Q1.

(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.

____

____

p.d. across secondary coil = ______________________ volts

(2)

(Total 2 marks)

Q2.

(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)

(Total 2 marks)

Q3.

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.

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

____

____

____

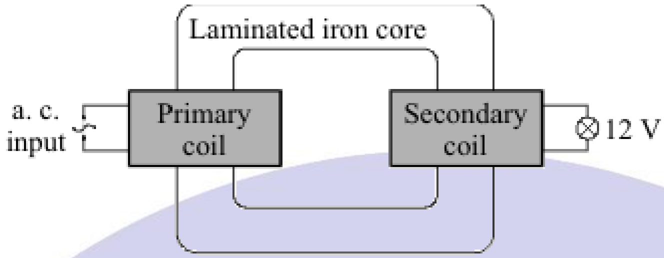
number of turns on the secondary coil = _____________

(2)

(Total 2 marks)

Q4.

The diagram represents a simple transformer used to light a 12 V lamp. When the power supply is switched on the lamp is very dim.



(a) The power station generates 100 MW of power at a voltage of 25 kV. Transformer **A**, which links the power station to the transmission cables, has 44 000 turns in its 275 kV secondary coil.

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

____

____

(1)

(ii) Calculate the number of turns in the primary coil of transformer **A**. Show clearly how you work out your answer.

____

____

____

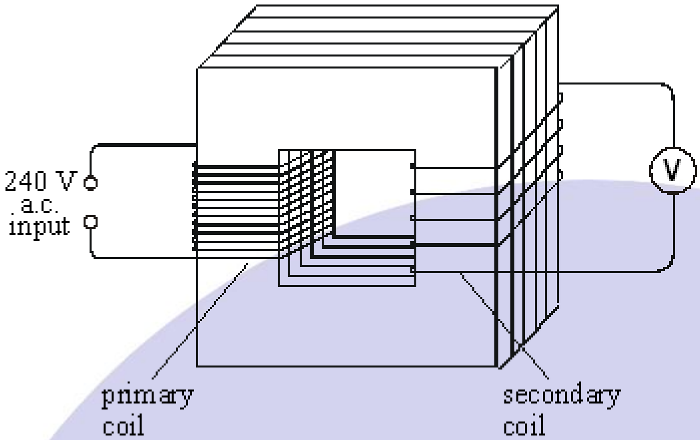
Number of turns = ____________________

(2)

(Total 3 marks)

Q5.

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.

____

____

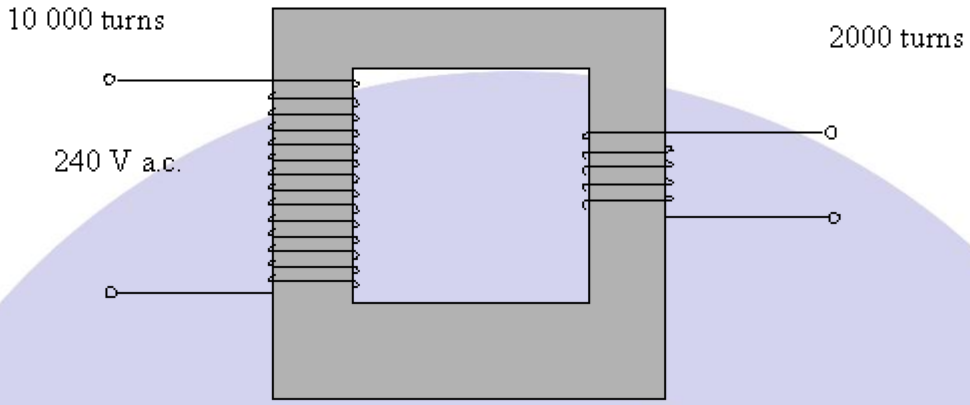
(1)

(Total 4 marks)

Q6.

