

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) alternating / changing (magnetic) field in the (iron) core

1

induces (alternating) p.d. across the secondary (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

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

(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 induced 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 $\frac{V_p}{V_s} = \frac{6}{12}$

$$\frac{V_p}{V_s} = \frac{6}{12}$$

accept any other correct ratio taken from the graph

1

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

$$N_p = 100$$

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 changing / alternating magnetic field*

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) induced 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 $230 \times I_p = \text{their (b)(i)} \times 3.45$

allow 1 mark for correct substitution, ie

$$230 \times I_p = 20 \times 3.45$$

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

$V = 3 \times 2$ 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

$18 \times 2 = 12 \times I$, scores **1** mark

2

[12]