Name _____ Class _____ Date _____

Concept-Development Practice Page **9-1**

Work and Energy

1. How much work (energy) is needed to lift an object that weighs 200 N to a height of 4 m?
   800 J

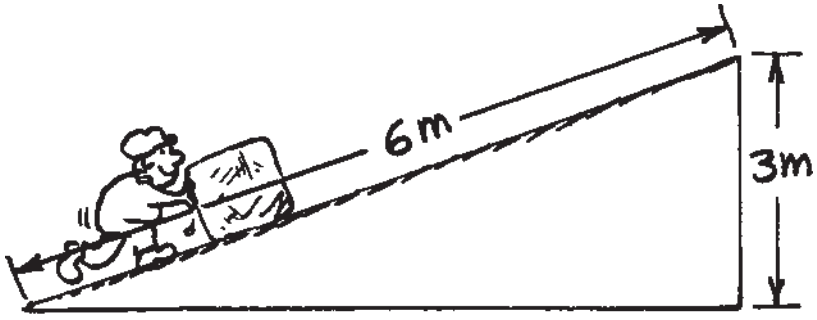
2. How much power is needed to lift the 200-N object to a height of 4 m in 4 s?
   200 W

3. What is the power output of an engine that does 60,000 J of work in 10 s?
   6 kW

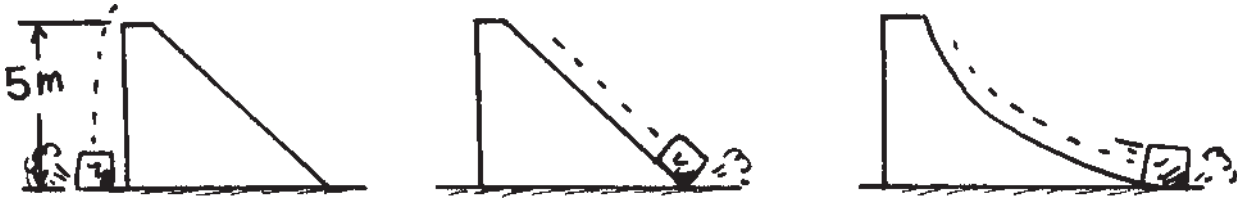
4. The block of ice weighs 500 newtons.

   a. What is the mechanical advantage of the incline?
      2:1

   b. How much force is needed to push it up the incline (neglect friction)?
      250 N



5. All the ramps are 5 m high. We know that the KE of the block at the bottom of the ramp will be equal to the loss of PE (conservation of energy). Find the speed of the block at ground level in each case. [*Hint*: Do you recall from earlier chapters how long it takes something to fall a vertical distance of 5 m from a position of rest (assume $g = 10$ m/s^2)? And how much speed a falling object acquires in this time? This gives you the answer to Case 1. Discuss with your classmates how energy conservation gives you the answers to Cases 2 and 3.]



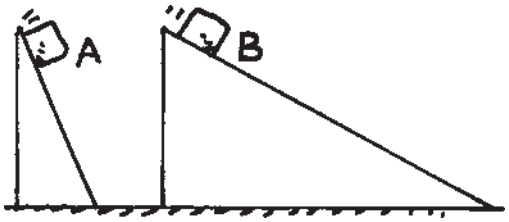
Case 1: Speed = 10 m/s Case 2: Speed = 10 m/s Case 3: Speed = 10 m/s

Block on A reaches bottom first; greater acceleration and less ramp distance. Although it will have the same *speed* at bottom, the *time* it takes to reach that speed is different!

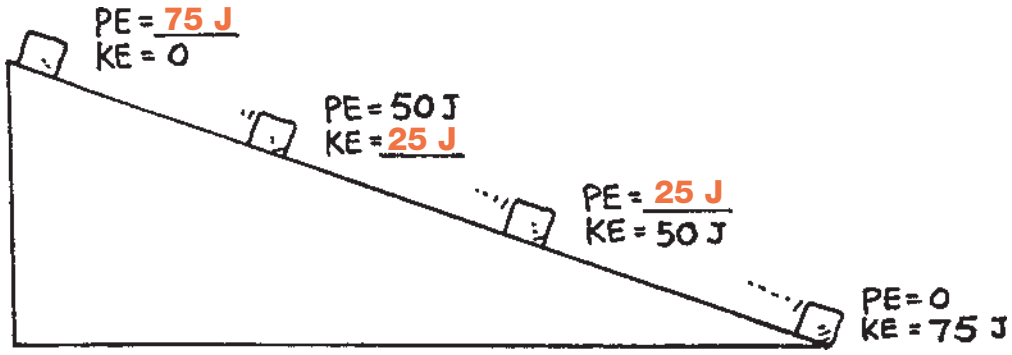
CONCEPTUAL PHYSICS

6. Which block gets to the bottom of the incline first? Assume no friction. (Be careful!) Explain your answer.

Ball A gets to the bottom first due to a greater acceleration down a shorter ramp. (Note that SPEED at the bottom, not TIME, is the same for both.)



7. The KE and PE of a block freely sliding down a ramp are shown in only one place in the sketch. Fill in the missing values.



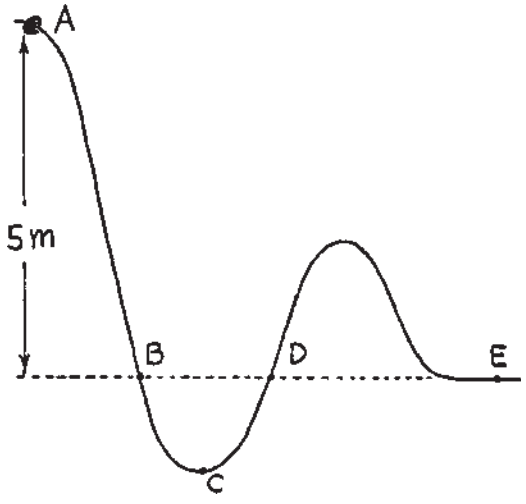
8. A big metal bead slides due to gravity along an upright friction-free wire. It starts from rest at the top of the wire as shown in the sketch. How fast is it traveling as it passes

Point B? 10 m/s

Point D? 10 m/s

Point E? 10 m/s

At what point does it have the maximum speed? C



9. Rows of wind-powered generators are used in various windy locations to generate electric power. Does the power generated affect the speed of the wind? Would locations behind the "windmills" be windier if they weren't there? Discuss this in terms of energy conservation with your classmates.

Yes, by the conservation of energy, the energy gained by the windmills is taken from the KE of the wind. So strictly speaking, the wind must slow down and locations behind would be a bit windier without the windmills.