1(a). Fig. 22.1 shows a diagram of a simple electric motor.

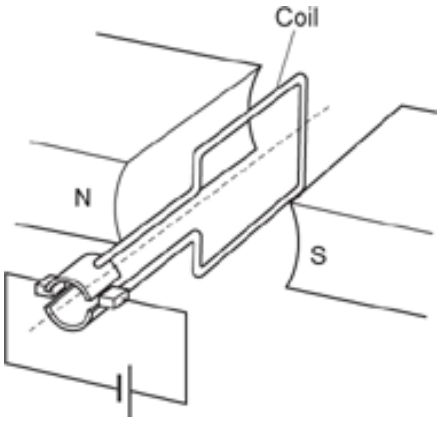


Fig. 22.1

Explain why the coil rotates when a current passes through it.

_____

_____

_____**[2]**

(b).

i. **Fig. 22.2** shows a diagram of a dynamo and **Fig. 22.3** shows a diagram of an alternator.

Describe **two similarities** and **two differences** between how these devices work.

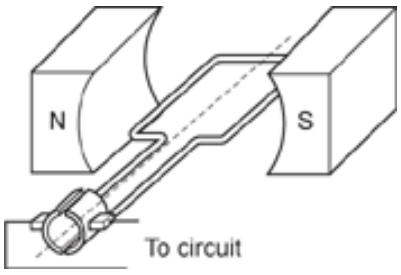


Fig. 22.2

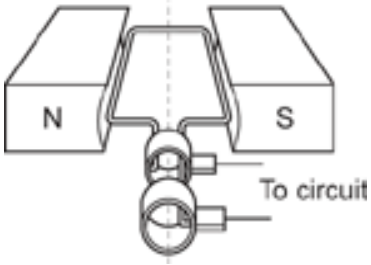


Fig. 22.3

Similarities

1 _____

2 _____

Differences

1 _____

2 _____ **[4]**

ii. Suggest **one** way to increase the output of these devices.

_____ **[1]**

(c). A conductor in a magnetic field of magnetic flux density 1.5 T experiences a force of 0.81 N.

The current in the conductor is 1.2 A.

Calculate the length of the conductor.

Use the Equation Sheet.

Length = ... m **[3]**

2. Which devices convert current variations in electrical circuits into pressure variations in sound waves?

A Loudspeakers and headphones
B Loudspeakers and microphones
C Microphones and headphones
D Microphones only

Your answer ☐ **[1]**

3(a). Explain **two** similarities and **two** differences between the operation of a loudspeaker and the operation of a microphone.

Similarities

_____

_____

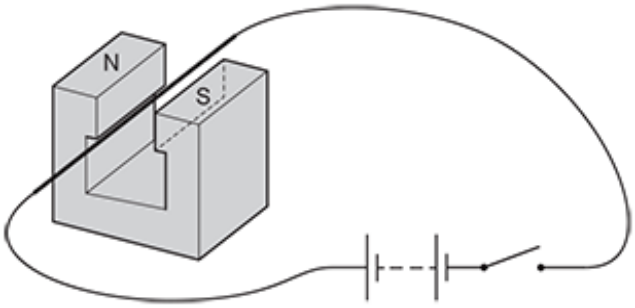
_____

Differences

---

[4]

(b). The diagram shows a current-carrying wire in the magnetic field between the North pole and the South pole of a magnet.



Describe and explain what happens to the wire when the switch is **closed**.

---**[3]**

(c). A current of 5.0 A passes through a wire with a length of 0.75 m.

The wire is in a field of magnetic flux density 0.30 T.

Calculate the force acting on the wire.

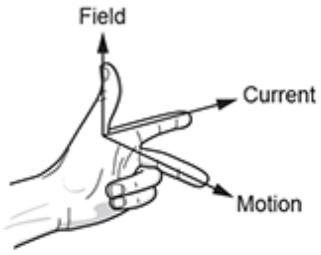
Give your answer to **2** significant figures.

Use the Equation Sheet June 23 J249-01-02-03-04.

