Name:

Date:

# P7 - Test 6
# MAGNETISM
# Advanced

**GCSE**

PHYSICS

AQA - Triple Science

Mark

Grade

## Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

## Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

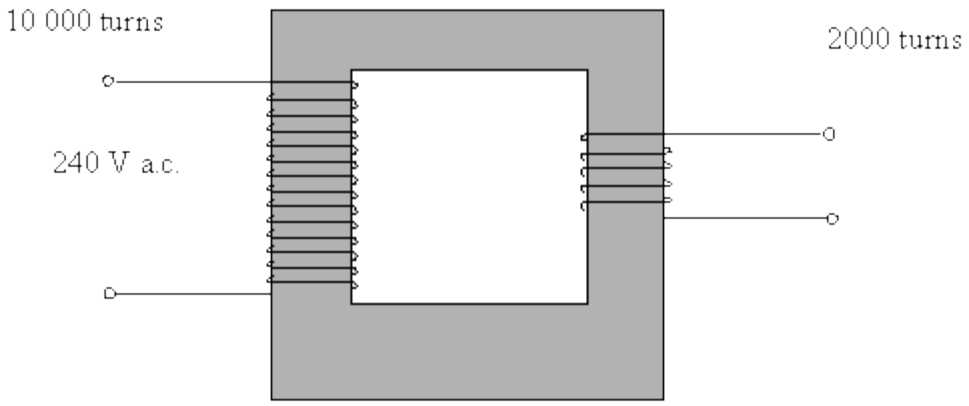
## Information

- The marks for the questions are shown in brackets


www.examqa.com

**1.** (a) An appliance in a house has a transformer. The transformer is used to reduce the voltage to the level needed by the appliance.

The diagram shows the transformer.




(i) Name the material used for the core of the transformer.

_____

**(1)**

(ii) The transformer has 10 000 turns on the input side and 2000 turns on the output side. If the mains voltage of 240 volts is applied to the input, calculate the output voltage. You may find the following information helpful:

$$\frac{\text{output voltage}}{\text{input voltage}} = \frac{\text{number of turns on output coil}}{\text{number of turns on input coil}}$$

_____

_____

_____

_____

**(3)**

(b) Explain, in terms of magnetic fields, how a transformer works.

_____

_____

_____

_____

_____

_____

**(4)**

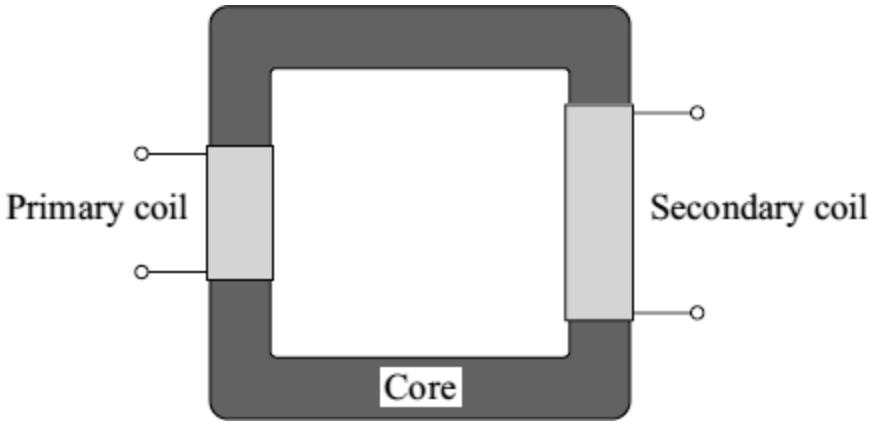
(c) A 12 V car battery is connected to the input leads of the transformer. It is hoped to reduce the voltage to 2.4 V in order to run a small motor. When the output voltage is measured it is found to be zero.

Explain why the output voltage is zero.

**(2)**

**(Total 10 marks)**

**2.** (a) The diagram shows the basic structure of a step-up transformer.




(i) What is the core made of?

