| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 9 (a) | gravitational potential (energy); | GPE | 1 |
| b | any three of:<br>MP1. turbine spins;<br>MP2. (causes) coils of wire spin;<br><br>MP3. between the poles of (large) magnets;<br>MP4. current or voltage is **induced;**<br>MP5. in or across the coils of wire; | allow<br>turbines rotates<br>magnets spin<br><br>inside coils of wire | 3 |
| c | any one of:<br>MP1. to keep voltage or current (value) constant;<br>MP2. voltage (or current) produced depends on the speed of rotation (of coil); | allow<br>frequency of voltage depends on the speed of rotation | 1 |
| d i | efficiency = $\frac{\text{useful energy output}}{\text{total energy input}}$ | | 1 |
| ii | substitution;<br>rearrangement;<br>evaluation of useful energy;<br>subtraction from input energy;<br>e.g.<br>$\frac{36}{100} = \frac{\text{output energy}}{1050}$ gains 1<br>OP energy = $\frac{36 \times 1050}{100}$ gains 2<br>=378 (kJ) gains 3<br>wasted energy = 1050-378 = 672 (kJ) gains 4 | allow alternative method by calc 64% of 1050 kJ<br><br>POT error (often as 36 not seen as % or fraction) loses 1st mark | 4 |
| iii | any two suitable energy forms:<br>e.g.<br>thermal energy (of the water);<br>frictional heating (along the pipe/in bearings);<br>noise/sound; | <br><br>condone 'heat'<br>not just 'friction' | 2 |

**Total 12 marks**