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

$$R_{dE} = \frac{0.6}{1} = 0.6\Omega$$

$$R_{dH} = Off$$

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

$$I_B = I_C = \frac{1 - 0.5}{2} = 0.25A$$

I_B & I_C are identical so have 0.25A of current passing through each.

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

$$R_A = \frac{1.25}{0.5^2 \times 1} = 5\Omega$$

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

$$V = \frac{1.25}{0.25} = 2.5V$$

$$R_B = R_C = \frac{2.5}{0.25} = 10\Omega$$

R_B & R_C are identical so both have a resistance of 10Ω

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

$$R_T = \left(\frac{1}{5} + \frac{1}{10} + \frac{1}{10} \right)^{-1}$$

$$R_T = 2.5\Omega$$

$$V = 1 \times 2.5 = 2.5V$$

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

$$V_D = 6 - 2.5 - 0.6 = 2.9V$$

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

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]

$$I = \frac{1}{4} = 0.25A$$

$$R = \frac{2}{0.25} = 8\Omega$$

$$R_T = \left(\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} \right)^{-1}$$

$$R_T = 2\Omega$$

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

$$V_F = 1 \times 6 = 6V$$

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]

$$R_T = 2.5 + 2.9 + 0.6 + 6 + 2$$

$$R_T = 14\Omega$$

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

$$\varepsilon = 2 + (1 \times 2)$$

$$\varepsilon = 4V$$