Sample Final Exam 02 Physics 106 (Answers on last page)

Name (Print): _____ 4 Digit ID:_____ Section: _____

Instructions:

1. There are 30 multiple choice questions on the test. There is no penalty for guessing, so you should attempt to answer all of them. You will need to do calculations on the question papers for most of the questions and may need to use the backs of the pages for extra space.
2. **Your final answers must be put on the Scantron sheet using #2 pencil.**
3. Be sure your name and section number are on both the Scantron form and the exam booklet.
4. Be sure you are in the right room for your section.
5. You may bring and use your own 8.5 x 11 formula sheet (both sides). A default formula sheet is also provided (**see the final page** of this booklet).
6. Make sure to bring your own calculator; sharing of calculators is not permitted.
7. As you know, NJIT has a zero tolerance policy for ethics code violations during and also after an exam. Students are not to communicate with each other once the test has started. All cell phones, pagers, or similar electronic devices should be turned off.
8. If you have questions or need something call your proctor or instructor.

1. A 4.0 kg block is sliding at constant speed down a ramp making a 26^0 angle with the horizontal. The coefficient of kinetic friction is closest to

A. 0.28
B. 0.35
C. 0.49
D. 0.54
E. 0.61

2. A 10-kg block is pulled from rest along a 2 meter long horizontal surface by a rope that exerts a 50-N force directed 30^o above the horizontal. The coefficient of kinetic friction is 0.31.

What is the acceleration of the block?

A. 1.0 m/s^2
B. 2.0 m/s^2
C. 3.0 m/s^2
D. 4.0 m/s^2
E. 5.0 m/s^2

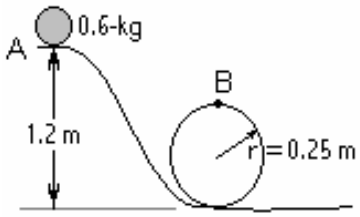
3. The total work done on the block in the previous problem is closest to

A. 10 J
B. 20 J
C. 40 J
D. 60 J
E. 100 J

4. A 2.0-kg ball is thrown straight up and reaches a maximum height of 16.2 m ? What is its initial velocity?
A. 20 m/s
B. 18 m/s
C. 16 m/s
D. 14 m/s
F. 12 m/s

5. A flat-bed trailer moving at 25.0 meters per second is carrying a large crate which is not strapped down. The shortest distance in which the truck can stop without the crate sliding forward is 50.0 meters. Therefore, the coefficient of static friction between the flat bed and the crate must be closest to:
A. 0.125
B. 0.250
C. 0.375
D. 0.500
E. 0.625

6. A 0.6-kg ball rolls down a frictionless, inclined track connected to a frictionless loop-the-loop of radius of 0.25 m, as shown in the figure. The ball is released at point A, 1.2 m above the bottom of the loop-the-loop. The speed of the ball at point B (the top of the loop) is closest to



A. 2.52 m/s
B. 3.74 m/s
C. 4.24 m/s
D. 4.88 m/s
E. 5.75 m/s

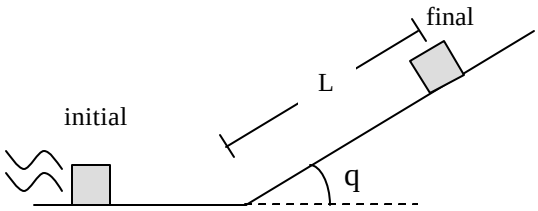
7. A spring is compressed 6 cm and an 8-kg block is placed against it. When the spring is released , the block shoots forward along a rough, horizontal surface traveling 1.2 m before coming to a stop. The coefficient of kinetic friction between the block and the surface is $\mu_k = 0.4$. Find the speed acquired by the block as it leaves the spring.

A. 1.52 m/s
B. 3.07 m/s
C. 4.24 m/s
D. 4.88 m/s
E. 5.75 m/s

8. Find spring constant of the spring.
A. 5 kN/m
B. 12 kN/m
C. 15 kN/m
D. 21 kN/m
E. 50 kN/m

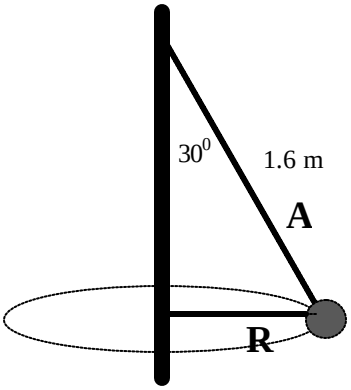
9. A 4-kg block slides on a horizontal surface with an initial speed of 5 m/s and then stops on a ramp making an angle 30^0 with the horizontal, as shown in the figure. If the coefficient of kinetic friction is 0.2 how far above the horizontal surface is the block in its final position?

