| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **1(a)** | D | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **1(b)** | substitution (1)<br>0.5 × 6.0<br><br>evaluation (1)<br>3<br><br>unit (1)<br>W / watts | <br><br><br>give (2) for correct answer, no working<br><br>0.003 kW (3)<br>3 kW (2)<br><br>J/s, VA<br>Accept kW for unit with incorrect or no numerical answer | **(3)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **1(c)(i)** | 150 (J) | 200 – 50 (J)<br>200 minus 50 (J) | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **1(c)(ii)** | substitution (1)<br>50 ÷ 200 (x 100%)<br><br>evaluation (1)<br>25 (%) | <br><br><br>0.25, 1/4<br><br>give (2) marks for correct answer, no working | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **1(d)** | (black) is a good {(thermal) emitter / radiator} | to keep the motor cool / eq<br>ignore absorbing / conducting / insulating heat | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(ai)** | (Bow and arrow:) kinetic (1)<br><br>(Electric kettle:) heat (thermal) (1)<br><br>(Microphone: ) sound (1) | <br><br>Heat/thermal | **(3)** |

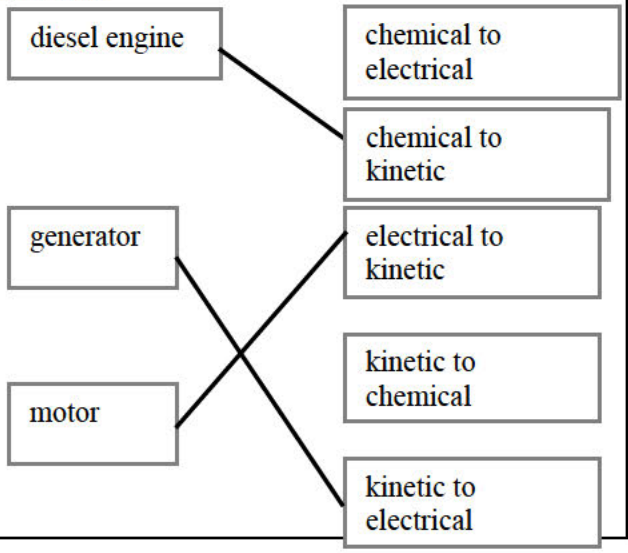
| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(a)(ii)** | Any **one** from<br>(transferred into) {thermal/heat/sound}(energy) (1)<br><br>(Energy) is dissipated (1) | <br>Do not accept light energy or it disappears<br><br>goes into surroundings/air<br><br>(energy) is wasted/lost | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(b)(i)** | 12 (J)<br>Ignore any unit given by candidate. | 20 - 8 (J) | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(b)(ii)** | An explanation linking any **two** of<br><br>• (For the) same amount of {electrical/supplied} (energy/power) (1)<br><br>• (CFL/it) has a greater output (of light energy) (1)<br><br>• (CFL/it) wastes less (electrical energy) (1) | <br><br>Same input (energy)<br><br>gives out/produces more {light/useful} (energy)<br>Do not accept more energy is used in the (CFL/it)<br>Ignore brightness.<br><br>(CFL/it) produces less thermal/heat (energy)<br><br>Accept explanations using data from the energy transfer diagrams as comparisons<br>eg (CFL/it) is four times as efficient gains both marks | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(c)** | An explanation linking<br>• dissipating heat (1)<br>• at same (rate)/as quickly as energy is being supplied (1) | {gives out/radiates/conducts/ convects /loses /produces} {heat/thermal/ energy}<br>gives out as much energy/power as it takes in(each second) Gains both marks<br>If no other marks scored:<br>There is a constant current/ steady flow of energy into the heater gains one mark<br>Ignore refs to thermostat | **(2)** |

