

Midterm Exam No. 03 (2014 Summer)

PHYS 203A: College Physics

Date: 2014 Jul 18

(Name)

(Signature)

1. **(10 points.)** The brakes of a truck cause it to slow down by applying a retarding force of $3.30 \times 10^3 \text{ N}$ to the truck over a distance of 860 m.
 - (a) What is the magnitude of the work done by this force on the truck?
 - (b) Is the work done by the force on the truck positive or negative?
2. **(10 points.)** A person lifts a 5.0 kg block a vertical distance of 1.7 m, then carries the block horizontally a distance of 53.6 m, and finally lowers the block a vertical distance of 1.7 m. Determine the work done by the force of gravity on the block in this process.
3. **(10 points.)** A 83.5 kg man is riding an escalator in a shopping mall. The escalator moves the man at a constant velocity from ground level to the floor above, a vertical height of 5.05 m. What is the work done on the man by the gravitational force?
4. **(10 points.)** A moving object has a kinetic energy of 150 J and a momentum with a magnitude of 30.0 kg-m/s. Determine the mass and speed of the object.
5. **(20 points.)** A flight attendant pulls her 10.0 kg flight bag a distance of 253 m along a level airport floor at a constant speed. The force she exerts is 45.0 N at an angle of 50.0° above the horizontal.
 - (a) What is the work done by the force exerted by the attendant on the flight bag?
 - (b) What is the work done by the normal force on the flight bag?
 - (c) What is the work done by the force of gravity on the flight bag?
 - (d) What is the work done by the force of friction on the flight bag?
6. **(10 points.)** A student, starting from rest, slides down a water slide. On the way down, a kinetic frictional force (a nonconservative force) acts on her. The student has a mass of 84.0 kg, and the height of the water slide is 12.7 m. If the kinetic frictional force does $-5.60 \times 10^3 \text{ J}$ of work, how fast is the student going at the bottom of the slide?

7. **(10 points.)** A two-stage rocket moves in space at a constant velocity of 4800 m/s . The two stages are then separated by a small explosive charge placed between them. Immediately after the explosion the velocity of the 1120 kg upper-stage is 5840 m/s in the same direction as before the explosion. What is the velocity (magnitude and direction) of the 2460 kg lower-stage after the explosion?
8. **(10 points.)** What is the ratio of the final kinetic energy to initial kinetic energy in a perfectly inelastic collision involving two particles of masses m and M when the mass M is initially at rest? Express your answer in terms of m and M .
9. **(10 points.)** A ball moving at constant speed of 5.13 m/s strikes a block initially at rest on a horizontal frictionless surface. Air resistance is negligible, and the collision is elastic. The masses of the ball and block are the same, 1.7 kg .
- (a) Find the velocity (magnitude and direction) of the ball after the collision.
 - (b) Find the velocity (magnitude and direction) of the block after the collision.