Transportation Unit Pre-Assessment

Answer the following questions in the space provided. It’s OK if you do not know all of the answers; do your best to answer each question as thoroughly as possible.

1. What is the energy of motion called?

2. Which has more energy, a rock rolling down a hill at a velocity of three meters per second (3 m/s) or a similarly sized rock rolling down a steeper hill at 6 m/s? Explain your reasoning.

3. What happens to the energy of a hammer as it strikes a nail and drives it into a piece of wood?

4. Draw a picture of a person (a stick person is fine!) sitting on a chair. Use arrows to show the force interactions between the person and the chair. Which is the greater force in your diagram? Explain your reasoning.
5. The diagram below shows a weight hanging on a string—a pendulum. Predict the future motion of the pendulum once the weight is released by drawing the pattern of its motion.
Transportation Today

- **Most American commuters drive alone in their own cars.**
  Look at the transport modes on the chart. Why do you think so few of today’s commuters ride bikes?

![Chart showing transportation modes](chart.png)

Go to: [https://www.census.gov/content/dam/Census/library/publications/2015/acs/acs-32.pdf](https://www.census.gov/content/dam/Census/library/publications/2015/acs/acs-32.pdf)

- **The U.S. has more cars per 1000 people than other countries.**
  Why do you think India has so few cars per 1000 people?

![Chart showing cars per 1000 residents](chart2.png)

• U.S. drivers make a lot of short trips. Use the chart to determine the percentage of all trips that are three miles or less.

Go to: https://www.solarjourneyusa.com/EVdistanceAnalysis7.php

• Almost 90% of Americans live in urban areas. How does North America compare to the world average?

• Workers in medium and large cities are more likely to walk and bike. Why might this be the case?

Go to: https://www.census.gov/content/dam/Census/library/publications/2014/acs/acs-25.pdf

• Summary of current commuter habits

Go to: https://www.payscale.com/infographics/commute
• After years of climbing, car travel is starting to level off.

Go to: https://www.enotrans.org/article/trends-in-per-capita-vmt/

• Fewer young people are getting driver’s licenses.

Go to: https://www.statista.com/chart/18682/percentage-of-the-us-population-holding-a-drivers-license-by-age-group/
KE Variables

Background Information: Kinetic energy is the energy that moving objects possess. It is sometimes called "the energy of motion."

Question: How do the mass and speed of a vehicle affect its kinetic energy?

You will design a series of experiments to answer this question using the following materials:

- Marbles of different masses (to represent vehicles of different mass)
- Ramp material
- Textbooks to change the angle of the ramp (this will vary the speed)
- A plastic cup with a hole cut into it (an "igloo" cup)
- A meter stick or ruler to measure how far the marble moves the cup

To get useful data, your experiments need to be “controlled.” The following questions might help you design productive experiments:

- Which variable will your team change? (This is the independent variable.)
- Which variables will the team observe and measure? (These are the dependent variables.)
- Which variables are being held constant? (controlled variables)

Keeping these variables in mind, make a list of some experiments you might use to answer the question:

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