Part A: Falling Problem

Conservation of Energy:
Energy cannot be created. Energy cannot be destroyed. Energy can only be converted between different types.

C.1. Because this law is so important, copy it three times:

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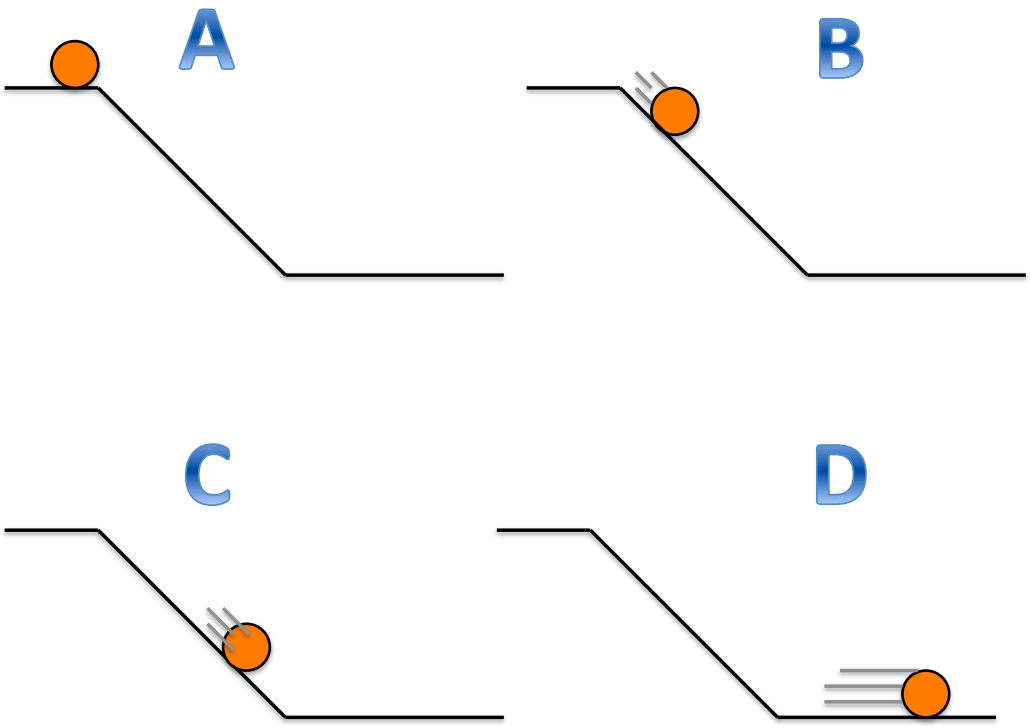
-
-

Falling Problems:
When an object falls down:
gravitational potential energy is converted into kinetic energy!

Total Energy = KE + GPE

Kinetic Energy and Speed:
Something has more *kinetic energy* when it is moving faster.
Gravitational Potential Energy and Height:
Something has more GPE when it has more height.



C.3. Where does the ball have the most *kinetic energy*?

C.4. Where does the ball have the most *gravitational potential energy*?

C.5. Rank each picture by its KE and GPE

	Most Kinetic Energy	Most Gravitation Potential Energy
First Place		
Second Place		
Third Place		
Last Place		

Part B: Conservation of energy quantitative

Imagine a rock is falling down and takes ten seconds to hit the ground. The following table shows its kinetic energy and gravitational potential energy as it falls. The energy follows two rules:

