

Shadows, Moon phases and eclipses explained

Grade 6 science (Year 7 · Class 6) · Lab answers

The model answers use the sample measurements in the table. Your own numbers will differ a little, but the shadow should shrink as the card moves away from the lamp, and the product should stay roughly constant.

Level: Grade 6 science (Year 7 · Class 6) · **Curriculum:** MS-ESS1-1

Question 1 Predict the shadow

$10 \times 100 \div 40 = \mathbf{25 \text{ cm}}$. The measured value is 25.2 cm, so it **agrees within 1 %**.

Question 2 Trend

The shadow height **decreases** as the card moves away from the lamp: from 50.5 cm at 20 cm down to 16.9 cm at 60 cm.

Question 3 Magnification

$50.5 \div 10 = \mathbf{5.05}$; $16.9 \div 10 = \mathbf{1.69}$. The shadow is 5 times the card at 20 cm but under 2 times at 60 cm.

Question 4 A constant product

$20 \times 50.5 = 1010$; $30 \times 33.8 = 1014$; $40 \times 25.2 = 1008$; $50 \times 19.8 = 990$; $60 \times 16.9 = 1014$. The values are **all about 1000** (10×100), so height is inversely proportional to d.

Question 5 Moon model

Ball between you and lamp: **new Moon**. Lamp at your side: **first or last quarter**. Lamp behind you: **full Moon**. Lamp at the other side: **the other quarter**.

Question 6 Sources of error

The lamp is not a point, so the shadow edge is blurred and hard to measure. The card may lean or the distance may be misread. **Any two** sensible reasons are accepted.

Question 7 Improvement

Use a smaller, brighter lamp or cover the lamp with a card with a tiny hole, and work in a **darker room**.