Part 1: 21 Multiple Choice Questions (1 mark each)

Use: The acceleration of gravity g = 10 m/s^2 and

The universal gravitational constant G = 6.67x10^{-11} N.m^2/kg^2.

1) Which one of the following list contains only vector quantities?
a) inertia, velocity, time, weight
b) power, force, work, acceleration
c) force, momentum, acceleration, impulse
d) mass , velocity, momentum, impulse
e) velocity, work, acceleration, force

2) When a car is moving along a horizontal road
a) friction is the only force exerted on the car.
b) the force of friction allows the car to move forward.
c) the car generate all the forces that allow it to move.
d) gravity does not affect the motion.
e) the net force on the car must be zero.

3) The average velocity and the instantaneous velocity of an object will be the same if
a) the object's speed is constant. b) the object's acceleration is zero.
c) the object's velocity is positive. d) the object's velocity is negative.
e) They are never the same.

4) A heavy rock and a light rock in free fall (zero air resistance) have the same acceleration. The reason the heavy rock doesn't have a greater acceleration is that the
a) force due to gravity is the same on each.
b) air resistance is always zero in free fall.
c) inertia of both rocks is the same.
d) ratio of force to mass is the same.
e) None of these.

5) A net force of 67.5 N is applied to an object whose mass is 9 kg. The object's acceleration will be:
a) 10 m/s^2 b) 7.5 m/s^2 c) 2.5 m/s^2 d) 3.33 m/s^2 e) zero

6) An object falls freely on a planet where the acceleration due to gravity there is 17 m/s^2, if its speed at a certain moment is 32 m/s, what is its speed 3 seconds later?
a) 83 m/s b) 51 m/s c) 17 m/s d) 32 m/s e) zero

7) A karate player delivers a force of 3000 N to a board that breaks. The force that the board exerts on the hand during this event is
a) less than 3000 N. b) 3000 N. c) greater than 3000 N.
d) 1500 N e) Need more information.

8) If a piece of rope is pulled by two people from both sides in opposite directions and each one pulls with a 400 N force, then the tension in the rope is:
a) 0 N b) 400 N c) 600 N d) 800 N e) none of the above

9) Ahmad is walking at 1.63 m/s. If Ahmad weighs 583 N, what is the magnitude of his momentum?
a) 951 kg.m/s b) 35.8 kg.m/s c) 95 kg.m/s d) 68.6 kg.m/s e) 71.5 kg.m/s

10) The average momentum of a 70 kg runner who covers 400 m in 50 s is

a) 8.75 kg.m/s b) 57 kg.m/s c) 5490 kg.m/s d) 560 kg.m/s e) none of the above.

11) What is the mass of an object that possesses 48 J of kinetic energy when moving at a speed of 4 m/s?
a) 3 kg b) 6 kg c) 12 kg d) 24 kg e) 36 kg

12) A horizontal force of 56 N pushes on a box. If a 21 N frictional force opposes the motion of the box, what is the net work done on the box during a 17 m long travel?
a) 1.94 J b) 1309 J c) 561 J d) 952 J e) 357 J

13) A 810 kg car accelerates from rest to 27 m/s in a distance of 120 m. What is the magnitude of the average net force acting on the car?
a) 740 N b) 2460 N c) 91 N d) 1300 N e) 7900 N

14) An object hits a wall and bounces back with **one third** of its original speed. What is the ratio of the final kinetic energy to the initial kinetic energy?
a) $\frac{1}{3}$ b) $\frac{1}{9}$ c) 3 d) 9 e) 1

15) Imagine that you're standing on the surface of a shrinking planet. If it shrinks to one fourth its original radius with no change in mass, your new weight on the shrunken surface compared to your original weight is
a) 1/16 times as much.
b) 1/4 times as much.
c) 16 times as much.
d) 4 times as much.
e) 64 times as much.

16) What is the power of a car engine that exerts a force of 6000 N to maintain a speed of 35 m/s?
a) 171 kwatt b) 185 kwatt c) 455 kwatt d) 210 kwatt e) 712 kwatt

17) what is the gravitational attractive force between a 60 kg woman and a 110 kg man when they are 6 m apart?
a) 1.22×10^{-8} N.
b) 183.33 N.
c) 7.32×10^{-8} N.
d) 1100 N.
e) zero N.

18) If a block of wood is completely submerged at the bottom of a certain liquid, then this means that the liquid
a) fails to produce a buoyant force on the wood block.
b) does not has enough mass to make to wood block float.
c) has larger density than the wood block.
d) has lower density than the wood block.
e) is not displaced by the submerged wood block.

19) If a piece of cotton is compressed, then
a) its mass is increased. b) its mass is decreased.
c) its density is increased. d) its density is decreased.
e) none of these

20) A block of density 0.53 g/cm^3 is submerged in a liquid of density 0.78 g/cm^3. The buoyant force acting on the block is
a) equal to its weight.
b) less than its weight.
c) larger than its weight.
d) anything is possible.
e) depends on the volume of the block.

21) Consider a block of wood floating on water. If you push down on the top of the block until it's completely submerged, the buoyant force on it
a) increases.
b) decreases.
c) remains the same.
d) becomes zero
e) depends on how far beneath the water surface it is pushed.

Part 2: Solve the following four problems in the space provided in between showing all your steps.

Problem 1 (6 marks): A 0.05 kg clay ball moving horizontally at 12 m/s strikes and sticks to a stationary 0.10 kg ball on a frictionless surface. What is the speed of the two balls after the collision?

Problem 2 (6 marks): A ball rolls off from the top of a **1.25 m** high table and hits the floor **2.7 m** from the base of the table.

(a) What is the time of flight for the ball?

(b) What is the velocity of the ball as it leaves the table?

Problem 3 (6 marks): A swimming pool of length 50 m and width 22 m is filled with water of density 1.15 g/cm^3 to a depth of 3.85 m.

a) what is the water pressure at the bottom of the pool

b) What is the mass of the water in the pool?

Problem 4 (6 marks): The weight of a block is 112 N in air and 78 N when completely submerged in a liquid of density 0.85 g/cm^3.

a) What is the buoyant force on the block?

b) What is the density of the block?