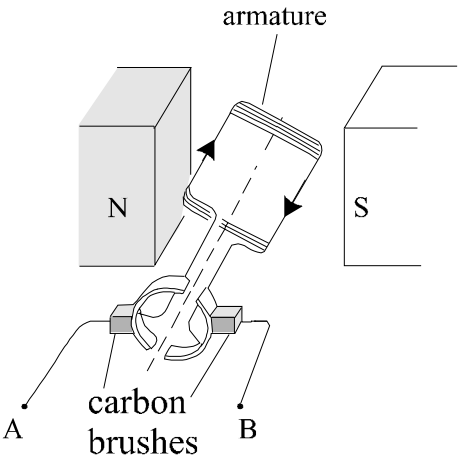
1.



Two students are using the equipment shown in the diagram.

One student thinks it is an electric motor.
The other student thinks it is a generator.

Explain, as fully as you can, how you would know which it is.

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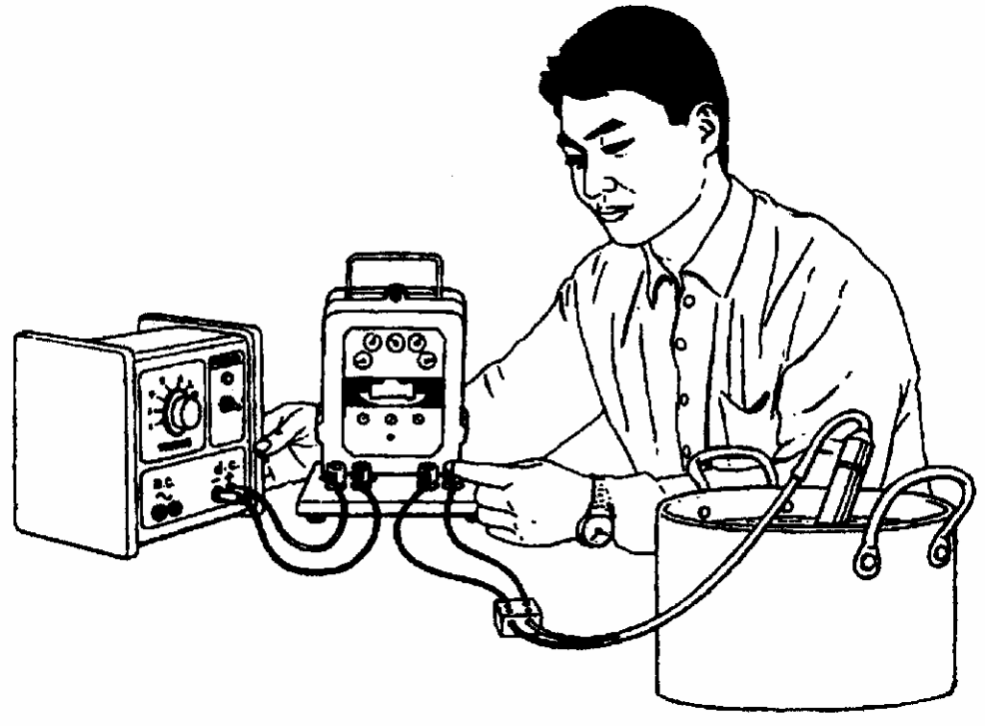
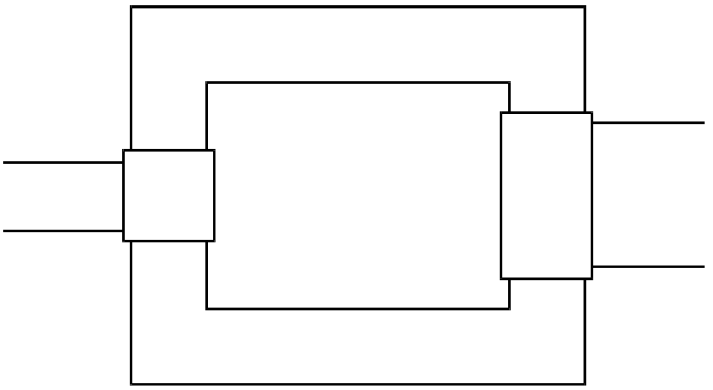
(Total 4 marks)

2. The drawing shows an experiment using a low voltage supply, a joulemeter, a small immersion heater and a container filled with water.



The immersion heater is designed for use in a tropical fish tank. It is connected to a step-down transformer supplied by 230 V a.c. mains.

The inside of a step-down transformer consists of three main parts. Name the **three** parts and briefly describe them. You may add to the diagram to help you to answer.



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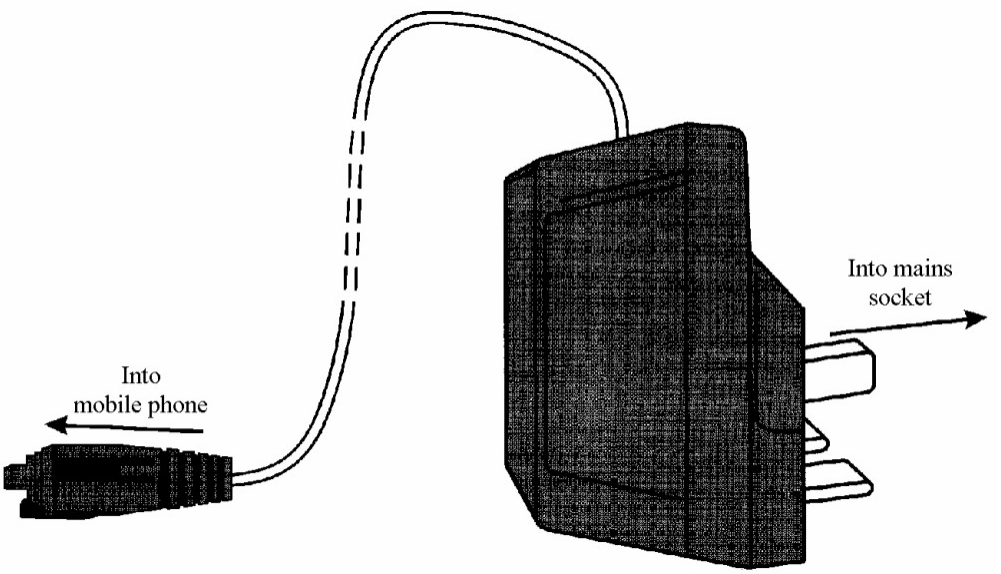
(Total 4 marks)

