

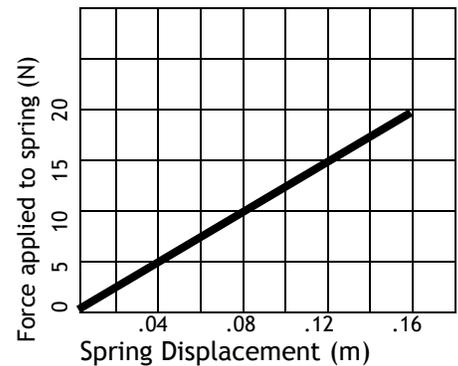
Energy Test

AP Physics B

Name _____
2-3a 3b-4 5-6a 6b-7

Multiple Choice: For the following questions, mark the best answer on your scantron. Each question is worth 1 point. **NOTA means "none of these answers"**. Write on this test, it is your copy.

1. A student used digital measuring devices to measure force and displacement on a spring. Their results are shown at right. How much work was used to compress the spring .08 m?
a. 0.8J b. 200J c. 0.4J d. 1.6J e. 125J



2. For the graph shown at right, what is the spring constant of this spring?
a. 80J b. 125J c. 62.5J d. 40J e. NOTA

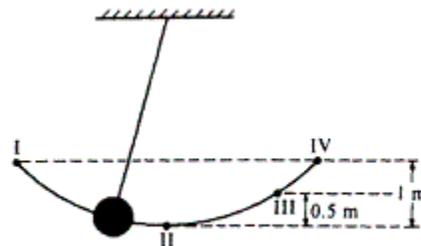
3. When an object is dropped from a tower, what is the effect of the air resistance as it falls?
a. does positive work
b. increases the object's kinetic energy
c. increases the object's potential energy
d. None of the above choices are valid.

4. If both mass and velocity of a ball in motion are doubled, the kinetic energy is increased by a factor of:
a. 2 b. 4 c. 8 d. 16 e. NOTA

5. A satellite is held in a constant speed orbit by a 2,000-N gravitational force. Each time the satellite completes an orbit of circumference 80,000 km, the work done on it by gravity is:
a. 0 J b. 1.6×10^{11} J c. 6.4×10^{11} J d. 1.6×10^8 J e. NOTA

6. A ball swings freely back and forth in an arc from point I to point IV, as shown below. Point II is the lowest point in the path, III is located 0.5 meter above II, and IV is 1 meter above II. Air resistance is negligible. If the potential energy is zero at point II, where will the kinetic and potential energies of the ball be equal?

- a. At point II
b. At some point between II and III
c. At point III
d. At some point between III and IV
e. At point IV

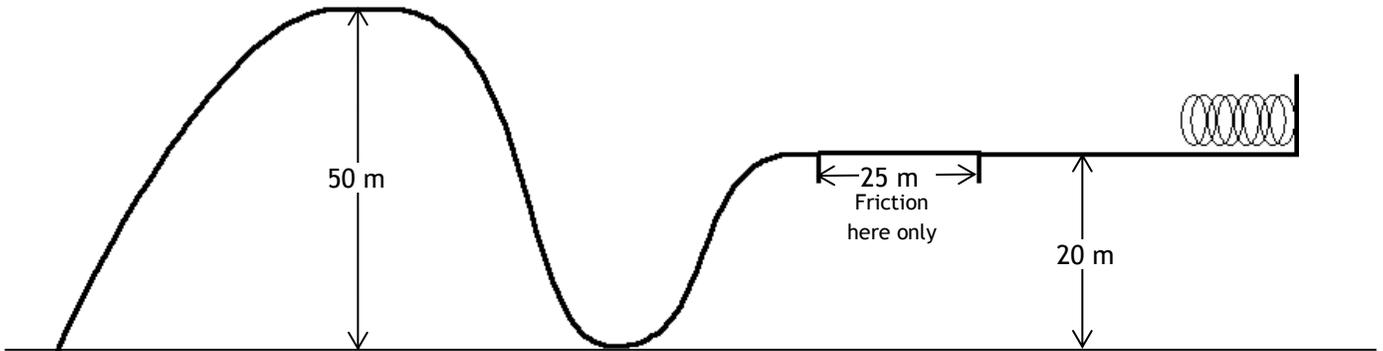


7. For the above pendulum, the speed of the ball at point III is most nearly
a. 3.2 m/s b. 4.5 m/s c. 10 m/s d. 14 m/s e. 20 m/s

