M1. (a) any **two** from:

- nuclear
- oil
- (natural) gas

2

(b) 4 (hours)

1

(c) a system of cables and transformers

1

(d) The power output of wind turbines is unpredictable

1

(e) 1500 / 0.6

1

2500 (wind turbines)

1

*allow 2500 with no working shown for **2** marks*

(f) Most energy resources have negative environmental effects.

1

[8]

M2. (a) iron

1

hairdryer

1

kettle

1

answers can be in any order

(b) (i) **Y**

1

(ii) bar drawn with any height greater than **Y**

ignore width of bar

1

(c) (bigger volume) takes more time (to boil)

accept explanation using data from graph

1

(so) more energy transferred

*do **not** accept electricity for energy*

1

(and) this costs more money

ignore reference to cost of water

wasting more money because heating more water than needed is insufficient

1

[8]

M3.(a) *there is a* magnetic field *(around the magnet)*

1

(this magnetic field) changes / moves

1

and cuts through coil

accept links with coil

1

so a p.d. *induced* across coil

1

the coil forms *a* complete circuit

1

so a current (*is* induced)

1

(b) ammeter reading does not change

must be in this order

accept ammeter has a small reading / shows a current

1

zero

1

greater than before

accept a large(r) reading

1

same as originally but in the opposite direction

accept a small reading in the opposite direction

1

(c) 0.30

*allow **1** mark for correct substitution, ie 0.05 = Q / 6*

2

C / coulomb

allow A s

1

[13]

M4.(a) (i) any **six** from:

- switch on
- read both ammeter and voltmeter

  allow read the meters
- adjust variable resistor to change the current
- take further readings
- draw graph
- (of) V against I

  allow take mean
- R = V / I

  allow take the gradient of the graph

6

(ii) resistor would get hot if current left on

1

so its resistance would increase

1

(iii) 12 (V)

*0.75 × 16 gains **1** mark*

2

(iv) 15 (Ω)

1

16 is nearer to that value than any other

1

(b) if current is above 5 A / value of fuse

1

fuse melts

allow blows / breaks

*do **not** accept exploded*

1

breaks circuit

1

[15]

M5. (a) he may receive an electric shock

or

he may be electrocuted

1

if he touches the live wire

1

(b) 10 690 = I × 230

1

I = 10 690 / 230

1

46.478(260) (A)

1

46

1

*allow 46 (A) with no working shown for **4** marks*

(c) cost is higher

1

more energy is used (per second)

1

[8]

M6.(a) current that is always in the same direction

1

(b) total resistance = 30 (Ω)

1

V = 0.4 × 30

1

12 (V)

1

*allow 12 (V) with no working shown for **3** marks*
*an answer of 8 (V) or 4 (V) gains **2** marks only*

(c) P = 0.4 × 12 = 4.8

1

5 (W)

1

*allow 5 (W) with no working shown for **2** marks*
*allow 4.8 (W) with no working shown for **1** mark*

[6]