

Name: SOLUTION KEY Recitation Instructor: _____

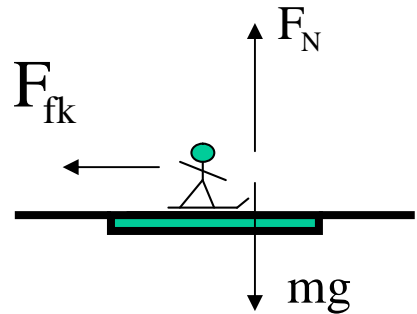
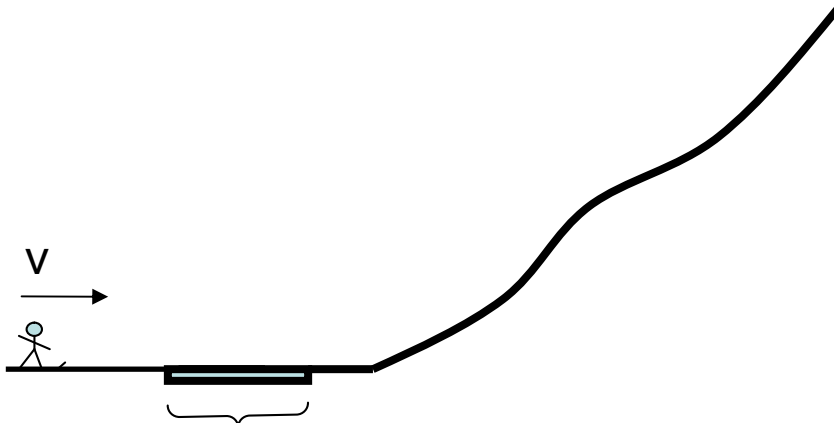
$$F_{fk} = \mu_k F_N \quad W = \vec{F} \cdot \vec{d} = Fd \cos\theta \quad K = \frac{1}{2}mv^2 \quad U_g = mgh \quad U_s = \frac{1}{2}kx^2 \quad E = K + U \quad \Delta E = -F_f d$$

Multiple Choice (5 pts): A force acting on a particle is conservative if:

- A) its work equals the change in the kinetic energy of the particle
- B) it obeys Newton's second law
- C) it obeys Newton's third law
- D) its work depends on the end points of the motion, not the path between
- E) it is not a frictional force

Show all work: A skier of mass 50.0kg is moving quickly with a speed of 10.0m/s along a flat frictionless surface as shown below. Ahead is a rough icy region 25.0m long, with coefficient of kinetic friction between the skis and the ice of 0.20. Beyond that there is a hill.

- a) To what vertical height up the hill does the skier ascend? (10 pts)
- b) A second skier of mass 85.0kg leaves from the same initial position as the first, with the same speed. To what vertical height up the hill does this skier ascend? (5 pts)



a)

$$\Delta E = E_f - E_i = -F_{fk} d$$

$$K_f + U_f - (K_i + U_i) = -F_{fk} d$$

$$0 + mgh - \left(\frac{1}{2}mv_f^2 + 0 \right) = -F_{fk} d = -\mu_k mgd$$

$$h = \frac{v_f^2}{2g} - \mu_k d$$

$$h = \frac{100}{2 \cdot 9.8} - 0.2 \cdot 25 = 5.1 - 5.0 = 0.1m$$

$$F_{fk} = \mu_k F_N = \mu_k mg$$

b) The speed is the same as in part a), since h does not depend on m.

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