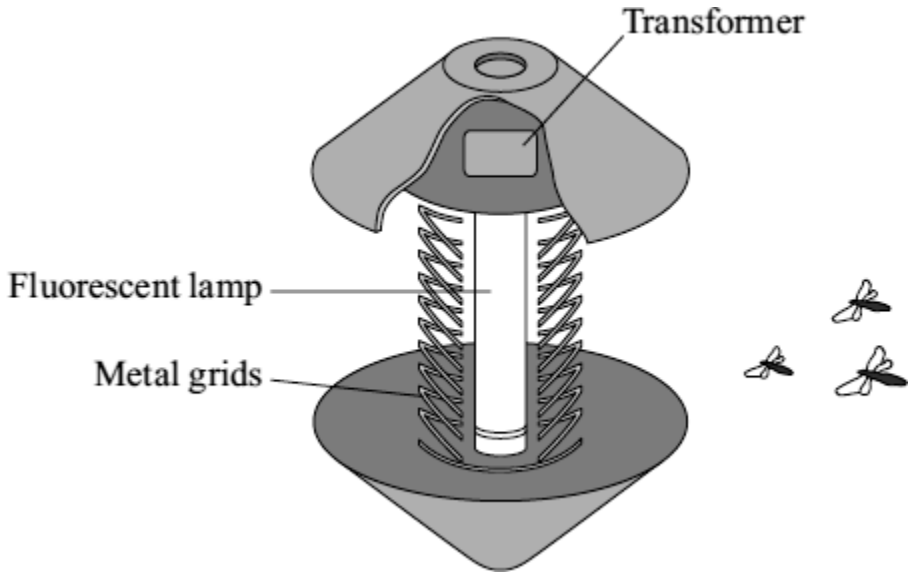
**(1)**

(ii) Explain how an alternating input produces an alternating output.

**(3)**

(b) Fly killers are used in kitchens and food stores because flying insects carry diseases which cause food poisoning.

The diagram shows the inside of one design. Insects are attracted to a fluorescent lamp. The metal grids have a high potential difference (p.d.) between them. The insects are killed as they fly between the grids.




A transformer is used in the fly killer. There is a p.d. of 230 V across the primary coil. There are 300 turns of wire on the primary coil and 4000 turns on the secondary coil.

Use the equation in the box to calculate the p.d. across the secondary coil.

$$\frac{\text{p.d. across primary}}{\text{p.d. across secondary}} = \frac{\text{number of turns on primary}}{\text{number of turns on secondary}}$$

Show clearly how you work out your answer.

Potential difference = _____ V

**(3)**

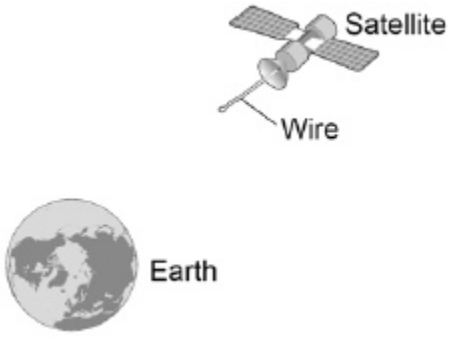
**(Total 7 marks)**

**3.** 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) What provides the force needed to keep a satellite in orbit around the Earth?

