

**M1. (a)** water heated by radiation (from the Sun)  
*accept IR / energy for radiation* 1

water used to heat buildings / provide hot water  
*allow for 1 mark heat from the Sun heats water if no other marks given*  
*references to photovoltaic cells / electricity scores 0 marks* 1

(b) 2 (minutes)

$$1.4 \times 10^3 = \frac{168 \times 10^3}{t}$$

*gains 1 mark*  
*calculation of time of 120 (seconds) scores 2 marks* 3

(c) (i) 150 (kWh) 1

(ii) £60(.00) or 6000 (p)  
*an answer of £6000 gains 1 mark*  
*allow 1 mark for  $150 \times 0.4(0)$   $150 \times 40$*   
*allow ecf from (c)(i)* 2

(iii) 25 (years)  
*an answer of 6000 / 240*  
**or**  
*6000 / their (c)(ii)  $\times 4$*   
*gains 2 marks*  
*an answer of 6000 / 60*  
**or**  
*6000 / their (c)(ii) gains 1 mark, ignore any other multiplier of (c)(ii)* 3

(iv) any **one** from:

- will get £240 per year  
*accept value consistent with calculated value in (c)(iii)*
- amount of light is constant throughout the year
- price per unit stays the same
- condition of cells does not deteriorate

1

(d) any **one** from:

- angle of tilt of cells
- cloud cover
- season / shade by trees
- amount of dirt

1

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**M2.** (a) (i) kinetic  
*accept KE*  
*do not accept movement* 1

(ii) 0.75  
$$\frac{60\,000}{80\,000}$$
*allow 1 mark for correct substitution ie*  
**or** 75 %  
*an answer 0.75 % or 0.75 with a unit gains 1 mark only*  
*an answer 75 with or without a unit gains 1 mark only* 2

(b) any **one** from:  

- large areas of land are flooded  
*uses large areas of land / takes up large areas of land is insufficient*
- people's homes may be destroyed
- habitat (of animals and plants) lost / damaged  
*construct is neutral*  
*very noisy is neutral*

1

(c) (i) system of cables and transformers  
*both required for the mark*  
*accept power lines / wires for cables*  
*ignore reference to pylons*  
*inclusions of power stations / consumers negates answer* 1

(ii) less energy loss / wasted (in the cables)  
*accept heat for energy*  
*do not accept no energy loss*  
*do not accept electricity for energy* 1

as the cables are shorter

1

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**M3.** (a) 9

*allow 2 marks for power = 1400 (kW)*

*if a subsequent calculation is shown award 1 mark only*

**or**

*allow 1 mark for correct substitution and transformation*

$$\text{power} = \frac{5600}{4}$$

*allow 1 mark for using a clearly incorrect value for power to read a corresponding correct value from the graph*

3

(b) (i) system of cables and transformers

*both required for the mark*

*ignore reference to pylons*

*inclusion of power stations / consumers negates the mark*

*wire(s) is insufficient*

1

(ii) (uses step-up transformer to) increase pd / voltage

*accept (transfers energy / electricity at) high voltage*

**or**

(uses step-up transformer to) reduce current

*accept (transfers energy / electricity at) low current*

*ignore correct references to step-down transformers*

1

(c) build a power station that uses a non-renewable fuel or biofuel

*accept a named fuel*

*eg coal or wood*

**or**

buy (lots of) petrol / diesel generators

1

stockpile supplies of the fuel

*accept fuel does not rely on the weather*

**or**

fuel provides a reliable source of energy

*accept as an alternative answer idea of linking with the National Grid (1)*

*and taking power from that when demand exceeds supply  
(1)*

**or**

*when other methods fail*

**or**

*when it is needed*

*answers in terms of using other forms of renewables is  
insufficient*

1

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**M4.** (a) *answers must be in terms of nuclear fuels*

concentrated source of energy

*idea of a small mass of fuel able to generate a lot of electricity*

1

that is able to generate continuously

*accept it is reliable*

*or can control / increase / decrease electricity generation*

*idea of available all of the time / not dependent on the weather*

*ignore reference to pollutant gases*

1

the energy from (nuclear) fission

1

is used to heat water to steam to turn turbine linked to a generator

1

(b) carbon dioxide is not released (into the atmosphere)