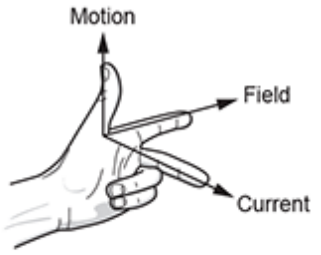
Force = ... N **[3]**

4. Which diagram shows the correct thumb and finger labels when using Fleming's left-hand rule?

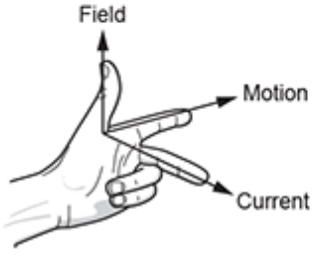
A



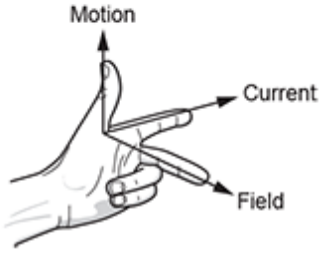
B



C

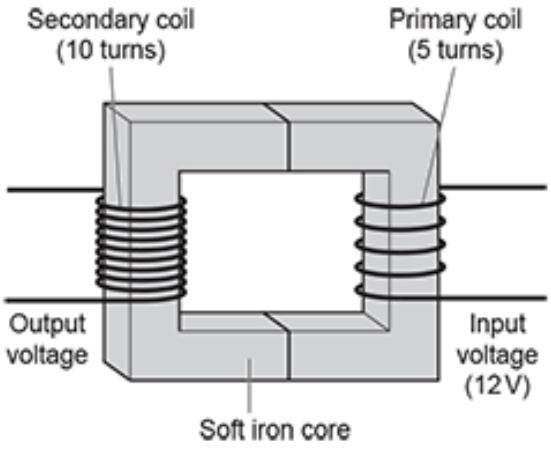


D



Your answer ☐ **[1]**

5. A teacher makes a model transformer as shown in the diagram.



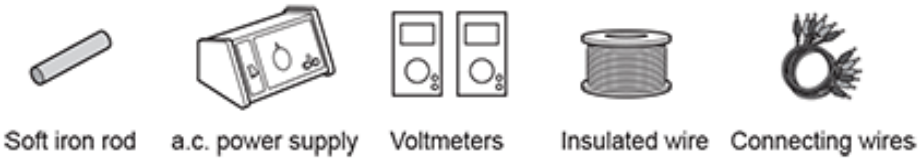
Which row gives the correct type of transformer and its output voltage?

	Type of transformer	Output voltage (V)
A	step-down	6.0
B	step-down	24
C	step-up	6.0
D	step-up	24

Your answer ☐ **[1]**

6(a). A student investigates how the potential difference across the secondary coil of a transformer changes with the number of turns on the secondary coil.

The diagram shows the student's equipment.



Describe a method that the student uses to obtain valid results.

You can include a labelled diagram to support your answer.

[4]

(b). A transformer is used to change the potential difference (p.d.) of a supply.

The table shows the data for this transformer.

Number of turns on the primary coil	3540
Number of turns on the secondary coil	300
p.d. across primary coil	230 V
Current in secondary coil	4.62 A

i. Calculate the p.d. across the secondary coil of the transformer.

Use the Equation Sheet June 23 J249-01-02-03-04.

p.d. across the secondary coil = ... V **[3]**

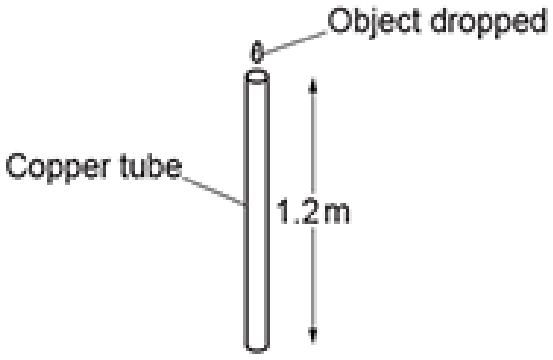
ii. Calculate the current in the primary coil of the transformer.

Use the Equation Sheet June 23 J249-01-02-03-04.

Current in primary coil = ... A **[3]**

7(a). A student drops a piece of metal and a small magnet through a vertical copper tube. They record the time taken for each object to pass through the tube.

The diagram shows how they set up the experiment.



The student records their results in a table.

	Time taken to fall through the copper tube (s)					
	1	**2**	**3**	**4**	**5**	**Mean**
Magnet	1.13	1.11	1.12	1.11	1.13	
Metal	0.44	0.45	0.46	0.44	0.43	0.4444

i. Calculate how many times longer it took the magnet to fall compared to the piece of metal.

Number of times longer: ..... **[1]**

ii. Calculate the mean speed of the metal through the copper tube.

Write your answer to **2** significant figures.

Use the equation: distance travelled = speed × time

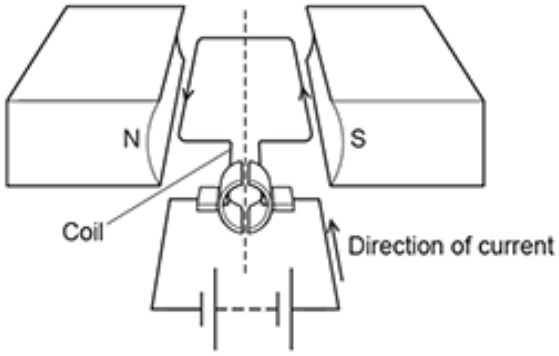
Mean speed = ... m / s **[4]**

(b). Explain why the magnet took longer to fall than the piece of metal.

Include ideas about electromagnetic induction in your answer.

[3]

8(a). A student investigates a simple electric motor as shown in the diagram.



i. Suggest why the coil turns when a current flows.

_____

[1]

ii. In which direction will this motor turn?
State the name of the rule you used to work this out.

Direction _____

Name of rule _____

[2]

(b). Suggest two ways in which the size of the force on the coil could be increased.

1 _____

2 _____

[2]

END OF QUESTION PAPER