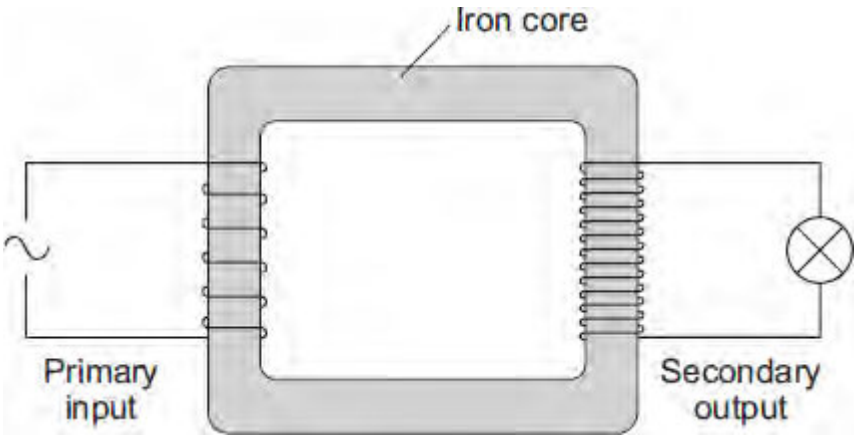
Q1. The diagram shows a transformer.



(a) (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 ☐

Give a reason for your answer.

.....

.....

(1)

(ii) Why is the core made of iron?

.....

.....

(1)

(b) The power supply to a laptop computer contains a transformer designed to change the 230 V mains input to a 15 V output. The transformer has 920 turns on its primary coil.

Use the equation in the box 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)

(Total 4 marks)

Q2. (a) In the National Grid, very large step-up transformers link power stations to the transmission cables.

A transformer used for this purpose has 800 turns on its primary coil and 12 800 turns on its secondary coil. The p.d. (potential difference) across its primary coil is 25 kV.

Use the equation in the box to calculate the p.d. across its 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 **and** give the unit.

.....

.....

p.d. across secondary coil = ...

(3)

(b) The primary and secondary coils of a transformer are made of insulated wire.

Why is this insulation necessary?

.....

.....

(1)

(c) Describe what happens when an alternating potential difference is applied across the primary coil of a transformer.

.....

.....

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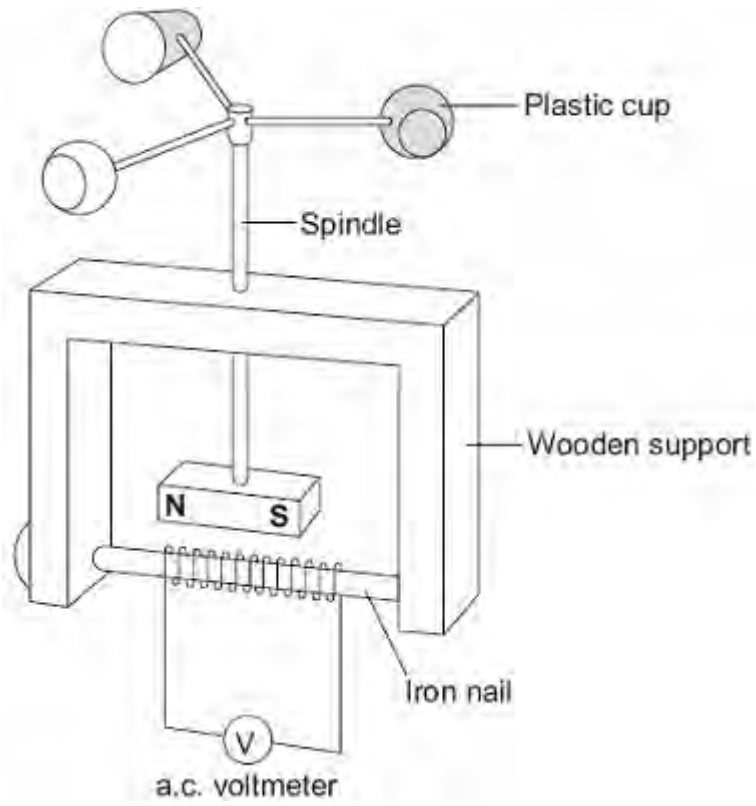
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(3)
(Total 7 marks)

Q3. 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.