(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:

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

____

____

____

____

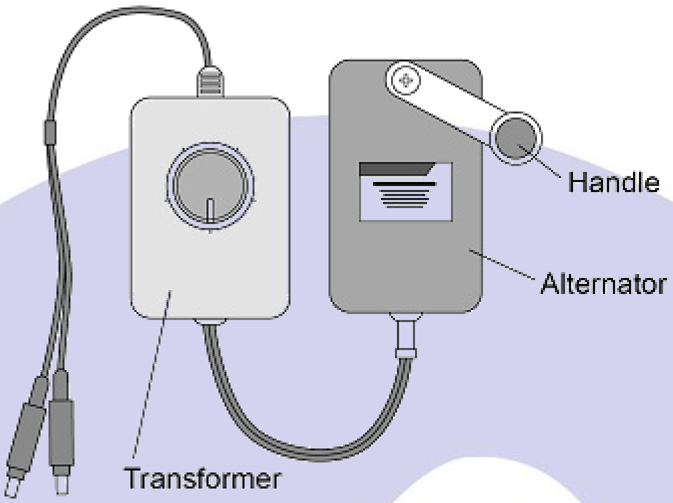
(3)

(Total 4 marks)

Q7.

Figure 1 shows a portable power supply.

Figure 1



(a) A lamp is connected to the power supply.

The lamp requires an input potential difference of 5.0 V.

The alternator generates a potential difference of 1.5 V.

The primary coil of the transformer has 150 turns.

Calculate the number of turns needed on the secondary coil.

____

____

____

____

____

____

Number of turns on the secondary coil = ________________

(3)

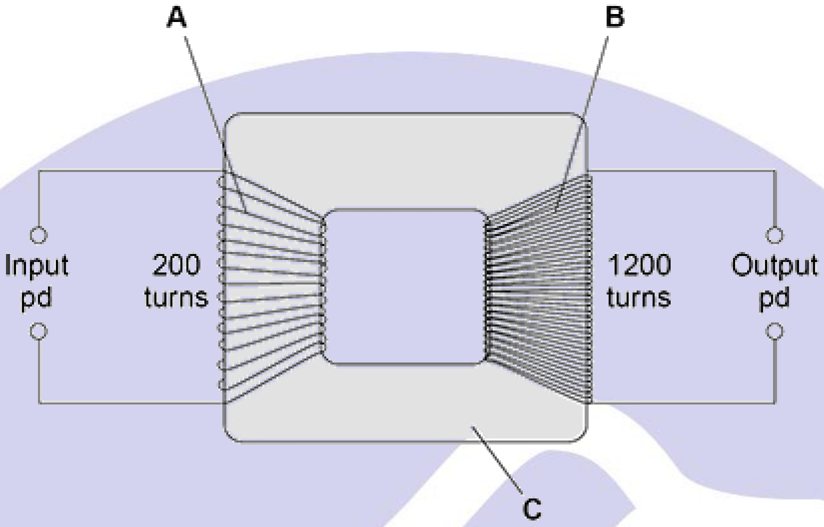
(Total 3 marks)

Q8.

The National Grid uses transformers to change potential difference (pd).

Figure 1 shows a transformer.

Figure 1



(a) Identify the parts of the transformer labelled in **Figure 1**.

A ________________________________

B ________________________________

C ________________________________

(2)

(b) There is an alternating input pd of 230 V.

Determine the output pd.

Use the Physics Equations Sheet.

____

____

____

____

____

Output pd = ____________ V

(3)

(Total 5 marks)

Q9.

(a) A small step-down transformer is used in the charger for an electric screwdriver.

The input to the transformer is 230 V a.c. mains supply and the output is 5.75 V a.c. There are 3200 turns on the primary coil.

Use the equation in the box to calculate the number of turns on the transformer's 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.

