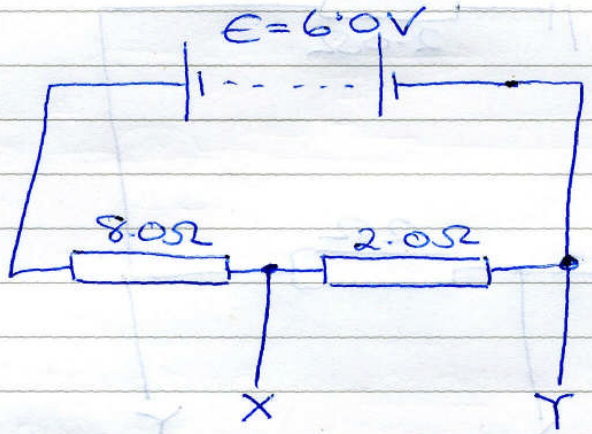
Lowe and Rounce - Exercise 20.8

Q1



By inspection

6·0 V is shared by 10Ω

∴ each Ω gets 0·6V

∴ between X and Y the pd is 1·2V

By calculation:-

$\varepsilon = I(R+r)$

$6.0 = I \times 10$

$\therefore I = 0.6\,A$

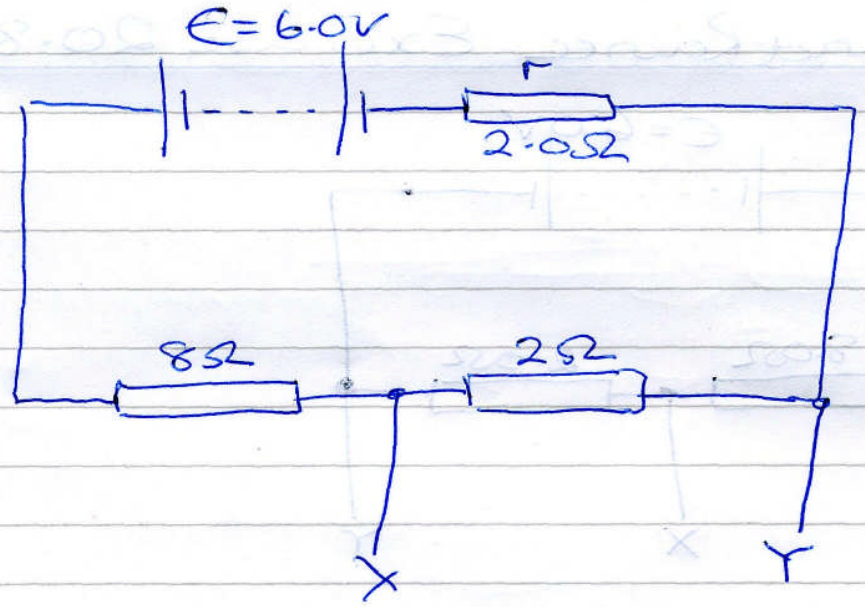
$\varepsilon = 6.0V$

$r = 0\Omega$

$R_{tot} = 10\Omega$

∴ over 2·0Ω resistor

$V = IR = 0.6 \times 2 = 1.2V$ Ans



Now 6.0V is shared by 12Ω
∴ each Ω gets 0.5V and the pd between X and Y = 1.0V

$r = 2.0\Omega$
$R = 10\Omega$
$\epsilon = 6.0V$

$\epsilon = I(R+r)$

$6.0 = I(10+2)$

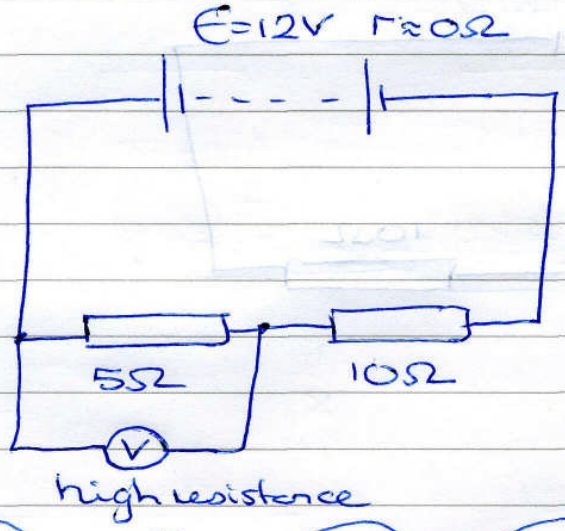
$I = 0.5\ A$

∴ across 2Ω resistor

$V = IR = 0.5 \times 2.0 = 1.0V$ Ans

Q2.

(a)



High resistance voltmeter – lets assume its resistance is ∞

Then, when we look at the combined resistance of 5Ω and the voltmeter

$$\frac{1}{R_{TOT}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$= \frac{1}{5} + \frac{1}{\infty} = \frac{1}{5} + 0$$