KE + GPE = Total Energy

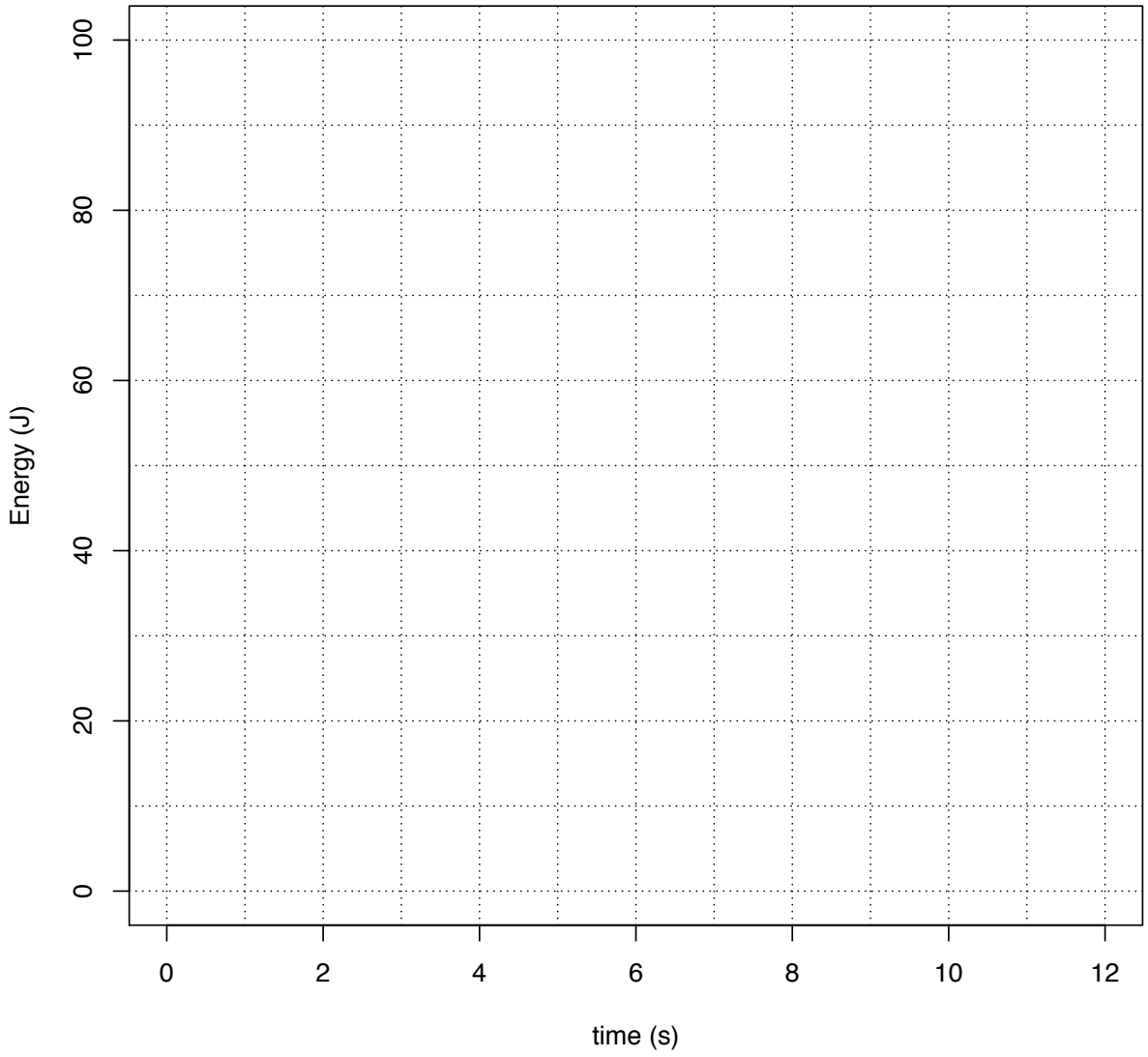
Total Energy does not change!

Time (seconds)	**Kinetic Energy (Joules)**	**Gravitational Potential Energy (Joules)**	**Total Energy (Joules)**
0	0		
2	20		
4	40	60	
6		40	
8	80		
10		0	

On the next page, create a graph of Kinetic Energy, Gravitational Potential Energy, and Total Energy.

Use a different mark for each quantity:

Quantity	**Mark**
Kinetic Energy	•
Gravitational Potential Energy	○
Total Energy	x



As the rock falls, what happens to Kinetic Energy?

As the rock falls, what happens to Gravitational Potential Energy?

As the rock falls, what happens to Total Energy?

What law states that total energy should not change?

Part C: The Kinetic Energy Formula, Algebra

$$KE = \frac{1}{2}mv^2$$

Symbol	Quantity	SI Unit
KE	Kinetic Energy	Joules (J)
m	Mass	Kilograms (kg)
v	Speed/velocity	Meters/second (m/s)

A.1. A person with a mass of 60 kg is running at a speed of 8 m/s. What is his kinetic energy?

Looking For	Formula
Already Know	
Answer as equation *with unit*:	

A.2. A car with a mass of 1100 kg is moving at a speed of 23 m/s. What is its kinetic energy?

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

A.3. A man has a speed of 5 m/s and a kinetic energy of 1000 Joules. What is his mass?

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

A.4. A rolling ball has a mass of 8.0 kg and a kinetic energy of 50 Joules. What is its speed?

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

A.5. A man has a mass of 60 kg and a kinetic energy of 750 Joules. What is his speed?

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

A.6. A boy on his bicycle have a mass of 120 kg and a speed of 12 m/s. What is its kinetic energy?

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

Part D: Gravitational Potential Energy Formula, Algebra

$$GPE = mgh$$

Symbol	Quantity	SI Unit
GPE	Gravitational Potential Energy	Joules (J)
m	Mass	Kilograms (kg)
g	9.8 m/s^2	Meters/second^2 (m/s^2)
h	Height	Meters (m)

B.1. A piano with a mass of 400 kg is on top of the high school, at a height of 50 m. What is its gravitational potential energy?

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

B.2. A book with a mass of 2 kg is on a desk that is 1.5 m tall. What is its gravitational potential energy?

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

B.3. A book has a mass of 5 kg and 150 J of gravitational potential energy. What is its height?

