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

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

**Total for Question 2 = 16 marks**