3. (a) The drawing shows a small transformer used to recharge the battery in a 4.2 V mobile phone from a 230 V mains supply.



Explain how you know that this is a *step-down* transformer.

.....

.....

(1)

(b) A transformer consists of an insulated coil of wire, called the primary coil, on one side of a core. Another coil of insulated wire, called the secondary coil, is on the other side.

Give **two** features of the *core*.

1 .....

2 .....

(2)

(c) Electricity is transmitted for long distances at voltages of 400 kV.

Explain one advantage and **one** disadvantage of using such high voltages.

Advantage .....

.....

.....

.....

(2)

Disadvantage .....

.....

.....

.....

(2)

(d) What charge, measured in coulombs (C), is passed when a voltage of 400 kilovolts (kV) transfers 200 megajoules (MJ) of energy?

$$\text{voltage} = \frac{\text{energy}}{\text{charge}}$$

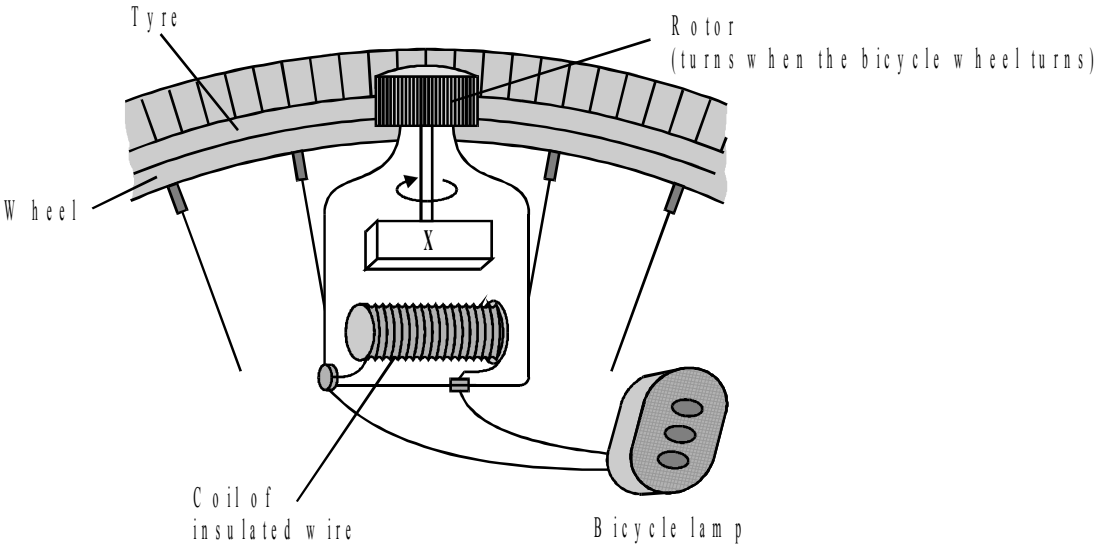
.....

.....

Charge = ... C

(3)
(Total 10 marks)

4. A bicycle can use a dynamo to generate electricity.



(a) Name part **X.**

.....

(1)

(b) Give **three** ways of increasing the size of the induced voltage from a dynamo.

1 .....

.....

2 .....

.....

3 .....

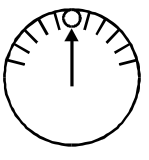
.....

(3)
(Total 4 marks)