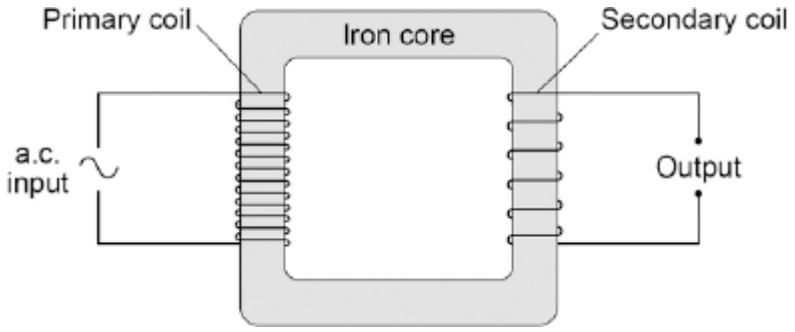
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(1)
(Total 4 marks)

Q4.Figure 1 shows the construction of a simple transformer.

Figure 1



(a) Why is iron a suitable material for the core of a transformer?

Tick **one** box.

It is a metal. ☐

It will not get hot. ☐

It is easily magnetised. ☐

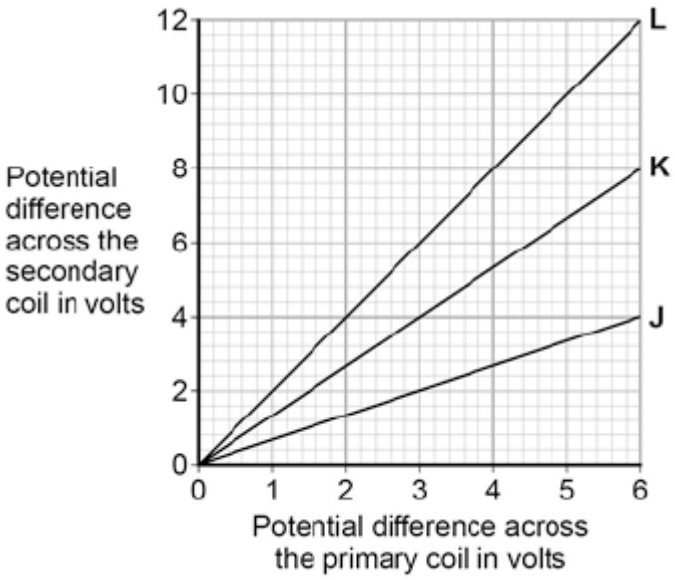
It is an electrical conductor. ☐

(1)

(b) A student makes three simple transformers, **J**, **K** and **L**.

Figure 2 shows how the potential difference across the secondary coil of each transformer varies as the potential difference across the primary coil of each transformer is changed.

Figure 2



How can you tell that transformer **J** is a step-down transformer?

.....

.....

(1)

(c) Each of the transformers has 50 turns on the primary coil.

Calculate the number of turns on the secondary coil of transformer **L**.

Use the correct equation from the Physics Equations Sheet.

.....

.....

.....

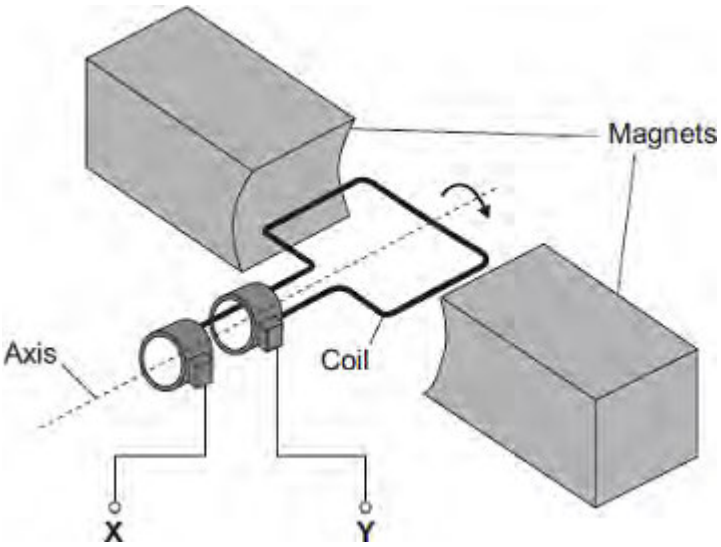
Number of turns on the secondary coil = ...

