Peer Instruction: A User's Manual

Eric Mazur

First Edition

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READING QUIZZES

I currently strongly encourage the use of Just-in-Time Teaching* to get students to complete their reading assignments. If you are not ready to do so, the following pages contain preclass reading quizzes for an introductory physics course, organized by subject. Note that most of the questions test knowledge of definitions rather than understanding. The answer key is at the end of the chapter.

All the quizzes in this chapter are suggested to suit your classroom needs. The quizzes may not otherwise be distributed or edited without written permission from the publisher.

*G. Novak, A. Gavrin, W. Christian, E. Patterson, *Just-in-Time Teaching: Blending Active Learning with Web Technology* (Prentice Hall, Upper Saddle River, NJ, 1999).

KINEMATICS

1. The slope of the curve in the position vs. time graph for a particle's motion gives

1. the particle's speed.
2. the particle's acceleration.
3. the particle's average velocity.
4. the particle's instantaneous velocity.
5. not covered in the reading assignment

2. Is it possible for an object's instantaneous velocity and instantaneous acceleration to be of opposite sign at some instant of time?

1. yes
2. no
3. need more information

3. Without air resistance, an object dropped from a plane flying at constant speed in a straight line will

1. quickly lag behind the plane.
2. remain vertically under the plane.
3. move ahead of the plane.
4. not covered in the reading assignment

4. A ball is thrown downward (not dropped) from the top of a tower. After being released, its downward acceleration will be

1. greater than g.
2. exactly g.
3. smaller than g.
4. not covered in the reading assignment

NEWTON'S LAWS

1. Which of these laws is not one of Newton's laws?

1. Action is reaction.
2. $F = ma$.
3. All objects fall with equal acceleration.
4. Objects at rest stay at rest, etc.

2. The law of inertia
   1. is not covered in the reading assignment.
   2. expresses the tendency of bodies to maintain their state of motion.
   3. is Newton's 3rd law.

3. "Impulse" is
   1. not covered in the reading assignment.
   2. another name for force.
   3. another name for acceleration.

FORCES

1. Viscous friction is
   1. larger than kinetic friction.
   2. equal to kinetic friction.
   3. smaller than kinetic friction.
   4. not covered in the reading assignment.

2. Astronauts on the Moon can jump so high because
   1. they weigh less there than they do on Earth.
   2. their mass is less there than it is on Earth.
   3. there is no atmosphere on the Moon.

3. Is the normal force on a body always equal to its weight?
   1. yes
   2. no
   3. not covered in the reading assignment

WORK

1. A woman holds a bowling ball in a fixed position. The work she does on the ball
   1. depends on the weight of the ball.
   2. cannot be calculated without more information.
   3. is equal to zero.

2. A man pushes a very heavy load across a horizontal floor. The work done by gravity on the load
   1. depends on the weight of the load.
   2. cannot be calculated without more information.
   3. is equal to zero.

3. When you do positive work on a particle, its kinetic energy
   1. increases.
   2. decreases.
   3. remains the same.
   4. need more information about the way the work was done

4. In a collision between two billiard balls,
   1. energy is not conserved if the collision is perfectly elastic.
   2. momentum is not conserved if the collision is inelastic.
   3. not covered in the reading assignment

CONSERVATIVE FORCES

1. The gravitational potential energy of a particle at a height z above Earth's surface
   1. depends on the height z.
   2. depends on the path taken to bring the particle to z.
   3. both 1 and 2.
   4. is not covered in the reading assignment.

2. Which of the following is not a conservative force?
   1. the force exerted by a spring on a particle in one dimension
   2. the force of friction
   3. the force of gravity
   4. not covered in the reading assignment

3. Which of the following was not discussed in the reading assignment?
   1. conservation of mechanical energy
   2. block and tackle
   3. power
   4. none of the above

POTENTIAL ENERGY

1. Suppose you know the potential energy function corresponding to a force. Is it always possible to calculate the force?

1. yes
2. only if the force is nonconservative
3. not covered in the reading assignment

2. The potential energy of a spring is

1. proportional to the amount the spring is stretched.
2. proportional to the square of the amount the spring is stretched.
3. not covered in the reading assignment.

3. A car slows down as a result of air friction. Which is true?

1. The car's kinetic energy decreases.
2. Heat is generated.
3. The energy of the car/road/air system is constant.
4. all of the above
5. none of the above

GRAVITATION

1. Which is true? The gravitational force between two particles

1. can be shielded by the presence of an intervening mass.
2. is inversely proportional to the distance between the particles.
3. obeys the law of superposition.
4. is independent of the distance between the particles.

2. The gravitational constant G is

1. equal to g at the surface of Earth.
2. different on the Moon than on Earth.
3. obtained by measuring the speed of falling objects having different masses.
4. none of the above

3. Which is one of Kepler's laws?

1. The gravitational attraction of Earth and the Sun provides a centripetal acceleration explaining Earth's orbit.

2. The gravitational and inertial masses of an object are equivalent.
3. The radial line segment from the Sun to a planet sweeps out equal areas in equal time intervals.

4. Which term was not introduced in today's reading assignment?
1. escape velocity
2. perihelion
3. gravitational mass
4. Hubble's constant

MOMENTUM

1. Which is true? Conservation of the total momentum of a system
1. holds only when mechanical energy is conserved.
2. holds for any system.
3. follows from Newton's second law.
4. is equivalent to Newton's third law.

2. The center of mass of a rigid object of arbitrary shape
1. is always inside the object.
2. can lie outside the object.
3. depends on the motion of the object.
4. depends on the frame of reference of the object.

3. Compared with the kinetic energy of its center of mass (CM), the total kinetic energy of a system is
1. always less than the kinetic energy of the CM.
2. always equal to the kinetic energy of the CM.
3. greater than or equal to the kinetic energy of the CM.
4. depends on the particular system

4. A rocket is propelled forward by ejecting gas at high speed. The forward motion is a consequence of
1. conservation of energy.
2. conservation of momentum.
3. both of the above.
4. neither of the above.