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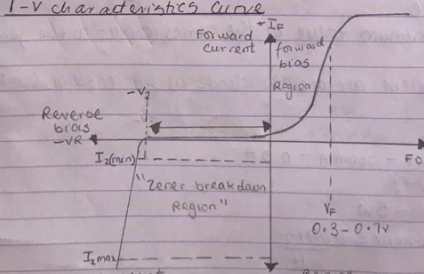
Answer.

1. Describe a zener diode regulator and:
   i Sketch the symbol and I-V characteristics curve
   ii Sketch and label the circuit diagram.

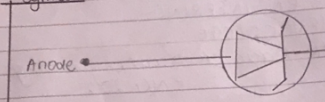
1a The zener diode or "Breakdown diode" as they are sometimes called, are basically the same as the standard PN junction diode but are specially designed to have a low predetermined Reverse breakdown voltage that takes advantage of this high reverse voltage. Zener diodes are heavily doped than ordinary diodes. They are used in 'reverse bias' or reverse breakdown mode.

i Sketch the symbol and I-V characteristics curve

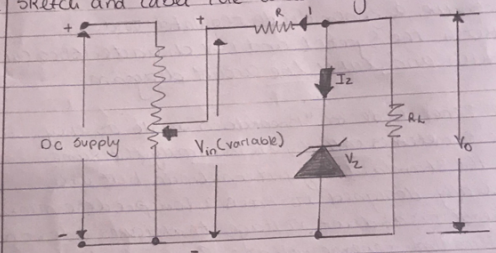
I-V characteristics curve



Symbol:



ii Sketch and label the circuit diagram



(2) A 5W maximum rated Zener diode has a 500mA maximum current flowing through it. If a 20V max bridge rectifier circuit is connected as input to the regulator circuit.

i calculate
The minimum value of the series resistor to the zener diode

ii The current across the diode at full load of 50Ω

Answer
Current - 500mA - 0.5A
V - ?
W - 5W
= Current = $\frac{\text{watts}}{\text{volt}}$

$\frac{5}{V} = 0.5$

$\frac{0.5V}{0.5} = \frac{5}{0.5}$

$V = \frac{5}{0.5} = 10V$

$V_{dc} = \frac{2V_{max}}{R} = \frac{2 \times 20}{3.14} = 12.73V$

$R = \frac{V_0 - V_2}{I_2} = \frac{12.73 - 10}{0.5} = 5.46 ohms$

(b) The current accross the diode at full load of 500Ω

$\rightarrow V = IR \qquad V = 10$

$R = 500$

$10 = 500I$

$I = \frac{500}{10} \qquad = I = \frac{10}{500} = 0.02A$

$0.5mA = I_2 + 0.02A$

$I_2 = 0.5 - 0.02 = 0.48$

$= 0.484$ or $480mA$