(3)

(Total 5 marks)

Q5. 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)

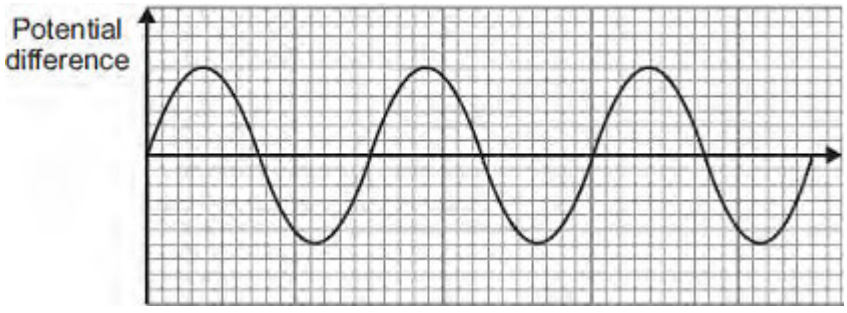
(iii) Name an instrument that could be used to measure the potential difference between **X** and **Y**.

.....

(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 .....

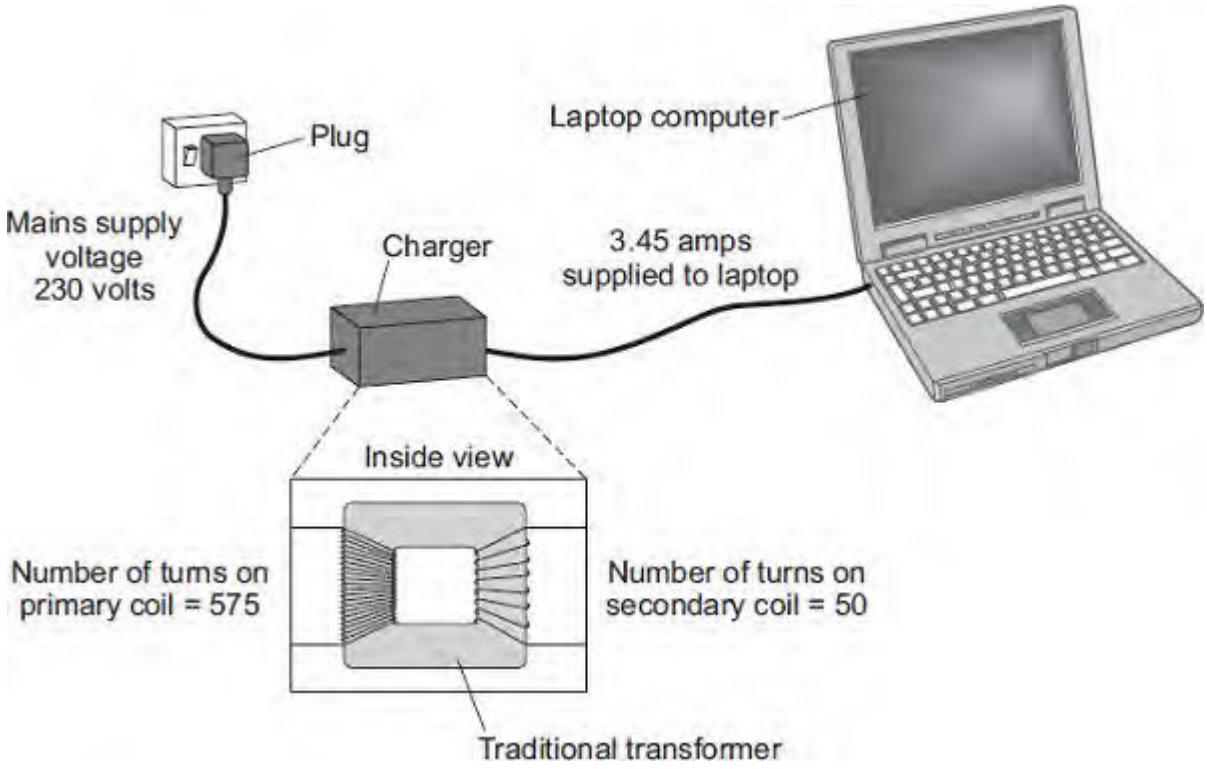
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2 .....

