Decelerating downwards. ☐

Stationary. ☐

(1)

(i) The seismometer cannot detect small vibrations.

Suggest **two** changes to the design of the seismometer that would make it more sensitive to small vibrations.

1. _____

_____

2. _____

_____

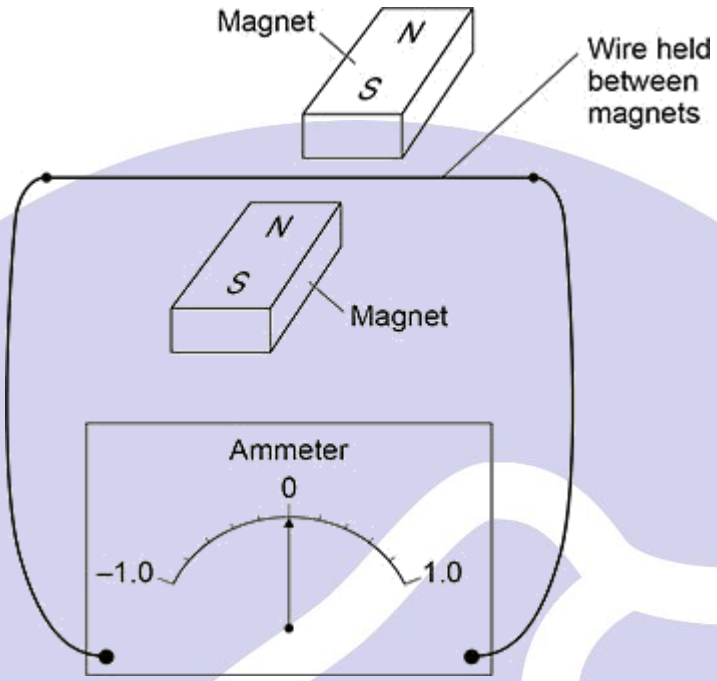
(2)

(Total 5 marks)

Q2.

Figure 1 shows some apparatus used by a teacher in a demonstration.

Figure 1



The teacher moved the wire upwards between the magnets.

The needle on the ammeter deflected to a value of +0.4 mA and then returned to zero.

(a) What effect did this demonstrate?

_____

(1)

(b) Explain why a current was detected when the wire in **Figure 1** was moved upwards.

_____

_____

_____

_____

_____

_____

(3)

(c) The teacher reversed the direction of the magnetic field.

The teacher replaced the wire in its original position.

The teacher moved the wire upwards in the same way as before.

What was the deflection of the needle on the ammeter?

Tick (✓) **one** box.

The needle will deflect to –0.4 mA. ☐

The needle will not move. ☐

The needle will deflect to +0.4 mA. ☐

(1)

(Total 5 marks)

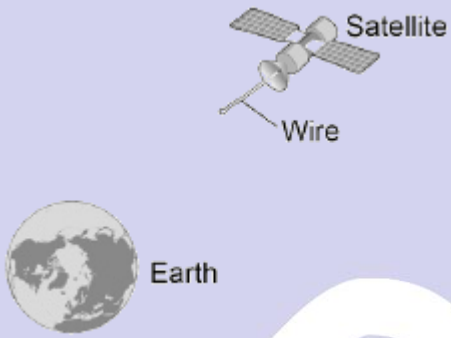
Q3.

Scientists have used a satellite system to investigate the idea of generating electricity in space.

As the system orbited the Earth a 20 km copper wire was reeled out.

Before the wire snapped a current of 1 amp was induced in the wire.

Figure 1



(a) Explain how a current is induced in the wire.

