

CAIE Physics A-level

21 - Alternating Currents

Flashcards

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What is the magnitude of the power dissipated in a resistor?



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I^2R , IV or V^2/R



What is the current and voltage for AC?
What is the peak current and voltage?



What is the current and voltage for AC? What is the peak current and voltage?

$$I = I_0 \sin \omega t, \text{ at its peak is } I = I_0$$

$$V = V_0 \sin \omega t, \text{ at its peak is } V = V_0$$



How can you work out the root mean squared (rms) value from the peak value? What does the rms value mean for an AC voltage/current?



How can you work out the root mean squared (rms) voltage from the peak value? What does the rms value mean for an AC voltage/current?

$$V_{\text{rms}} = V_0 / \sqrt{2}$$

The rms value is effectively an average voltage/current value of a varying AC. It is the equivalent DC voltage/current, of a sinusoidal AC supply.



How does the mean power of passing through a component, in a circuit with an AC supply, compare to its peak power?



How does the mean power of passing through a component, in a circuit with an AC supply, compare to its peak power?

$$I_{\text{rms}} = I_0 / \sqrt{2}$$

$$P = I^2 R$$

$$P_{\text{Peak}} = I_0^2 R, P_{\text{Mean}} = (I_0 / \sqrt{2})^2 R = I_0^2 R / 2$$

$$P_{\text{Mean}} = P_{\text{Peak}} / 2$$

The mean power is half the max. power passing through an AC component.

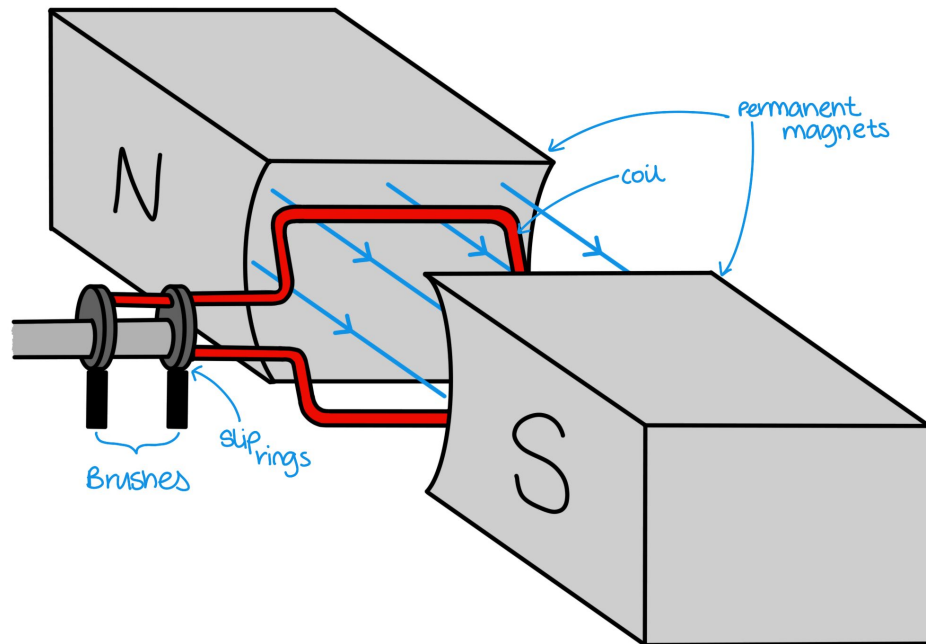


What is the structure of a simple A.C. generator?



What is the structure of a simple A.C. generator?

A rectangular coil which spins in a uniform magnetic field.



What is rectification?