$\therefore R_{TOT} = 5\,V$

~ this means adding a v. high resistance voltmeter does <u>not</u> interfere with the voltage distribution in the circuit.

<u>By inspection</u> — 4.0V

$\epsilon = 12V$

$R_{TOT} = 15\Omega$

$r = 0\Omega$

<u>By calculation</u>

$\epsilon = I(R+r)$

$12 = I \times 15$

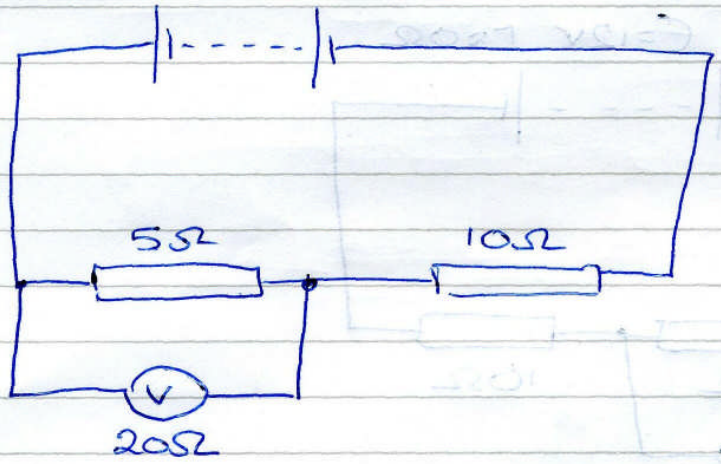
$\therefore I = 0.8A$

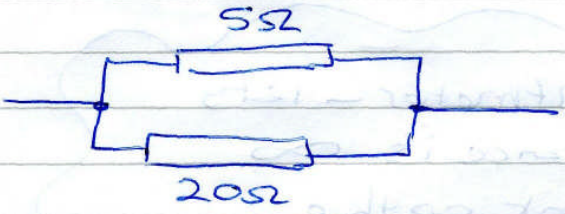
$V = IR$

$= 0.8 \times 5$

$= 4.0V$

(b) $\epsilon = 12V, r \cong 0\Omega$





$\equiv$ 

$$\frac{1}{R_{TOT}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_{TOT}} = \frac{1}{5} + \frac{1}{20}$$

$$\frac{1}{R_{TOT}} = \frac{25}{100}$$

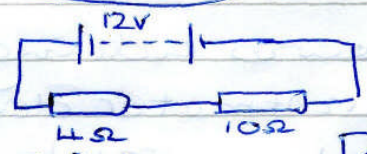
$$R_{TOT} = 4\Omega$$

By Inspection 14Ω share $12V$

$\therefore 1\Omega$ gets $12/14$ and 4Ω gets $48/14$

$= 3.4V$

By calculation



$R = 4 + 10 = 14\Omega$

$r = 0\Omega$

$\epsilon = 12V$

$\epsilon = I(R + r)$

$12 = I(14 + 0)$

$I = 12/14 \quad A$

$$V = IR = \frac{12}{14} \times 4 = 3.4V$$