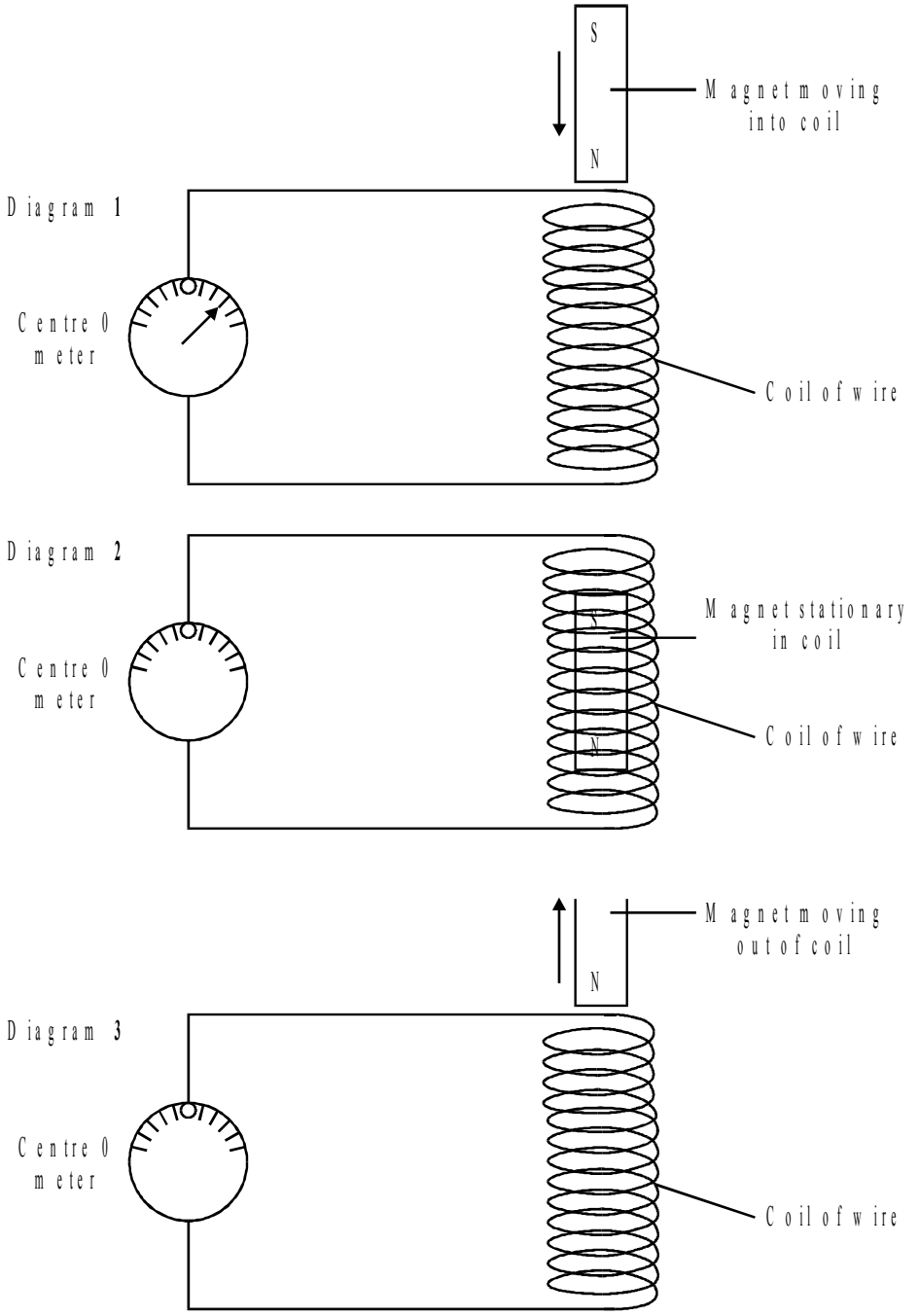
5.

- Diagram **1** shows a magnet being moved into a coil.
- Diagram **2** shows a magnet stationary in a coil.
- Diagram **3** shows a magnet being moved out of a coil.

The meter looks like this when no current is flowing.



(a) The position of the meter pointer has been drawn on diagram **1**.
Draw the positions of the meter pointer on diagrams **2** and **3**.



(2)

(b) Bicycle dynamos generate electricity by rotating a magnet inside a coil of wire.

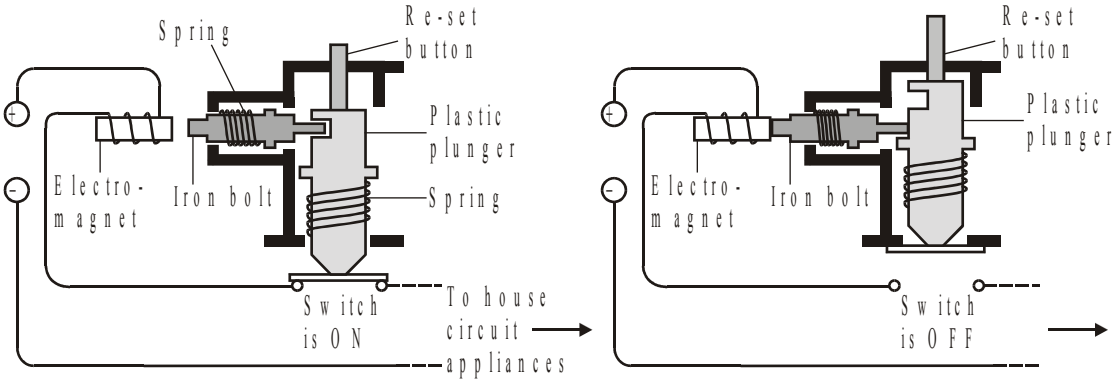
Give **two** ways of increasing the voltage produced by this kind of generator.

1 .....

2 .....

(2)
(Total 4 marks)

6. Circuit breakers help to make the electricity supply in homes safer.
A circuit breaker is an automatic safety switch. It cuts off the current if it gets too big.