A. 0.91 m
B. 1.8 m
C. 2.4 m
D. 3.8 m
E . 5.0 m



10. A 4-kg ball is attached to the vertical rod with a cord A, 1.6 m long. As the ball rotates around the vertical rod in a circle of radius R = 0.8 m, what is the tangential speed of the ball?

A. 2.14 m/s
B. 3.28 m/s
C. 4.16 m/s
D. 5. 44 m/s
E. can not be determined



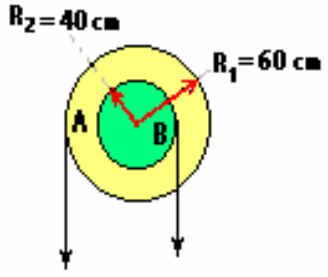
11. A wheel, with radius R=2.0 m, initially has an angular velocity of 12 rad/s, and is slowing down at a rate of 2.0 rad/s^2. By the time it stops spinning about its center, a point on the outer rim will have traveled a total distance of:

A. 24 m
B. 36 m
C. 48 m
D. 72 m
E. 144 m

12. A wheel, with rotational inertia I = 2 kgm^2, initially has an angular velocity of 4 rev/s in the counterclockwise direction It decreases its speed to 2 rev/sec in 5 sec. If the wheel rotates in a horizontal plane, the magnitude and direction of the retarding torque is:

A. 5 Nm, up
B. 5 Nm, down
C. 10 Nm, up
D. 10Nm, down
E. 12 Nm, up

13. A two-level pulley of rotational inertia I = 4 kgm^2 is pivoted about a frictionless axis, as shown. The angular acceleration of the pulley is α = 2 rad/s^2 clockwise. The tension in the cord attached to body B is 50 N. The tension in the cord attached to body A is closest to:
A. 10 N
B. 15 N
C. 20 N
D. 25 N
E. 30 N



14. A 32-kg wheel with moment of inertia I = 3 kg·m^2 is rotating at 280 rev/min. It must be brought to stop in 15 seconds. The work required to stop the wheel is:

A. 1000 J
B. 1050 J
C. 1100 J
D. 1300 J
E. 1600 J

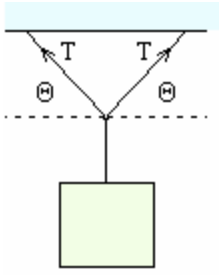
15. The figure shows a 3 - kg rod, 4 m long, with 2.00-kg balls attached at each end. What is the rotational inertia of the rod about left end of the rod?

A. 12 kgm^2
B. 24 kgm^2
C. 36 kgm^2
D. 48 kgm^2
E. 64 kgm^2

16. A phonograph record of radius 0.15 m and rotational inertia I =0.065 kgm^2 rotates about a vertical axis through its center with an angular speed of 33.3 rev/min. A wad of putty whose mass is 0.2 kg drops vertically onto the record and sticks to its edge. What is the angular speed of the record immediately after the putty sticks to it?

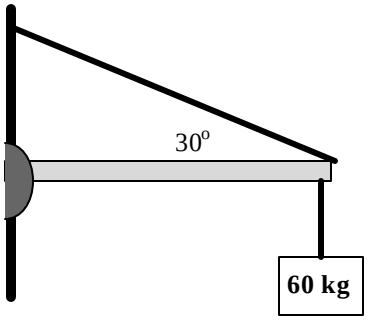
A. 29.2 rev/min
B. 31.1 rev/min
C. 33..3 rev/min
D. 35.2 rev/min
E. can not be determined

17. A 22 kg traffic light is suspended from a cable as shown. Find the tension T if $\theta_1 = \theta_2 = 25^0$.



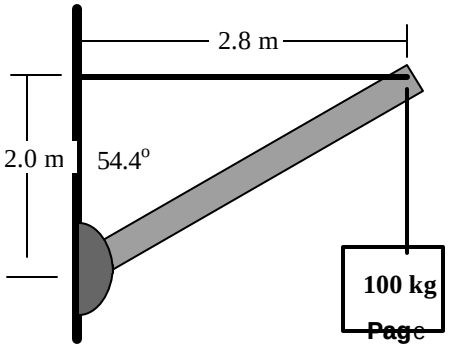
A) 120 N
B) 165 N
C) 196 N
D) 220 N
E) 255 N

