

MARK SCHEME

GCSE

PHYSICS

AQA - TRIPLE SCIENCE

P7 - TEST 5
MAGNETISM
Advanced

Mark schemes

1.

(a) any **one** from:

- too few turns / coils on the secondary
allow number of turns / coils on the primary was increased
- p.d. across the primary was reduced
ignore human error

1

(b) the p.d. (across the secondary) goes above 2V

allow p.d. across secondary is higher than p.d. across primary after 20 turns

1

(c) it increases (until the nails reach a constant temperature)

1

(d) $\frac{640}{4} = \frac{V_p}{1.75}$

1

$$V_p = \frac{640 \times 1.75}{4}$$

1

$$V_p = 280 \text{ (V)}$$

1

$$280 \times I_p = 336$$

allow their calculated

$$V_p \times I_p = 336$$

1

$$I_p = 1.2 \text{ (A)}$$

allow an answer that is consistent with their calculated value of V_p

1

or

$$336 = I_s \times 1.75 \text{ (1)}$$

$$I_s = \frac{336}{1.75} \text{ (1)}$$

$$I_s = 192 \text{ (A) (1)}$$

$$I_p = 192 \times \frac{4}{640} \text{ (1)}$$

allow

$$I_p = \text{their calculated } I_s \times \frac{4}{640}$$

$$I_p = 1.2 \text{ (A) (1)}$$

allow an answer that is consistent with their calculated value of I_s

an answer of 1.2 (A) scores 5 marks

[8]

2.

60

allow 1 mark for correct transformation

2

[2]

3.

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

$V_s = 12$

accept any other correct ratio taken from the graph

1

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

$12 N_p = 50 \times 12$

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]

4.

(a) motor effect

1

(b) increase the strength of the magnet

or

increase the current

1

(c) $4.8 \times 10^{-4} = F \times 8 \times 10^{-2}$

1

$F = 6 \times 10^{-3} \text{ (N)}$

1

$6 \times 10^{-3} = B \times 1.5 \times 5 \times 10^{-2}$

1

$B = \frac{6 \times 10^{-3}}{7.5 \times 10^{-2}}$

1

$B = 8 \times 10^{-2} \text{ or } 0.08$

1

allow 8×10^{-2} or 0.08 with no working shown for 5 marks

a correct method with correct calculation using an incorrect value of F gains 3 marks

Tesla

accept T

1

do not accept t

[8]

5. (a) (i) (closing the switch makes) a current (through the wire) 1
 (the current flowing) creates a magnetic field (around the wire) 1
 this field interacts with the permanent magnetic field
accept links / crosses attracts / repels is insufficient 1
- (ii) arrow drawn showing upwards force on XY
judge vertical by eye the arrow must be on or close to the wire XY 1
- (iii) motor
accept catapult 1
- (b) (i) the wire moves up and down
 or
 the wire vibrates
back and forth or side to side is insufficient for vibrate 1
- (ii) the force (continually) changes direction (from upwards to downwards, on the wire)
accept the direction of the magnetic field (of the wire) changes 1
6. (i) away from magnet
arrow should be perpendicular to field lines and current as judged by eye 1
- (ii) current in wire creates magnetic field around wire 1
 two fields interact **or** combine giving a resultant force (on the wire) 1
7. (a) an alternating current through the primary coil (in the charging base)
it must be clear which coil is being referred to 1
 causes a changing / alternating magnetic field in / around the (iron) bar 1
 which induces an (alternating) p.d. across the secondary coil (in the toothbrush)
accept induces an (alternating) current in the secondary coil 1

[7]

[3]

(b) 18

allow 1 mark for correct substitution, ie

$$\frac{230}{7.2} = \frac{575}{n_s}$$

2

[5]

8.

(a) 400 000

allow 1 mark for correct substitution ie

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

or

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

2

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

1

(ii) (easily) magnetised (and demagnetised)

accept '(it's) magnetic'

do **not** accept 'because it's a conductor'

1

(iii) alternating current in the primary (coil)

1

produces a changing magnetic field (in the core)

1

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

1

(c) any **two** from:

- if the (local) power station breaks down / fails / demand / load exceeds supply
- electricity / power can be switched from elsewhere in the system / from other power station(s)
- electricity can be generated in places remote from customers
- (in total) fewer power stations are needed
- power available in rural / remote areas
- National Grid allows for (better) control of supply and demand

2

[9]