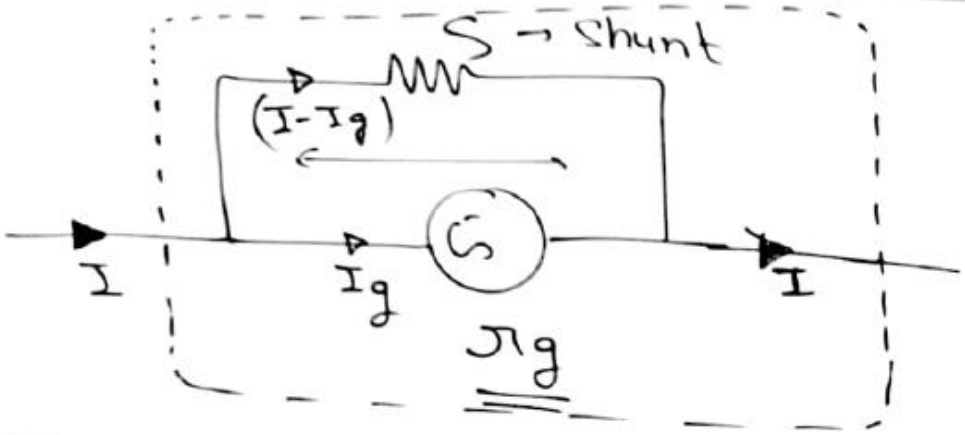
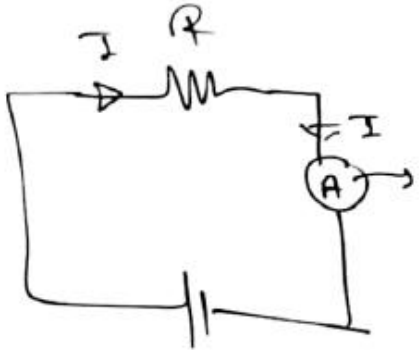
Conversion of Galvanometer into ammeter :





I_g → maximum current in Galvanometer

S → very low resistance.

$$(I - I_g)S = I_g R_g$$

$$IS - I_gS = I_gR_g$$

$$IS = I_gR_g + I_gS$$

$$I = \frac{I_g(R_g + S)}{S}$$

Conversion of Galvanometer into ammeter :-

AIPMT-2008

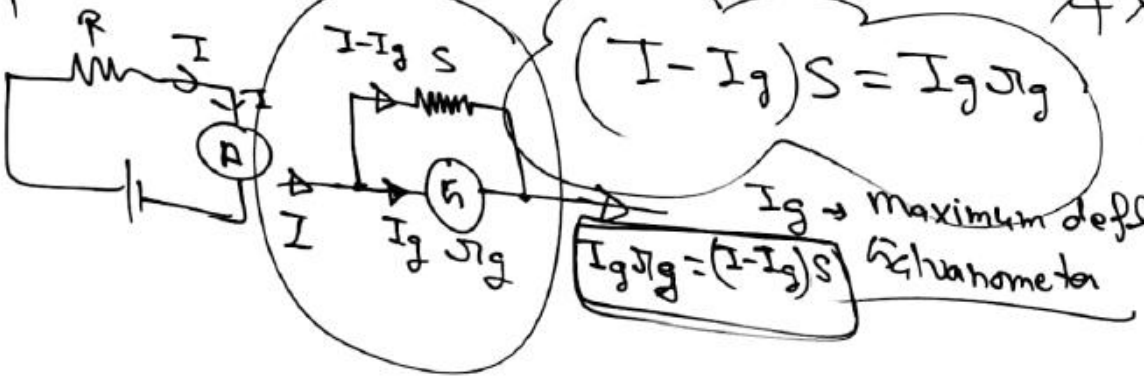
Q1) A galvanometer having a coil of resistance (60 ohm.) shows full deflection when a current of 1 amp passes through it. it can be converted into an ammeter to read current upto 5amp by

(a) putting in series a resistance of 15Ω.

(b) putting in series a resistance of 2Ω.

(c) putting in parallel a resistance of 15Ω.

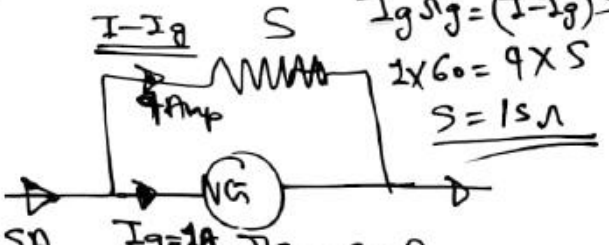
(d) putting in parallel a resistance of 2Ω.



