

Instructions: In the Science ACT, you will see three “Experiments” passages where the results from different experiments will be presented. Skim through the opening paragraphs to get the basic idea of what is being tested. Then, after reading each experiment, jot some quick notes about what is being tested, what was the testing condition, and brief results.

PASSAGE VII

A student conducted experiments to determine the coefficients of friction between blocks of different types of wood and a lacquered tabletop. The student determined both the static and kinetic coefficients of friction for the various wood-table pairs. Static friction is the friction inherent in stationary objects, while kinetic friction is the friction inherent in moving objects. Coefficients of friction depend only on the two materials involved: the object and the surface.

Experiment 1

The student placed a block of wood flat on the table 50 centimeters from the edge. Attached to the wood was a cord that went through a pulley mounted on the end of the table. Hanging off the table at the end of the cord was a platform. The student carefully placed weights on the platform until the block of wood began to move. The mass, m , which caused the block to begin moving, is known as the threshold mass. The results are shown in Table 1.

Table 1

Trial	Wood	Mass (kg)	Threshold Mass (g)	Coefficient of Friction
1	Fir	1 kg	396 g	0.396
2	Fir	2 kg	808 g	0.404
3	Fir	4 kg	1608 g	0.402
4	Oak	2 kg	1246 g	0.623
5	Oak	3 kg	1863 g	0.621
6	Oak	5 kg	3090 g	0.618

Experiment 2

The student used the exact same setup as in Experiment 1 and the information gathered from that experiment. The student placed weights *greater* than the threshold mass on the platform and measured how quickly the blocks were dragged over the side. The time was measured so that acceleration and the coefficient of friction could be calculated. The results are shown in Table 2.

Table 2

Trial	Wood	Mass (kg)	Hanging Mass m (g)	Time (s)	a (m/s ²)	Coefficient of Friction
7	Fir	1 kg	500 g	0.783	1.63	0.337
8	Fir	2 kg	1000 g	0.788	1.61	0.339
9	Oak	2 kg	1500 g	0.604	2.74	0.476
10	Oak	3 kg	2000 g	0.733	1.86	0.481

1. If a new block of oak with mass 4 kilograms were tested, the threshold mass would be closest to:

- A. 1,635 grams
- B. 2,420 grams
- C. 3,090 grams
- D. 3,740 grams

2. Based on the information in both experiments, which of the following statements about coefficients of friction is correct?

- F. Increasing the mass of the block always increases the coefficient of friction.
- G. Increasing the mass of the block always decreases the coefficient of friction.
- H. Increasing the mass of the block can increase the coefficient of friction for some materials.
- J. There is no relationship between the mass of the block and the coefficient of friction.

3. Which of the following would have the highest coefficient of friction?

- A. Stationary fir
- B. Moving fir
- C. Stationary oak
- D. Moving oak

4. If the student repeated the experiments on an inclined plane made of the same substance as the table, what quantity would not change?

- F. Coefficient of friction
- G. Acceleration
- H. Threshold mass
- J. Time

5. The purpose of each experiment was to measure the coefficient of friction. Which one measured static, and which one measured kinetic?

- A. 1st: kinetic; 2nd: static
- B. Both measured kinetic
- C. 1st: static; 2nd: kinetic
- D. Both measured static

6. If the student repeated Trial 7 with a heavier hanging mass, how would the results differ?

F. Acceleration: increase, time: decrease, coefficient of friction: constant

G. Acceleration: constant, time: constant, coefficient of friction: constant

H. Acceleration: decrease, time: increase, coefficient of friction: increase

J. Acceleration: decrease, time: increase, coefficient of friction: decrease

Answers

1. The best answer is B. This question is asking you to predict a value based on information they've already given you. If a new block of 4 kilograms is used, its threshold mass should be between that of the 3-kilograms block and the 5-kilograms block. The only answer that falls between 1,893 grams and 3,090 grams is (B).
2. The best answer is J. As the block's mass is increased in any of the experiments, the coefficient of friction doesn't change in any predictable way. In fact, the passage states that "coefficients of friction depend only on the two materials involved." Because there's no relationship, only (J) makes sense.
3. The best answer is C. Stationary oak consistently has a higher coefficient of friction than any other in the experiments conducted.
4. The best answer is F. Because the coefficient of friction only depends on the two materials involved, it should not change. Using an inclined plane would, however, lessen the threshold mass, increase the acceleration, and decrease the time because the block would now be sliding down a hill.
5. The best answer is C. Because the first experiment dealt with things not moving, it dealt with static friction. However, the second experiment dealt with the blocks moving and, therefore, dealt with kinetic friction.
6. The best answer is F. A larger mass would not change the coefficient of friction, so (H) and (J) should be eliminated. A larger mass would cause the acceleration to change (increase) and would also cause the time to change (decrease), so (F) is the best answer.