1

but is (caught and) stored (in huge natural containers)

1

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**M5.** (a) (i) replaced faster than it is used  
*accept replaced as quick as it is used*  
*accept it will never run out*  
*do **not** accept can be used again*

1

(ii) any **two** from:  
*two sources required for the mark*

- wind
- waves
- tides• fall of water  
*do **not** accept water / oceans*  
*accept hydroelectric*
- biofuel  
*accept a named biofuel eg wood*
- geothermal

1

(b) (i) any **two** from:

- increases from 20° to 30°
- reaches maximum value at 30°
- then decreases from 30°
- same pattern for each month  
*accept peaks at 30° for **both** marks*  
*accept goes up then down for **1** mark*  
*ignore it's always the lowest at 50°*

2

(ii) 648  
*an answer of 129.6 gains 2 marks allow 1 mark for using 720*  
*value only from table*  
*allow 2 marks for answers 639, 612, 576, 618(.75)*



*allow 1 mark for answers 127.8, 122.4, 115.2, 123.75*

3

- (c) (i) (sometimes) electricity demand may be greater than supply (of electricity from the system)  
*accept cloudy weather, night time affects supply*

**or**

can sell (excess) electricity (to the National Grid)

1

- (ii) decreases the current  
*accept increases the voltage*

1

reducing energy loss (along cables)

*accept less heat / thermal energy lost / produced*

1

**[10]**

- M6.** (a) (i) produces carbon dioxide / nitrogen oxides  
*accept greenhouse gases*  
*ignore pollutant gases* 1
- that (may) contribute to global warming  
*accept causes global warming*  
*damages ozone layer negates this mark*  
*accept alternative answers in terms of: sulfur dioxide /*  
*nitrogen oxides causing acid rain* 1
- (ii) carbon capture / storage  
*answer must relate to part (a)(i)*  
*collecting carbon dioxide is insufficient*
- or**
- plant more trees
- or**
- remove sulfur (before burning fuel) 1
- (b) (i) (power station can be used) to meet surges in demand  
*accept starts generating in a short time*  
*can be switched on quickly is insufficient* 1
- (ii) can store energy for later use  
*accept renewable (energy resource)*  
*accept does not produce CO<sub>2</sub> / SO<sub>2</sub> / pollutant gases* 1
- (c) (i) turbines do not generate at a constant rate  
*accept wind (speed) fluctuates*  
*accept wind is (an) unreliable (energy source)* 1

(ii) any **one** from:

- energy efficient lighting (developed / used)  
*use less lighting is insufficient*
- increased energy cost (so people more likely to turn off)  
*accept electricity for energy*
- more people becoming environmentally aware

1

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**M7.** (a) any **one** from:

- energy / source is constant
- energy / source does not rely on uncontrollable factors  
*accept a specific example, eg the weather*
- can generate all of the time  
*will not run out is insufficient*

1

(b) (dismantle and) remove radioactive waste / materials / fuel  
*accept nuclear for radioactive*  
*knock down / shut down is insufficient*

1

(c) any **two** from:

- reduce use of fossil fuelled power stations  
*accept specific fossil fuel*  
*accept use less fossil fuel*
- use more nuclear power  
*accept build new nuclear power stations*
- use (more) renewable energy sources  
*accept a named renewable energy source*  
*do not accept natural for renewable*
- make power stations more efficient
- (use) carbon capture (technology)  
*do not accept use less non-renewable (energy) sources*

2

(d) (by increasing the voltage) the current is reduced

1

this reduces the energy / power loss (from the cable)  
*accept reduces amount of waste energy*  
*accept heat for energy*  
*do not accept stops energy loss*

1

and this increases the efficiency (of transmission)

1

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