

Energy Data Detectives

Read data closely to graph mass, speed, and height relationships.

S8P2.a "Analyze and interpret data to create graphical displays that illustrate the relationships of kinetic energy to mass and speed, and potential energy to mass and height of an object."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline statements that tell which variable changes, and circle statements that tell how an energy graph should look.

Reading Energy Data

- ① Energy data can show how motion and position change an object's energy. Kinetic energy, KE, depends on mass and speed: $KE = \frac{1}{2} \times \text{mass} \times \text{speed}^2$. Because speed is squared, a faster rolling cart can gain energy quickly. The table records trials in which one variable was held steady while the other changed.

ROLLING CART TRIALS

Speed (m/s)	Kinetic Energy (J)
1	1
2	4
3	9
4	16

- ② To make a kinetic-energy graph, put the changed variable on the horizontal axis and kinetic energy on the vertical axis. In a fair comparison of mass, keep speed the same. As mass rises, KE rises in direct proportion. In a speed graph, the curve bends upward rather than forming a straight line.
- ③ Potential energy, PE, is stored because of height. Near Earth, $PE = \text{mass} \times \text{gravity} \times \text{height}$. When gravity stays the same, increasing mass increases PE, and increasing height increases PE. A graph of either comparison is a straight rising line. Label units clearly so another scientist can interpret the relationship.

2 ANSWER WITH EVIDENCE Use the passage

1 In the cart trials, which variable changes, and which variable stays steady?

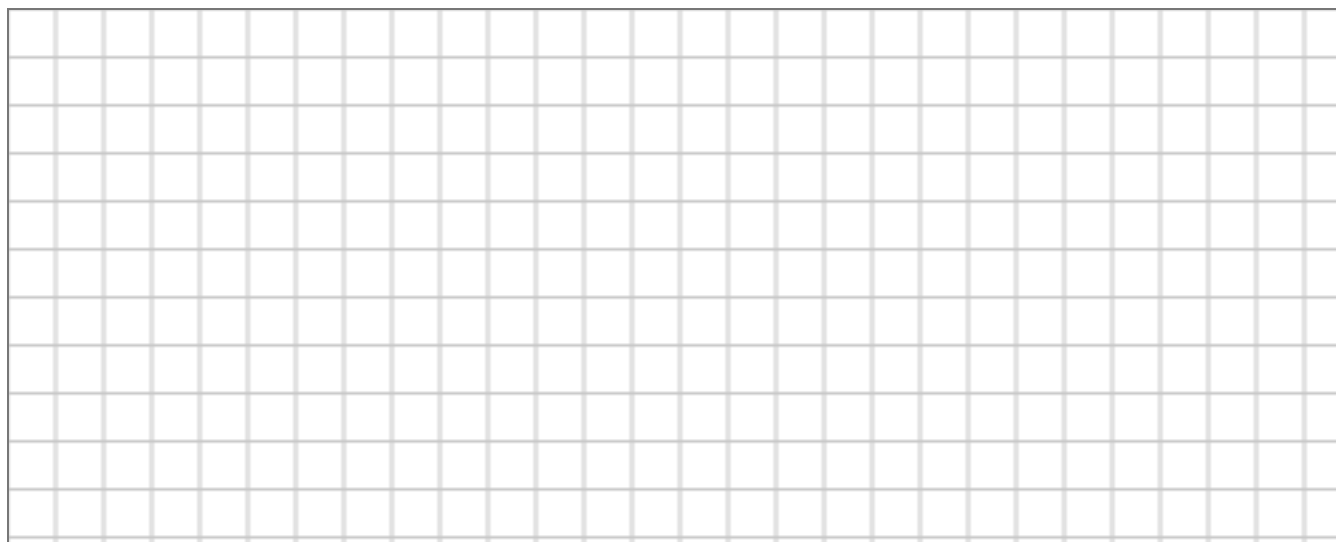
2 Compare the trials at 2 m/s and 4 m/s. How many times greater is the kinetic energy?

3 What belongs on the horizontal and vertical axes for a graph of the cart table?

4 If height increases while mass stays the same, what pattern should a potential-energy graph show?

3 YOUR TURN Your own words

A 3 kg planter is lifted to heights of 1, 2, 3, and 4 m. Use gravity = 10 N/kg. On the grid, graph potential energy versus height, then write one sentence describing the pattern.



PART 1 • READ AND MARK

Underline statements that tell which variable changes, and circle statements that tell how an energy graph should look. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	In the cart trials, which variable changes, and which variable stays steady?	Speed changes. Mass stays steady at 2 kg.
2	Compare the trials at 2 m/s and 4 m/s. How many times greater is the kinetic energy?	The kinetic energy is 4 times greater, from 4 J to 16 J.
3	What belongs on the horizontal and vertical axes for a graph of the cart table?	Horizontal axis: speed (m/s). Vertical axis: kinetic energy (J).
4	If height increases while mass stays the same, what pattern should a potential-energy graph show?	It should show a straight rising line because potential energy increases as height increases.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Title: Planter Potential Energy. Horizontal axis: height (m). Vertical axis: potential energy (J). Plot (1, 30), (2, 60), (3, 90), and (4, 120), then draw a straight rising line. Potential energy increases by 30 J for each 1 m increase in height.

Accept equivalent wording for variables, axes, and graph patterns. For the graph, accept a correctly scaled rising straight line with points at 30, 60, 90, and 120 J.