$(I-I_g)S = I_g R_g$

$I_g R_g = (I-I_g)S$

I_g → maximum deflection current in Galvanometer



$I_g R_g = (I-I_g)S$

$1 \times 60 = 4 \times S$

$S = 15\Omega$

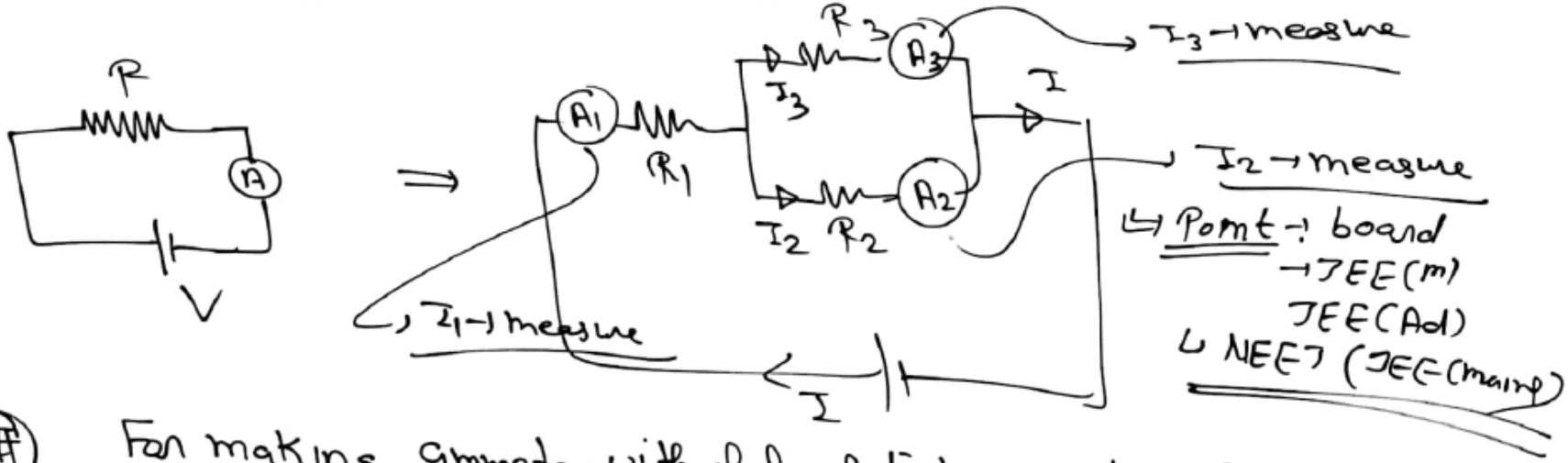
$4 \times S = 1 \times 60$

$S = 15\Omega$

Conversion of Galvanometer into ammeter :

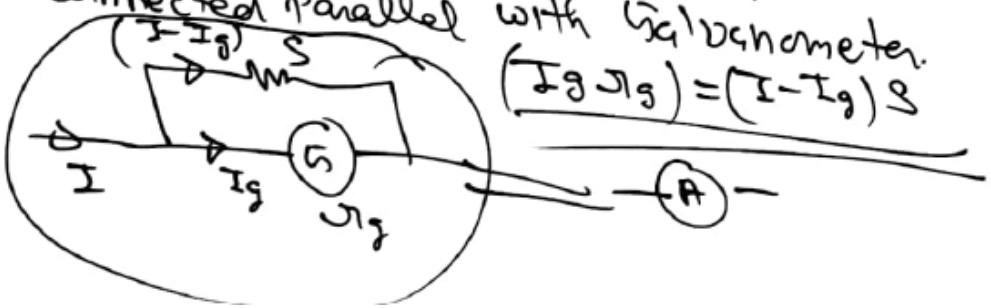
Ammeter :- It is a device which measure current in ckt.

⇒ Ammeter is connected in series with circuit.



For making ammeter with help of Galvanometer, Shunt is connected parallel with Galvanometer.

$(I_g G_g) = (I - I_g) S$



Ammeter

$(I-I_g)S = I_g G_g$

"I_g → It is maximum current which can flow through Galvanometer"

$(R_{eq})_{ammeter} = \dfrac{G_g \cdot S}{(G_g+S)}$ (NICERT)

