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a. Calculate the resistance of E and H for the circuit's configuration. [3]

$$\frac{0.6}{1} = 0.6\Omega \quad E = 0.6\Omega$$

$$\frac{0.7}{1} = 0.7\Omega \quad H = 0.7\Omega$$

b. B and C are identical and the current passing through A is 0.5A, calculate the current passing through B and C. [2]

$$1A - 0.5A = 0.5A$$

$$\frac{0.5A}{2} = 0.25A$$

$$B = 0.25A$$

$$C = 0.25A$$

c (i) The Resistance of A. [2]

$$P = I^2 x R$$

$$1.25w = (0.5A)^2 x R$$

$$R = \frac{1.25w}{(0.5A)^2}$$

$$Ra = 5\Omega$$

c (ii) The Resistance of B and C [3]

$$R = \frac{V}{I}$$

$$R = \frac{2.5}{0.25}$$

$$Rb = 10\Omega$$

$$Rc = 10\Omega$$

c (iii) The potential difference across A, B and C [1]

$$R_{total} = \frac{1}{\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}}$$

$$RT = \frac{1}{\frac{1}{5} + \frac{1}{10} + \frac{1}{10}} = 2.5\Omega$$

$$V = I x R$$

$$V = 1A x 2.5$$

$$V = 2.5\Omega$$

c (iv) Since the total potential difference across L to M is 6V, calculate the potential difference across D and find its Resistance. [2]

$$PD = 2.5 + PD + 0.6$$

$$PD = 6 - 2.5 - 0.6$$

$$V = 2.9V$$

$$R = \frac{V}{I}$$

$$\frac{2.9}{1} = 2.9\Omega$$

d. The 'lost volts across one of the cells in the parallel arrangement is 2 V. Calculate r and hence the total resistance of the parallel combination of cells. [3]

$$R = \frac{V}{I}$$

$$R = \frac{2}{0.25}$$

$$R = 8\Omega$$

$$R_{total} = \frac{1}{\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} + \frac{1}{R4}}$$

$$RT = \frac{1}{\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8}} = 0.5\Omega$$

$$0.5\Omega \times 4 = 2\Omega$$

e. Given that the resistance F is 6Ω, calculate the voltage drop across it. [2]

$$1 \times 6 = 6$$

$$V = 6V$$

f. Calculate the total resistance of the circuit; this includes total internal and the resistance cause by the reverse polarity battery and the open diodes in given scenario (ignore any "non-open diodes"). [2]

$$2.5\Omega + 2.9\Omega + 0.6\Omega + 6\Omega + 2\Omega = 14\Omega$$

g. Calculate the emf of each of the cells in the parallel combination. [3]