

**PH3HP**

**Question 7**

question	answers	extra information	mark
<b>7(a)</b>	(the alternating current creates) a <u>changing / alternating magnetic</u> 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) <u>induced</u> in / across secondary coil	accept voltage for p.d.	1
<b>7(b)(i)</b>	20	allow 1 mark for correct substitution, ie  $\frac{230}{V_s} = \frac{575}{50}$ <b>or</b> $\frac{V_s}{230} = \frac{50}{575}$	2

**Question 7 continues on the next page . . .**

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**Question 7 continued . . .**

question	answers	extra information	mark
7(b)(ii)	0.3 <b>or</b> correct calculation using $230 \times I_p = \text{their (b)(i)} \times 3.45$	allow <b>1</b> mark for correct substitution, ie $230 \times I_p = 20 \times 3.45$  allow ecf from (b)(i) for 20 <b>OR</b> substitution into this equation $\frac{I_p}{I_s} = \frac{N_s}{N_p}$	2
7(c)	(switch mode transformers) use (very) little power / current / energy when switched on but no load is applied  <b>or</b>  it is more efficient	accept no for little  ignore it is more portable  do <b>not</b> accept electricity for power / current / energy  accept does not get as hot <b>or</b> less heat produced	1
7(d)	any <b>one</b> from: <ul style="list-style-type: none"> <li>fewer (waste) batteries have to be sent to / buried in land-fill</li> <li>the soil is polluted less by batteries in land-fill</li> <li>fewer (waste) batteries have to be recycled</li> <li>fewer batteries have to be made</li> <li>less raw materials are used in making batteries</li> <li>customers have to replace their batteries less often</li> <li>customers have to buy fewer (replacement) batteries</li> </ul>	longer lifetime is insufficient  it costs less is insufficient	1
<b>Total</b>			<b>9</b>

**UMS Conversion Calculator:** [www.aqa.org.uk/umsconversion](http://www.aqa.org.uk/umsconversion)



Question	Answers	Extra information	Mark	AO / Spec. ref.
8(a)	an alternating current through the primary coil (in the charging base)	it must be clear which coil is being referred to	1	AO1 P3.3.2d
	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	
8(b)	18	allow 1 mark for correct substitution, ie $\frac{230}{7.2} = \frac{575}{n_s}$	2	AO2 P3.3.2g
<b>Total</b>			5	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
<b>2(a)</b>	a magnetic field	accept electromagnetic field heat is insufficient	1	AO1 3.3.2d
	that is alternating / changing		1	
<b>2(b)</b>	20	allow <b>1</b> mark for correct substitution, ie $\frac{230}{11.5}$ provided no subsequent step	2	AO2 3.3.2g
<b>2(c)</b>	(most) transformers are not 100% efficient	allow energy / power is lost to the surroundings  allow energy / power is lost as heat / sound  power is lost is insufficient	1	AO1 3.3.2h
<b>2(d)(i)</b>	0.01 (V)		1	AO3 3.3.2a 3.3.2b
	because there is a change in p.d. each time (the number of turns changes)	allow because all the results (to 2 decimal places) are different  accept if results were to 1 decimal place, there might not be a difference	1	
<b>2(d)(ii)</b>	student 2 moved the coil more slowly (than student 1)	accept student 2 moved the coil at a different speed to student 1  do not accept student 2 moved the coil faster (than student 1)	1	AO3 3.3.2a 3.3.2b
<b>2(d)(iii)</b>	both sets of results show the same pattern	accept trend for pattern  results are similar is insufficient results follow a pattern is insufficient	1	AO3 3.3.2a 3.3.2b

Question 2 continues on the next page ...

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(d)(iv)	(electromagnetic) induction	accept it is induced do not accept electric / magnetic induction	1	AO1 3.3.2a
2(e)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• more economical / cheaper for the consumer</li> <li>• easier/cheaper to replace if broken/lost</li> <li>• since fewer transformers need to be made less resources are used</li> </ul>	allow more convenient  allow in case one gets lost  allow fewer plug sockets are needed  allow fewer transformers are needed  environmentally friendly is insufficient	1	AO3 3.3.2
<b>Total</b>			11	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	any <b>two</b> from: <ul style="list-style-type: none"> <li>The number of turns on the coil</li> <li>The strength of the magnet</li> <li>The (stiffness of the) elastic bands</li> </ul>	do not accept number of coils allow how tightly the turns are wrapped allow distance between the magnet and coil / cone allow strength/elasticity/tension for stiffness ignore references to size of paper cone change direction of current or magnet is insufficient	2	AO3 3.3.1c
1(b)(i)	1.3 (cm)	two values (1.4 and 2.7) correctly taken from the graph scores <b>1</b> mark	2	AO2 3.3.1b
1(b)(ii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>(Below 1A) as the current increases the distance increases</li> <li>Above 1A the distance does not change (with current)</li> <li>Between 0.3A and 0.7A the relationship is linear</li> </ul>	accept the maximum distance (that the cone can move) is 2.8 cm accept between 0.6 cm and 2.2 cm the relationship is linear ignore references to positive correlation and direct proportionality a description of the shape of the graph is insufficient eg the line levels off after 1A	2	AO3 3.3.1c
<b>Total</b>			<b>6</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	It is easily magnetised.		1	AO1/1 4.7.3.3
06.2	p.d. across the secondary coil is smaller (than p.d. across the primary coil)		1	AO3/2a 4.7.3.3 WS3.5
06.3	ratio $\frac{V_p}{V_s} = \frac{6}{12}$ $\frac{6}{12} = \frac{50}{N_p}$ $N_p = 100$	accept any other correct ratio taken from the graph  use of the correct turns ratio and substitution or correct transformation and substitution  allow 100 with no working shown for <b>3</b> marks	1  1  1	AO2/1 4.7.3.3
<b>Total</b>			<b>5</b>	



Question	Answers	Extra information	Mark	AO / Spec. Ref.
12.1	motor effect		1	AO1/1 4.7.2.2
12.2	increase the strength of the magnet <b>or</b> increase the current		1	AO2/1 4.7.2.2
12.3	$4.8 \times 10^{-4} = F \times 8 \times 10^{-2}$ $F = 6 \times 10^{-3} \text{ (N)}$ $6 \times 10^{-3} = B \times 1.5 \times 5 \times 10^{-2}$ $B = \frac{6 \times 10^{-3}}{7.5 \times 10^{-2}}$ $B = 8 \times 10^{-2} \text{ or } 0.08$  Tesla	         allow $8 \times 10^{-2}$ <b>or</b> 0.08 with no working shown for <b>5</b> marks a correct method with correct calculation using an incorrect value of F gains <b>3</b> marks  accept T do not accept t	1 1 1 1 1   1	AO2/1 4.7.2.2 4.5.4       AO1/1 4.7.2.2
<b>Total</b>			<b>8</b>	