____

____

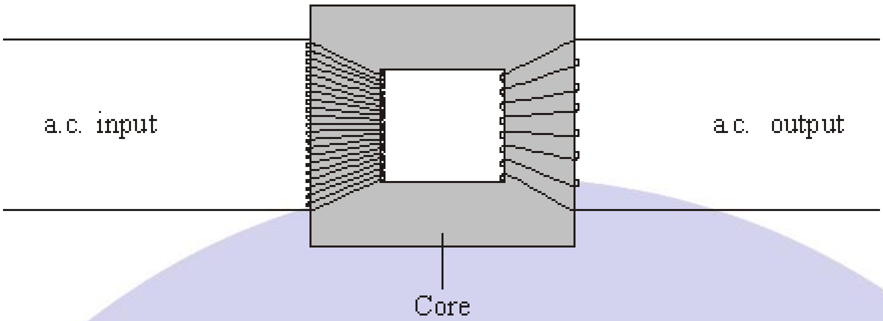
Number of turns = ______________

(2)

(Total 2 marks)

Q10.

(a) The diagram shows a transformer.



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)

(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.

____

____

____

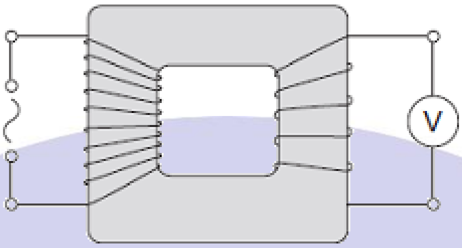
Potential difference across the secondary coil = _______________ volts

(2)

(Total 3 marks)

Q11.

The diagram shows a transformer with a 50 Hz (a.c.) supply connected to 10 turns of insulated wire wrapped around one side of the iron core.
A voltmeter is connected to 5 turns wrapped around the other side of the iron core.



(a) What type of transformer is shown in the diagram?

Draw a ring around the correct answer.

step-down **step-up** **switch mode**

(1)

(b) The table shows values for the potential difference (p.d.) of the supply and the voltmeter reading.

p.d. of the supply in volts	Voltmeter reading in volts
6.4	3.2
3.2	
	6.4

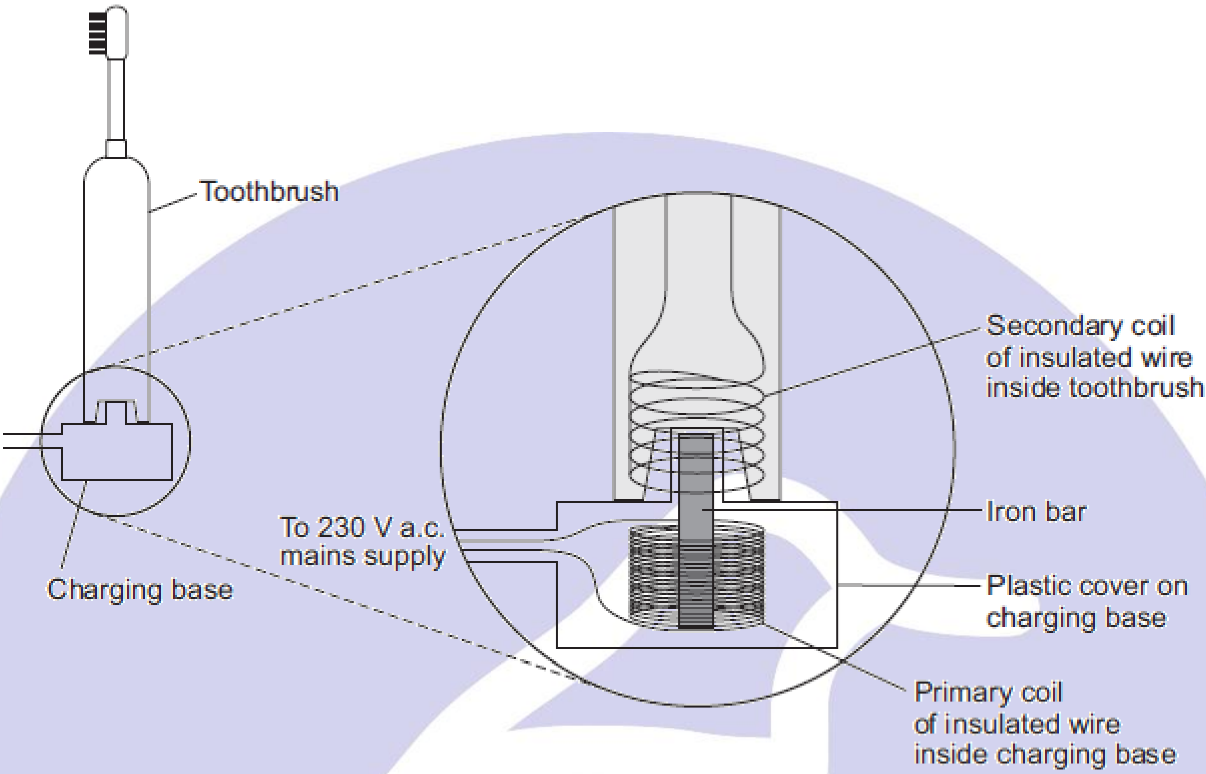
(i) Complete the table.