Describe, in as much detail as you can, how this circuit breaker works.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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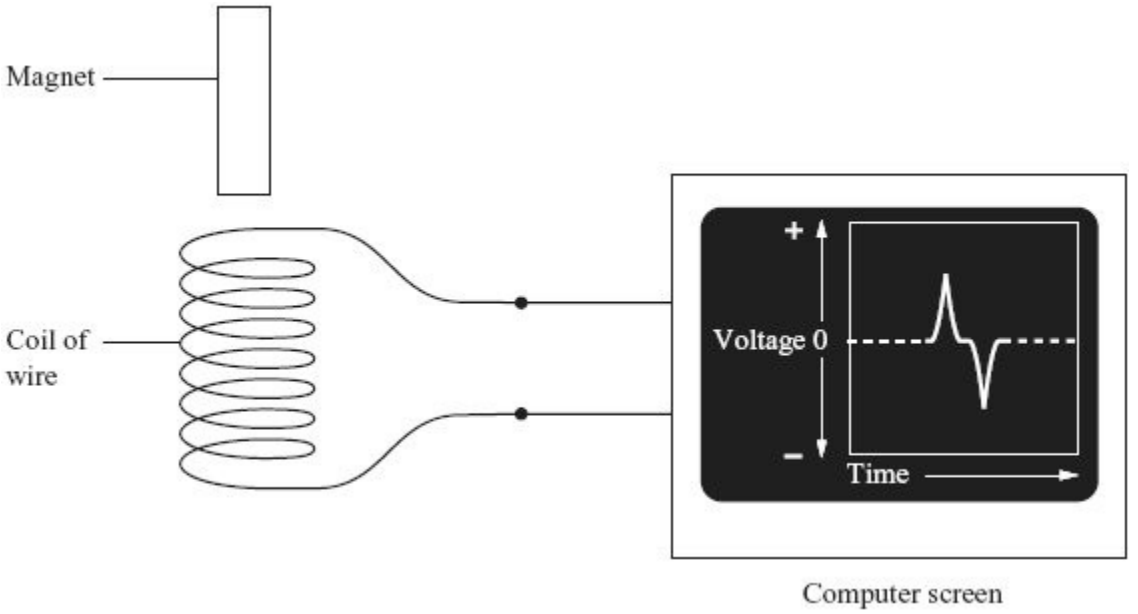
(Total 6 marks)

7. The equipment shown was used to produce the trace on the computer screen.



Describe and explain what was done with the equipment to produce this trace.

To gain full marks for this question, you should write your ideas in good English. Put them in a sensible order and use the correct scientific words.

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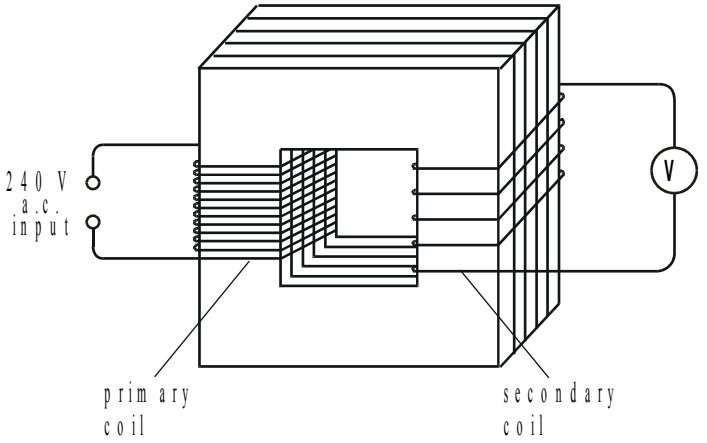
(Total 4 marks)

8. The diagram below shows a transformer.



(i) Name the material used to make the core of the transformer.

.....

(1)

(ii) The primary coil has 48 000 turns and the secondary coil 4000 turns.

If the input voltage is 240 V a.c., calculate the output voltage.

.....

.....

Answer V

(2)

(iii) Explain how the use of such a transformer could be adapted to transform a low voltage into a higher voltage.

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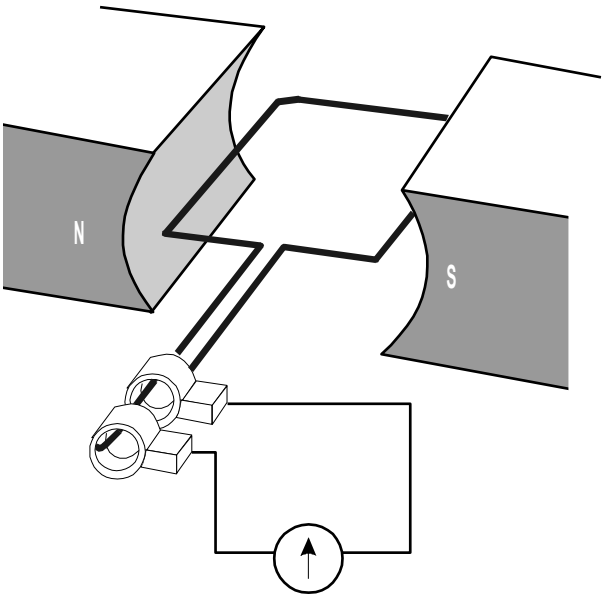
(1)
(Total 4 marks)

9. The diagram below shows an electric generator.



(a) What must be done to the generator to enable it to produce electricity?

.....

.....

(1)

(b) Why is a voltage induced in the coil?

.....

.....

(1)

(c) Give **four** ways in which the size of the induced voltage could be increased if another generator was built.

1. .....

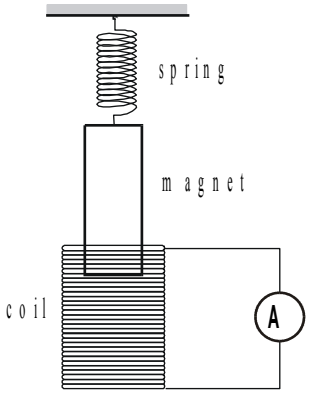
2. .....

3. .....

4. .....

(4)
(Total 6 marks)

10. (a) In the diagram below a magnet, attached to a spring, is free to vibrate in a coil of wire.



When the magnet is pushed down and released its vibrations rapidly die away.

The magnet is now replaced by an iron bar, the same size and mass as the magnet. When this is pushed down the same distance and released its vibrations take considerably longer to die away.

Explain why the vibrations of the magnet did not last as long as those of the iron bar.

