1. \( W = \frac{1}{2}mv^2 = \frac{1}{2} (70 \text{ kg}) (5.6 \text{ m/s})^2 = 1080 \text{ J} \)

2. \( W = mgh = (80 \text{ kg}) (9.8 \text{ m/s}^2) (4 \text{ m}) = 3100 \text{ J} \)

\[ P = \frac{3100 \text{ J}}{5 \text{ sec}} = 620 \text{ W} \]

3. 75 kW useful work \( \Rightarrow \) total input = \( \frac{75 \text{ kW}}{18\%} = 420 \text{ kW} \)

\( \Rightarrow \) heat output = 420 kW - 75 kW = 345 kW

Out of 100 gallons, 18 gallons account for motion

4. advantages: good acceleration (electric motors), reduced mechanical structure (no drive train, just electric motors at wheels)

   disadvantages: more complex electric power plant + motors

5. There is no magnetic charge.

6. c) is not possible - does not conserve charge

7. 1 Amp = 1 C/s \( \Rightarrow \) in one minute 60 C flow. Zero Coulombs are stored in the bulb.
8. | Medium        | Oscillation     | Rest Force | Speed | Wavelength | T/L |
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<tbody>
<tr>
<td>air</td>
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<td>air pressure</td>
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<td>0.3 m</td>
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<td>surface height</td>
<td>gravity</td>
<td>10 m/s</td>
<td>5 m</td>
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<td>string</td>
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<td>string tension</td>
<td>10 m/s</td>
<td>1 m</td>
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<td>slinky</td>
<td>coil separation</td>
<td>spring force</td>
<td>2 m/s</td>
<td>0.5 m</td>
<td>L</td>
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</table>

Sound: 1000 Hz, \( \lambda = \frac{300 \text{ m/s}}{1000 \text{ Hz}} = 0.3 \text{ m} \)

9. 

10. 150 MW electric desired

30% efficient \( \Rightarrow \frac{150 \text{ MW}}{30\%} = 500 \text{ MW} \) solar needed

Annual average solar power at surface in North America = 200 W/m²

\[ \text{area} = \frac{500 \text{ MW}}{200 \text{ W/m}^2} = 2.5 \times 10^6 \text{ m}^2 \]

(equivalent to square field 1.6 km on a side)