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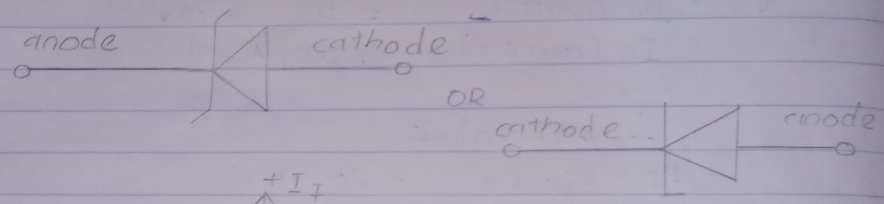
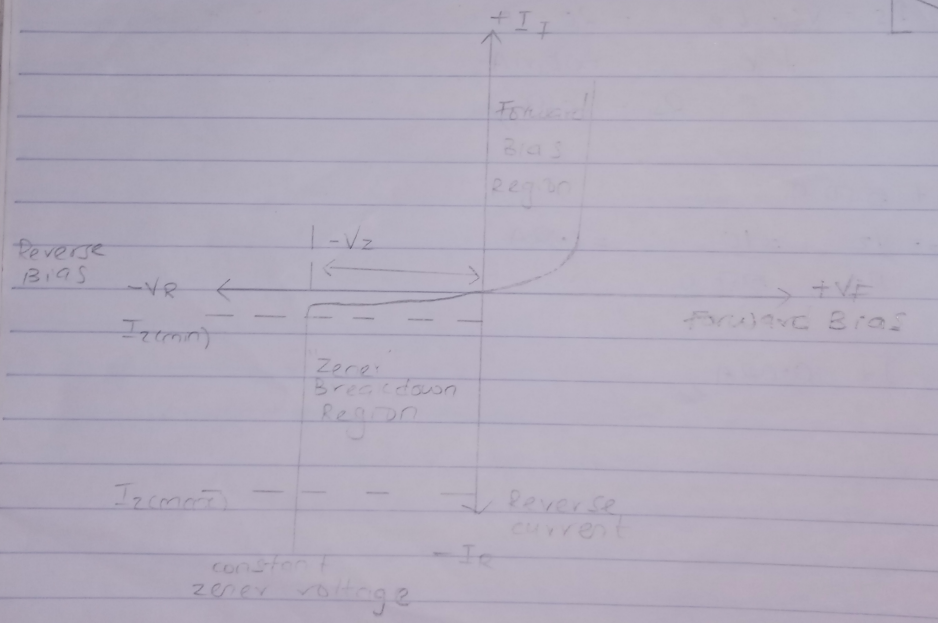
18/ENG08/1014
Biomedical engineering.

1) A zener diode as a voltage regulator is a silicon semiconductor with a p-n junction that is specifically designed to work in the reverse biased condition. It consists of a current limiting resistor Rs connected in series with the input voltage Vs with the zener diode connected in parallel with the load R_L in this reverse biased condition.

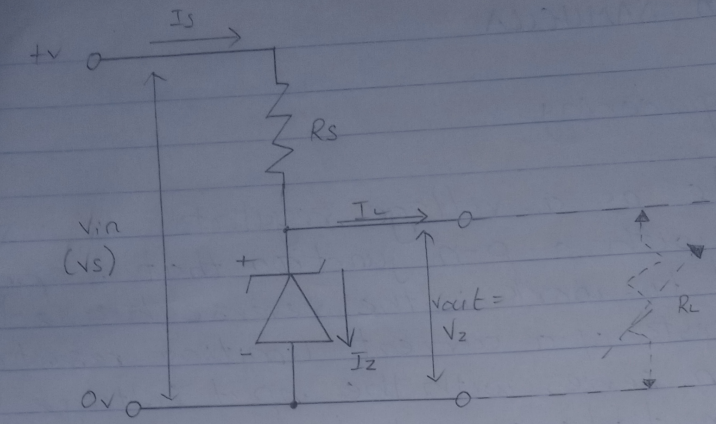
i) symbol.





I-V characteristic curve

i)



circuit diagram of a zener diode regulator.

2a) First V_L of the zener diode

$$V = \frac{W \text{ (watt)}}{I \text{ (current)}} = \frac{5}{500mA} = 10v$$

∴ min value

$$Rs = \frac{Vs - V_z}{I_T} = \frac{20 - 10}{500mA}$$

$$Rs = 20\Omega //$$

b) I at 500 Ω

$$I_z = \frac{V_z}{R_L} = \frac{10}{500\Omega} = 0.02A$$

∴ $I_L = 0.02A // = 20mA //$

$R_2 = (500 - 20) =$ ~~480mA~~, 480Ω