LESSON MAKER PRO

Where Energy Waits

Use numbers to compare stored energy.

GRADE 8 · 8.14

8.14 "Use models to construct an explanation of how a system of objects may contain varying amounts of potential energy, including gravitational, elastic, and chemical."

NAME _____ DATE _____

THREE ENERGY MODELS

With the ground as zero, gravitational energy = weight × height. Elastic energy = stiffness × stretch × stretch / 2. Chemical energy = energy per cell × number of cells. Energy is measured in joules (J).

WORKED EXAMPLE

A 7 N bag is lifted 3 m. How much gravitational energy does it gain?

Energy gained [7 J | 7 J | 7 J] **?**

1. Each meter of height adds 7 J.
2. 3 × 7 = 21 J.

Answer: 21 J

PRACTICE 4 problems

1 A 20 N skateboard is 4 m above the ground. Find its gravitational energy.

ANSWER _____

2 A spring has a stiffness of 10 N/m and is stretched 2 m. Find its elastic energy.

ANSWER _____

3 A toy has 4 cells that store 9 J each. Find their total chemical energy.

ANSWER _____

4 A 6 N ball rises from 2 m to 5 m. Find its gravitational energy at each height.

ANSWER _____

_____

APPLY IT Show your work

1 A trampoline cord has a stiffness of 16 N/m. It stretches 1 m on a small bounce and 2 m on a big bounce. How much more elastic energy does it store on the big bounce?

WORK SPACE

ANSWER _____

2 A game controller has 4 cells with 8 J of chemical energy each. After play, each cell has 5 J. How much chemical energy was used?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Use the bike delivery kit model. Which object stores the most potential energy, and by how many joules does it exceed the other two combined?

BIKE DELIVERY KIT

Object	Energy model values
Raised bag	20 N, 5 m high
Stretched cord	18 N/m, stretched 2 m
Spare cells	4 cells, 5 J each

WORK SPACE AND ANSWER

Where Energy Waits

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A 20 N skateboard is 4 m above the ground. Find its gravitational energy.	**80 J**
2	A spring has a stiffness of 10 N/m and is stretched 2 m. Find its elastic energy.	**20 J**
3	A toy has 4 cells that store 9 J each. Find their total chemical energy.	**36 J**
4	A 6 N ball rises from 2 m to 5 m. Find its gravitational energy at each height.	**At 2 m: 12 J. At 5 m: 30 J.**

PART 2 · APPLY IT

1. **24 J more** The cord stores 8 J at 1 m and 32 J at 2 m. Subtract: 32 − 8 = 24 J.
2. **12 J** The cells start with 32 J and end with 20 J. The difference is 12 J.

CHALLENGE

The raised bag stores the most: 100 J. The cord stores 36 J and the cells store 20 J, so the bag exceeds them combined by 44 J.

Use ground level as zero for gravitational energy. For the challenge, accept 100 − (36 + 20) = 44 J.