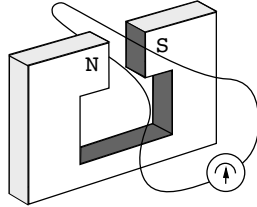


## GCSE Electromagnetic Induction

Name & Set

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



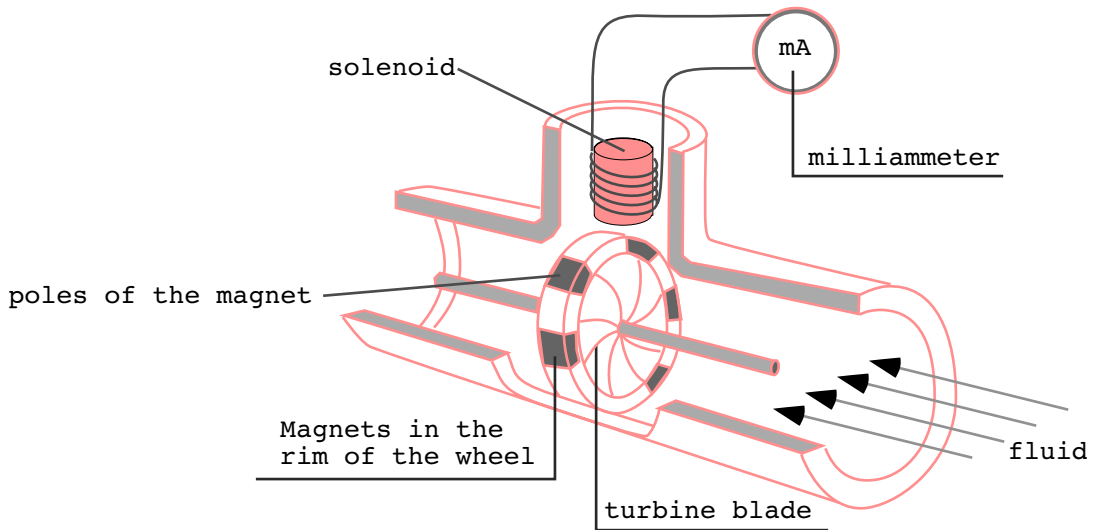
What will be the reading on the milliammeter as the loop of wire moves down?

\_\_\_\_\_ [1]

Give a reason for your answer.

\_\_\_\_\_  
 \_\_\_\_\_ [2]

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



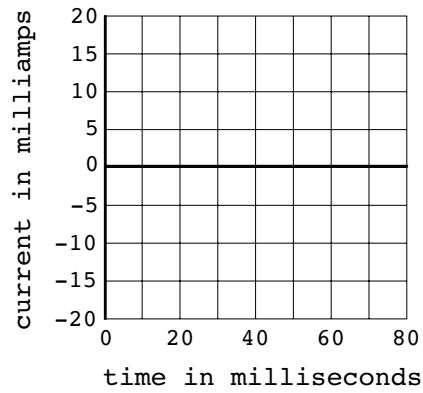
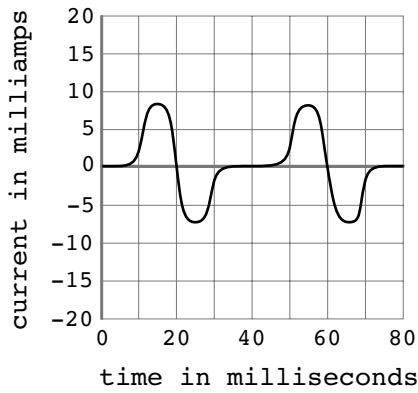
Explain how the flow of fluid through the pipe causes an alternating current to be induced in the solenoid.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [3]

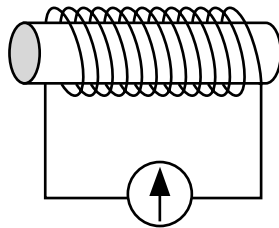
(c) The graph below left shows how the milliammeter reading changes with time when a fluid flows at a steady rate through the pipe.

Draw on the grid below right, 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]



2 (a) To avoid cutting through cables, a gas company uses a device to detect their position before digging holes. The magnetic field produced by the cable induces a voltage across the coil. This is registered on a meter attached to the coil.