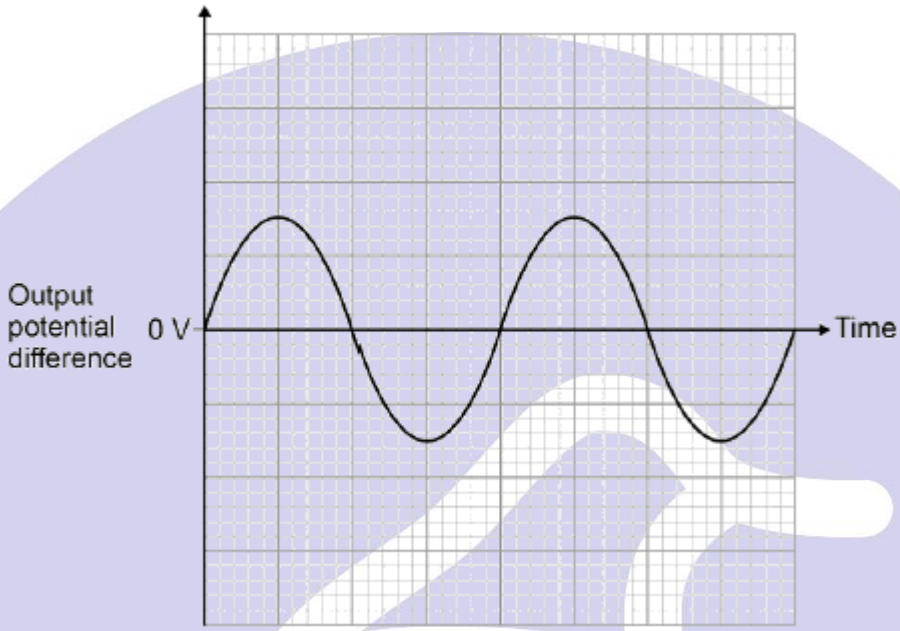
(3)

An alternator is connected to a data logger.

The data logger is connected to a computer.

Figure 2 shows how the output potential difference of the alternator varies with time.

Figure 2



(b) The coil inside the alternator now rotates at twice the frequency.

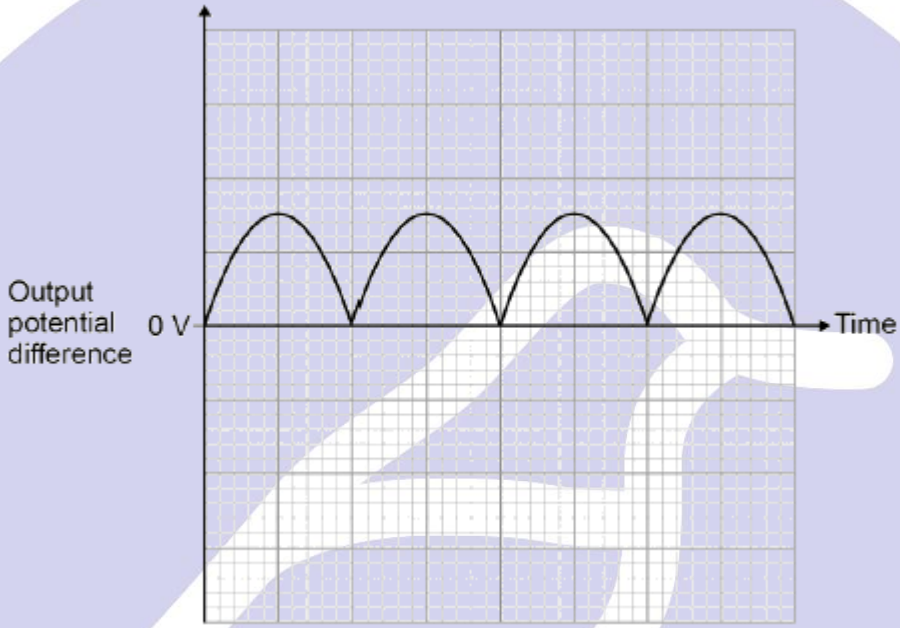
Draw on **Figure 2** to show how the output potential difference varies with time at this new frequency.

(2)

Another type of generator is now connected to the data logger and computer.

Figure 3 shows how the output potential difference varies with time for this generator.

Figure 3



(c) What name is given to this second type of generator?

_____

(1)

(d) Look at **Figure 2** and **Figure 3**.

Give one difference between the outputs from the two types of generator.