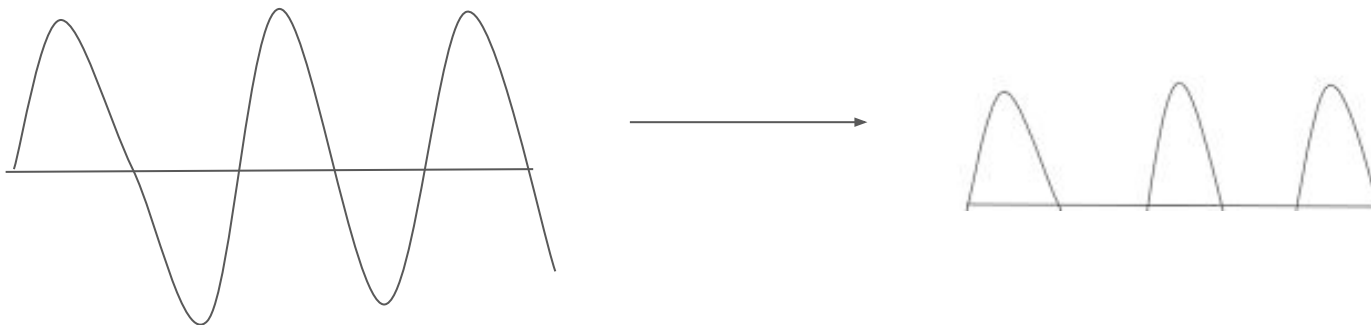
Rectification is the process of converting AC to DC.



What is Half-Wave Rectification?



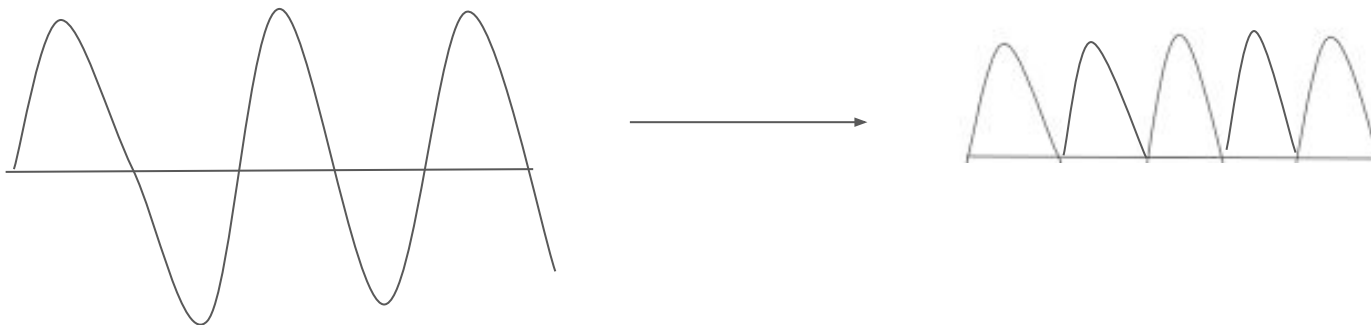
What is Half-Wave Rectification?



What is Full-Wave Rectification?



What is Full-Wave Rectification?



How is a single diode able to achieve half-wave rectification but not full-wave rectification?



How is a single diode able to achieve half-wave rectification but not full-wave rectification?

Diodes are components that only allow current to flow through them in a single direction. This naturally facilitates half but not complete rectification.



Can diodes be used to achieve full-wave rectification?



Can diodes be used to achieve full-wave rectification?

Yes,

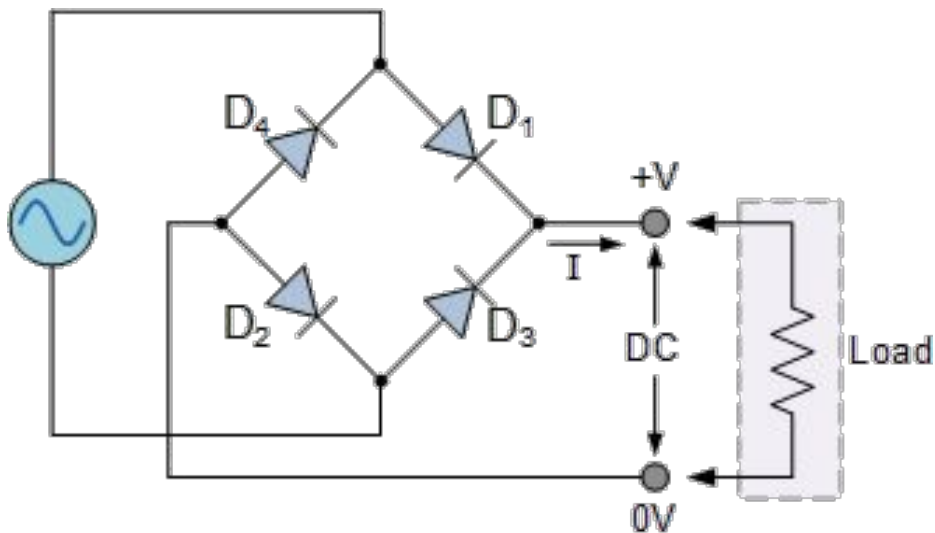
one arrangement that facilitates full wave rectification is the four diode bridge rectifier.