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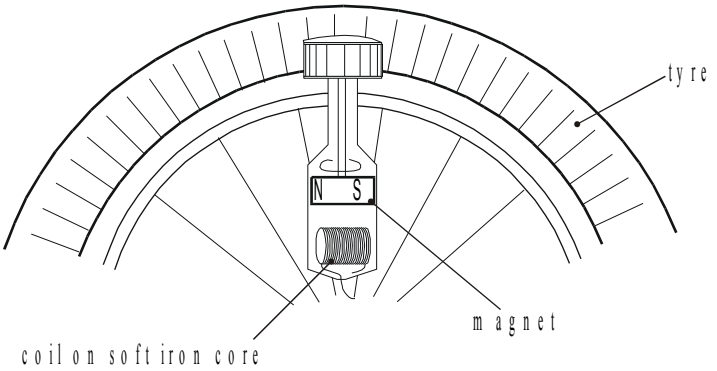
(6)

(b) The diagram below shows a dynamo suitable for use on a cycle.



(i) Explain why a voltage is generated when the dynamo is turned by the tyre.

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.....

(ii) Explain why the brightness of the lamp increases as the cyclist goes faster.

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(iii) Describe **three** changes you would make to the design of the dynamo if you wanted it to generate a bigger voltage.

1. .....

.....

.....

2. .....

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3. .....

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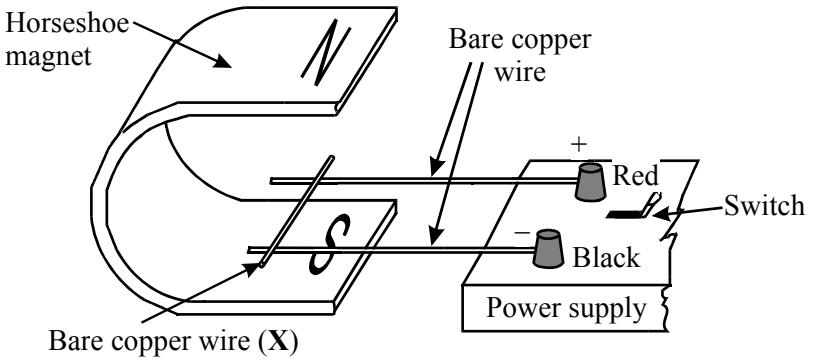
(9)
(Total 15 marks)

11. The diagram shows apparatus used to demonstrate the motor effect. **X** is a short length of bare copper wire resting on two other wires.



(a) (i) Describe what happens to wire **X** when the current is switched on.

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.....

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(ii) What difference do you notice if the following changes are made?

A The magnetic field is reversed.

.....

.....

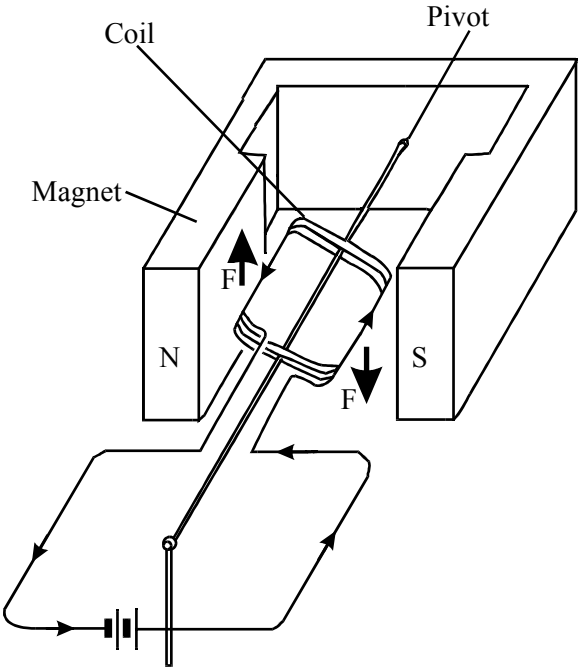
B The current is increased.

.....

.....

(3)

(b) The diagram shows a coil placed between the poles of a magnet. The arrows on the sides of the coil itself show the direction of the conventional current.



The arrows labelled **F** show the direction of the forces acting on the sides of the coil. Describe the motion of the coil until it comes to rest.

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.....

(3)

(c) Most electric motors use electromagnets instead of permanent magnets. State three of the features of an electromagnet which control the strength of the magnetic field obtained.

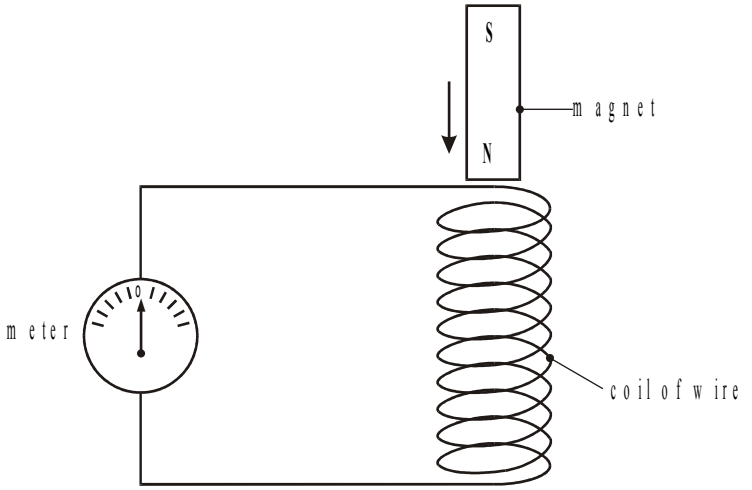
1 .....

