Concept:

Here, gravitational potential energy is ultimately converted to the heat energy that warms the lead shot. Conservation of energy gives

$$E_{gravity} = E_{thermal}$$

$$mgh = mc\Delta T$$

$$\Delta T = \frac{gh}{c}$$

Here, $g = 9.8\,\mathrm{m/s}^2$, $h = 10 \times 2\,\mathrm{m} = 20\,\mathrm{m}$, and $c_{lead} = 130\,\mathrm{J/kg\cdot°C}$.

This gives an expected temperature rise of 1.5°C, which in practice should be somewhat less due to thermal losses. Note that the result clearly does not depend on the mass of lead shot used.

Equipment:

- Demonstration Multimeter
- Thermometer Probe
- Bag of Lead Shot
- 2 Meter Ruler

Procedure:

1. Insert the thermometer probe deep into the bag of lead shot and take note of its initial temperature.

2. Tightly close and secure the bag of lead shot.

3. Quickly have one person drop the bag from a height of 2 meters while another person picks it up and quickly hands it back to them. Do this a total of 10 times so that the bag has fallen a total of 20 meters.

4. Quickly insert the thermometer probe back into the bag and take note of the final temperature.