FUNDAMENTALS OF PHYSICS TEST \#3 (Chapters 6-8)

1. True or False? Classical mechanics considers "ideal motion" to be "motion without opposing force."
2. Connect the laws of motion with their proper definitions.
a. First law of motion
b. Second law of motion
c. Third law of motion
3. An object at rest will continue to stay at rest, and an object in motion will continue to move at constant velocity, unless acted upon by an external force.
4. When an object exerts a force on a second object, the second object exerts a force of equal magnitude in the opposite direction to the first object.
5. The acceleration of an object is directly proportional to the force acting upon it, and inversely proportional to the mass of the object receiving the force.
6. If an object in motion stays in motion at constant velocity, why did Galileo find that the ball never reached the same height on the other side of the smooth curved surface?

7. True or False? Velocity is a vector force, but acceleration is not.
8. True or False? Inertia is the tendency of an object at rest to stay at rest, or of an object in motion to stay in motion.
9. Choose the correct statements.
a. In the ideal first law world, an object in dynamic equilibrium would remain indefinitely in dynamic equilibrium.
b. An object is accelerated when it changes speed and/or direction.
c. A 7 kg bowling ball weighs 7 kg on earth and 7 kg on the moon.
d. Compared to an object with lower density, an object with higher density has more matter contained in the same volume.
e. Observationally, on earth, we know that in order for an object in motion to stay in motion, a constant force needs to be applied to the object.
10. In the diagram below, assume the two objects that are being weighed are both solid and are exactly the same size in all dimensions, which means their matter takes up the same space (has the same volume). True or False? The object on the left weighs more because it contains more matter.

11. What are the appropriate mass units? What are the appropriate weight units? Which one is affected by the gravitational pull of celestial bodies (like planets and moons) and which one isn't?
12. Even though they are not the same measurement, why is it considered scientifically "OK" to weigh an object on a scale and report its "weight" in mass units instead of weight units?
13. True or False? There is an inverse relationship between mass and inertia such that the more mass something has, the less inertia it has.
14. The picture below shows a water balloon, which was held perfectly still, an instant after it popped. Choose the correct statements.
a. Before the water balloon popped, gravity was not acting on the water because it was in the balloon.
b. As soon as gravity has a chance to act on the water, its motionless inertia will be changed, and it will start falling toward the earth.
c. Before the water balloon popped, the water's inertia was motionless, so the water in the balloon has the tendency to remain motionless.
d. The water's inertia kept it motionless for an instant after the balloon popped, which is why the water appears to be "floating."

15. Describe in words the equation $a=F / m$ and what the relationship of " $F$ " and "m" are to "a."
16. True or False? Acceleration occurs when an object's velocity decreases.
17. Make your own free body diagram for the picture below and label thrust and drag. Indicate net force in the "up-down" direction using the appropriate symbol.

18. True or False? An object in dynamic equilibrium has a net force in the direction it is moving; otherwise, it wouldn't be moving.
19. In the diagram below, the Space Shuttle is moving from right to left. Make your own free body diagram from this, label drag and friction and indicate their vectors. Also, indicate the direction of motion, acceleration and inertia.

20. A person is running at $9.4 \mathrm{~km} / \mathrm{h}$. How long will it take him to run 12 km (round to tenths)?
21. Based on the following data, is acceleration present? Why or why not?

| Direction | Time (s) | Distance (m) |
| :---: | :---: | :---: |
| North | 25 | 100 |
| North | 50 | 200 |
| Northwest | 12.5 | 50 |

19. Based on the following data, is acceleration present?

| Direction | Time (s) | Distance (km) |
| :---: | :---: | :---: |
| Up | 57 | 99.75 |
| Up | 50 | 87.5 |
| Up | 64 | 112 |

20. True or False? Acceleration can be present when $\Sigma \mathrm{F}=0$.
21. True or False? Motion can be present when $\Sigma F=0$.
22. In the diagram below, both the biker/bike and the truck are at static equilibrium before stickman applies force to them. From the second law of motion standpoint, why does the force of 500 N cause the biker/bike to accelerate but the same force does not cause the truck to accelerate?

23. True or False? When acceleration occurs to an object, the direction of acceleration is always in the same direction as the net force applied to the object.
24. What is the acceleration of a 46 g golf ball when it receives a force of $1,800 \mathrm{~N}$ ?
25. True or False? If the golf ball from question 24 was hit with twice the force, it would accelerate twice as quickly.
26. An object receives a force of 209 N and accelerates at $3.2 \mathrm{~m} / \mathrm{s}^{2}$. What is the mass of the object receiving the force?
27. If all objects are accelerated by gravity at the same rate, why does an unfolded paper towel fall to the ground slower than a gallon of milk if they are simultaneously dropped from the same height?