2 .....

3 .....

(3)
(Total 9 marks)

12. The diagram below shows a coil of wire connected to a meter which can measure small currents.



(a) What, if anything, happens to the needle of the meter as the magnet is moved into the coil?

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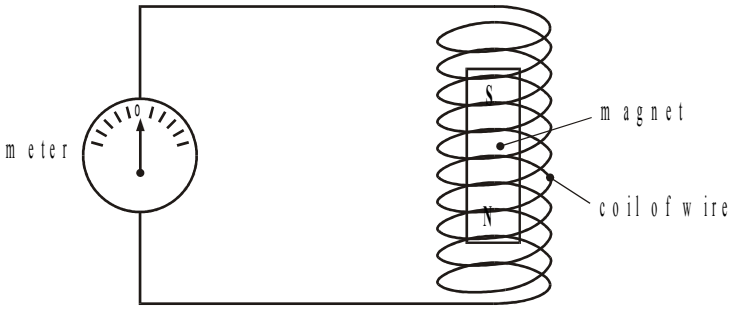
.....

(1)

(b) The magnet is now left stationary inside the coil as shown in the diagram below.



What, if anything, happens to the needle of the meter?

.....

.....

(1)

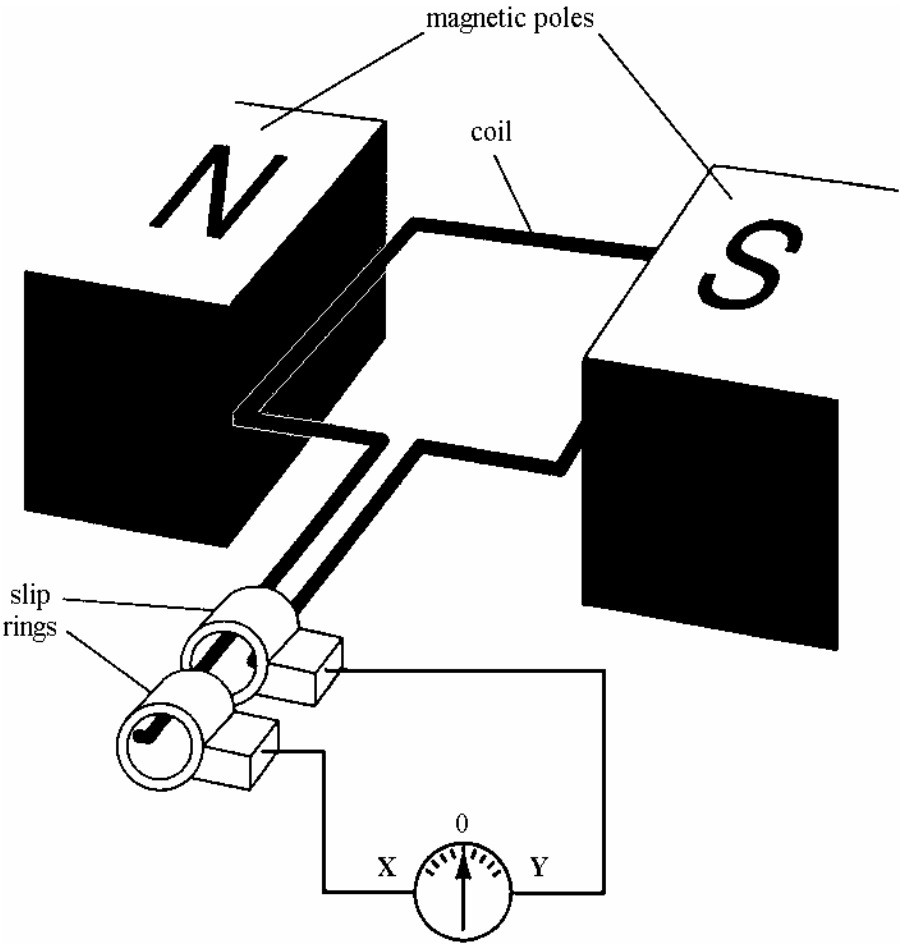
(c) What, if anything, happens to the needle of the meter as the magnet is lifted out of the coil?

.....

.....

(2)
(Total 4 marks)

13. The diagram below shows a rectangular coil of wire between the poles of a magnet.
The two ends of the coil make contact with two slip rings.
The slip rings are connected at points X and Y to a centre-zero meter.



(a) (i) Describe what happens to the meter needle if the coil is rotated in the magnetic field.

.....

.....

(2)

(ii) Explain your answer.

.....

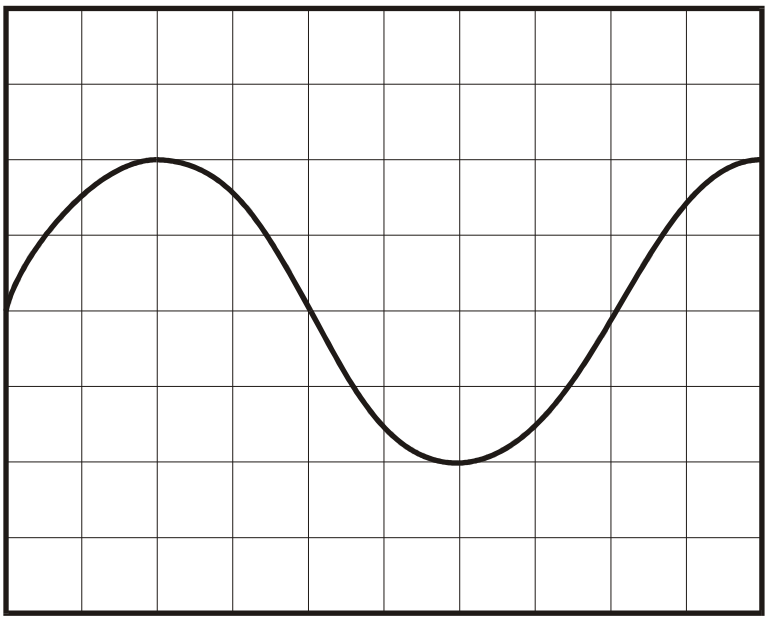
.....

