

Name: \_\_\_\_\_

Class Period: \_\_\_\_\_

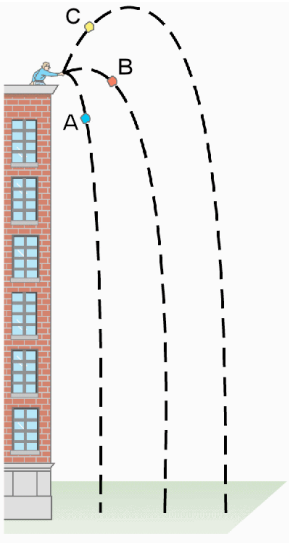
### Honors Physics:

### Problem Set – Work, Power, and Energy

*\*Set Calculators to Degrees*

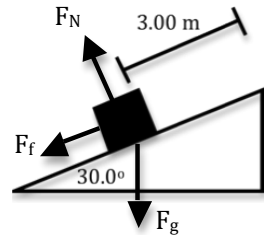
### Conceptual Questions:

1. What does work tell you about a force? What does power tell you?
2. How does work relate to kinetic energy? How does work relate to gravitational potential energy?
3. Can the velocity of an object change if the net work done on it is zero?
4. Can kinetic energy ever be negative? Can the *change* in kinetic energy ever be negative? Use the formula for kinetic energy or a practical example to prove your point.
5. The figure to the left shows three water balloons. Each is thrown with the same initial velocity but at different angles. Which balloon will be moving the fastest as it hits the ground?

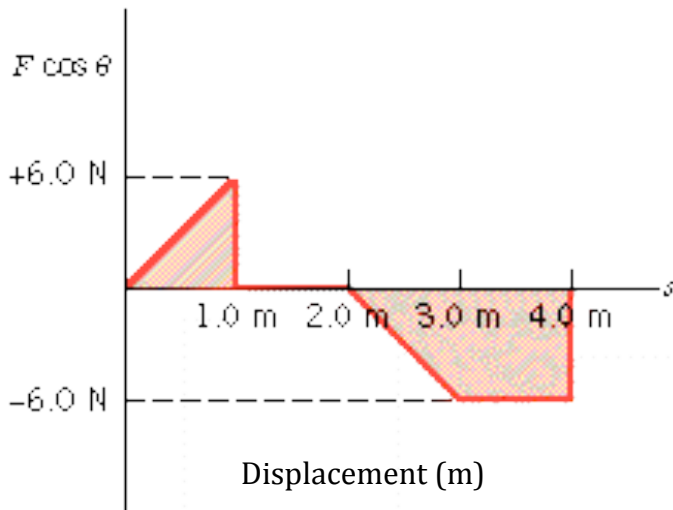


### Mathematical Questions:

6. A 6.00 kg block is given a quick push up a ramp (applied force is then removed) giving the block an initial velocity of 8.50 m/s and resulting in the FBD shown. The block moves 3.00 m up the ramp before coming to rest. The ramp has an incline of  $30.0^\circ$ .
  - A. Based on the FBD, which forces can contribute work to the system?
  - B. Utilizing the work-energy theorem, find the magnitude of the force of the kinetic friction.
7. A 193 kg theater curtain needs to be lifted 7.50 m at a constant velocity in as close to 5.00 s as possible. The motor used to lift the curtain has three power settings ( $1.00 \times 10^3$  W,  $3.50 \times 10^3$  W, and  $5.50 \times 10^3$  W). Which setting is best for the job?
8. Sam is pushing a 10.0 kg sack of flour a distance of 4.70 m across a horizontal grocery store floor. He pushes with a force of 55.0 N. Unfortunately, friction is working against him. The coefficient of friction is 0.400. What is the velocity of the sack of flour after being moved 4.70 m if it begins from rest?



9. A hang glider is moving at a velocity of 8.70 m/s. It then dives to an altitude 4.60 m lower. Neglecting drag and air resistance, using the conservation of energy, what is the new velocity of the glider at the lower altitude? (Consider where you might want to set  $h = 0$  m).
10. In the high jump, the kinetic energy of an athlete is transformed into gravitational potential energy without the aid of a pole. With what minimum velocity must the athlete leave the ground in order to lift his or her body 2.10 m and cross the bar with a velocity of 0.70 m/s?
11. The graph below shows the force vs. displacement graph for a force exerted on a 2.00 kg object Use the graph to find the following:
- What is the work done between the interval  $x = 0$  to  $x = 1.00$  m.
  - What is the work done between the interval  $x = 2.00$  m to  $x = 4.00$  m.
  - What is the net amount of work done through all 4.00 m?
  - If the 2.00 kg was initially moving at 4.00 m/s at the point  $x = 0.0$  m, what is the object's final velocity at  $x = 4.00$  m?



**Numerical Answers:**

- |  |                     |
|--|---------------------|
| 6. A) Only forces in the x-direction ( $F_{fk}$ and $F_{gx}$ ) | 10. $v = 6.45$ m/s  |
| B) $F_{fk} = 42.9$ N   | 11. A) $W = 3.00$ J |
| 7. Setting 2 ( $P = 3500$ W) would be the closest              | B) $W = -9.00$ J    |
| 8. $v_f = 3.85$ m/s  | C) $W = -6.00$ J    |
| 9. $v = 12.9$ m/s  | D) $v_f = 3.16$ m/s |