_____

**(1)**

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

_____

_____

_____

_____

_____

_____

_____

_____

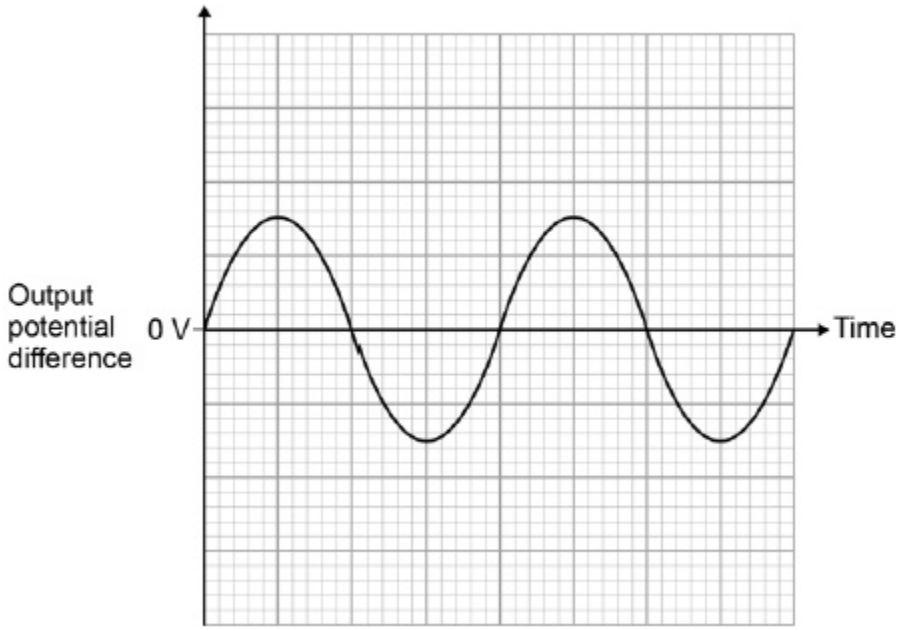
**(3)**

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**




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

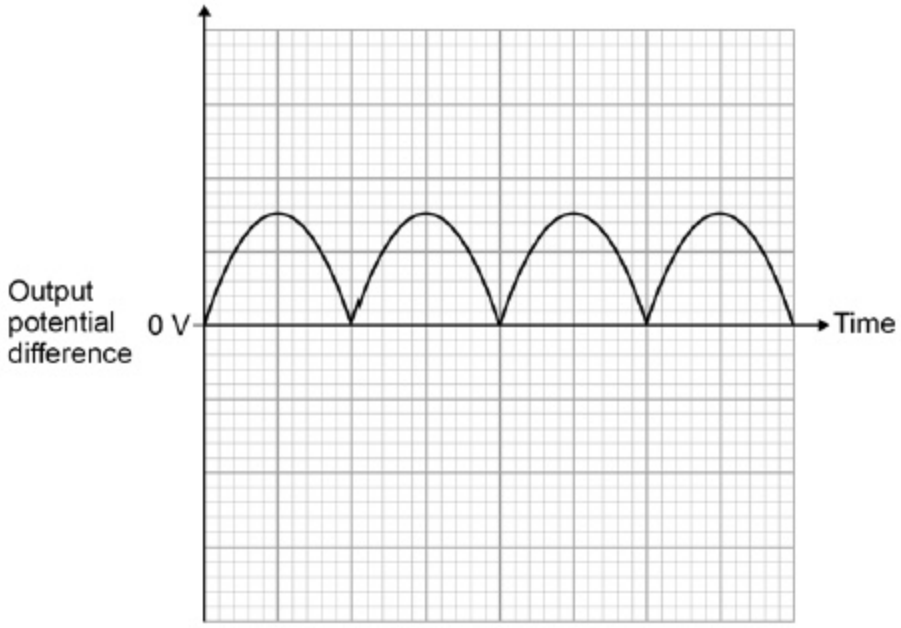
Draw on **Figure 2** to show how the output potential difference varies with time at this new frequency.

**(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**




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

_____

**(1)**

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

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

_____

_____

_____

**(1)**

(f) The charger used to charge the battery inside a laptop computer contains a small transformer.

The charger plugs into the mains electricity supply.

