Physics 11 – MIDTERM TEST Name: _____ Date:_____

PLEASE READ ALL QUESTIONS CAREFULLY. DO NOT RUSH - YOU WILL BE GIVEN SUFFICENT AMOUNT OF TIME

☺ GOOD LUCK ☺

/108

[10] A: Multiple-Choice: Each question is worth 1 mark

1. The larger the _____ of an object, the greater its inertia:

a) weight b) mass c) volume d) velocity

2. An object is said to be in equilibrium if:

a) it is in weightless environment

b) the net force acting on it is zero

c) the net force acting on it is **not** zero

d) it accelerates

3. A free-falling object will:

a) experience force of gravity only

b) experience force of gravity and normal force

c) experience normal force only

d) move with constant velocity

4. An object is a projectile:

a) if it does not propel itself

b) if it moves with constant horizontal velocity

c) if it experiences vertical acceleration

d) answers a),b) and c) are all correct

5. Velocity is:

a) given by distance and time taken

b) the rate of change in speed

c) given by displacement and time taken

d) always positive

6. The slope of the line tangent to the curve on a velocity-time graph at a particular time is the ....

a) Average velocity

b) Instantaneous acceleration

c) Instantaneous velocity

d) Displacement

7. Which of the following statements is true about vector and scalar quantities?

a) All vectors have direction only

b) All vectors have magnitude or direction

c) All scalars have direction only

d) All scalars have magnitude only

8. An object that is experiencing forces that are **not** balanced will:

a) remain at rest

b) continue moving at constant velocity

c) accelerate

d) always stop

9. Bob runs two complete laps on a 400m long track in 3.0 minute exactly, arriving back where he started. What was the magnitude of his average velocity?

a) 0 m/s

b) 6.7 m/s

c) 40 m/s

d) there is not enough data provided

10. Strength of a gravitational field of any object is:

a) inversely proportional to the mass of the object

b) inversely proportional to the universal gravitational constant

c) directly proportional to radius of the object

d) given in Newtons per kilogram

[10] B: Fill-in blanks. 1 mark each

1. If an object rests on a strictly horizontal surface and does not experience any forces except the force of gravity and the normal force, then the magnitude of the normal force is equal to _____

2. Force, displacement , acceleration and velocity are all _____ quantities.

3. _____ is the natural tendency of an object to resist change in its motion or state of rest.

4. Average and instantaneous velocity are equal for an object that moves with _____ velocity.

5. Projectile experiences acceleration due to _____.

6. For any object on the same surface the force of kinetic friction is always _____ than the force of static friction.

7. An object that moves in non-uniform motion will experience changes in its _____.

8. Acceleration due to gravity is independent of object's _____ .

9. When a projectile reaches its maximum height its vertical velocity is _____ .

10. If an object is set in motion on a strictly horizontal frictionless surface it will never _____ unless acted on by an unbalanced force.

[25] C: Decide whether the statements below are true or false. 1 mark each

_____ Force of friction is never beneficial to humans

_____ An object has zero inertia when in weightless environment

_____ All objects that have mass form a gravitational field around them

_____ Weight of an object is directly proportional to the object's mass and to the strength of a gravitational field

_____ A projectile speeds up the closer it gets to the ground

_____ Normal force acting on an object that lies on a horizontal surface and is being pulled upwards at the same time is always smaller in magnitude than the magnitude of the force of gravity acting on the object

_____ The only way an object can experience zero acceleration is when it is at rest

_____ If Earth had only 50% of its mass the acceleration due to gravity on Earth would be 4.9 m/s^2

_____ Coefficient of friction has no units

_____ Force of gravity is an example of contact force

_____ A spring constant **k** is given in Newtons per meter

The motion of objects A and B is described by the position-time graph below. Decide whether the statements about the objects' motion are true or false:

_____ Object B moves with greater velocity

_____ Objects A and B have the same initial position

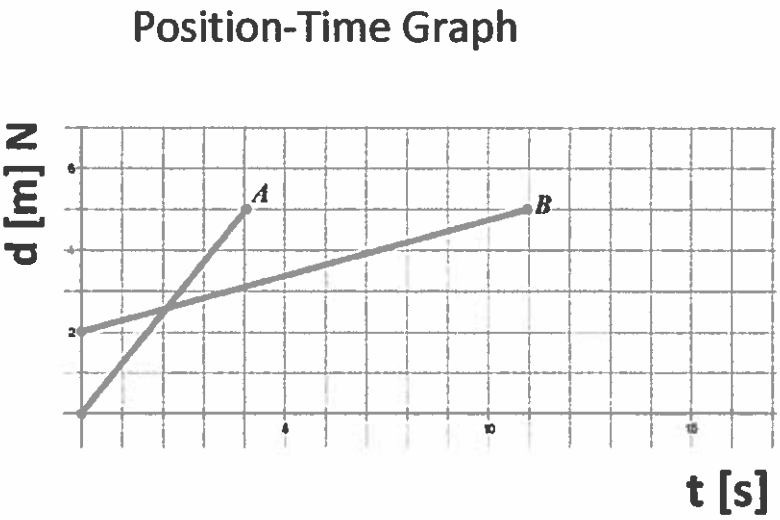
_____ Object A does not accelerate

_____ Objects A and B have the same velocity at the point where their graphs intersect

_____ Object B moves with velocity 0.27 m/s [N]

_____ Both objects cover the same distance

_____ Both objects have the same final position



The motion of objects C and D is described by the velocity-time graph below. Decide whether the statements about the objects' motion are true or false:

_____ Object D has smaller initial velocity then object C

_____ At all times, object C has higher speed than the speed of object D

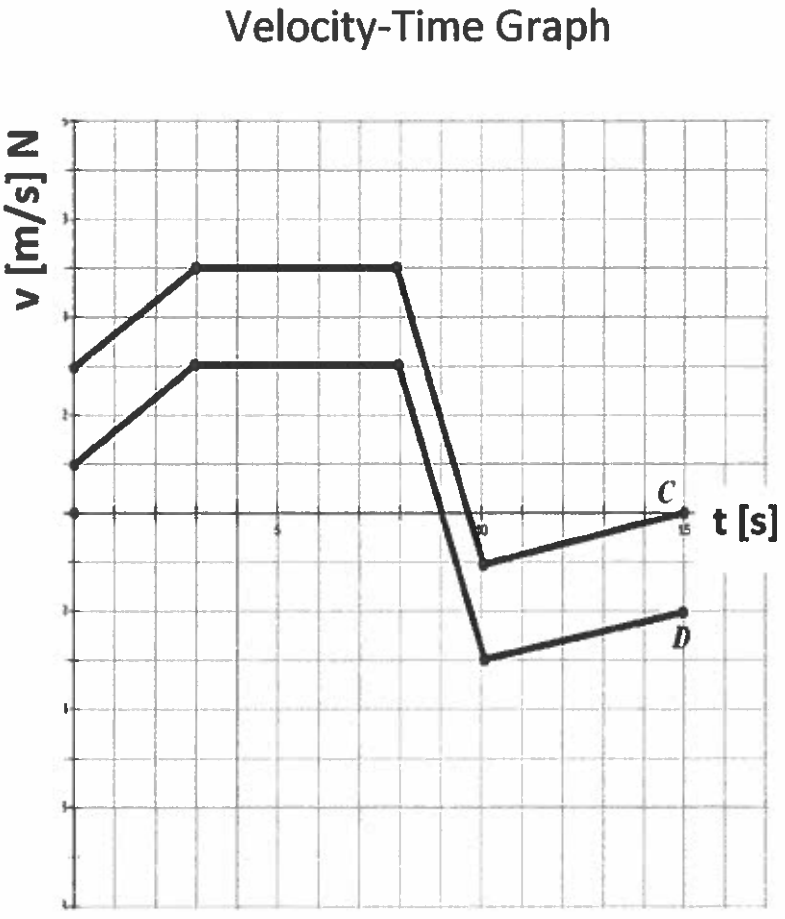
_____ Object D is not moving at time 9 s.

_____ Object C is at rest twice between 0 and 15s.

_____ There is only one 5s time interval during which neither of the objects accelerates

_____ Object D accelerates at the rate of $0.67 m/s^2$ during the first 3 seconds

_____ Object C moves at 5m/s [N] during the time interval between 3 and 8 seconds



D: Short Answer: Please use the "GRASS" method where appropriate and show all your work. **[63]**

[2] 1. a)Sketch a free-body diagram of a ball experiencing forces of 50 N [up], 100 N [left] and 50N [down]

[2] b) Provided that the ball is on a horizontal surfaces and the force 50 N [down] is the force of gravity acting on the ball, what do you know about the magnitude and direction of the normal force?

[5] 2. Find the average speed of a train that needs only 1 hour and 30 minutes to cover 400 km.

[5] 3. State Newton's Second Law:

[8] 4. Find the mass of an object that rests on a horizontal surface and requires an applied force of 500 N in order to start moving. The coefficient of static friction between the surfaces of contact is 0.35 and the coefficient of kinetic friction for the same surfaces is 0.28.

[2] 5. a) Sketch a diagram of displacement vector $\vec{d} = 500\ km\ [N\ 30°W]$

[4] b) Find the vector components of the displacement vector $\vec{d} = 500\ km\ [N\ 30°W]$

[8] 6. A train's stopping distance, even when full emergency brakes are engaged, is 1.3 km. If the train was travelling at an initial velocity of 90 km/h [forward], determine its acceleration under full emergency braking.

[8] 7. How long does a boat need to sail to reach a light house 36 km [east], provided that its initial velocity is 35 km/h and it experiences constant acceleration of 18 km/h^2 [east]?

[4] 8. Convert the following:

350 km/h ⟶ _____ (m/s)

35 m/s ⟶ _____ (km/h)

9. A projectile is fired with an initial velocity of 200 m/s at an angle of 30° above the horizontal from the top of a cliff 120 m high.

[2] Sketch a labelled diagram:

Find:

[2] a) the time taken to reach maximum height

[2] b) the maximum height with respect to the ground next to the cliff

[2] c) the total time in the air

[2] d) the range

[2] e) the vector components of the final velocity just before the projectile hits the ground below the cliff.

[3] f) Sketch a diagram of the final velocity vector, neatly placed in a labelled coordinate system. Clearly indicate the vector components you found in the previous question. **Find the direction and magnitude of the final velocity vector.**