_____

_____

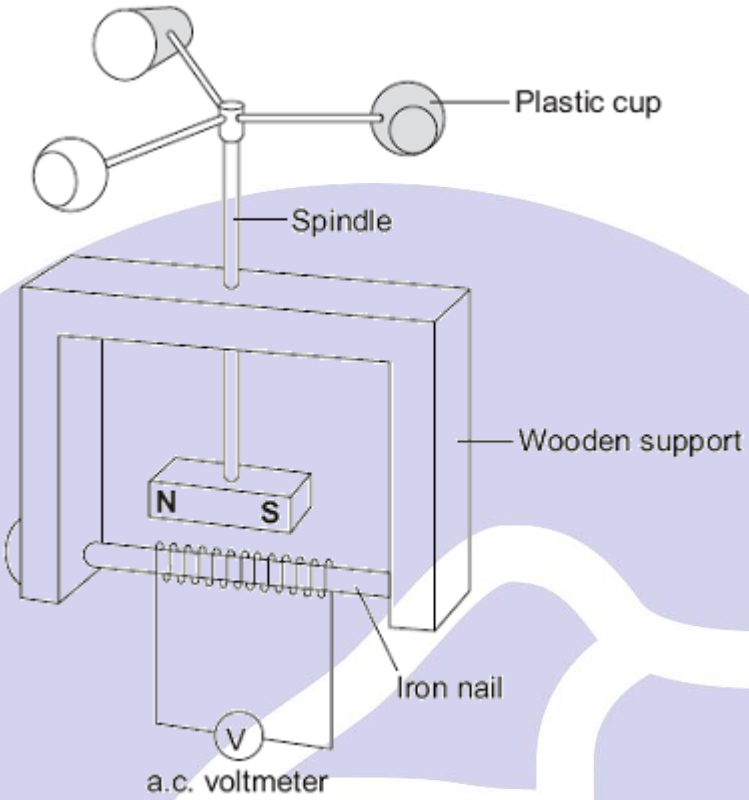
_____

(1)

(Total 7 marks)

Q4.

The diagram shows a student's design for a simple wind speed gauge.



(a) Explain why the wind causes the a.c. voltmeter to give a reading. The explanation has been started for you.

The wind causes the plastic cups to turn _____

_____

_____

_____

_____

_____

_____

(3)

(b) The gauge is not sensitive enough to measure light winds.

Suggest **one** way that the design can be modified to make the gauge more sensitive.

_____

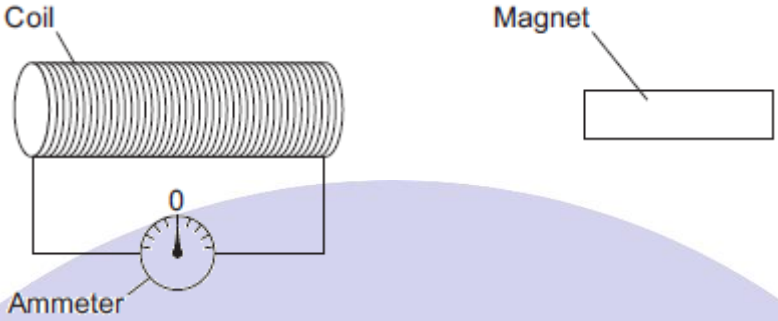
_____

(1)

(Total 4 marks)

Q5.

The figure below shows a coil and a magnet. An ammeter is connected to the coil.



The ammeter has a centre zero scale, so that values of current going in either direction through the coil can be measured.

(a) A teacher moves the magnet slowly towards the coil.

Explain why there is a reading on the ammeter.

(6)

(b) The table below shows some other actions taken by the teacher.

Complete the table to show the effect of each action on the ammeter reading.

Action taken by teacher	**What happens to the ammeter reading?**
Holds the magnet stationary and moves the coil slowly towards the magnet	
Holds the magnet stationary within the coil	
Moves the magnet quickly towards the coil	
Reverses the magnet and moves it slowly towards the coil	

(4)

(c) The magnet moves so that there is a steady reading of 0.05 A on the ammeter for 6 seconds.

Calculate the charge that flows through the coil during the 6 seconds.

Give the unit.