.....

(2)

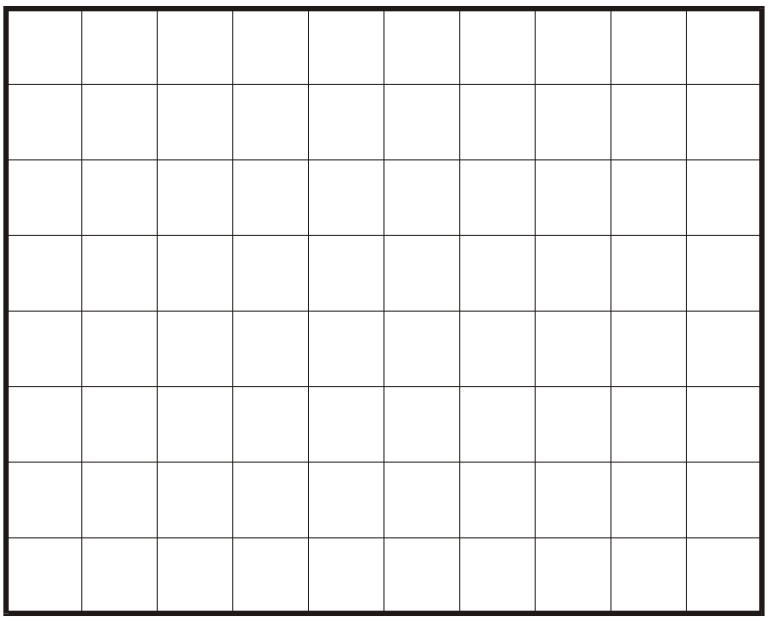
(b) The meter is now removed from the circuit.
The contacts at **X** and **Y** are then connected to the inputs of a cathode ray oscilloscope.

The grid below shows the trace on the oscilloscope when the coil is rotated at a steady rate in the magnetic field.



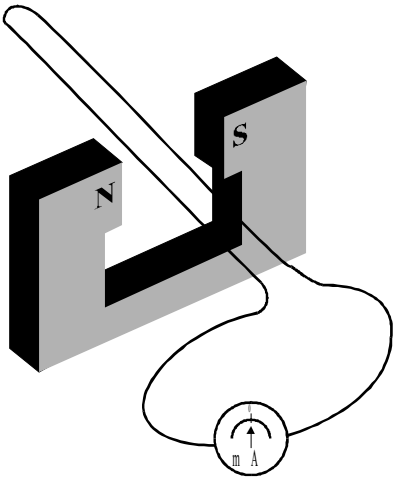
The speed of rotation of the coil is now doubled.

On the grid below sketch the trace which you would expect to see on the oscilloscope screen.
The controls of the oscilloscope have not been changed.



(3)
(Total 7 marks)

14. (a) The diagram shows a loop of wire which is being moved rapidly down between the poles of a magnet.



What will be the reading on the milliammeter as the loop of wire moves down?

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Give a reason for your answer.

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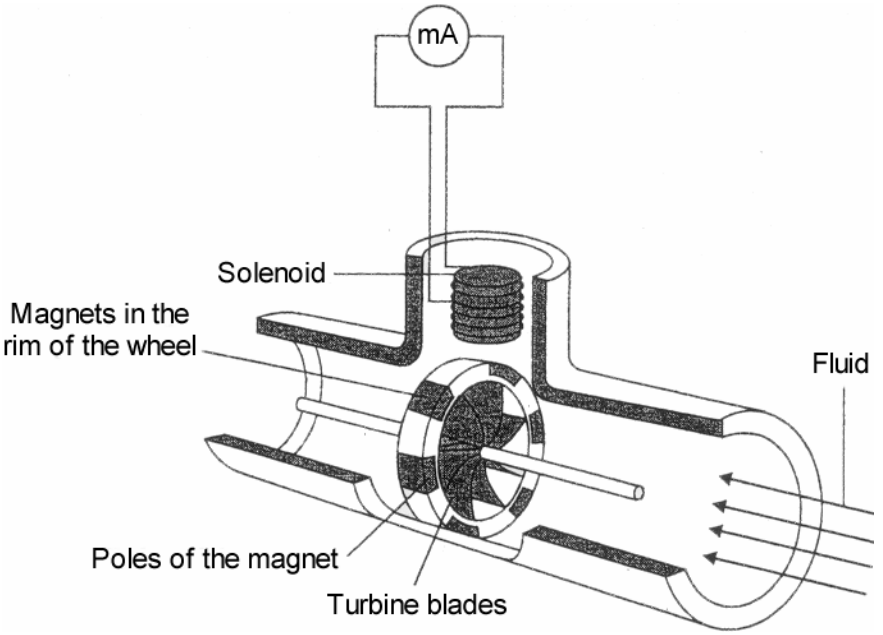
(2)

(b) The diagram shows one way of measuring the rate of flow of fluid through a pipe.



Explain how the flow of fluid through the pipe causes an alternating current to be induced in the solenoid.

