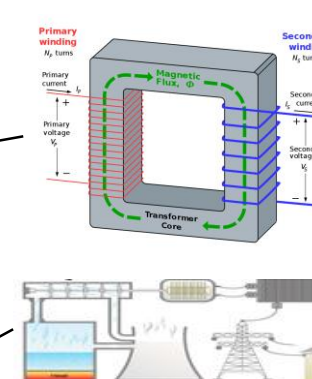


From power stations	<i>Electrical energy is transferred at high voltages</i>	Improves the efficiency by reducing heat loss in transmission lines.
To homes, factories and buildings	<i>Electrical energy is transferred at lower voltages</i>	Makes it safer for appliances and users



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

Electromagnetic induction	<i>The induction of potential difference across an electrical conductor which is affected by a change in an external magnetic field.</i>
p.d. can be induced in two ways:	
<ul style="list-style-type: none"> <li>Moving the conductor in a magnetic field</li> <li>Changing or moving the magnetic field</li> </ul>	

Factors affecting size of induction	Depends on:
	<ul style="list-style-type: none"> <li>Number of turns in a coil</li> <li>The strength of magnetic field</li> <li>How fast the wire moves or the magnetic field changes.</li> </ul>

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

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.

**HIGHER ONLY**

**Electromagnetic induction**

**PHYSICS HIGHER ONLY**

**EDEXCEL TOPIC 13 ELECTROMAGNETIC INDUCTION**

**The National Grid**

**National Grid**

*Distributes electricity generated in power stations around UK*

**HIGHER ONLY**

**Transformers**

*Change the size of alternating voltage*

Made up of two coils of insulated wire wound on an iron core.

Step-up transformers	<i>More turns on secondary coil</i>	Potential difference increases
Step-down transformers	<i>More turns on primary coil</i>	Potential difference decreases

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.

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

**PHYSICS HIGHER ONLY**

$$V_p \div V_s = N_p \div N_s$$

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

**Transformers and energy**

Potential difference across primary coil X current in primary coil = Potential difference across secondary coil X current in secondary coil

$$V_p \times I_p = V_s \times I_s$$

**PHYSICS HIGHER ONLY**

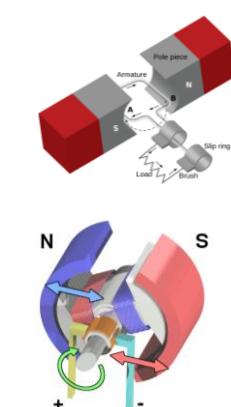
Transmitting power at high voltage is more efficient

*Use these questions to prove this.*

Power = Energy transferred ÷ time taken

Electrical Power = Current X Potential difference

Power = Current squared X Resistance



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

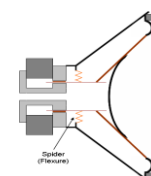
Rotating electromagnetic surrounded by coils of wire.

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

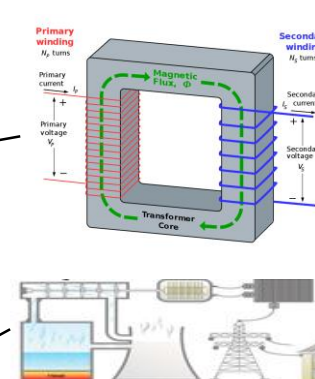
Loud speakers	<i>Converts variations in electrical current into sound waves.</i>	Varying current flows through a coil that is in a magnetic field. A force on the wire moves backwards and forwards as current varies. Coil connected to a diaphragm. Diaphragm movements produce sound waves.
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**Microphones**

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



	<b>Electrical energy is transferred at high voltages</b>	Improves the efficiency by reducing heat loss in transmission lines.
	<b>Electrical energy is transferred at lower voltages</b>	Makes it safer for appliances and users



	<b>Increase voltage, decrease current</b>	<b>Decrease voltage, increase current</b>
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**Distributes electricity generated in power stations around UK**

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Depends on:

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

**HIGHER ONLY**

**Electromagnetic induction**

**The National Grid**

**HIGHER ONLY**

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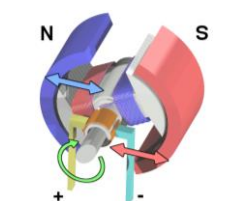
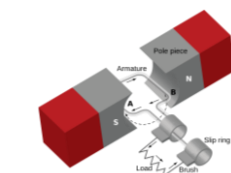
**PHYSICS HIGHER ONLY**

**EDEXCEL TOPIC 13 ELECTROMAGNETIC INDUCTION**

**PHYSICS HIGHER ONLY**

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**Transformers and energy**

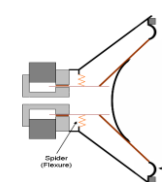
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**Converts pressure variations in sound waves into variations in current in electrical circuits.**



**PHYSICS HIGHER ONLY**

Transmitting power at high voltage is more efficient

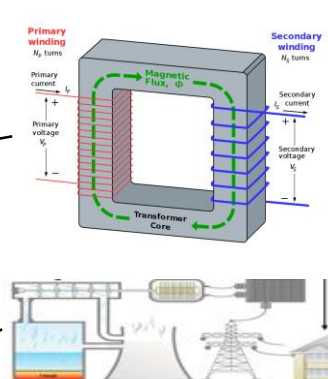
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From power stations		
To homes, factories and buildings		



Step-up transformers	Step-down transformers

Electromagnetic induction	

National Grid	
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Transformers	

Alternating current
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Factors affecting size of induction	
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**HIGHER ONLY**

**Electromagnetic induction**

**The National Grid**

**HIGHER ONLY**

Step-up transformers		
Step-down transformers		

The magnetic field
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The magnetic field
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Reversing the

A changing magnetic field

A coil is

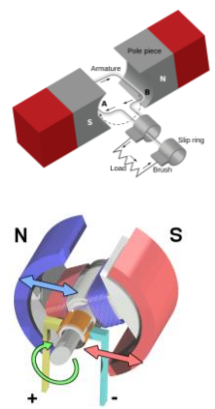
**PHYSICS HIGHER ONLY**

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**PHYSICS HIGHER ONLY**

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Potential difference across primary coil



Generators		
Dynamo		

Rotating electromagnetic

Large scale generators

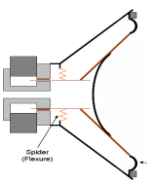
**Transformers and energy**

Potential difference across primary coil

$$V_p \times I_p = V_s \times I_s$$

Loud speakers		
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Microphones	
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**PHYSICS HIGHER ONLY**

Transmitting power

*Use these questions to prove this.*

Power =

Electrical Power =

Power =