mains electricity supply = 230 V

number of turns on the primary coil of the transformer = 690

number of turns on the secondary coil of the transformer = 57

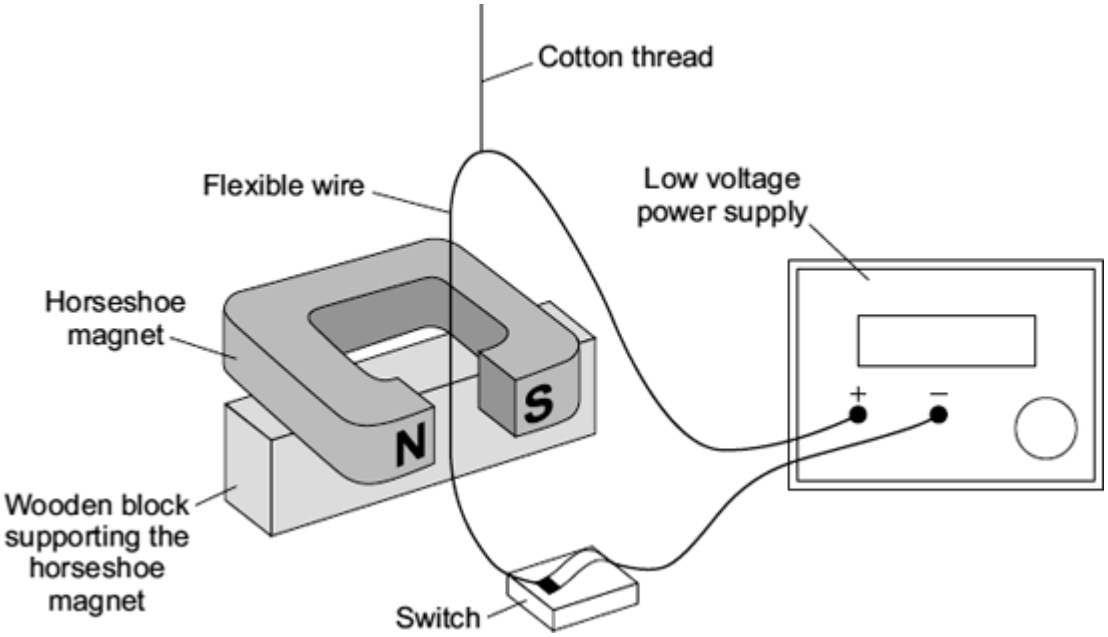
Calculate the potential difference applied by the charger across the battery inside the computer.

Potential difference = _____ V

**(3)**

**(Total 11 marks)**

**4.** (a) A laboratory technician sets up a demonstration.




A flexible wire is suspended between the ends of a horseshoe magnet. The flexible wire hangs from a cotton thread. When the switch is closed, the wire kicks forward.

Identify the effect which is being demonstrated.

_____

**(1)**

(b) A teacher makes some changes to the set-up of the demonstration.

What effect, if any, will each of the following changes have?

(i) more powerful horseshoe magnet is used.

_____

_____

**(1)**

(ii) The connections to the power supply are reversed.

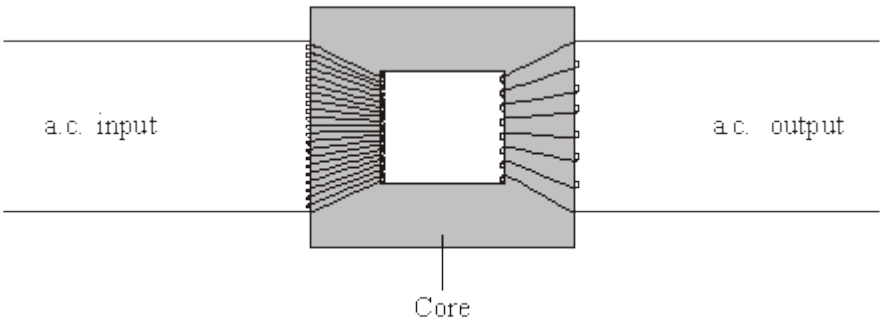
_____

_____

**(1)**

**(Total 3 marks)**

**5.** (a) The diagram shows a transformer.




(i) Is the transformer in the diagram being used as a step-up transformer or as a step-down transformer?

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

a step-up transformer ☐

a step-down transformer ☐

Explain your answer.

_____

_____

**(1)**

(ii) Why is insulated wire, and not uninsulated wire, used to make the coils?

_____

_____

**(1)**

(iii) Why is the core made of iron?

_____

_____

**(1)**

(b) A transformer has 500 turns on its primary coil and 7500 turns on its secondary coil. The potential difference across the primary coil is 150 volts.