8. A 1000kg car travels from 0 to 20 m/s in 4 seconds. What is the car's horsepower? (746W=1Hp)
a. 3.4 hp b. 13.4Hp c. 33.5Hp d. 67 Hp e. 134Hp

9. You slam on the brakes of your car in a panic, and skid a certain distance on a straight, level road. If you had been traveling twice as fast, what distance would the car have skidded, under the same conditions?
- It would have skidded 2 times farther.
 - It would have skidded 4 times farther.
 - It would have skidded 1.4 times farther.
 - It is impossible to tell from the information given.
10. Two different springs are both compressed .25m. What is the same for both springs?
- spring constant
 - potential energy stored
 - work done on the springs
 - mass of the springs
 - None of these
11. How much energy does a 100W lightbulb use in 1 minute?
- 100J
 - 60J
 - 600J
 - 1000J
 - 6000J
12. A block of mass m slides on a horizontal frictionless table with an initial speed v_0 . It then compresses a spring of force constant k and is brought to rest. How much is the spring compressed from its natural length?
- $\frac{v_0^2}{2g}$
 - $\frac{mg}{k} v_0$
 - $\frac{m}{k} v_0$
 - $\sqrt{\frac{m}{k}} v_0$
 - NOTA
13. Can work be done on a system if there is no motion?
- Yes, if an outside force is provided.
 - Yes, since motion is only relative.
 - No, since a system which is not moving has no energy.
 - No, because of the way work is defined.
14. When broken down into fundamental units, 1 Joule is equivalent to
- $1 \text{ kg}\cdot\text{m}/\text{s}^2$
 - $1 \text{ kg}\cdot\text{m}^2/\text{s}^2$
 - $1 \text{ kg}\cdot\text{m}^2/\text{s}^3$
 - $1 \text{ kg}^2\cdot\text{m}^2/\text{s}^2$
 - NOTA
15. A compressed spring has 9J of stored energy. What is the fastest speed that it could give to a 2kg object?
- 3 m/s
 - 4.5 m/s
 - 2.1m/s
 - 18m/s
 - NOTA

A chain link motor is used to pull an empty rollercoaster ($m = 1000\text{kg}$) to a height of 50 meters in 150 seconds. The coaster pauses briefly before starting down the first hill. It then coasts up a second hill, of height 20 meters, where it encounters a surface with a coefficient of friction of 0.6, for a distance of 25 meters. To stop the coaster at the end of the ride, it rolls into a spring, with a spring constant of 500 N/m. The whole ride is frictionless, except the plateau on the second hill.



1) What is the minimum power of the chain link motor used to pull the coaster up the hill?

2) How fast is the coaster going at the bottom of the first hill?

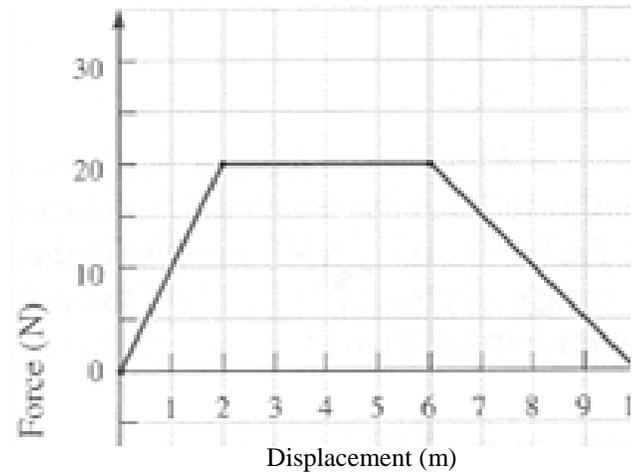
3) How far does the stopping spring get compressed?

4) If the car were to be loaded with people, what would happen to the distance the spring is compressed?

_____ INCREASES _____ DECREASES _____ STAYS THE SAME

Justify your answer.

A 3 kg lab cart moves in a straight line. The net force acting on the cart varies with the cart's displacement as shown in the graph to the right. The cart starts from rest at displacement, $x=0\text{m}$, and time $t=0\text{sec}$ and is displaced a distance of 10 m. Determine the following



a) What is the acceleration of the lab cart at 4 m?

b) The velocity of the cart after the first 2 meters is 3.65m/s. What is the velocity of the cart after 6meters?

c) How much time does it take the cart to roll from 2m-6m?

b) Over which 1 m interval was the smallest amount of work done? Justify your answer.

c) What is the final velocity of the cart after the full 10 meters?