Name: _____ **Class:** _____ **Date:** _____ **ID: A**

Practice Test

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. Ball A has triple the mass and speed of ball B. What is the ratio of the kinetic energy of ball A to ball B.
   a. 3 b. 6 c. 9 d. 27

2. How much elastic potential energy is stored in a bungee cord with a spring constant of 10.0 N/m when the cord is stretched 2.00 m?
   a. 10.0 J b. 20.0 J c. 40.0 J d. 200 J

3. Which of the following is a true statement about the conservation of energy?
   a. Potential energy is always conserved. b. Kinetic energy is always conserved. c. Mechanical energy is always conserved. d. Total energy is always conserved.

4. When an object is moving with uniform circular motion, the object's tangential speed
   a. is circular. b. is perpendicular to the plane of motion. c. is constant. d. is directed toward the center of motion.

5. A ball is whirled on a string, then the string breaks. What causes the ball to move off in a straight line?
   a. centripetal acceleration b. centripetal force c. centrifugal force d. inertia

6. The gravitational force between two masses is 36 N. What is the gravitational force if the distance between them is tripled? ($G = 6.673 \times 10^{-11}$ N•m^2/kg^2)
   a. 4.0 N b. 9.0 N c. 18 N d. 27 N

7. Kepler developed his laws of planetary motion as he tried to reconcile
   a. Ptolemaic theory with Copernican theory. b. Ptolemaic theory with Copernicus's data. c. Copernican theory with Tycho Brahe's data. d. Copernican theory with his own data.

8. Conservation of Momentum collisions can be described as being (**Circle all that apply)**
   a. plastic b. Totally unplastic c. Totally inelastic d. elastic e. Like yeah

9. To have conservation of momentum one must define a closed system. A closed system has:
   a. four walls or barriers
   b. no external force
   c. external torque
   d. A sign stating the hours of the systems operation

10. The formula $F\Delta t = m\Delta v$ is known as:
    a. Impulse-Momentum Theorem b. Conservation of Angular Momentum Theorem
    c. Elastic-Momentum Theorem d. Newton's Theorem

Problem

11. A worker pushes a box with a horizontal force of 50.0 N over a level distance of 5.0 m. If a frictional force of 43 N acts on the box in a direction opposite to that of the worker, what net work is done on the box?

A 35 kg child moves with uniform circular motion while riding a horse on a carousel. The horse is 3.2 m from the carousel's axis of rotation and has a tangential speed of 2.6 m/s.

12. What is the centripetal force on the child?

A new planet is discovered orbiting a star with a mass 3.5×10^{31} kg at a distance of 1.2×10^{11} m. Assume that the orbit is circular.

13. What is the orbital speed of the planet? ($G = 6.673 \times 10^{-11}$ N•m^2/kg^2)

14. A 90 kg halfback runs north and is tackled by a 120 kg opponent running south at 4 m/s. The collision is perfectly inelastic. Just after the tackle, both players move at a velocity of 2 m/s north. Calculate the velocity of the 90 kg player just before the tackle.

Practice Test
Answer Section

MULTIPLE CHOICE

1. D
2. B
3. D
4. C
5. D
6. A
7. C
8. A
9. A
10. A

PROBLEM

11. 35 J

Given
$F_w = 50.0\text{ N}$

$F_k = -43\text{ N}$

$d = 5.0\text{ m}$

Solution
$W_{net} = F_{net}d = \left(F_w + F_k\right)d = \left[\,(50.0\text{ N}) + (-43\text{ N})\,\right](5.0\text{ m}) = 35\text{ J}$

12. 74 N

Given
$m = 35\text{ kg}$

$v_t = 2.6\text{ m/s}$

$r = 3.2\text{ m}$

Solution
$F_c = \dfrac{mv_t^{\,2}}{r} = \dfrac{\left(35\text{ kg}\right)(2.6\text{ m/s})^{\,2}}{3.2\text{ m}} = 74\text{ N}$

13. 1.4×10^{5} m/s

Given
$m = 3.5\times10^{31}$ kg

$r = 1.2\times10^{11}$ m

$G = 6.673\times10^{-11}$ Nm^2 / kg^2

Solution

$$v_t = \sqrt{G\frac{m}{r}} = \sqrt{\left(6.673\times10^{-11}\ \text{Nm}^2/\text{kg}^2\right)\frac{\left(3.5\times10^{31}\ \text{kg}\right)}{\left(1.2\times10^{11}\ \text{m}\right)}} = 1.4\times10^{5}\ \text{m/s}$$

14. 10 m/s to the north

Given
$m_1 = 90$ kg

$m_2 = 120$ kg
$\mathbf{v_{2,i}} = 4$ m/s to the south; $v_{2,i} = -4$ m/s

$\mathbf{v_{1,f}} = 2$ m/s to the north; $v_{1,f} = 2$ m/s

$\mathbf{v_f} = 2.0$ m/s to the north; $v_f = 2.0$ m/s

Solution
$m_1\mathbf{v_{1,i}} + m_2\mathbf{v_{2,i}} = \left(m_1 + m_2\right)\mathbf{v_f}$

$$v_{1,i} = -\frac{\left(m_1 + m_2\right)v_f - m_2v_{2,i}}{m_1} = -\frac{\left(90\ \text{kg} + 120\ \text{kg}\right)(2\ \text{m/s}) - \left(120\ \text{kg}\right)(-4\ \text{m/s})}{90\ \text{kg}} = 1\times10^{1}\ \text{m/s}$$

$\mathbf{v_{1,i}} = 10$ m/s to the north