(2)

(Total 3 marks)

Q12.

An electric toothbrush is charged by standing it on a separate charging base.
The diagram shows the inside of the electric toothbrush and the charging base.



(a) When the toothbrush is being charged, the p.d. across the primary coil in the charging base is 230 V.

The charging p.d. across the secondary coil in the toothbrush is 7.2 V.

The primary coil in the charging base has 575 turns of wire on its coil.

Calculate the number of turns on the secondary coil inside the toothbrush.

____

____

____

____

Number of turns on the secondary coil = ____________________

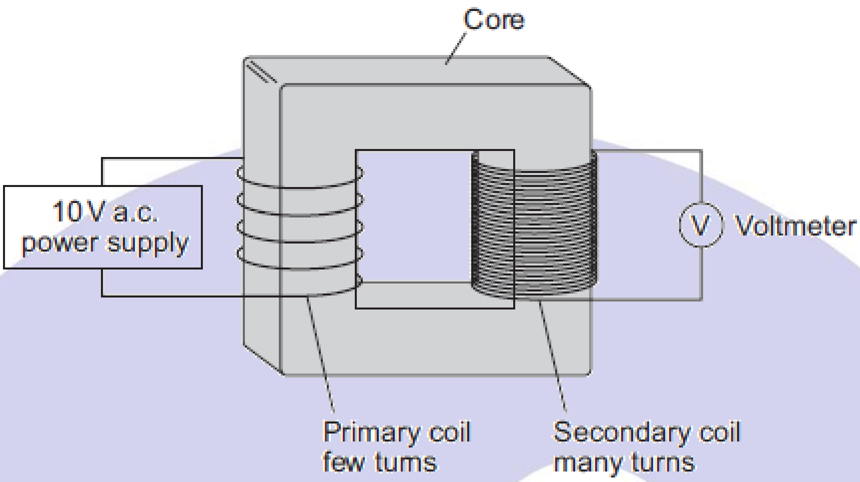
(2)

(Total 5 marks)

Q13.

Figure 1 shows a traditional transformer.

Figure 1



(a) (i) Which metal should the core of the transformer be made from?

Tick (✓) **one** box.

aluminium ☐

copper ☐

iron ☐

(1)

(ii) What would the reading be on the voltmeter shown in **Figure 1**?

Draw a ring around the correct answer.

2 V **10 V** **50 V**

Give the reason for your answer.

____

____

(2)