Construct a circuit drawing of a four diode bridge rectifier?



Construct a circuit drawing of a four diode bridge rectifier?

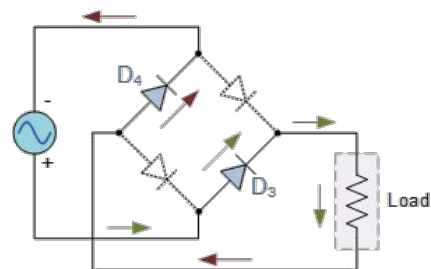
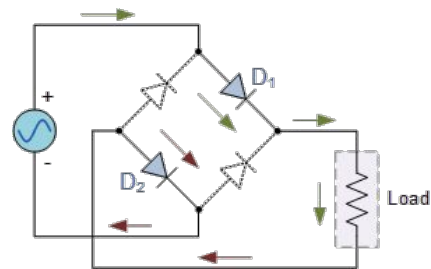


How does the bridge rectifier work? Use circuit diagrams to help you explain.



How does the bridge rectifier work? Use circuit diagrams to help you explain.

In the first (positive) half cycle of the alternating supply, Diodes D_1 and D_2 allow current to pass through. In the second (negative) half cycle, Diodes D_3 and D_4 allow current to pass through. As a result, both positive and negative cycles can be rectified.



Why are capacitors sometimes added to circuits that involve a bridge rectifier, when converting AC into DC?



Why are capacitors sometimes used in series with a bridge rectifier, when converting AC into DC?

Capacitors act to smooth the “bumpy” signal outputted by the bridge rectifiers.



How do capacitors smooth a rectified signal?



How do capacitors smooth a rectified signal?

The capacitor is charged as the current outputted by the bridge rectifier increases.

As the current output decreases the capacitor discharges.



How would the capacitor be connected in the circuit and what might a smoothed signal look like?



How would the capacitor be connected in the circuit and what might a smoothed signal look like?

The capacitor should be connected in parallel with the rectifier and with the current/voltage output.

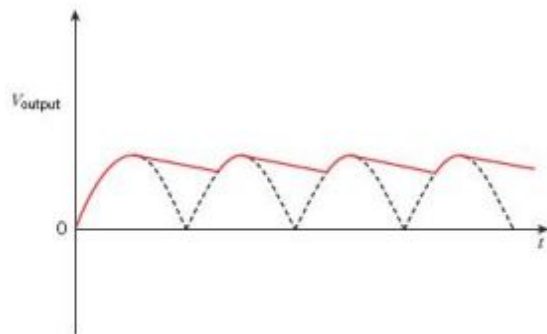
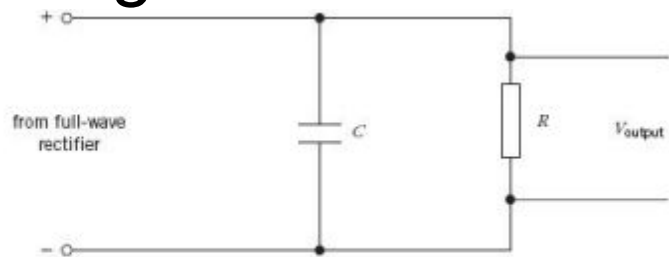


Figure 24.8 Smoothing by capacitor



A smoother DC signal is produced when the capacitance of the smoothing capacitor is _____.



A smoother DC signal is produced when the capacitance of the smoothing capacitor is _____.

A smoother DC signal is produced when the capacitance of the smoothing capacitor is **higher**.



The smoothness of the DC signal is _____ by the load resistance, the _____ only affects the magnitude of the DC produced, whereby a smaller DC is produced if the load resistance is _____.



The smoothness of the DC signal is _____ by the load resistance, the _____ only affects the magnitude of the DC produced, whereby a smaller DC is produced if the load resistance is _____.

The smoothness of the DC signal is **unaffected** by the load resistance, the **load resistance** only affects the magnitude of the DC produced, whereby a smaller DC is produced if the load resistance is **larger**.

