M1.   (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]

M2. (a) (i) A

1

(ii) bar drawn with correct height
  ignore width of bar

1

(b) (i) $E = P \times t$

2.4
  *allow **1** mark for correct substitution*
  ie 1.2 × 2
  provided no subsequent step shown

2

(ii) 36 or their (b)(i) × 15 correctly calculated

or

their (b)(i) × 0.15 correctly calculated with an answer given in £
  *allow **1** mark for correct substitution*
  ie 2.4 × 15
  or
  their (b)(i) × 15
  *allow **1** mark for correct substitution*
  provided no subsequent step shown
  an answer £0.36 gains both marks

2

[6]

M3. (a) fan

1

drill

1

washing machine
*four circled including correct three scores **1** mark*
five circled scores zero

1

(b)   Appliances only transfer part of the energy usefully

1

The energy transferred by appliances makes the surroundings warmer

1

[5]

M4. (a) (i)   temperature (increase) and time switched on are <u>directly</u> <u>proportional</u>

accept the idea of equal increases in time giving equal increases in temperature

answers such as:
- *as time increases, temperature increases*
- *positive correlation*
- *linear relationship*
- *temperature and time are proportional*

*score **1** mark*

2

(ii)   any **one** from:

"it" refers to the metal block

- energy transfer (from the block) to the surroundings
  accept lost for transfer
  accept air for surroundings

- (some) energy used to warm the heater / thermometer (itself)
  accept takes time for heater to warm up

- (metal) block is not insulated

1

(iii)   15 000

*allow **1** mark for correct substitution, ie 50 × 300 provided no subsequent step shown*

2

(b)   lead

reason only scores if lead is chosen

1

needs least energy to raise temperature by 1°C

accept needs less energy to heat it (by the same amount)
lowest specific heat capacity is insufficient

1

[7]

M5. (a) (i) TV

1

(ii) hairdryer and sandwich toaster
both required either order but no others

1

(b) (i) 1.2
*allow **1** mark for correct substitution*
ie 0.4 × 3 provided that no subsequent step is shown

2

(ii) 18
accept £0.18 for both marks
or
their (b)(i) × 15 correctly calculated
*an answer 0.18 scores **1** mark*
*allow **1** mark for correct substitution*
ie 1.2 or their (b)(i) × 15 provided that no subsequent step is shown

2

[6]

M6. (a) £16.50

> *allow **1** mark for correct substitution ie 110 × 15*
> *an answer of 1650 gains **both** marks*
> *an answer of 43.80 gains **both** marks*
> *allow **1** mark for 292 × 15*

2

(b) 292

> *allow **1** mark for correctly using the reading 53490 ie 53782*
> *– 53490*
> *accept £43.80 for both marks*

2

[4]

M7. (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]

M8. (a) solid

1

(b) decreased

correct order only

1

decreased

1

increased

1

(c) (i) A

reason only scores if A chosen

1

uses least / less energy (in 1 year)

a comparison is required
accept uses least power
accept uses least kWh

1

(ii) greater the volume the greater the energy it uses (in 1 year)

1

(iii) a very small number sampled

accept only tested 3
accept insufficient evidence / data
*allow not all fridges have the same efficiency **or** a correct description implying different efficiencies*
only tested each fridge once is insufficient
there are lots of different makes is insufficient

1

[8]

M9. (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]