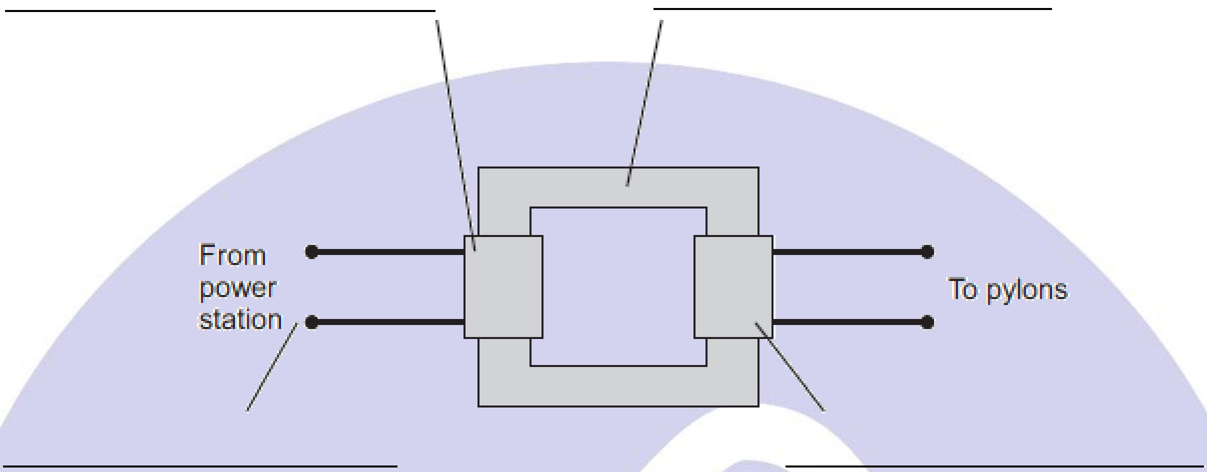
(Total 3 marks)

Q14.

Transformers are used to change potential differences (p.d.) in the National Grid.

Figure 1 shows a step-up transformer that is used at a power station.

Figure 1



(a) (i) Use words from the box to label **Figure 1**.

Input p.d.	**Iron core**	**Output p.d.**
Primary coil		**Secondary coil**

(4)

(ii) One of the coils in **Figure 1** has a p.d. of 25 kV across it and has 1000 turns.

The other coil has a p.d. of 400 kV across it.

Calculate the number of turns on this other coil.

____

____

____

____

Number of turns = ________________________

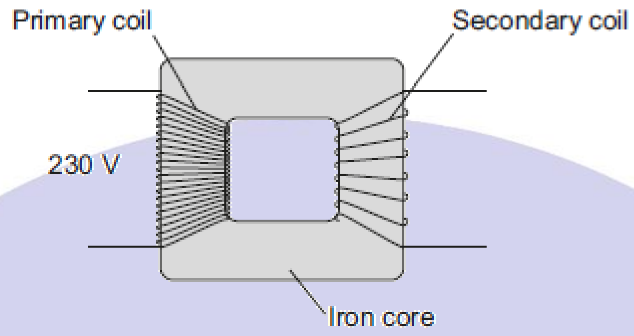
(2)

(Total 6 marks)

Q15.

Figure 1 shows the structure of a traditional transformer.

Figure 1



(a) There is an alternating current in the primary coil of the transformer.

State what is produced in the iron core.

___

___

(2)

(b) A transformer has only **one** turn of wire on the secondary coil.
The potential difference across the secondary coil is 11.5 V
The potential difference across the primary coil is 230 V

Calculate the number of turns on the primary coil.

___

___

___

___

Number of turns on the primary coil = ______

(2)

(Total 4 marks)

Q16.

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

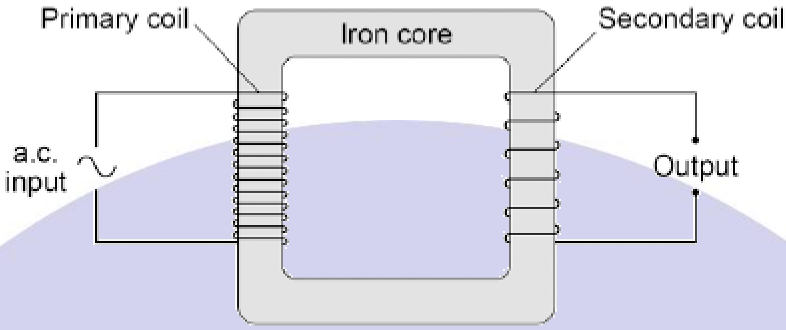
(3)

(Total 3 marks)

Q17.

