Spring 99 Physics 101
Test #1

SHOW ALL WORK CLEARLY FOR CREDIT
Assume there is no friction in all problems unless otherwise stated..
b) What force must Barney pull with in order to accelerate the box at 2 m/s²?
b) What is the shape of the track itself? (circle one)

c) What is the acceleration of the ball when it is on the middle section of the ramp?

d) What is the length of the inclined section of track?
b) What is the average frictional force that acts on Karen as she slides?
b) What are the X and Y components of the arrow's velocity when it hits the ground?
   x component: __________
   y component:__________

c) How far below the cliff edge does the arrow strike the ground?

5. A rocket of weight 50,000 N takes off from a launch pad at $t = 0$. Each second it accelerates from
   the launch pad, its velocity increases by 90 miles per hour.
   a) How much time does the rocket take to reach a velocity of 600 m/ s?

   b) What is the net force on the rocket as it accelerates?

BONUS IF YOU HAVE TIME: Karen throws a birthday balloon upward from ground level. (It is an ordinary
   balloon filled with air) The time the balloon takes to go up is  1) more than  2) less than  3) equal to  the time it
   takes to fall back down. Explain your answer in terms of Newton's Second Law.
Multiple Choice Section: Select the one best answer
1. In order for a team to win a game of Tug-Of-War, they must
   1) pull on the rope harder than the other team
   2) push on the ground harder than the losing team
   3) all of the above
   4) none of the above

2. As the space shuttle orbits the earth, the astronauts inside feel weightless because
   1) the gravitational pull from the moon and planets balances the earth's pull of gravity
   2) their weight at that great height is so small that it is not noticeable
   3) their gravitational force is balanced by a centripetal force in the opposite direction
   4) the earth's gravity does not extend above the earth's atmosphere
   5) the shuttle and the astronauts are falling towards the earth together
4. Why is the weight of a chihuahua different on Mars than it is on earth?
   1) The constant G is different on Mars.  2) The chihuahua's mass is different on Mars.
   3) The masses and radii of Mars and earth are not the same.  4) All of the above

5. Water does not fall out of a bucket swung overhead because 1) the centripetal force holds it in
   2) the centrifugal force holds it in  3) the gravitational force holds it in
   4) the bucket accelerates downward with an acceleration greater than g
7. A ball is thrown upward. When it reaches the top of its path, its acceleration is
1) upward    2) downward    3) zero    4) may be any of the above depending on the circumstances

8. For the speed of a buffalo to decrease, 1) its acceleration must be zero    2) it must accelerate in the
opposite direction of its velocity    3) it must have a centripetal acceleration    4) its centripetal
acceleration must be greater than its centrifugal acceleration    5) its velocity must be negative

9. A chihuahua scampers in a circular path with a constant speed as it chases a bug. The acceleration of
the chihuahua    1) is zero because the speed is constant    2) is zero because the centripetal force is
canceled by the centrifugal force    3) is not zero because the velocity changes direction
10. A falling sky diver eventually reaches a terminal velocity because  1) things in motion tend to stay in motion at constant speed  
2) the diver’s acceleration remains constant  
3) no object can fall faster than the speed of sound  
4) the faster the diver falls, the greater the force of air friction
12. In the game of baseball, the pitcher throws the ball to the catcher. The force the catcher experiences as he catches the ball is 1) greater than  2) less than  3) equal to  the force that the pitcher pitched the ball with.

13. A bowling ball is dropped from rest. If we can ignore the effect of friction, the acceleration of the ball as it falls  1) increases  2) decreases  3) remains constant

14. If the distance between two objects triples, the gravitational force between the two objects  1) is increased by a factor of three  2) remains unchanged  3) is cut by a factor of one third  4) is cut by a factor of one ninth  5) none of the above.
17. As a satellite orbits the earth in a circular orbit, it
   1) accelerates in the direction of its velocity
   2) accelerates in the opposite direction of its velocity
   3) accelerates downward towards the earth
   4) does not accelerate

18. On a newly discovered planet, an astronaut discovers that a hammer released from rest takes 3
    seconds to fall 4 meters. What is the acceleration due to gravity on this planet?
   1) 0.89 m/ s²  2) 1.3 m/ s²  3) 2.7 m/ s²  4) 12 m/ s²  5) Unable to determine from information given
20. The kinetic energy of a comet as it orbits the sun 1) is greatest when it is closest to the sun 2) is smallest when it is closest to the sun 3) remains constant as it orbits the sun

21. The gravitational force the earth exerts on the moon is 1) greater than 2) less than 3) equal to the gravitational force the moon exerts on the earth.

22. When a box does not accelerate when a 10 N force is applied horizontally to it, we can assume that 1) its inertia is too large 2) the force of friction is greater than 10 N 3) Both 1 and 2 4) the force of friction is less than 10 N 5) net force on the box is zero
23. As a car moves it possesses kinetic energy. What happens to the car's energy when it stops at a red light?  
1) it vanishes  
2) it is transformed into potential energy  
3) it is transformed into rotational energy  
4) it is transformed into gravitational energy  
5) it is transformed into heat energy  

24. If a net force acts on a box in the opposite direction that the box moves  
1) the kinetic energy of the box must decrease  
2) the force will do negative work  
3) both 1 and 2  
4) It is impossible for a force to act in the opposite direction of motion  

25. Frank throws an egg to Cleo. In order to catch the egg without breaking it, Cleo must  
1) maximize initial and final velocities  
2) minimize initial and final velocities  
3) maximize initial velocity and minimize final velocity  
4) maximize acceleration  
5) minimize acceleration
The earth exerts a gravitational force of 5.0 N on an apple as it falls freely from a tree. The force that the apple exerts on the earth as it falls is 1) 5.0 N 2) slightly less than 5.0 N 3) a small fraction of 1 N 4) zero