Use the equation in the box to calculate the potential difference across the secondary coil.

$$\frac{\text{p.d. across primary}}{\text{p.d. across secondary}} = \frac{\text{number of turns on primary}}{\text{number of turns on secondary}}$$

Show clearly how you work out your answer.

Potential difference across the secondary coil = _____ volts

**(2)**

(c) Step-down transformers are used between power lines and people's houses.

Explain why.

**(2)**

(d) Before 1926, large towns had their own local power stations. After 1926, these power stations were connected to form the National Grid.

Explain the advantage of having a National Grid system.

**(2)**

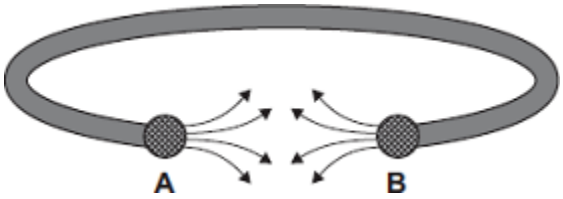
**(Total 9 marks)**

**6.** (a) Some people wear magnetic bracelets to relieve pain.

**Figure 1** shows a magnetic bracelet.

There are magnetic poles at both **A** and **B**.
Part of the magnetic field pattern between **A** and **B** is shown.

**Figure 1**



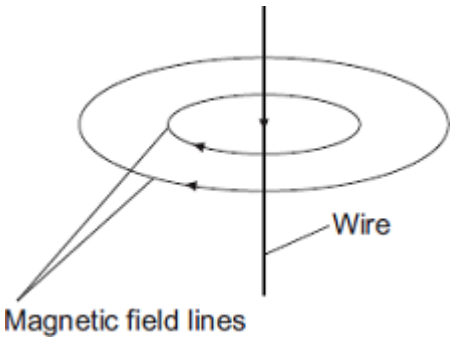

What is the pole at **A**? _____

What is the pole at **B**? _____

**(1)**

(b) **Figure 2** shows two of the lines of the magnetic field pattern of a current-carrying wire.

**Figure 2**




The direction of the current is reversed.

What happens to the direction of the lines in the magnetic field pattern?

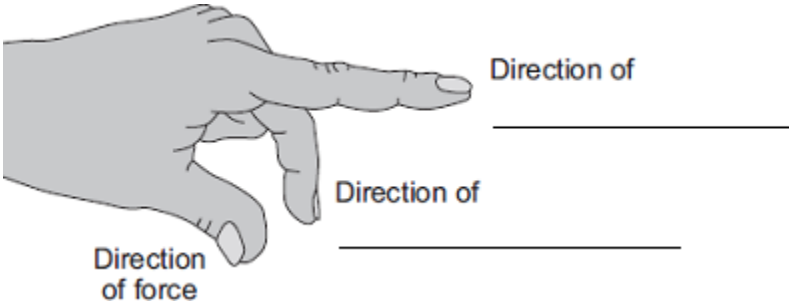
_____

**(1)**

(c) Fleming's left-hand rule can be used to identify the direction of a force acting on a current-carrying wire in a magnetic field.

(i) Complete the labels in **Figure 3**.

**Figure 3**

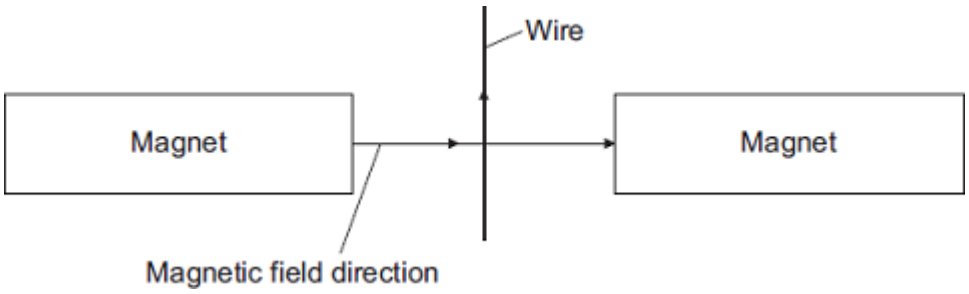



**(2)**

(ii) **Figure 4** shows:

- the direction of the magnetic field between a pair of magnets
- the direction of the current in a wire in the magnetic field.

