M1. (a) (i) step-up

both parts required

more turns on the secondary / output (coil)

*do **not** accept coils for turns*

'secondary output is greater than primary input' is insufficient

1

(ii) (easily) magnetised (and demagnetised)

accept (it's) magnetic

it's a conductor negates answer

1

(b) 60

*allow **1** mark for correct substitution, ie* $\frac{230}{15} = \frac{720}{N_s}$

2

[4]

M2. *(a) 400 000*

*allow **1** mark for correct substitution ie*

$$\frac{25000}{?} = \frac{800}{12800}$$

or

$$\frac{25}{?} = \frac{800}{12800}$$

2

volt(s) / V

*an answer 400 gains **2** marks*

*an answer 400 kilovolts / kV gains **3** marks*

*although the unit mark is independent to gain **3** marks it must be consistent with the numerical value*

1

*(b) any **one** from:*

*do **not** accept any response in terms of heat insulation, safety or electric shock*

- *(so that there is) no short circuit*
- *(so that the) current goes round the coil*

  *do **not** accept electricity for current*
- *(so that the) current does not enter the core*

1

(c) (the alternating p.d. in the primary causes) an (alternating) current in the primary

reference to the current in the core negates this mark

1

(causes an) <u>alternating / changing</u> (magnetic) field in the (iron) core

1

<u>induces</u> (alternating) p.d. across the <u>secondary</u> (coil)

accept in / through or similar for across

accept current for p.d.

accept output (coil) for secondary (coil)

*to gain **3** marks the sequence must be correct*

1

[7]

M3. *(a) which causes the magnet to turn / spin / rotate*

1

(magnetic) field / lines of force / flux rotate(s) / move(s) / through / in / cut(s) the coil

*do **not** credit the idea that movement 'creates' the magnetic field*

1

potential difference / p.d. / voltage <u>induced</u> across the coil

*do **not** credit just 'current induced'*

1

*(b) any **one** from:*

- *more powerful / stronger / lighter magnet*

  *do **not** credit 'a bigger magnet'*
- *larger / more / bigger / lighter cups / with a bigger surface area*
- *longer arms*
- *lubricate the spindle*
- *add more turns to the coil*

1

[4]

M4. *(a) It is easily magnetised.*

1

(b) *p.d. across the secondary coil is smaller (than p.d. across the primary coil)*

1

(c) *ratio* $\frac{V_p}{V_s} = \frac{6}{12}$

accept any other correct ratio taken from the graph

1

$\frac{6}{12} = \frac{50}{N_p}$

use of the correct turns ratio and substitution or correct transformation and substitution

1

$N_p = 100$

*allow 100 with no working shown for **3** marks*

1

[5]

M5. *(a)* *(i)* *generator*

1

(ii) *alternating current*

1

(iii) *voltmeter / CRO / oscilloscope / cathode ray oscilloscope*

1

(b) (i) *time*

1

(ii) *peaks and troughs in opposite directions*

1

amplitude remains constant
dependent on first marking point

1

(c) *any **two** from:*

- *increase speed of coil*
- *strengthen magnetic field*
- *increase area of coil*

*do **not** accept larger*

2

[8]

M6. (a) *(the alternating current creates) a <u>changing / alternating magnetic field</u>*

1

(magnetic field) in the (iron) core

accept that links with the secondary coil

current in the core negates this mark

1

(causing a) potential difference (to be) <u>induced</u> in / across secondary coil

accept voltage for p.d.

1

(b) (i) 20

*allow **1** mark for correct substitution, ie* $\frac{230}{V_s} = \frac{575}{50}$

or $\frac{V_s}{230} = \frac{50}{575}$

2

(ii) 0.3

or

correct calculation using 230 × I_p = their (b)(i) × 3.45

*allow **1** mark for correct substitution, ie*

230 × I_p = 20 × 3.45

allow ecf from (b)(i) for 20

OR

substitution into this equation $\frac{I_p}{I_s} = \frac{N_s}{N_p}$

2

*(c) any **one** from:*

- *fewer (waste) batteries have to be sent to / buried in land-fill*
- *the soil is polluted less by batteries in land-fill*
- *fewer (waste) batteries have to be recycled*

- *fewer batteries have to be made*
- *less raw materials are used in making batteries*
- *customers have to replace their batteries less often*
  longer lifetime is insufficient
- *customers have to buy fewer (replacement) batteries*
  it costs less is insufficient

1

[8]

M7.*Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a*

'best-fit' approach to the marking.

0 marks
No relevant / correct content.

Level 1 (1–2 marks)
Either *there is an attempt at a description of the construction of a transformer*

or

a correct statement of the effect of one type of transformer on the input p.d.

Level 2 (3–4 marks)
There is a description of the construction of a transformer
and
a correct statement of the effect of one type of transformer on the input p.d.

Level 3 (5–6 marks)
There is a clear description of the construction of a transformer
and
there is a correct description of how transformers affect the input p.d.

details of construction:
extra information

a (laminated) core

core is made from a magnetic material / iron

2 coils

the coils are made from an electrical conductor / copper

the coils are covered in plastic / insulation

the coils are (usually) on opposite sides

step-up transformer has more turns on secondary coil than (its) primary (or vice versa)

step-down transformer has fewer turns on secondary coil than (its) primary (or vice versa)

effect on input p.d. :

step-up transformer, the output p.d. is greater (than the input p.d.)
accept voltage for p.d.

step-down transformer, the output p.d. is lower (than the input p.d.)

6

[6]

M8.*(a) attempt to draw four cells in series*

1

correct circuit symbols

circuit symbol should show a long line and a short line, correctly joined together

example of correct circuit symbol:



1

(b) (i) 6 (V)

*allow **1** mark for correct substitution, ie*

*V = 3 × 2 scores **1** mark*

provided no subsequent step

2

(ii) 12 (V)

ecf from part (b)(i)

18 – 6

or

*18 – their part (b)(i) scores **1** mark*

2

(iii) 9 (Ω)

ecf from part (b)(ii) correctly calculated

3 + their part (b)(ii) / 2

or

*18 / 2 scores **1** mark*

provided no subsequent step

2

(c) (i) need a.c.

1

battery is d.c.

1

(ii) *3 (A)*

*allow **1** mark for correct substitution, ie*

*18 × 2 = 12 × I_s scores **1** mark*

2

[12]