

- 1 (a) changes a.c. to d.c. OR rectifies a/c OR allows current to flow one way only
OR prevents current flowing backward B1
- (b) $I \times t$ or 2×12 or $2 \times 12 \times 60 \times 60$ or amps \times seconds C1
24 Ah or 86 400 C or 86 000 C A
- (c) emf = J/C OR energy converted/work done per unit charge/coulomb C1
OR W/A OR volts/p.d. when no current in circuit
12 J of energy are delivered/needed for every coulomb of charge A
OR 12 W is the power to drive a current of 1 A
- (d) (i) series connection shown, any recognisable symbols B1
- (ii) total power = 16 W OR 8/6 C1
1.33 A accept fraction c.a.o. A1
- (iii) any power \times any time or $16 \times 60 \times 60$ or IVt or $8 \times 60 \times 60$ C1
57 600 J or 0.016 kWh or 28 800 J or 0.008 kWh [10]
- 2 (a) connections such that all lamps will light B1
- ammeter in correct position B1
- variable resistor in correct position (condone poor symbol) B1
- switch in appropriate position (could be 2 switches) B1 [4]
- (b) (i) 3 A B1 [1]
- (ii) 4Ω OR 12/his(i) correctly evaluated B1 [1]
- (iii) 2Ω OR $\frac{1}{2} \times$ his(ii) correctly evaluated B1 [1]
- (iv) 1080 J e.c.f. from (i) & (ii) if working shown B1 [1]
- (c) lamps in series M1
- less current/less p.d. (across 1 lamp)/voltage shared/higher resistance A1 [2]
NOT current shared

[Total: 10]

3	<p>(a) circuit 1 series AND circuit 2 parallel</p> <p>(b) switch off each one separately one fails, other works both get full current/voltage/same voltage other good point e.g. more heat in parallel lower resistance</p> <p>(c) (total R =) 10 (Ω) (V =) 12V</p> <p>(d) $1/R = 1/4 + 1/6 (= 5/12)$ OR $1/R = 1/R_1 + 1/R_2$ 2.4 (Ω)</p> <p>(e) (i) 3(A) (ii) 24W (iii) 7200J e.c.f. (ii)</p>	<p>B1</p> <p>))) any 2))</p> <p>C1 A1</p> <p>C1 A1</p> <p>B1 B1 B1</p> <p>[Total: 10]</p>
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4	<p>(a) $I = W/V$ or $9/6$ $I = 1.5$ A</p> <p>(b) (i) 8 ohm (ii) 6 V</p> <p>(c) (i) brightness decreases/dimmer (ii) resistance of circuit greater current through lamp falls</p> <p>(d) (i) 4 ohm (ii) 4 ohm</p>	<p>C1 A1 2</p> <p>A1 A1 2</p> <p>B1 B1 B1 3</p> <p>A1 A1 2 [9]</p>
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