PHYSICS 218 EXAM 2
FALL 2003

Name (Last, First): 
Section: 
Email: 
SID (all digits): ___ - ___ - ___ - ___ - ___ - ___

1. You have the full class period to complete the exam.
2. Formulae are provided on a separate colored sheet. You may NOT use any other formula sheet.
3. You may use a calculator.
4. You must put your answer on the fill in sheet on the back of this page. DO NOT leave it on the question. Any marks there WILL BE IGNORED. You do NOT need a scantron.
5. If you need additional space to answer a problem, use the back of the sheet it is written on, or ask for scratch paper.
6. There is NO partial credit
7. Your exam will not be returned to you.
8. Put your name on all sheets of paper.
Student Answers go here!

Problem 1 (5 pts): 

Problem 2 (5 pts): 

Problem 3 (5 pts): 

Problem 4 (10 pts): 

Problem 5 (5 pts): 

Problem 6 (5 pts): 

Problem 7 (5 pts): 

Problem 8 (10 pts): 

Problem 9 (5 pts): 

Problem 10 (5 pts): 

Problem 11 (5 pts): 

Problem 12 (10 pts): 

Problem 13 (5 pts): 

Problem 14 (5 pts): 

Problem 15 (5 pts): 

Problem 16 (10 pts): 

Total (100 points):
1. (5pts) A force of 20 N is applied downward at an angle of 30° with the horizontal to a 10 kg box sitting on the floor. The resulting horizontal acceleration of the box has what magnitude in m/s²?

2. (5 pts) A 10 kg block slides down a frictionless plane inclined at 45° with the horizontal. The magnitude of the normal force, in Newtons, of the plane on the block is?

3. (5 pts) A block is placed at the top of a frictionless inclined plane with angle 30° and released. The incline has a height of 15 m vertically above the ground (the length of the incline is NOT 15m) and the block has mass 4 kg. How long will it take the block to reach the bottom of the incline?

4. (10 pts) A 10 kg block is placed on an inclined plane of angle 30° (with the horizontal) and pushed up the plane with a purely horizontal force of magnitude 40 N. The magnitude of the block's acceleration (in m/s²) is
5. (5 pts) A force of 40 N is applied horizontally to a block of mass 10 kg. The block sits on a table; the coefficient of kinetic friction between the block and table is 0.3. The acceleration of the block is (in m/s²)

6. (5 pts) A skier accelerates down a slope inclined at angle θ. From this information we can conclude that
   a. μ_k > tan θ
   b. μ_k < tan θ
   c. μ_k = tan θ
   d. μ_k = μ_s

7. (5 pts) A box of mass 75 kg is pulled across a floor with a force inclined at an angle θ with respect to the horizontal. The coefficient of kinetic friction between the box and the floor is 0.3. The angle θ which will maximize the acceleration of the box is how many degrees above the horizontal

8. (10 pts) A bucket of mass 2 kg is whirled in a vertical circle of radius 1 m. At the lowest point of its motion the tension in the rope supporting the bucket is 25 N. The speed of the bucket, in m/s, is
For these problems the following information may be helpful:

Mass of the Moon = 7.35E22Kg
Radius of the Moon = 1.74E3Km
Mass of the Earth = 5.97E24Kg
Radius of the Earth = 6.38E3Km

9. (5 pts) Two objects with masses \( m_1 \) and \( m_2 \) are located a distance \( d \) apart. If their masses are each doubled and the separation between them is reduced to \( d/2 \), by what factor does the gravitational force between them change?
   a. 1/16
   b. 1/2
   c. 4
   d. 16

10. (5 pts) Consider a massive object in the shape of a ring lying in the x-y plane with its center at the origin. The direction of the gravitational force at the origin due to this ring is
   a. in the positive z direction
   b. in the negative z direction
   c. in the positive x direction
   d. the force is zero

11. (5 pts) Suppose a person can lift a mass no greater than 75 kg on Earth. The same person on the Moon could lift how large a mass (in kg):

12. (10 pts) The period of a satellite orbiting the Earth 2000 km above the surface is how many seconds?
13. (5 pts) A box of mass 10 kg is pushed 4 m up a plane inclined at an angle of 30° by a horizontal force of magnitude 100 N. The work done by this force, in Joules, is?

14. (5 pts) A box is given a push across a table so that its initial speed is \( v_0 \). The box travels a distance \( d \) and is brought to rest by friction. If instead the box is given an initial speed of \( 2v_0 \), how far will the box travel now?

15. (5 pts) A spring attached to 2 kg mass is compressed 30 cm and released from rest. When the spring is compressed 5 cm, the mass is moving at 3.5 m/s. The spring constant, in N/m, is:

16. (10 pts) A block of mass 10 kg is subject to a force \( F = 3x + 4x^2 \) (in N). The block is initially at rest at \( x = 1 \). Its speed when it has moved to \( x = 5 \), in m/s, is