_____

_____

_____

Charge = _____

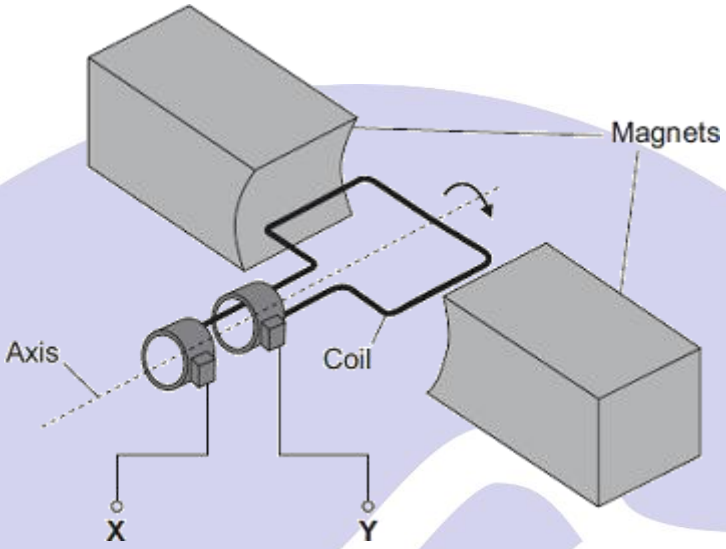
(3)

(Total 13 marks)

Q6.

The diagram shows an a.c. generator.

The coil rotates about the axis shown and cuts through the magnetic field produced by the magnets.



(a) (i) A potential difference is induced between **X** and **Y**.

Use the correct answer from the box to complete the sentence.

electric	**generator**	**motor**	**transformer**

This effect is called the _____ effect.

(1)

(ii) What do the letters a.c. stand for?

_____

(1)

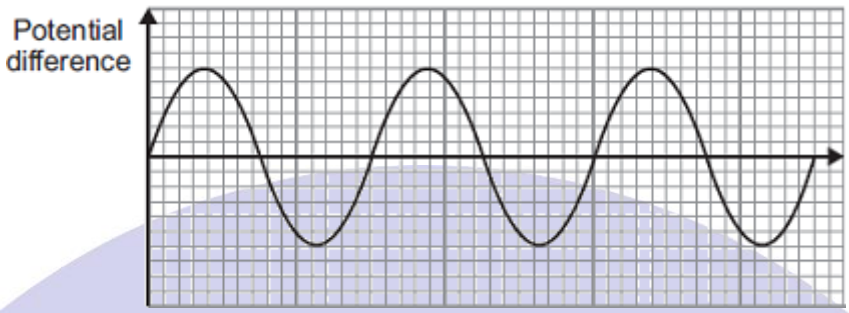
(iii) Name an instrument that could be used to measure the potential difference between **X** and **Y**.

_____

(1)

(b) **Graph 1** shows the output from the a.c. generator.

Graph 1



(i) One of the axes on **Graph 1** has been labelled 'Potential difference'.

What should the other axis be labelled?

_____

(1)

(ii) The direction of the magnetic field is reversed.

On **Graph 1**, draw the output from the a.c. generator if everything else remains the same.

(2)

(c) The number of turns of wire on the coil is increased. This increases the maximum induced potential difference.

State **two** other ways in which the maximum induced potential difference could be increased.

1. _____

_____

2. _____

_____

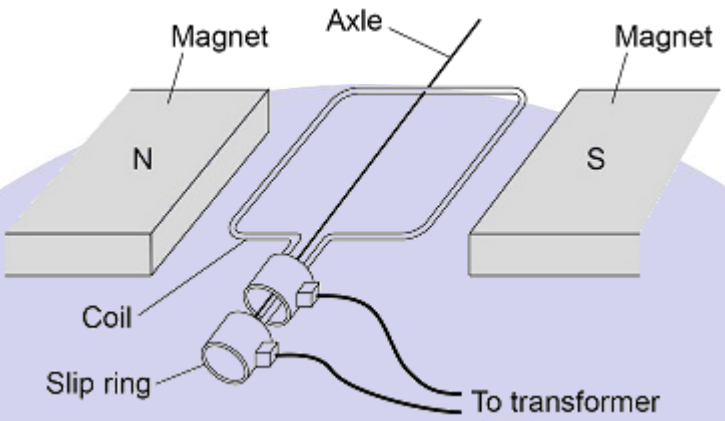
(2)

(Total 8 marks)

Q7.

Figure 1 shows the inside parts of the alternator.

Figure 1



(a) The handle of the alternator is turned, causing the coil to rotate.

Explain why an alternating current is induced in the coil.

(5)

(b) Suggest the purpose of the slip rings.

(1)

(c) The alternator from the portable power supply is disconnected from the transformer and lamp.