**Figure 4**




In which direction does the force on the wire act?

_____

**(1)**

(iii) Suggest **three** changes that would **decrease** the force acting on the wire.

1. _____

2. _____

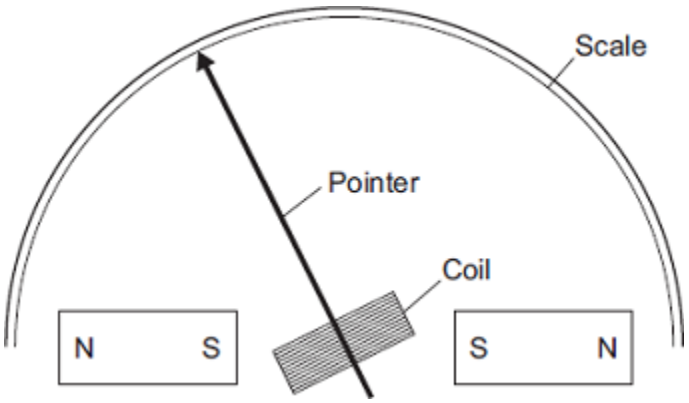
3. _____

**(3)**

(d) **Figure 5** shows part of a moving-coil ammeter as drawn by a student.

The ammeter consists of a coil placed in a uniform magnetic field.
When there is a current in the coil, the force acting on the coil causes the coil to rotate and the pointer moves across the scale.

**Figure 5**




(i) The equipment has **not** been set up correctly.

What change would make it work?

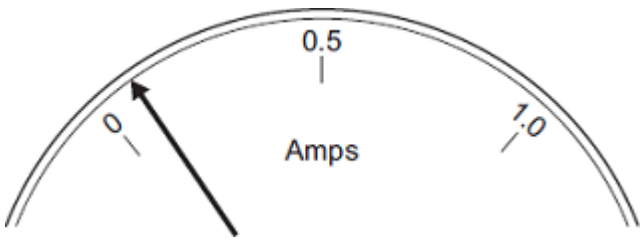
_____

_____

**(1)**

(ii) **Figure 6** shows the pointer in an ammeter when there is no current.

**Figure 6**




What type of error does the ammeter have?

_____

**(1)**

**(Total 10 marks)**

**7.** (a) This notice is on the back of a television set.


The transformer used in the television set has 75 turns on its primary coil. The potential difference (p.d.) across the primary coil is 230 volts and the p.d. across the secondary coil is 32 200 volts.

Use the equation below to calculate the number of turns on the secondary coil.

$$\frac{\text{p.d. across primary}}{\text{p.d. across secondary}} = \frac{\text{number of turns on primary}}{\text{number of turns on secondary}}$$

Show clearly how you work out your answer.

_____

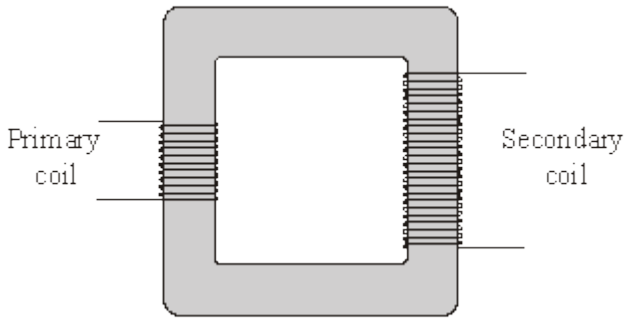
_____

_____

Number of turns on the secondary coil = _____

**(2)**

(b) The diagram shows the structure of a transformer.




Explain how the transformer works.

_____

_____

_____

_____

_____

_____

**(3)**

**(Total 5 marks)**