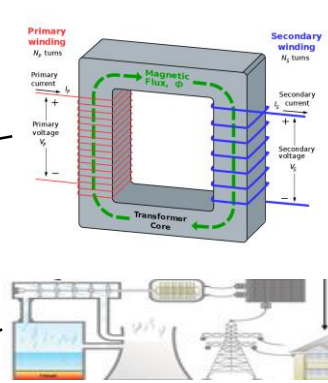**PiXL** Partners in excellence

| From power stations | *Electrical energy is transferred at high voltages* | Improves the efficiency by reducing heat loss in transmission lines. |
| To homes, factories and buildings | *Electrical energy is transferred at lower voltages* | Makes it safer for appliances and users |

Step-up transformers	Step-down transformers
Increase voltage, decrease current	*Decrease voltage, increase current*
Increases efficiency, reduces heat loss.	Makes safer for houses.

| Electromagnetic induction | *The induction of potential difference across an electrical conductor which is affected by a change in an external magnetic field.* |

p.d. can be induced in two ways:
- Moving the conductor in a magnetic field
- Changing or moving the magnetic field

| National Grid | *Distributes electricity generated in power stations around UK* |

| Transformers | *Change the size of alternating voltage* |
| Made up of two coils of insulated wire wound on an iron core. | |

Alternating current in the primary coil creates a magnetic field, which is constantly changing.

The magnetic field is carried to the secondary coil by The iron core.

HIGHER ONLY

The National Grid

HIGHER ONLY

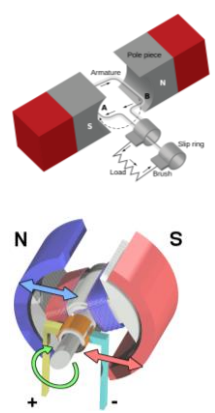| Factors affecting size of induction | Depends on:
• Number of turns in a coil
• The strength of magnetic field
• How fast the wire moves or the magnetic field changes. |

Reversing the magnetic field, reverses the direction of the induced p.d.

| Step-up transformers | *More turns on secondary coil* | Potential difference increases |
| Step-down transformers | *More turns on primary coil* | Potential difference decreases |

The magnetic field induces a changing potential difference in the secondary coil.

Electromagnetic induction

EDEXCEL TOPIC 13 ELECTROMAGENIC INDUCTION

PHYSICS HIGHER ONLY

A changing magnetic field can induce a p.d. in a wire. Current then flows.

PHYSICS HIGHER ONLY

$V_P \div V_S = N_P \div N_S$

A coil is used so there is more wire in the changing magnetic field.

Potential difference across primary coil ÷ Potential difference across secondary coil = Number of turns on primary coil ÷ Number of turns on secondary coil

| Generators | *Coil of wire rotating inside a magnetic field. The end of the coil is connected to slip rings.* | Produces altering current. |
| Dynamo | *Coil of wire rotating inside a magnetic field. A commutator switches over the connection every half turn.* | Produces direct current. |

Rotating electromagnetic surrounded by coils of wire.

Large scale generators work in the same way in power stations.

Transformers and energy

Potential difference across primary coil X current in primary coil = Potential difference across secondary coil X current in secondary coil
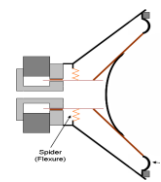
$V_P \times I_P = V_S \times I_S$

| Loud speakers | *Converts variations in electrical current into sound waves .* | Varying current flows through a coil that is in a magnetic field. A force on the wire moves backwards and forwards as current varies. Coil connected to a diaphragm. Diaphragm movements produce sound waves. |

| Microphones | *Converts pressure variations in sound waves into variations in current in electrical circuits.* |

PHYSICS HIGHER ONLY

Transmitting power at high voltage is more efficient

Use these questions to prove this.

Power = Energy transferred ÷ time taken

Electrical Power = Current X Potential difference

Power = Current squared X Resistance

PiXL
Partners in excellence

PiXL Science

Electrical energy is transferred at high voltages	Improves the efficiency by reducing heat loss in transmission lines.
Electrical energy is transferred at lower voltages	Makes it safer for appliances and users
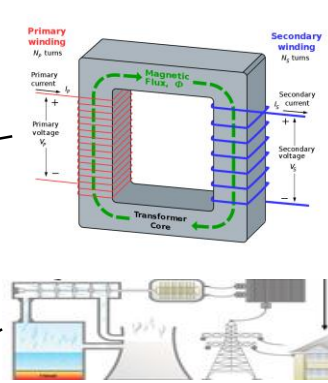
Increase voltage, decrease current	**Decrease voltage, increase current**
Increases efficiency, reduces heat loss.	Makes safer for houses.

	The induction of potential difference across an electrical conductor which is affected by a change in an external magnetic field.

p.d. can be induced in two ways:
- Moving the conductor in a magnetic field
- Changing or moving the magnetic field

Distributes electricity generated in power stations around UK

Alternating current in the primary coil creates a magnetic field, which is constantly changing.

	Change the size of alternating voltage
	Made up of two coils of insulated wire wound on an iron core.

