

Question number	Answer	Notes	Marks
1 (a)	any four from:  MP1. there is a current in the rod;  MP2. (therefore) magnetic field around rod;  MP3. magnetic fields interact / overlap;  MP4. producing a force (on the rod); MP5. catapult effect / motor effect / LH rule;  MP6. rod moves to the right / towards the power supply;	allow 'AB' for rod throughout  allow current in the rail  ignore references to cutting field lines  accept the rod moves sideways / left	4
(b)	any four from:  MP1. alternating current changes direction (continuously); MP2. current in coil produces alternating magnetic field/eq; MP3. (producing) force on the coil/cone; MP4. reversing direction of current reverses direction of the force; MP5. hence coil/cone vibrates;  MP6. cone vibrates air particles;	allow any marking point if clear from diagram  allow changing magnetic field  allow coil / cone moves in and out / backwards and forwards  total marks = 8	4

Question number	Answer	Notes	Marks
2 (a)	any two from: MP1. reverse the magnet (N into coil); MP2. reverse the connections at the ammeter; MP3. move the magnet out of coil;	ignore all references to • speed of movement • numbers of turns on the coil CARE that candidate does not conflate MP2 and 3 to negate their answer allow for MP2 invert the coil	(2)
(b) (i)	Y= magnet; Z = coil (of wire);		(2)
(ii)	(±)1.6 (V);		(1)
(iii)	reading of time for 1 cycle ; evaluation; e.g. 0.04s 25 (Hz)	no mark for eqn as it is given time can be assumed if f= 1/0.04 seen allow for 1 mark 50, 12.5 (Hz)	(2)
(iv)	C higher higher ;		(1)
(v)	any one from stronger magnet; more turns on the coil;	ignore bigger magnet condone more coils	(1)
(c) (i)	rearrangement of eqn; substitution; evaluation; e.g. work done (energy output) = power x time (=) 3.1 x 290 900 (W)	Accept 899 (W)	(3)
(ii)	$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$	accept standard abbreviations rearrangements with factor of X 100	(1)
(iii)	substitution; rearrangement of eqn; evaluation; e.g. input energy = $\frac{\text{output energy}}{\text{efficiency}}$  = $\frac{899 \text{ (W)}}{0.72}$ = 1200 (J)	ECF from ci  allow 900 for 899  1245, 1250, 1300 (J)	(3)

**Total for Question 2 = 16 marks**