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KIPP/2024/_____

Remote Learning Packet
Assignment #5

Application of Skills

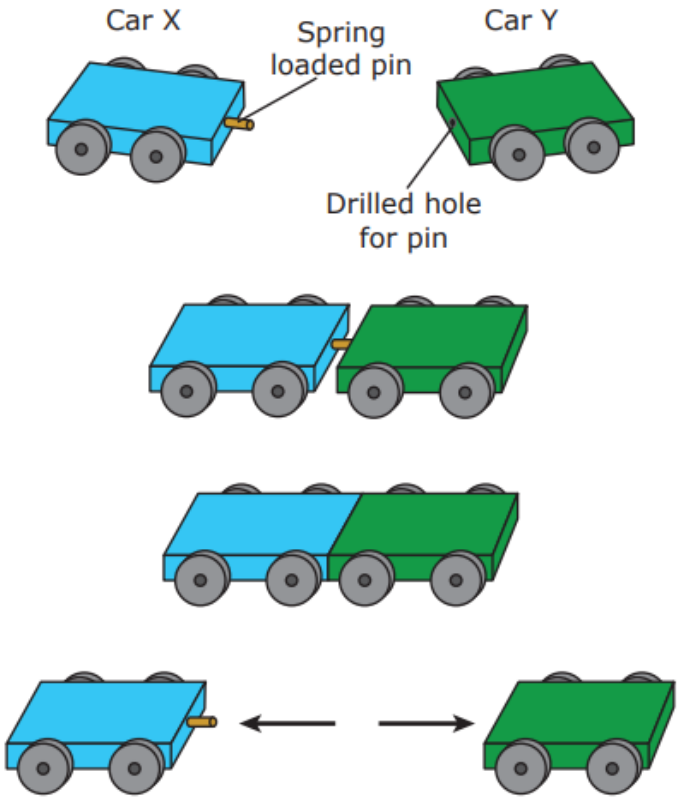
Part 1.
Directions: Use all of the text, graphics, and data to help you answer the questions in this section.

Students observe a video of two astronauts on the International Space Station (ISS) demonstrating a scientific principle. The ISS is in a microgravity environment. That means that astronauts experience weightlessness in the ISS. The students observe one astronaut push on the second astronaut's back while both are floating near each other. As a result of the push, both astronauts move away from each other in opposite directions. Figure 1 shows the astronauts inside the ISS floating near each other. Figure 2 shows the astronauts moving away from each other.

Figure 1. Astronauts Floating in The ISS

Figure 2. Astronauts Moving in Opposite Directions After Push

Figure 3. Student Setup



To better understand the ISS demonstration, the students constructed two cars from wood blocks. A hole was drilled into a side of each block. A spring attached to a pin was inserted into one block and used to exert an initial force after the cars were released. The setup is shown in Figure 3.

The students changed some variables and repeated the investigation several times. Table 1 shows the average data collected.

Figure 3. Student Setup

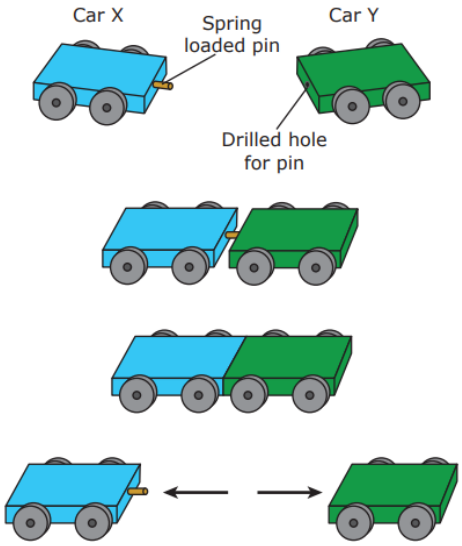


Table 1. Observed Data

Trial	Mass (kg)		Distance (m)	
	Car X	Car Y	Car X	Car Y
1	0.15	0.15	1.50	1.50
2	0.15	0.30	1.80	0.75
3	0.30	0.15	0.75	1.80
4	0.30	0.30	0.75	0.75

1. Which variables have the greatest effect on the distance traveled by each astronaut in the demonstration described by Figure 1 and Figure 2? **Circle <u>two</u> correct answers.**

   a. The speed of the ISS.

b. The force of the push.
c. The weight of the ISS.
d. The mass of each astronaut.
e. The gravity acting on the astronauts.

