

Revision Sheet

A-Level Physics · Unit 20 Magnetic fields

10 vocabulary items · 38 marks of exam questions (4 questions)

Part 1 · Vocabulary review answer key. Section A wants the exact English spelling.

Question	Answer	Marks
1	ferrous	1
2	solenoid	1
3	coil	1
4	magnetic flux density	1
5	Fleming's left-hand rule	1
6	Hall voltage	1
7	Hall probe	1
8	magnetic flux	1
9	flux linkage	1
10	Lenz's law	1

11(a)(i)	PQRS and WXYZ
11(a)(ii)	force on charge carriers is perpendicular to both (magnetic) field and current
	as charge carriers are deflected to one side, an electric field is set up
	(steady V_H when) electric and magnetic forces on charge carriers are equal (and opposite)
11(b)(i)	n : number density of charge carriers
	t : distance PW (or SZ or QX or RY)
	q : charge on each charge carrier
11(b)(ii)	V_H inversely proportional to t
	(so t needs to be small for) V_H to be large enough to measure

12(a)	constant voltage
	that produces/dissipates same power as (the mean power of) the alternating voltage
12(b)(i)	(maximum) rate of cutting of (magnetic) flux doubles
	(peak and hence) r.m.s. induced e.m.f. doubles
12(b)(ii)	sketch: (sinusoidal) wave of period 10 ms
	peak E shown as $\pm 34\text{ V}$
	(1 mark out of 2 awarded if peak E shown as $\pm 17\text{ V}$ or $\pm 24\text{ V}$)
12(c)	current in the coil results in forces that oppose its rotation or current in the resistor dissipates the energy of rotation
	coil stops rotating

13(a)	<i>any 2 points from:</i> <ul style="list-style-type: none"> (angular) displacement velocity momentum (centripetal) acceleration (resultant) force
13(b)(i)	$Bqv = mv^2 / r$
	$v = 2\pi r / T$
	completion of algebra leading to $B = 2\pi m / qT$
13(b)(ii)	$B = (2\pi \times 4 \times 1.66 \times 10^{-27}) / (2 \times 1.60 \times 10^{-19} \times 2.5 \times 10^{-6})$
	= 0.052 T
13(b)(iii)	either the same because T is independent of r or the same because B , q and m are unchanged or the same because both radius and speed have doubled
13(b)(iv)	$qE = Bqv$
	$E = Bv = 0.052 \times 1.1 \times 10^6$ $= 5.7 \times 10^4 \text{ N C}^{-1}$

14(a)	there must be a current (in the wire)
	(wire) must be at a non-zero angle to the magnetic field
14(b)(i)	arrow from X pointing horizontally to the left
	arrow from Y pointing diagonally upwards and to the left at about 45°
	arrow from Z pointing horizontally to the right
14(b)(ii)	(flux densities at W and X are approximately) equal
	(flux density at) Y greater than (flux density at) Z
14(c)	current in wire creates magnetic field around wire
	(each) wire sits in the magnetic field created by the other
	(for each wire,) current / wire is perpendicular to magnetic field (due to other wire), (so) experiences a (magnetic) force