.....

(2)
(Total 8 marks)

Q6. Batteries inside laptop computers are charged using laptop chargers. The laptop charger contains a traditional transformer.



(a) The alternating current flowing through the primary coil of the transformer creates an alternating current in the secondary coil.

Explain how.

.....

.....

.....

.....

.....

.....

.....

.....

(3)

(b) (i) Use information from the diagram to calculate the potential difference the charger supplies to the laptop.

.....

.....

.....

.....

Potential difference = ... V

(2)

(ii) Calculate the current in the primary coil of the transformer when the laptop is being charged.

Assume the transformer is 100% efficient.

.....

.....

.....

.....

Current = ... A

(2)

(c) Laptop batteries and mobile phone batteries can only be recharged a limited number of times. After this, the batteries cannot store enough charge to be useful. Scientists are developing new batteries that can be recharged many more times than existing batteries.

Suggest **one** other advantage of developing these new batteries.

.....

.....

.....

(1)

(Total 8 marks)

Q7.In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

There are two types of traditional transformer; step-up and step-down.

Describe the similarities and differences between a step-up transformer and a step-down transformer.

You should include details of:

- construction, including materials used
- the effect the transformer has on the input potential difference (p.d.).

You should **not** draw a diagram.

.....

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Extra space .....

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.....

(Total 6 marks)

Q8. The current in a circuit depends on the potential difference (p.d.) provided by the cells and the total resistance of the circuit.

(a) Using the correct circuit symbols, draw a diagram to show how you would connect 1.5 V cells together to give a p.d. of 6 V.

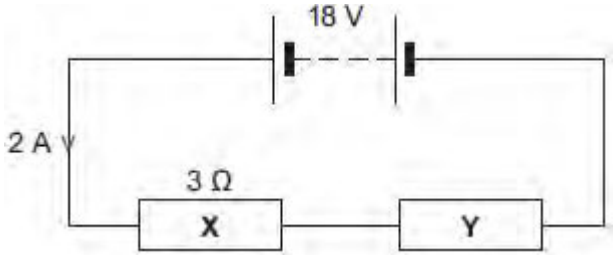
(2)

(b) **Figure 1** shows a circuit containing an 18 V battery.

Two resistors, **X** and **Y**, are connected in series.

- **X** has a resistance of 3 Ω.
- There is a current of 2 A in **X**.

Figure 1



(i) Calculate the p.d. across **X**.

.....

.....

P.d. across **X** = ... V

(2)

(ii) Calculate the p.d. across **Y**.

.....

.....

.....

P.d. across **Y** = ... V

(2)

(iii) Calculate the total resistance of **X** and **Y**.

.....

.....

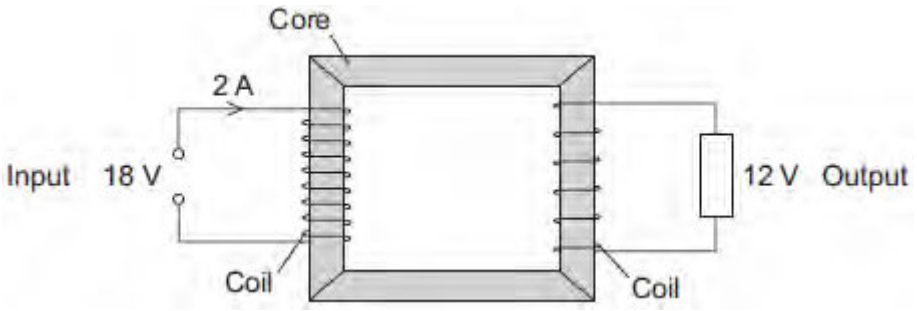
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Total resistance of **X** and **Y** = ... Ω

(2)

(c) **Figure 2** shows a transformer.

Figure 2



(i) An 18 V battery could **not** be used as the input of a transformer.

Explain why.

.....

.....

.....

.....

(2)

(ii) The transformer is 100% efficient.

Calculate the output current for the transformer shown in **Figure 2**.

.....

.....

.....

Output current = ... A

(2)

(Total 12 marks)