

Fuels, nuclear power, renewables and the climate

Grade 8 science (Year 9 · Class 8) · Lab answers

These model answers use the sample table. Your own voltages will differ a little, but the power should fall steadily as the cell turns away from the lamp, reaching about half its maximum near 60°.

Level: Grade 8 science (Year 9 · Class 8) · **Curriculum:** MS-ESS3-3

Question 1 Check the first power

$$P = V^2 \div R = 1.80^2 \div 20 = 3.24 \div 20 = \mathbf{0.162 \text{ W}}.$$

Question 2 Power at 40 degrees

$$P = 1.58^2 \div 20 = 2.4964 \div 20 = 0.125 \text{ W}, \text{ so the power is } \mathbf{0.125 \text{ W}}.$$

Question 3 Percentage of the maximum

$$P \text{ at } 60^\circ = 1.27^2 \div 20 = 0.0806 \text{ W. Percentage} = 0.0806 \div 0.162 \times 100 = 49.8 \%, \text{ which is } \mathbf{\text{about } 50 \%}.$$

Question 4 Describing the pattern

The power decreases as the angle increases, slowly at first and then faster. **Power falls as θ increases.**

Question 5 Graph

The graph is a curve that starts at 0.162 W at 0° and falls towards zero as the angle approaches 90°, when the light just skims the cell. The prediction at 90° is **close to zero**.

Question 6 Real panels

A tilted panel faces the Sun more directly, so more light falls on its surface and the power is higher. **It keeps θ small.**

Question 7 Uncertainty

Percentage uncertainty in $V = 0.02 \div 0.75 \times 100 = 2.7 \%$. Because P depends on V^2 , the uncertainty in P is about double, which is **about 5.3 %**.

Question 8 Improving the investigation

Any two of: repeat each reading and average; shield the cell from other light; keep the lamp distance fixed with a ruler; let the lamp warm up first; use a protractor fixed to the stand.

Repeat and shield from stray light are good examples.