AP Physics C
Drozdoff 8–9
Quiz Solutions — Chapter 5, 9/18/2007

Scored out of 20 points; maximum of 20.5 points possible.

1 The two principle classes of forces are contact forces (forces that act on objects that are touching; for example, the frictional force) and field forces (forces that act on objects that are not touching; for example, the gravitational force).

Scoring: pne point each for identifying *contact* and *field* forces; one point each for valid examples (answers vary for contact forces; the only acceptable answers for field forces are the gravitational force, the strong nuclear force, the weak nuclear force, the electromagnetic force, the magnetic force, the electrical force, or the electroweak force).

2 First Law : $\sum \mathbf{F} = 0 \Rightarrow \Delta \mathbf{v} = 0$ (accept word form equivalent)

Second Law: $\sum \mathbf{F} = \frac{d\mathbf{p}}{dt}$ (do not require sigma; accept word form equivalent)

Third Law: $\mathbf{F}_{a\to b} \Rightarrow -\mathbf{F}_{b\to a}$ (accept word form equivalent)

Scoring: one point for each part correct

3a true
3b true

Scoring: one half point for each part correct

4 The machine's pulley is *massless* and *frictionless*.

Scoring: one point for first correct answer; one half additional for the second

5 μ_s

Scoring: one point for a correct answer

6 "To get the box to slide, you must push harder than the maximum static frictional force. Once the box is moving, you need to push with a force equal to the kinetic frictional force to maintain the box's motion." —solutions manual

Scoring: one point for identifying when static friction is relevant; one point for identifying when kinetic friction is relevant

7 "As the rocket takes off, it burns fuel, pushing the gases from the combustion out the back of the rocket. Since the gases have mass, the total remaining mass of the rocket, fuel, and oxidizer decreases. With a constant thrust, a decrease in the mass results in an increasing acceleration." —solutions manual

Scoring: one point for stating that the rocket's mass decreases; one point for stating that a decreasing mass results in an increasing acceleration

8a

$$\mathbf{a} = \frac{\Delta \mathbf{v}}{\Delta t} = \frac{30.0 \text{ m}\cdot\text{s}^{-1}}{6.00 \text{ s}} = 5.00 \text{ m}\cdot\text{s}^{-2}$$

$$\sum \mathbf{F}_x = m\mathbf{a}_x$$

$$(0.100 \text{ kg})(9.80 \text{ m}\cdot\text{s}^{-2})\sin\theta = (0.100 \text{ kg})(5.00 \text{ m}\cdot\text{s}^{-2})$$

$$\theta = 30.7°$$

Scoring: one point for stating $\mathbf{a} = \frac{\Delta \mathbf{v}}{\Delta t}$; one point for $\sum \mathbf{F}_x = m\mathbf{a}_x$; one point for correct value of θ

8b

$$\sum \mathbf{F}_y = m\mathbf{a}_y$$

$$\mathbf{F}_t = m\mathbf{a}_g \cos\theta$$

$$\mathbf{F}_t = (0.100 \text{ kg})(9.80 \text{ m}\cdot\text{s}^{-2})\cos 30.7°$$

$$\mathbf{F}_t = 0.843 \text{ N}$$

Scoring: one point for stating $\sum \mathbf{F}_y = m\mathbf{a}_y$; one point for $\mathbf{F}_t = m\mathbf{a}_g \cos\theta$; one point for correct value of $\mathbf{F}_t$