Total for Question 2 = 9 marks

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3 (ai)** | A line connecting a train part with a useful energy transfer as shown below (1)<br><br>Train part transfer — useful energy<br><br> | Lines need not be straight<br><br>Ignore any arrow heads drawn<br><br>Note: if more than one line is drawn from a train part then zero mark for that train part. | **(3)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3 (aii)** | (transfer of energy to) thermal (1) | heat/sound | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3 (bi)** | 1400 – 1300 (= 100) (kJ) (1) | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3 (bii)** | Substitution (1)<br>1300 / 1400 x 100<br><br>Evaluation (1)<br>93(%) or 0.93 | <br><br><br><br>A value which rounds to 93(%) or 0.93<br><br>Correct answer with no working scores 2 marks | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **3 (c)** | Any one from<br><br>black is a good thermal radiator (1)<br><br>(helps to) prevent motors overheating (1) | <br><br>(good) emitter<br><br>(helps to) remove wasted energy/ heat (from the motor) | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(a)** | A | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(b)(i)** | 6% | 100 - 94 | **(1)** |
| **(ii)** | comparing reflected amount for water with any one of the others (1) | saying one {named material (on the graph) is/all materials (on the graph) are} solid | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(c)(i)** | An explanation to include the following<br>• more thermal (heat) energy is absorbed (1)<br>• because water (liquid) absorbs more than ice (solid) (1) | more radiation is absorbed<br>because water (liquid) reflects less than ice (solid)<br>because less ice surface to reflect<br>because more water surface to absorb | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(c)(ii)** | its temperature rises | gets hotter<br>water level increases/gets higher<br>Ignore '{water/it} {increases/rises}'<br>**Reject** toxicity | **(1)** |

| Question Number | | Indicative content | Mark |
|---|---|---|---|
| **QWC** | ***4(d)** | A description including some of the following<br><br>• solar / heat / light<br>• photosynthesis<br>• chemical / fossil fuel<br>• burning<br>• thermal<br>• in steam<br>• kinetic<br>• in turbine<br>• electrical<br>• in generator | **(6)** |
| **Level** | **0** | no rewardable material | |
| **1** | **-2** | • a limited description which identifies an energy in an appropriate place e.g. thermal energy in the boiler<br>OR e.g. the (same) energy flows from the boiler to the turbine<br>• the answer communicates ideas using simple language and uses limited scientific terminology<br>• spelling, punctuation and grammar are used with limited accuracy | |
| **2** | **-4** | • a simple description which includes details of a relevant energy transfer e.g. (steam causing) the turbine to rotate turns the coil in the generator transferring kinetic energy into electrical energy<br>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately<br>• spelling, punctuation and grammar are used with some accuracy | |
| **3** | **5 - 6** | • a detailed description to includes details of a sequence of transfers e.g. chemical energy stored in the coal is transferred in the boiler to thermal energy producing steam. The steam turns the turbine which turns the coil.<br>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately<br>• spelling, punctuation and grammar are used with few errors | |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **5(a)** | C | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **5(b)(i)** | Any **two** from the following points<br>• cover box with transparent material (1)<br>• use of reflector (1)<br>• method to increase energy supplied (1)<br>• method to reduce energy loss (1)<br>• paint (box) black/dull/matt (1) | use glass box<br>mirror / foil<br>{angle to sun} / {warmer place}/lens<br>use insulating box / wooden box / lagging<br>Ignore answers to do with hosepipe | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **5(b)(ii)** | An explanation linking the following points<br>• pipe / water absorbs heat (1)<br>• pipe radiates heat (1)<br>• radiation (rate) increases with temperature(1)<br>• (at constant temperature) absorption <u>rate</u> = radiation <u>rate</u> (1) | accept takes in for absorbs<br>accept emits for radiates<br>If no other marks given accept output = input or water boils for 1 mark | **(3)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **5(c)** | 4000 (1)<br><br>(4000)/200 (1) | <br><br>20 (W)<br><br>give full marks for correct answer, no working<br><br>accept for 1 mark<br>4000<br>10000/200<br>6000/200<br>16000/200 | <br><br><br><br><br><br><br><br>**(2)** |