2. A student conducts a fifth trial with Car X having a mass of 0.45 kg and Car Y having a mass of 0.15 kg. Construct a statement that best describes the results. Write the answers in the correct blanks. Not all answers will be used.

A. the same for both cars	B. more	C. less	D. 0.5 m
E. 2.0 m	F. different for both cars		

It is likely the results will show that Car X traveled _____ than _____ and Car Y traveled about _____ . The force which caused motion was_____ .

3. Compare the activity represented in Figures 1 and 2 to the activity represented in Figure 3. Complete the statement describing the similarities in the two activities. Write the correct answer in each blank.

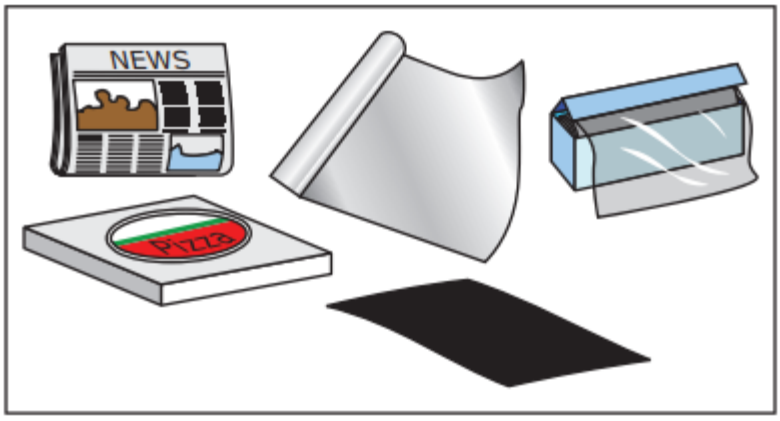
A. frictional	B. acceleration
C. a force	D. an action-reaction

Each activity demonstrates _____ producing motion. In both activities _____ force affects motion.

Part 2.
Directions: Use all of the text, graphics, and data to help you answer the questions in this section.

A group of students want to create a device that will cook foods using energy from the Sun. Their goal is to design a solar cooker that will maximize the rate of cooking. Figure 1 shows the materials available to the students which include newspaper, plastic wrap, aluminum foil, black construction paper, and a pizza box.

Figure 1. Available Materials



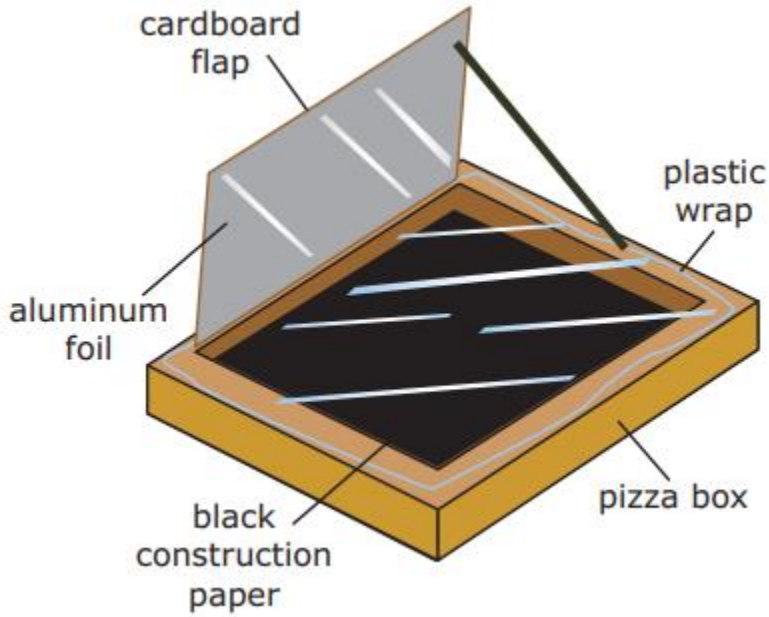
1. What measurements would they make to determine the dependent variable? **Circle <u>two</u> correct answers.**
   a. color
   b. mass
   c. temperature
   d. time
   e. Volume

