Mark schemes

Q1.

(a) generator (effect)

allow electromagnetic induction

1

(b) wire cuts through the magnetic field (between the magnets)

1

a potential difference was <u>induced</u> (across the wire)

1

as it was part of <u>complete circuit</u> (there was a current in the circuit)

1

(c) the needle will deflect to –0.4 mA

1

(d) (the pressure variations in) the sound (waves) cause the diaphragm to vibrate

allow air particles collide with diaphragm causing it to vibrate

diaphragm moves is insufficient

do not accept moves the diaphragm up and down

1

the diaphragm causes the coil / wire to vibrate

do not accept moves the coil / wire up and down

1

(the coil repeatedly changes direction) <u>inducing</u> an alternating current (in the circuit)

*if MP1 and MP2 do not score, allow sound (waves) cause the coil / wire to vibrate for **1** mark*

1

[8]

Q2.

(a) 16 mA = 0.016 A

allow 1.6 × 10^{-2} (A)

1

0.013 = B × 0.016 × 6.5

allow correct substitution using incorrectly / not converted current

1

$$B = \frac{0.013}{0.016 \times 6.5}$$

allow correct re-arrangement using incorrectly / not converted current

1

B = 0.125 (T)

allow correct calculation using incorrectly / not converted current

allow 0.13 (T)

1

[4]

Q3.

(a) iron

allow nickel / cobalt

do not allow steel

1

it is easily magnetised (and demagnetised)

allow it is a magnetic material

1

MP 2 is dependent on MP 1

(b) $\frac{230}{V_s} = \frac{2000}{40}$

1

$$V_s = \frac{40}{2000} \times 230$$

subsequent marks can only be awarded if the first equation is correct and has been used

1

V_s = 4.6 (V)

1

$V_s = 4.6 \times I_s = 6.9$

this mark may be awarded if the pd is incorrectly calculated

1

$I_s = 1.5$ A

allow a correctly calculated I_s using an incorrectly calculated pd

1

OR

$6.9 = I_p \times 230$ (1)

$I_p = \frac{6.9}{230}$ (1)

subsequent marks can only be awarded if the first equation is correct and has been used

$I_p = 0.03$ (A) (1)

$I_s = 0.03 \times \frac{2000}{40}$ (1)

this mark may be awarded if I_p is incorrectly calculated

$I_s = 1.5$ (A) (1)

allow a correctly calculated I_s using an incorrectly calculated I_p

1

[7]

Q4.

(a) the coil moves through the (magnetic) field
or
the coil cuts (magnetic) field lines

1

a potential difference is induced (across the coil)

1

there is a complete circuit, so a current is induced (in the coil)

1

(because) each half-revolution, the two ends of the coil swap from one brush to the other
or
each half-revolution, (the two halves of) the commutator switch brushes / contacts

(because) the half of the coil connected to each brush always moves in the same direction

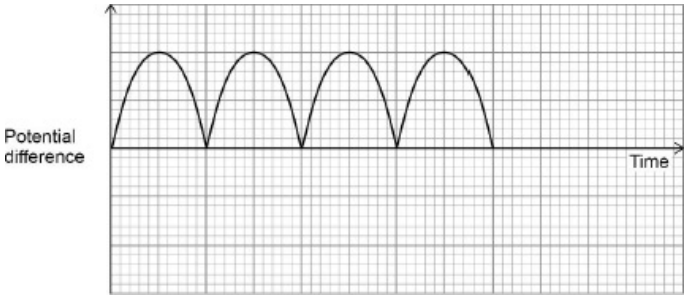
1

(so) the direction of the (induced) current / potential difference does not reverse every half rotation

allow the direction of the (induced) current / potential difference is the same every half rotation

1

(b)



allow a correct graph showing a negative output potential difference only

1

(c) (after disconnection) there is no (induced) current

1

(so) no magnetic field (produced around / by the coil)

1

to oppose the movement of the coil

allow no force opposes the movement of the coil

1

[9]

Q5.

(a) **A** primary coil
and
B secondary coil

1

C iron core

1

(b) $\frac{230}{V_s} = \frac{200}{1200}$

1

$V_s = \frac{1200 \times 230}{200}$

1

V_s = 1380 (V)

1

(c) (the alternating current causes) a changing magnetic field around the primary (coil)

1

creates magnetic field that changes direction in the core

allow creates a changing magnetic field in the core

1

this induces an alternating potential difference across the secondary (coil (causing an alternating current)

1

(d) down

1

(e) $B = 60 \times 10^{-6}$ T

1

$0.045 = 60 \times 10^{-6} \times 50 \times l$

allow correct substitution of incorrectly / not converted value of B

1

$l = \frac{0.045}{60 \times 10^{-6} \times 50}$

allow correct rearrangement using an incorrectly / not converted value of B

1

l = 15 (m)

allow a correct calculation using an incorrectly / not converted value of B

1

(f) the wire / force is at right angles to the magnetic field

allow the current is constant

allow the cable is straight

allow the field is uniform

allow the force is constant

1

[14]