$R_A = \dfrac{G_g S}{G_g+S} \Rightarrow R_A = \dfrac{S}{\frac{G_g+S}{G_g}}$

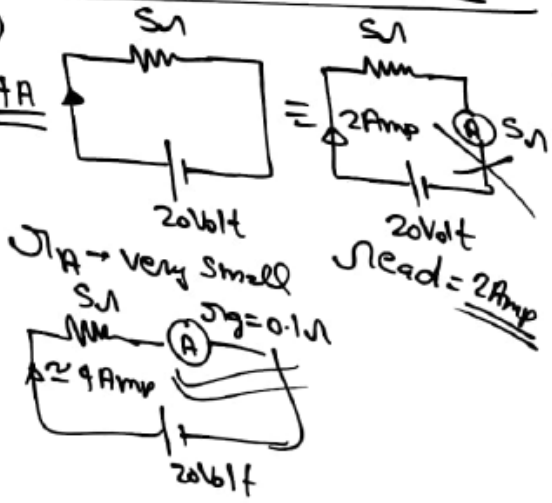
$R_A = \dfrac{S}{\frac{G_g}{G_g}+\frac{S}{G_g}}$ $\quad R_A = \dfrac{S}{1+\frac{S}{G_g}}$

$R_A < S$

Ideal ammeter

$R_A = 0$,

For good ammeter G_g is very small., Shunt S is very small



Q) AIPMT 2011
A galvanometer of Resistance G, is shunted by a resistance S. ohm. To keep the main current in the circuit unchanged, the resistance to be put in series with galvanometer.

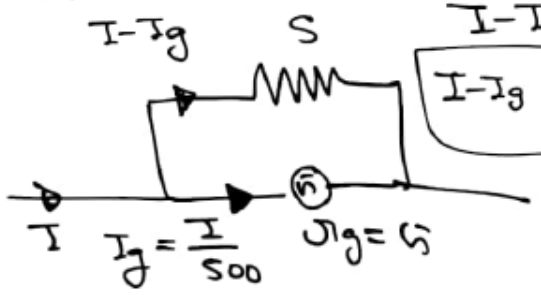
~~Q3)~~ good
In an ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be. [2019]

(a) $\frac{1}{499}G$.

(b) $\frac{499}{500}G$.

(c) $\frac{1}{500}G$

(d) $\frac{500}{499}G$.



$I_g = I \times \frac{0.2}{100} = \frac{I \times 2}{1000} = \frac{I}{500}$

$I - I_g = I - \frac{I}{500}$

$I - I_g = \frac{499}{500} I$

$R_A = \frac{G \times S}{G + S} = \frac{G \times \frac{G}{499}}{G + \frac{G}{499}}$

$(I - I_g)S = I_g G$

$\frac{499}{500} I \times S = \frac{I}{500} \times G$

$S = \frac{G}{499}$

$R_A = \frac{G^2}{499 \times \frac{500}{499}} = \frac{G}{500}$

$R_A = \frac{G}{500}$

AIPMT 2011

Q) A galvanometer of Resistance G, is shunted by a resistance S. ohm. To keep the main current in the circuit unchanged, the resistance to be put in series with galvanometer.

Q) Main current = 2 Amp.

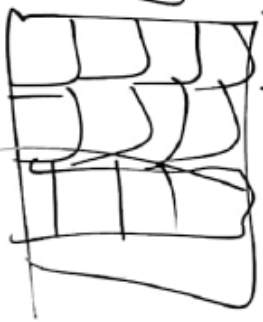
I_g = 0.1 Amp. $(I-I_g)S = I_g G_g$

G_g = 100Ω

Find Value of Shunt Resistance

↳ Short Notes

⇒ Wall → I



I = 2 Amp

I_g = 0.1 Amp

$I - I_g$ = 2 − 0.1 = 1.9 Amp

$(I-I_g)S = I_g G_g$

$1.9 \times S = 0.1 \times 100$

$1.9S = 10$

$S = \frac{10}{1.9} = \frac{100}{19} = 5.2\cdots\ \Omega$

Main current = 2Amp

I_g = 1mA

G_g = 1000Ω

S = ?

$(I-I_g)S = I_g G_g$

$(2 - 1\times10^{-3})S = 10^{-3} \times 1000$

$(2-0.001)S = 1$

$S = 1$

$2S = 1$

$S = \frac{1}{2} = 0.5\ \Omega$

Q) AIPM
A galvanometer of Resistance G, is shunted by a resistance S. ohm. To keep the main current in the circuit unchanged, the resistance to be put in series with galvanometer.

$I_g \rightarrow$ 0.01 % of main Current.

$G_g \rightarrow$ 10Ω find Shunt resistance

Solve:- lets main current is I

$$I_g = I \times \frac{0.01}{100} = I \times 10^{-4}$$

$$I - I_g \simeq I$$

$$(I - I_g)S = I_g G_g$$

$$I \times S = 10^{-4} \times I \times 10$$

$$S = 10^{-3}\ \Omega$$

$$S = 0.001\ \Omega$$