The magnetic field is carried to the secondary coil by The iron core.

	Depends on:
	- Number of turns in a coil - The strength of magnetic field - How fast the wire moves or the magnetic field changes.

Reversing the magnetic field, reverses the direction of the induced p.d.

HIGHER ONLY

HIGHER ONLY

The National Grid

More turns on secondary coil	Potential difference increases
More turns on primary coil	Potential difference decreases

The magnetic field induces a changing potential difference in the secondary coil.

Electromagnetic induction

PHYSICS HIGHER ONLY

A changing magnetic field can induce a p.d. in a wire. Current then flows.

A coil is used so there is more wire in the changing magnetic field.

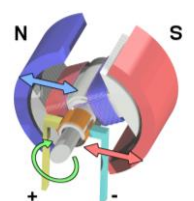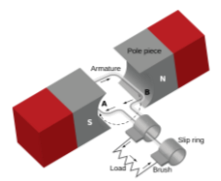**EDEXCEL TOPIC 13 ELECTROMAGENIC INDUCTION**

PHYSICS HIGHER ONLY

$V_P \div V_S = N_P \div N_S$

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	Coil of wire rotating inside a magnetic field. The end of the coil is connected to slip rings.	Produces altering current.
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Rotating electromagnetic surrounded by coils of wire.

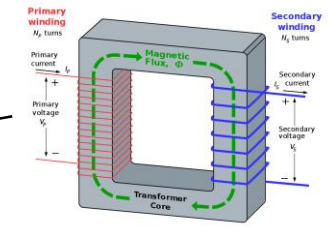Large scale generators work in the same way in power stations.

Transformers and energy

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$V_P \times I_P = V_S \times I_S$

	Converts variations in electrical current into sound waves .	Varying current flows through a coil that is in a magnetic field. A force on the wire moves backwards and forwards as current varies. Coil connected to a diaphragm. Diaphragm movements produce sound waves.

	Converts pressure variations in sound waves into variations in current in electrical circuits.

PHYSICS HIGHER ONLY

Transmitting power at high voltage is more efficient
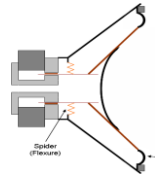
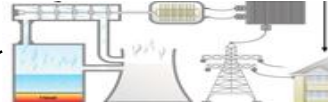*Use these questions to prove this.*

Power = Energy transferred ÷ time taken

Electrical Power = Current X Potential difference

Power = Current squared X Resistance

|	Step-up transformers	Step-down transformers
From power stations		
To homes, factories and buildings		

Electromagnetic induction

Factors affecting size of induction

Reversing the

A changing magnetic field

A coil is

National Grid

HIGHER ONLY
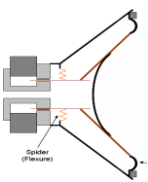
Electromagnetic induction

PHYSICS HIGHER ONLY

The National Grid

EDEXCEL TOPIC 13 ELECTROMAGENIC INDUCTION

HIGHER ONLY

Transformers

Alternating current

The magnetic field

Step-up transformers		
Step-down transformers		

The magnetic field

PHYSICS HIGHER ONLY

$V_P \div V_S = N_P \div N_S$

Potential difference across primary coil

Generators

Dynamo
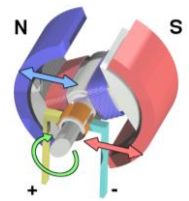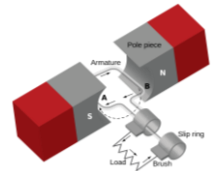
Rotating electromagnetic

Large scale generators

Transformers and energy

Potential difference across primary coil

$V_P \times I_P = V_S \times I_S$

Microphones

Loud speakers

PHYSICS HIGHER ONLY

Transmitting power

Use these questions to prove this.

Power =

Electrical Power =

Power =
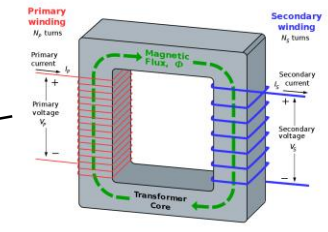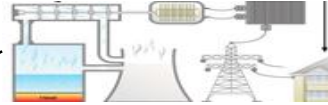
Alternating current

The magnetic field

The magnetic field

HIGHER ONLY

The National Grid

HIGHER ONLY

HIGHER ONLY

Electromagnetic induction

Reversing

PHYSICS HIGHER ONLY

A changing magnetic field

A coil

EDEXCEL TOPIC 13 ELECTROMAGENIC INDUCTION

PHYSICS HIGHER ONLY

$V_P \div V_S = N_P \div N_S$
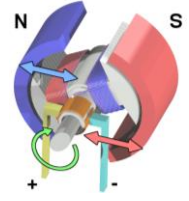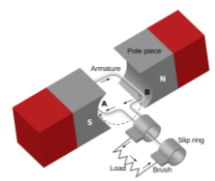
Rotating

Large scale generators

Transformers and energy

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PHYSICS HIGHER ONLY

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