(a) Explain how this device can detect cables

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[2]

(b) The device cannot detect cables that carry a steady direct current. Explain the reason for this.

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[2]

(c) State two ways in which you could get a larger reading on the meter.

1 \_\_\_\_\_

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[1]

2 \_\_\_\_\_

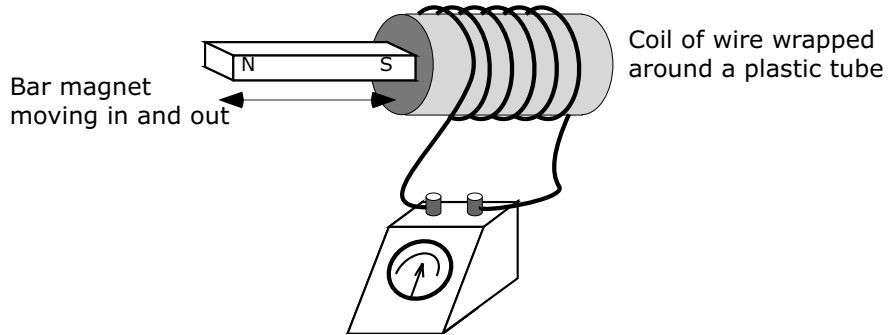
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[1]

ELECTROMAGNETIC INDUCTION

3 (a) Write in the missing words in the following description of an electrical effect.  
 If a wire, which forms part of a complete circuit, is moved to cut through a magnetic \_\_\_\_\_  
 then a current will be \_\_\_\_\_ in the wire. This effect is called electromagnetic \_\_\_\_\_ [3]

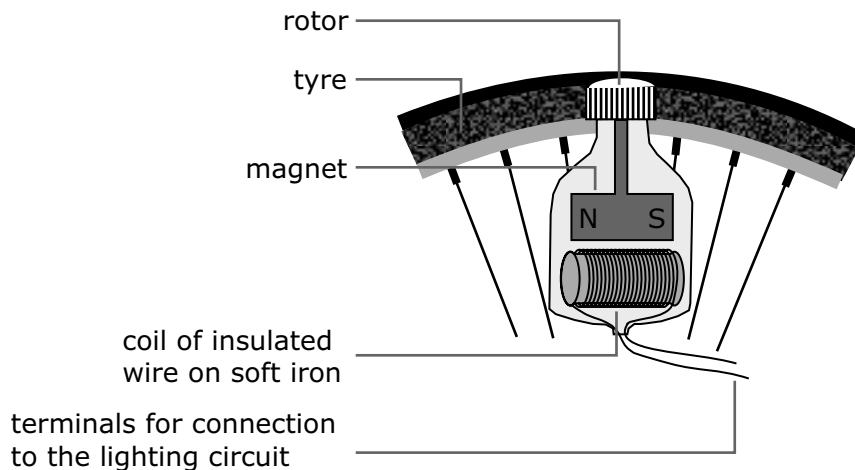
(b) The following diagram shows a way of demonstrating the effect in part (a).



(i) What would be the best type of meter for this demonstration?  
 \_\_\_\_\_ [2]

(ii) Give three ways of increasing the current produced in this demonstration.  
 1 \_\_\_\_\_ [1]  
 \_\_\_\_\_ [1]  
 2 \_\_\_\_\_ [1]  
 \_\_\_\_\_ [1]  
 3 \_\_\_\_\_ [1]  
 \_\_\_\_\_ [1]

(c) The following diagram shows the inside of a bicycle dynamo.



(i) Why must insulated wire be used to make the coil?  
 \_\_\_\_\_ [1]  
 (ii) Why is an iron core used?  
 \_\_\_\_\_ [1]

(iii) Complete the following boxes to show the **useful** energy transfer made by the dynamo.

_____ energy	into	_____ energy
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[2 marks]

(iv) [a] What is the name of the force which acts between the rotor and the moving tyre?

\_\_\_\_\_ [1]

[b] Give two effects this force will have on the bicycle.