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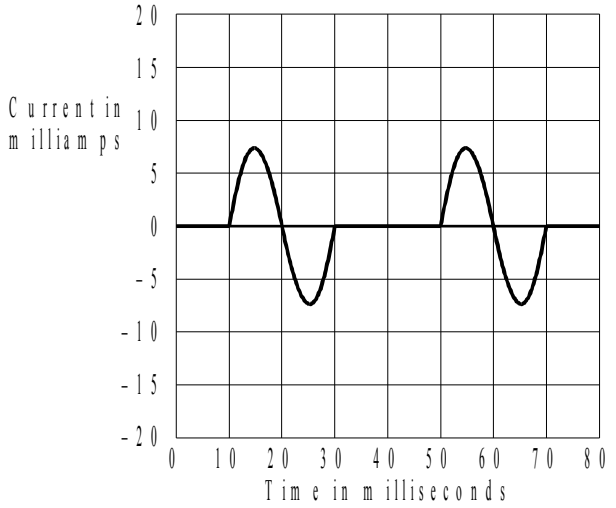
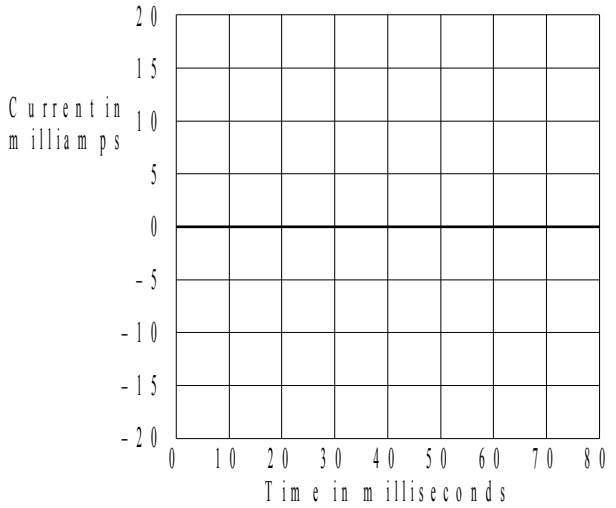
(3)

(c) The graph shows how the milliammeter reading changes with time when a fluid flows at a steady rate through the pipe.



Draw on the grid below, a graph to show how the milliammeter reading would change if the fluid flow is increased, so that the turbine rotates twice as fast.



(2)
(Total 7 marks)

15. (a) Name a material that could be used to make the outside case of the plug.

.....

Give a reason for your choice.

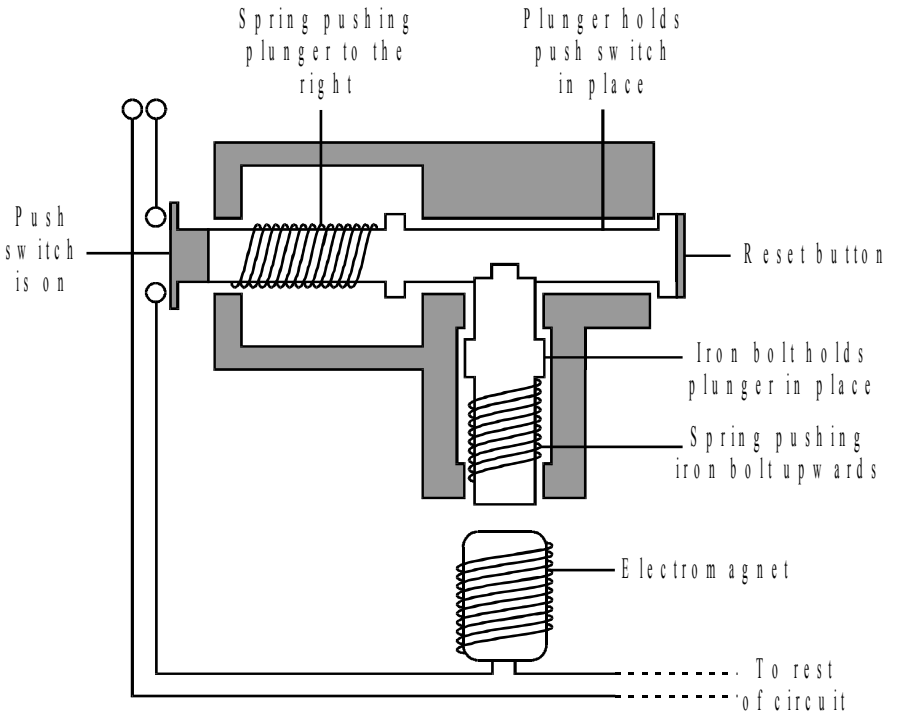
.....

.....

(2)

(b) *To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.*

Some electrical circuits are protected by a circuit breaker. These switch the circuit off if a fault causes a larger than normal current to flow. The diagram shows one type of circuit breaker. A normal current (15 A) is flowing.



Source: adapted from V. PRUDEN and K. HIRST, *AQA GCSE Sceince*
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Explain what happens when a current larger than 15A flows. The answer has been started for you.

When the current goes above 15 A, the electromagnet becomes stronger and

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(3)
(Total 5 marks)

16. A transformer is used to reduce the 230 V a.c. mains to the 12 V supply required for the lighting system. The transformer has 1150 turns on its primary coil.

(i) Write down the equation which links the number of turns of each transformer coil to the voltage across each transformer coil.

.....

.....

(1)

(ii) Calculate the number of turns on the secondary coil of the transformer. Show clearly how you work out your answer.

.....

.....

.....

number of turns on the secondary coil = ...

(2)
(Total 3 marks)