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. ☐

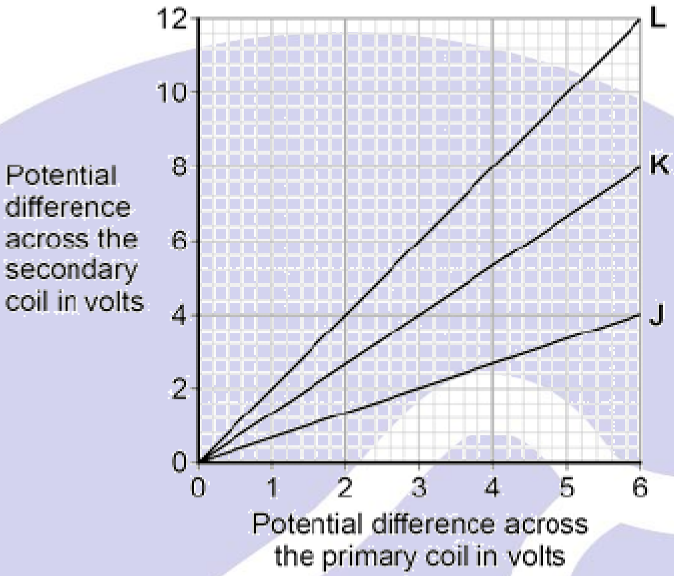
It is an electrical conductor. ☐

(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.

____

____

____

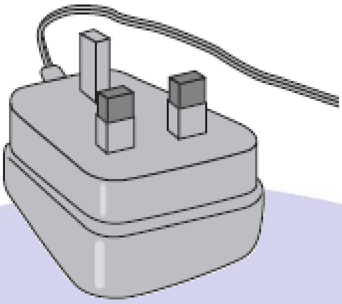
Number of turns on the secondary coil = ________________

(3)

(Total 5 marks)

Q18.

(a) The drawing shows the plug for operating a radio from the mains.



This plug contains a transformer. There are 4600 turns on its primary coil and 200 turns on its secondary coil. The plug is used on the mains supply and has a potential difference (p.d.) of 230 V across its primary coil.

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

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

Show clearly how you work out your answer.

____

____

____

____

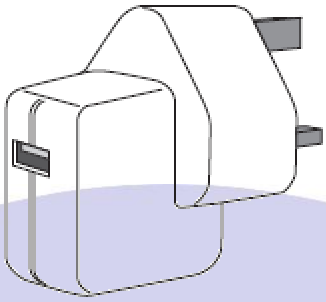
p.d. across secondary = ____________________ V

(2)

(Total 2 marks)

Q19.

The diagram shows a USB power adapter which plugs into a 230 V a.c. mains socket.



The adapter contains a small step-down transformer.

There are 500 turns on one coil of the transformer and 20 000 turns on the other 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 and give the unit.

___

___

___

p.d. across the secondary = ___

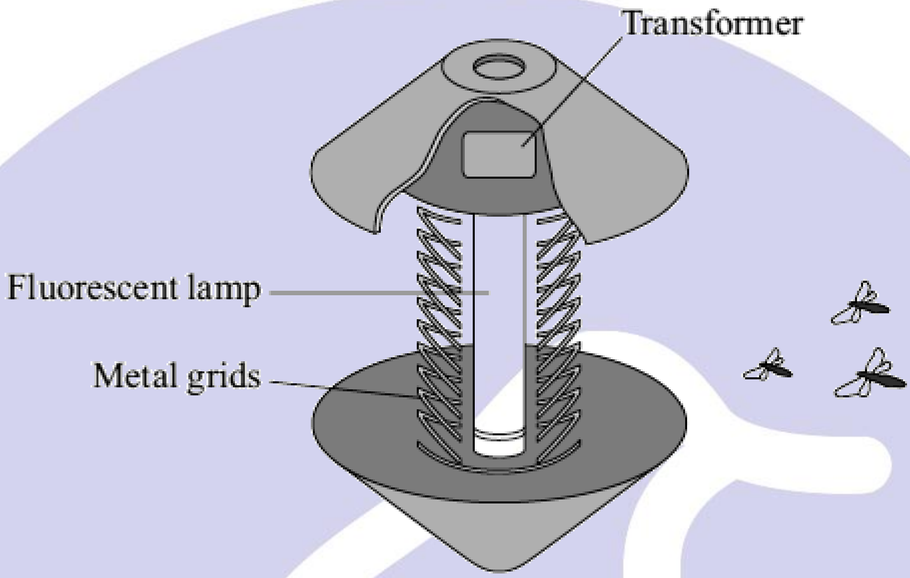
(3)

(Total 3 marks)

Q20.

