Review Questions #1

Physics 102.002
Fall 2007
Which of these is an accurate statement of Newton's first law? When there is no net force, an object

a. at rest remains at rest.
b. in motion remains in motion.
c. will eventually stop.
d. maintains a constant velocity
A force

a. can be seen and directly observed.

b. cannot be seen, but can be proven to exist.

c. is a meaningless concept.

d. can be measured but cannot be directly observed.
Forces of 4 N and 6 N act on an object? What is the minimum value for their sum?

a. zero  
b. 2 N  
c. 4 N  
d. 10 N
What is the mass of a box if a net force of 400 N produces an acceleration of 2 m/s²?

a  100 kg  
b  200 kg  
c  400 kg  
d  500 kg
A 20 kg child stands on a scale while riding in an elevator. What does the scale read while the elevator is accelerating up with $a=2\text{m/s}^2$?

A 160 N
B 200 N
C 240 N
D 280 N
A ball is fired horizontally at 10 m/s from the top of a very high cliff. What is the vertical speed of the ball at $t = 3$ s?

A 15 m/s  
B 20 m/s  
C 30 m/s  
D 40 m/s
What two facts did Newton need to calculate the acceleration of the Moon?

1. The distance to the Moon and the Moon’s diameter.
2. The time it takes the Moon to make one revolution and the distance from Earth to the Sun.
3. The Moon’s diameter and its speed of rotation.
4. The distance to the Moon and the time it takes the Moon to make one revolution.
What is the relationship between Newton's third law and his law of gravity? The gravitational force

A. keeps moving objects in motion and resting objects at rest.
B. between two objects is proportional to the mass of each object.
C. between two objects depends entirely on the mass of the larger object.
What was one obstacle Newton encountered in developing his theory of universal gravitation?

1. He had to figure out why the Moon doesn't fall.
2. He had to spend many years observing the movement of the planets.
3. He had to prove that Earth’s mass acts as if it was concentrated at its center.
4. He had to prove the inverse-square law.
What is the acceleration due to gravity at a distance of 1 Earth radius above Earth’s surface?

1. 2.5 m/s²
2. 5 m/s²
3. 10 m/s²
4. 20 m/s²
5. 40 m/s²
Two satellites are 10 km apart and have a gravitational attraction of 100,000 N. What is the force if they are 5 km apart?

1. 400,000 N
2. 200,000 N
3. 100,000 N
4. 50,000 N
5. 25,000 N
Assume that two cars have the same mass, but that the red car has twice the speed of the blue car. We then know that the red car has _____ kinetic energy as the blue car.

a. twice as much  
b. one-half as much  
c. four times as much  
d. one-fourth as much
A mass on a string is in uniform circular motion. If the angular speed is doubled, the tension of the string

A. Stays the same
B. Decreases by a factor of 2
C. Increases by a factor of 2
D. Increases by a factor of 4
A tennis ball is hit with a vertical speed of 10 m/s and a horizontal speed of 30 m/s. How far will the ball travel horizontally before landing?

a. 30 m  
b. 40 m  
c. 60 m  
d. 80 m
If Earth’s mass were suddenly and magically reduced to half its present value, the magnitude of Earth’s acceleration about the Sun would be

a. be reduced by a factor of 4.
b. be reduced by a factor of 2.
c. remain the same.
d. increase by a factor of 2.
How fast would you have to throw a 200g ball to give it the same momentum as a 10g bullet traveling at 800 m/s?

A. 4 m/s
B. 20 m/s
C. 40 m/s
D. 80 m/s
Which of the following will cause the largest change in the momentum of an object? A force of _____ acting for _____.

a. 3 N ... 6 s  
b. 4 N ... 5 s  
c. 5 N ... 5 s  
d. 6 N ... 3 s
Carts I and II initially at rest push apart on an air track via a spring. Cart I has twice the mass as cart II. Afterwords, the speed of I is ______ that of II.

A. half
B. Equal to
C. Twice
D. Cannot be determined
A boxcar traveling at 10 m/s approaches a string of three identical boxcars sitting stationary on the track. The moving boxcar collides and links with the stationary cars, and the four move off together along the track. What is the final speed of the four cars immediately after the collision? (You may take the mass of each boxcar to be 18,537 kg.)

a. 2 m/s  
b. 2.5 m/s  
c. 3.33 m/s  
d. 10 m/s
Which of the following does not “have” a potential energy?

A. Spring
B. Gravity
C. friction
Where in the motion of the pendulum is the potential energy greatest?

A. 
B. 
C. It is constant
A cylinder and a sphere have the same mass and radius. Which has the larger rotational inertia about its center?

A. cylinder
B. sphere
C. They are the same
Consider a cylinder rotated about axis 1 and axis 2. Which axis has the greater moment of inertia?

A. Axis a  
B. Axis b  
C. They are the same
# ANSWERS

1. D  
2. D  
3. B  
4. B  
5. C  
6. C  
7. D  
8. B  
9. C  
10. A  
11. A  
12. C  
13. D  
14. C  
15. C  
16. C  
17. C  
18. A  
19. B  
20. C  
21. A  
22. A  
23. B