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

B.4. A man is on top of a tall building, with a potential energy of 34,000 J and a height of 50 m. What is his mass?

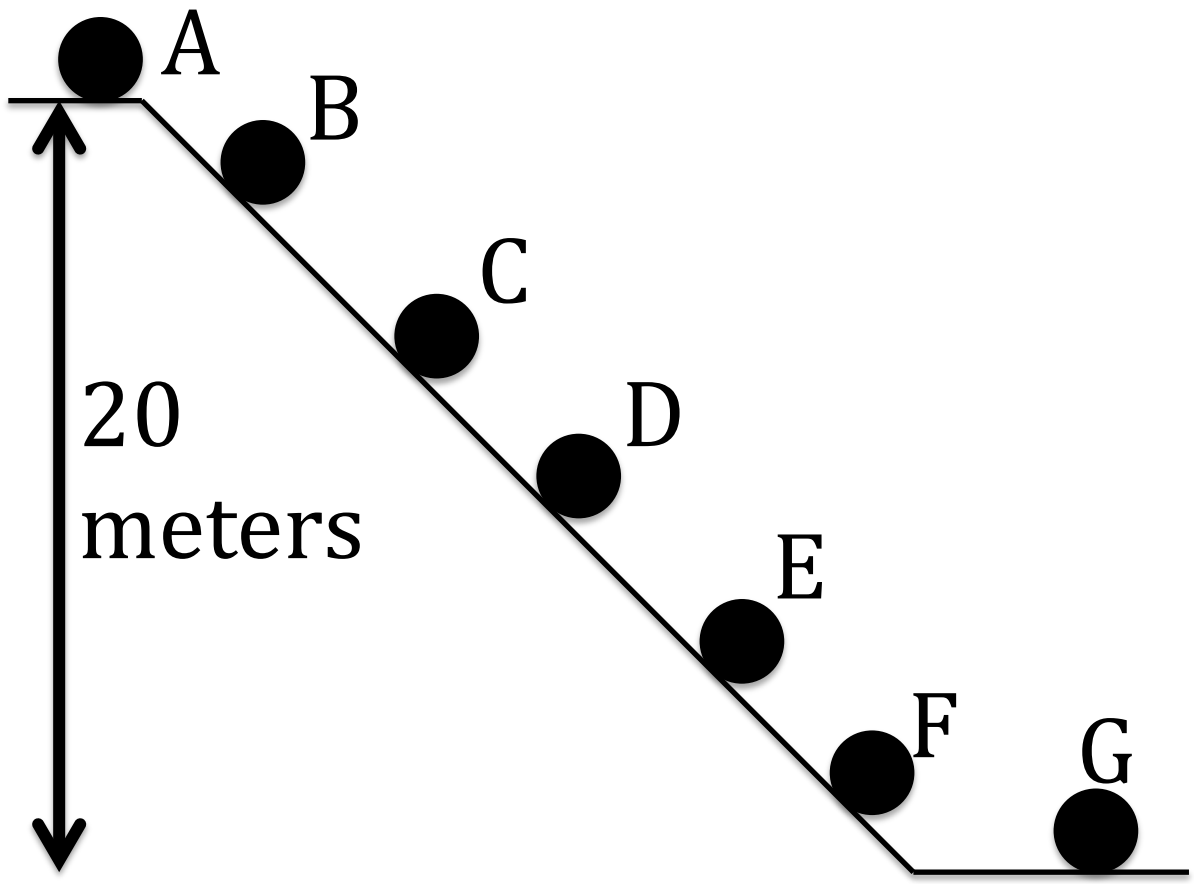
Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

B.5. An astronaut on the moon, in his suit, has a mass of 120 kg. He is 2 m off the ground of the moon, and on the moon, g is 1.6 m/s^2. What is his gravitational potential energy?

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

B.6. A dude on earth jumps to a height of 0.5 m. He has a mass of 80 kg. What was his potential energy at the top of his jump?

Part E: A Full Falling Problem
A ball is rolling down a ramp that is 20 meters tall. Assume friction and air resistance are negligible.



D.1. Fill out the following table: Remember that *Total Energy stays the same*.

Point	KE (J)	GPE (J)	Total Energy (J)
A	0		
B	10		
C		69	
D	49	49	
E		37	
F	87		
G		0	

D.2 At point A, what is the height of the ball?

At point A, what is the GPE of the ball?

Find the *mass* of the rolling ball:

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

The mass does not change!

D.3 At point B, what is the kinetic energy of the ball?

Find the speed of the ball at point B:

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

D.4 At point D, what is the gravitational potential energy of the ball?

Find the height of the ball at point D:

Looking For	Formula
Already Know	
Answer in a complete sentence with unit	

D.5 Find the speed and mass at each point
(Note: two of these boxes you already solved. Use the same method for the others).

Point	**Speed (m/s)**	**Height (m)**
A		20
B		
C		
D		
E		
F		
G		

Space to complete the work: