<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>12ai</td><td>Use of $I = P/A$ (1)<br>Maximum energy received in one hour = $3.6 \times 10^{19}$ J (1)<br><br><u>Example of calculation</u><br>$P = I \times A = (1100\ \text{Wm}^{-2}) \times (9.2 \times 10^{12}\ \text{m}^2) = 1.0 \times 10^{16}$ W<br>$E = P \times t = (1.0 \times 10^{16}\ \text{W}) \times (60 \times 60) = 3.6 \times 10^{19}$ J</td><td>(2)</td></tr>
<tr><td>12aii</td><td>Calculates total energy usage in 2014<br>Or Calculates total energy received by solar panels in 1 year (1)<br><br>Comparison of energies (hours with hours or years with years) to come to a correct conclusion. (1)<br><br>Allow e.c.f. from values in (a)(i)<br><br>Possible comparisons:
<table>
<tr><th>Total energy worldwide in 2014</th><th>Total energy received by solar panels</th></tr>
<tr><td>23800 TWh (in a year)</td><td>87,600,000 TWh (if using 24 hours)</td></tr>
<tr><td>23800 TWh (in a year)</td><td>43,800,000 TWh (if using 12 hours)</td></tr>
<tr><td>$8.6 \times 10^{19}$ J (in a year)</td><td>$3.2 \times 10^{23}$ J (if using 24 hrs)</td></tr>
<tr><td>$8.6 \times 10^{19}$ J (in a year)</td><td>$1.6 \times 10^{23}$ J (if using 12 hrs)</td></tr>
<tr><td>$9.8 \times 10^{15}$ J (in an hour)</td><td>$3.6 \times 10^{19}$ J (in an hour)</td></tr>
</table>
<u>Example of calculation</u><br>Total $E$ worldwide in 1 year = $23{,}800 \times (3.6 \times 10^{15}\ \text{J}) = 8.6 \times 10^{19}$ J<br>$8.6 \times 10^{19}\ \text{J} / 3.6 \times 10^{19}\ \text{J} = 2.4$ (hours), so worldwide electrical energy consumption for 2014 would be produced in less than 3 hours</td><td>(2)</td></tr>
<tr><td>12b</td><td>MAX 2 from:<br><br>Sand(storms) reduce amount/intensity/energy/power of light (1)<br><br>Fewer electrons released in the (solar) panel (1)<br><br>Sand(storms) absorbs/blocks/reflects some light (1)<br><br>Sand(storms) reduces area of panel/desert (1)</td><td>(2)</td></tr>
<tr><td></td><td>Total for question 12</td><td>6</td></tr>
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