CURRENT ELECTRICITY

1. D
2. C

3. C

4. D

5. both measure (energy / work) / charge B1
for e.m.f., transfer of chemical energy to electrical energy B1
for p.d., transfer of electrical energy to thermal energy / other forms B1 [3]

6. Solution

a. Find the current in the circuit.

For R_1 and R_2 combined,

$$R_{12} = R_1 + R_2 = 170\ \Omega + 190\ \Omega = 360\ \Omega$$

$$V_{12} = V_{source} - V_3 = 75\ V - 21\ V = 54\ V$$

$$I = \frac{V_{12}}{R_{12}} = \frac{54\ V}{360\ \Omega} = 0.15\ A$$

b. Find the resistance of R_3.

$$R_3 = \frac{V_3}{I} = \frac{21\ V}{0.15\ A} = 140\ \Omega$$

7. (a) energy transferred from source / changed from some form to electrical M1
per unit charge (to drive charge round a complete circuit) ..... A1 [2]
(b) and power in R = I 2X M1
E = I (X + r) M1
power in cell = EI and algebra clear leading to ratio = X / (X + r) ..... A1 [3]

(c) (i) 1.4 W A1
0.40 Ù .....(allow ¤\pard

8.
(a) (i) 1 total resistance = 0.16 Ω A1
2 e.m.f. = either (14 - E) or (E - 14) A1 [2]
(ii) either 14 - E = 42 × 0.16 or (E - 14) = -42 × 0.16 C1
E = 7.3 V A1 [2]
(b) (i) charge = It C1

= 12.5 × 4 × 60 × 60
= 1.8 × 105 C A1 [2]
(ii) either energy = EQ or energy = Eit C1
either energy = 14 × 1.8 × 105 or energy = 14 × 12.5 × 4 × 3600
= 2.52×10^6 J A1 [2]
(iii) energy = I
2Rt or Vit and V = IR C1
= 12.52 × 0.16 × 4 × 3600
= 3.6×10^5 J A1 [2]
(c) efficiency = $(2.52 \times 10^6 - 3.6 \times 105)/(2.52 \times 10^6)$ C1
= 86% A1 [2]