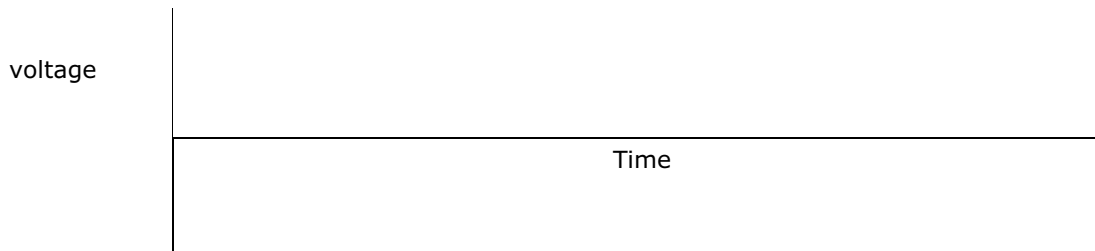
1 \_\_\_\_\_ [1]

2 \_\_\_\_\_ [1]

(d) The dynamo gives an alternating output.

(i) Complete the following sketch graph of voltage against time for an alternating output.

Show clearly what is one output cycle on your graph.



[2]

(ii) The output frequency is 8 Hz. How long does one cycle take to complete?

\_\_\_\_\_ [1]

(e) The generators used in power stations give alternating current. Explain why.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]



(d) The electricity supplied to our homes is at 50 hertz (Hz). Explain what this means.

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[3]

(e) When a lamp is switched on and is working normally it has a resistance of 1440 ohms ( $\Omega$ ).

(i) Calculate the current that will now through this lamp when it is used on a 240 volt supply.  
Write down the equation you are going to use. Then clearly show how you get to your answer.

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[4]

(ii) Calculate the power of this lamp.

Write down the equation you are going to use, then clearly show how you get to your answer.

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[4]

(iii) **Four** of these lamps are connected in series. Calculate their total electrical resistance.

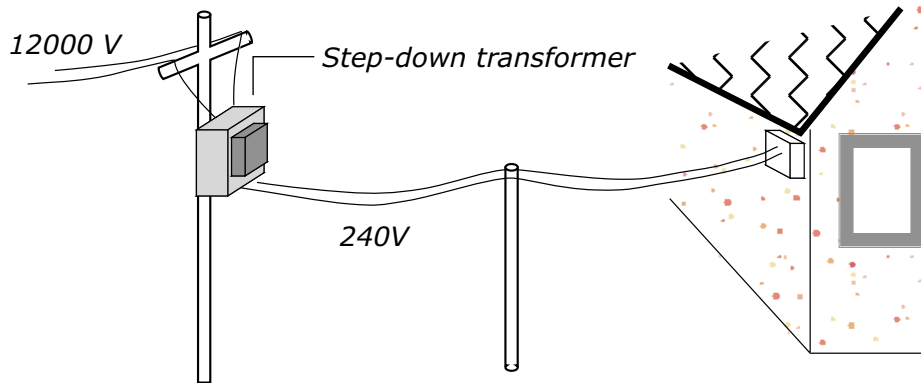
Write down the equation you are going to use.  
Then clearly show how you get to your answer.

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[2]

6 The drawing shows the final part of the system to supply a farmhouse with electricity. The transformer steps down an input of 12 000 V to an output of 240 V.



(a) What is the name of the system of power lines and transformers that connects all the power stations to all the consumers of electricity?

\_\_\_\_\_ [1]

(b) Explain why the electricity is not transmitted all the way from the power station at 240 V.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [4]

(c) Explain why the 12 000 V electricity supply is stepped down to 240 V before it is used in the farmhouse.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [4]

(d) Why must an alternating current be supplied to the transformer?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

(e) The number of turns on the secondary (output) coil of the transformer is 2000. Calculate the number of turns on the primary (input) coil of the transformer. Write down the equation you are going to use and show clearly how you get to your final answer.

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[3]

(f) In the farmhouse kitchen there is a 720 W electric food mixer which uses the 240 V supply.

(i) Calculate the current through the motor of the food mixer. Write down the equation you are going to use. Show clearly how you get to your answer and give the unit.

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[4]

(ii) Calculate the resistance of the motor of the food mixer. Write down the equation you are going to use. Show clearly how you get to your answer and give the unit.

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[4]

(g) When a food mixer, or any other machine, is used, some of the energy is transferred to the surroundings. Explain why it is almost impossible to make any further use of this energy.

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[2]