Explain why the handle of the alternator becomes much easier to turn.

_____

_____

_____

_____

_____

_____

(3)

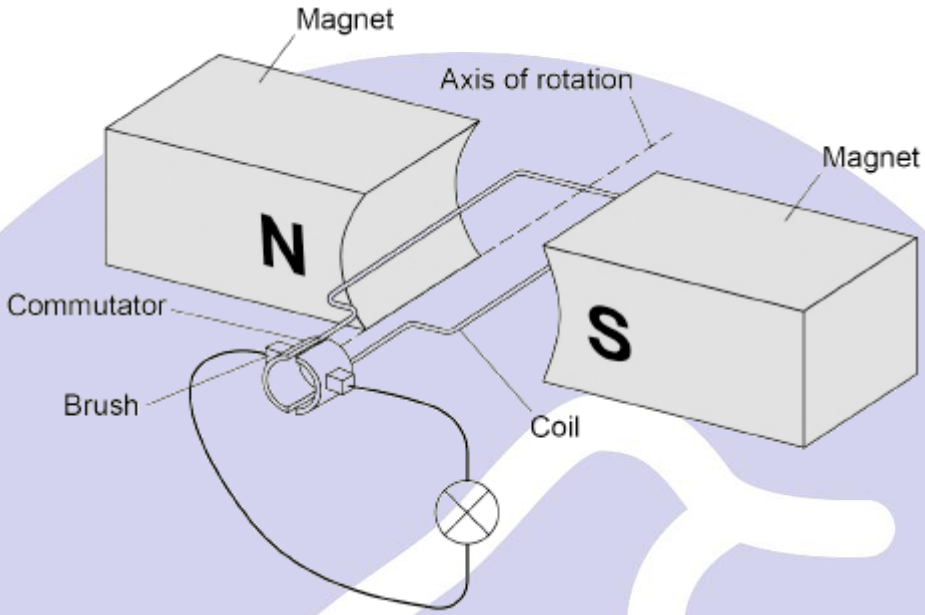
(Total 9 marks)

Q8.

A dynamo is used to generate an electric current.

Figure 1 shows the inside parts of the dynamo connected to a lamp.

Figure 1



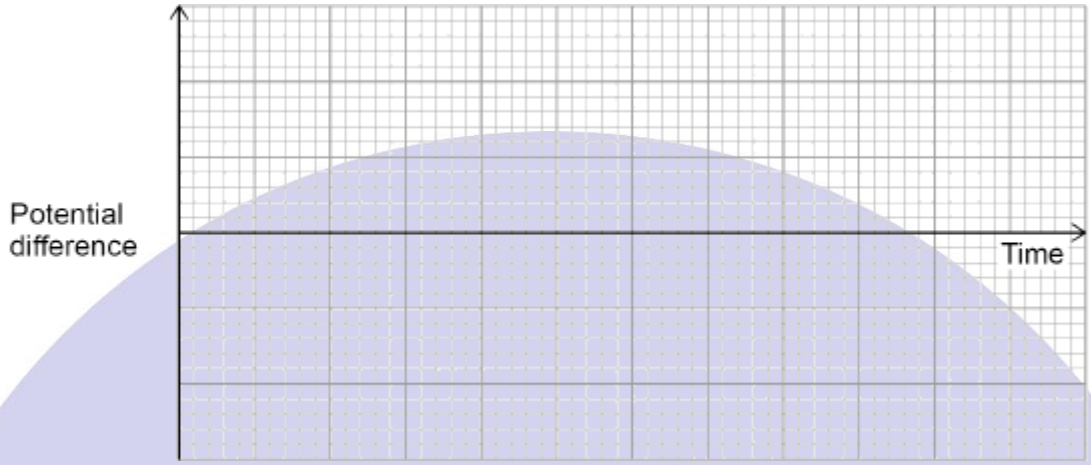
(a) The coil is rotated.

Explain why a direct current is induced in the coil.

(5)

(b) Sketch a graph on **Figure 2** to show how the potential difference generated across the lamp varies for **two** complete revolutions of the dynamo coil.

Figure 2



(1)

(c) The lamp is disconnected from the dynamo.

Explain why the dynamo becomes much easier to turn.

_____

_____

_____

_____

_____

_____

(3)

(Total 9 marks)