18. The tension in the cable supporting the 12-m weightless beam is closest to.



A. 600 N
B. 1200 N
C. 1800 N
D. 2400 N
E. 3000 N

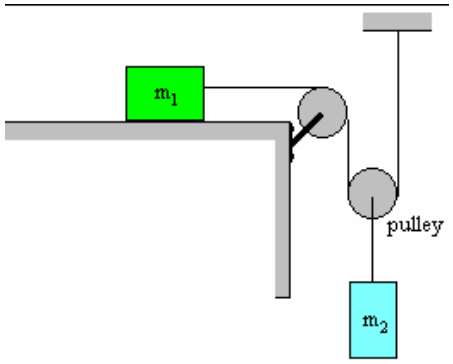
19. A uniform 150-kg strut, which is 3.44 m long, is pinned at one end and supported at the other end by a horizontal cable, as shown. The tension in the cable is closest to:



A. 1000 N
B. 1400N
C. 1800 N
D. 2000 N
E. 2400 N

20. The **magnitude** of the force that the wall exerts on the strut is closest to
A. 1000 N
B. 1200 N
C. 1700 N
D. 2500 N
E. 3500 N

21. For the system in the figure mass m_1 is 10 kg and mass m_2 is 5 kg. What is acceleration of m_1 if the horizontal surface is frictionless? Hint:how does a_1 compare to a_2?
A. 1.80 m/s^2
B. 2.20 m/s^2
C. 3.00 m/s^2
D. 4.94 m/s^2
E. 5.65 m/s^2



22. How high above the surface of the earth is the gravitational acceleration 5 m/s^2?
A. 2500 km
B. 3600 km
C. 4800 km
D. 6370 km
E. 7800 km

23. A geosynchronous satellite circles the earth once every 24 hours. If the mass of the earth is 5.98x10^{24} kg; and the radius of the earth is 6.37x10^6 m., how far above the **surface** of the earth does a geosynchronous satellite orbit the earth?
A. 12500 km
B. 36000 km
C. 52000 km
D. 63700 km
E. 78000 km

24. The speed of a geosynchronous satellite is closest to
A. 2500 m/s
B. 3100 m/s
C. 4800 m/s
D. 6370 m/s
E. 7800 m/s

25. A 3 -kg mass connected to a spring with negligible mass and spring constant 3000 N/m executes simple harmonic motion. The amplitude of the oscillation is 25 cm. What is the speed of the mass at position x = 18 cm?
A. 2.52 m/s
B. 3.74 m/s
C. 4.24 m/s
D. 4.88 m/s
E. 5.48 m/s

26. A vertical spring stretches 80 cm when a 1.6-kg block is hung from its end. What is the spring constant of this spring?
A. 2 N/m
B. 20 N/m
C. 200 N/m
D. 2000 N/m
E. 20000 N/m

27. A 2- kg mass, connected to a spring with negligible mass oscillates on a frictionless horizontal surface. The displacement of the oscillator is given by:

$$x(t) = 24\text{cm} \cos[(60\text{rad/s})\, t]$$

Find the spring constant of the spring
A. 25 N/m
B. 120 N/m
C. 450 N/m
D. 7200 N/m
E. 12000 N/m

28. In the problem above, how far from the starting point is the mass at t = 12 seconds?

A. + 20 cm
B. -20 cm
C. +15 cm
D. -15 cm
E. +10 cm

29. What is the total energy of this spring-mass system?
A. 50 J
B. 150 J
C. 207 J
D. 488 J
E. 500 J

30. What is the period of a simple pendulum of mass of 2 kg and length of 49 cm?
A) 1.4 s
B) 2.1 s
C) 4.2 s
D) 6.8 s
E) 10 s

Answers to Sample Final Exam 2

1. C	**16. B**
2. B	**17. E**
3. C	**18. B**
4. B	**19. E**
5. E	**20. E**
6. B	**21. B**
7. B	**22. A**
8. D	**23. B**
9. A	**24. B**
10. A	**25. E**
11. D	**26. B**
12. B	**27. D**
13. C	**28. B**
14. D	**29. C**
15. D	**30. A**