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 3 marks)

Q21.

(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.

____

____

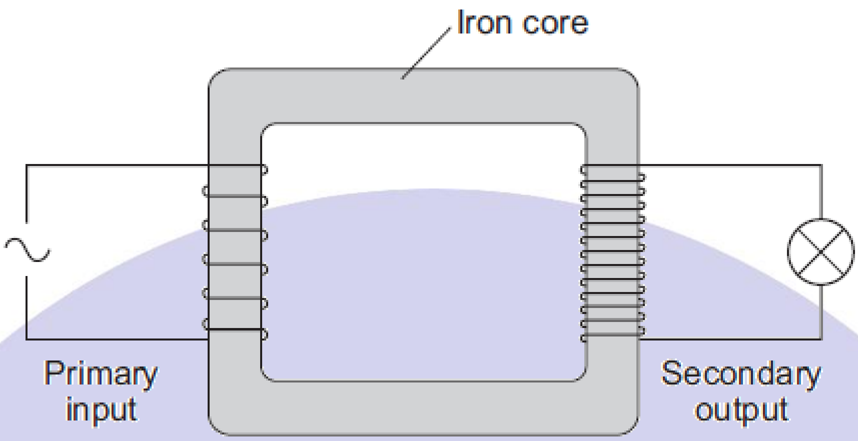
p.d. across secondary coil = ______________________________

(3)

(Total 3 marks)

Q22.

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.

____

____

____

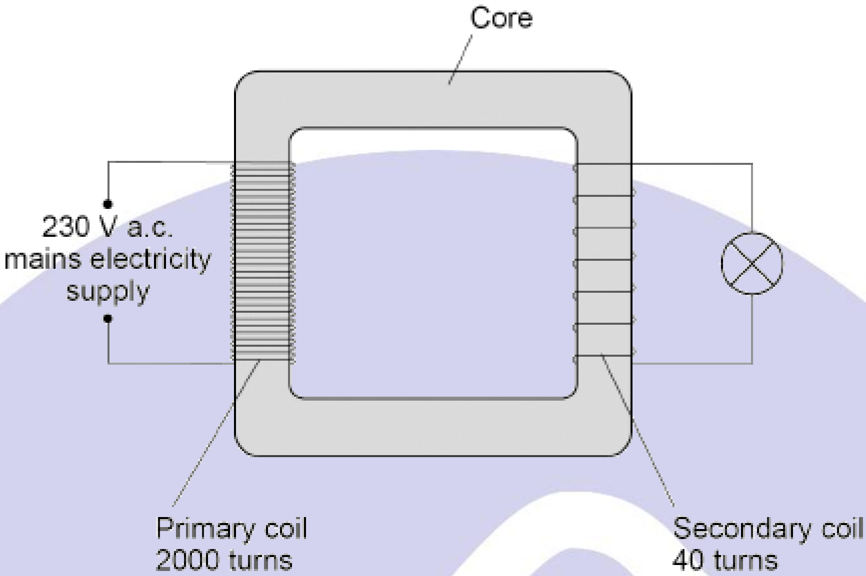
Number of turns on the secondary coil = ____________________

(2)

(Total 4 marks)

Q23.

The figure below shows a transformer used to power a lamp using the mains electricity supply.



Determine the current in the secondary coil when the power output of the transformer is 6.9 W.

The transformer is 100% efficient.

Use the Physics Equations Sheet.

____

____

____

____

____

____

____

____

____

Current in the secondary coil = ____________________ A

(5)

(Total 5 marks)