Grade 12 Physics
Kinematics Test

First Name: _____

Last Name: _____

Directions:

- Please answer to 2 decimal points
- The test is designed to be completed in 75 minutes

For grading use only

Page:	2	3	4	Total
Points:	9	17	20	46
Score:				

Multiple Choice (10 marks)

1. (1 point) What is the SI unit of momentum?
   A. Joule (J)
   B. Newton (N)
   C. kilogram·meter/second (kg·m/s)
   D. kilogram·meter/second² (kg·m/s²)
2. (1 point) A 2 kg object moves at 3 m/s. What is its momentum?
   A. 6 kg·m/s
   B. 3 kg·m/s
   C. 2 kg·m/s
   D. 1.5 kg·m/s
3. (1 point) A force of 10 N acts on an object for 5 seconds. What is the impulse imparted?
   A. 50 N·s
   B. 2 N·s
   C. 10 N·s
   D. 5 N·s
4. (1 point) In an inelastic collision, which quantity is conserved?
   A. Kinetic energy
   B. Momentum
   C. Both momentum and kinetic energy
   D. Neither
5. (1 point) Two ice skaters push off each other. Skater A (60 kg) moves at 2 m/s. What is Skater B's (80 kg) velocity?
   A. 1.5 m/s
   B. 2 m/s
   C. 0.5 m/s
   D. 1.0 m/s
6. (1 point) A ball (0.5 kg) hits a wall at 10 m/s and rebounds at 8 m/s. What is the impulse?
   A. 1 kg·m/s
   B. 9 kg·m/s
   C. -9 kg·m/s
   D. -1 kg·m/s
7. (1 point) Which has greater KE if both have same momentum?
   A. Car
   B. Truck
   C. Both same
   D. Cannot determine
8. (1 point) A 1000 kg car accelerates from rest to 20 m/s in 5 s. Average force?
   A. 2000 N
   B. 4000 N
   C. 1000 N
   D. 500 N
9. (1 point) Baseball (0.1 kg) thrown at 30 m/s and hit back at 35 m/s. Impulse magnitude?

A. 0.5 kg·m/s
B. 3.0 kg·m/s
C. 6.5 kg·m/s
D. 65 kg·m/s

10. (1 point) Collision where objects stick together is:
    A. Elastic
    B. Inelastic
    C. Perfectly elastic
    D. Impossible

Long Answer (40 marks)

11. A 0.50 kg cart moving at 2.0 m/s collides elastically with a stationary 0.75 kg cart.
    (a) (4 points) Calculate the total momentum of the system before the collision.
    (b) (4 points) Determine the velocity of each cart after the collision.

12. A rocket with a mass of 5000 kg expels 50 kg of fuel per second at a velocity of 400 m/s relative to the rocket.
    (a) (4 points) Calculate the thrust produced by the rocket.
    (b) (4 points) Determine the rocket's acceleration when its total mass is 4000 kg.

13. Two curling stones collide on ice. Stone A (mass 18 kg) is moving at 4 m/s at 45° north of east, and Stone B (mass 22 kg) is moving at 3 m/s at 60° south of east. After the collision, Stone A moves at 2 m/s at an angle of 30° north of east.

(a) (5 points) Determine the velocity (magnitude and direction) of Stone B after the collision.

(b) (5 points) Verify if the collision is elastic.

14. A grenade at rest explodes into three fragments. Fragment 1 (2.5 kg) moves at 6 m/s at 20° north of west, Fragment 2 (3.5 kg) moves at 5 m/s at 40° south of east, and Fragment 3 has a mass of 4 kg.

    (a) (5 points) Determine the velocity (magnitude and direction) of Fragment 3 after the explosion.

    (b) (5 points) Calculate the total kinetic energy released in the explosion.