2. Describe an effective solar cooker. Write the correct answer in each blank. Not all answers will be used.

A. mass	B. kinetic energy	C. potential energy
D. temperature	E. thermometer	F. scale

As the cooker works, the food particles gain_____. This can be measured by using a _____ to determine a rise in _____ .

3. The students learn that as energy travels throughout the solar cooker, each material used can serve a particular purpose by interacting with energy differently. Match the materials to the purpose for which they are best suited. Write the correct answer in each box.
   a. Trap energy
   b. Reflect energy
   c. Absorb energy



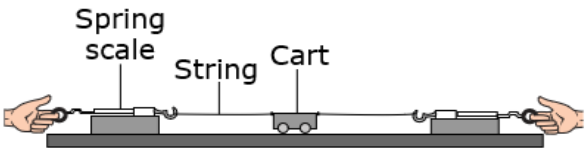
Materials	Purpose
Aluminum Foil	
Black Paper	
Plastic Wrap	

Part 3. Multiple Choice and Multiple Select (3 problems)

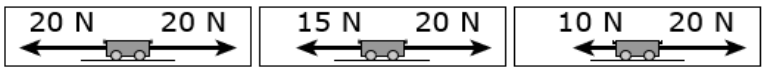
Two students are investigating how balanced and unbalanced forces affect the motion of a small cart with freely rolling wheels. The students want to demonstrate three cases of motion:

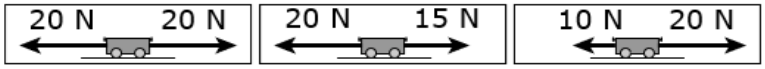
- acceleration to the right
- acceleration to the left
- no acceleration

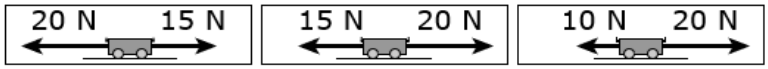
The students use string to attach two spring scales to the cart so that the forces exerted on it can be measured in newtons (N), as shown in the figure. The cart is then released from rest.

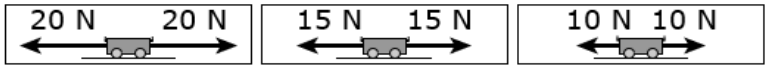


Which set of forces will allow the students to demonstrate all three cases of motion?

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

A student wants to show a friend that a magnetic field exists in the region around a permanent magnet.

For each demonstration listed in the table, select a check box to indicate whether the student can use the demonstration to show that a field exists in a region around a magnet.

	Does show a field exists	**Does not show a field exists**
A magnet touched to a paper clip picks it up from a table.	☐	☐
A magnet held near a small metal ball makes the ball roll across a table.	☐	☐
The north pole of a magnet sticks to the south pole of a second magnet when they touch.	☐	☐
A small magnet held under a piece of paper with iron filings on top makes the filings move into a pattern that covers the whole piece of paper.	☐	☐

A scientist measures the amplitude and wavelength of waves in the ocean. The scientist also calculates the amount of energy contained in one square meter of water for each wave. The data and calculations for four different waves are shown in the table.

Amplitude (meters)	Wavelength (meters)	Energy (joules)
0.20	8.0	200
0.20	16.0	200
0.40	8.0	800
0.40	16.0	800

Which wave characteristics, if any, does the energy in the wave depend on?

Ⓐ the amplitude only

Ⓑ the wavelength only

Ⓒ both the amplitude and the wavelength

Ⓓ neither the amplitude nor the wavelength