PHYSICS DEPARTMENT

PHY 2048 Test 1 September 20, 2007

Name (print): _____ Signature: _____

On my honor, I have neither given nor received unauthorized aid on this examination.

YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.

(1) **Code your test number on your green answer sheet (use 76–80 for the 5-digit number)**. Code your name on your answer sheet. Darken circles completely. Code your UF ID number on your answer sheet.
(2) Print your name on this sheet and sign it also.
(3) Do all scratch work on this exam to the right of the questions, and anywhere else on this exam that you like. At the end of the test, this exam printout is to be turned in. No credit will be given without both the answer sheet and printout, with the scratch work which most questions demand of anyone.
(4) You will receive one point for each correct answer and zero points for an incorrect answer or no answer.
(5) Use a number 2 pencil on the answer sheet. Do not make any stray marks, or the answer sheet may not be read properly.

>>>>>>>>**BEFORE YOU FINISH** <<<<<<<<

Fold the computer printout so your name is on top, include any figure sheet inside the printout. Hand in the answer sheet separately.

Useful Equations:

$\vec{A}\cdot\vec{B} = A_xB_x + A_yB_y + A_zB_z$	$\vec{A}\cdot\vec{B} = \lvert\vec{A}\rvert\lvert\vec{B}\rvert\cos\theta$	$\lvert\vec{A}\times\vec{B}\rvert = \lvert\vec{A}\rvert\lvert\vec{B}\rvert\sin\theta$	$\sin 30^\circ = \cos 60^\circ = 1/2$
$\vec{x} - \vec{x}_0 = \vec{v}_0 t + \frac{1}{2}\vec{a}t^2$	$\vec{v} = \vec{v}_0 + \vec{a}t$	$\vec{V}_{AC} = \vec{V}_{AB} + \vec{V}_{BC}$	$\cos 30^\circ = \sin 60^\circ = \sqrt{3}/2$
$\frac{1}{2}(v^2 - v_0^2) = \vec{a}\cdot(\vec{x} - \vec{x}_0)$	$v = \sqrt{2ax}$	$f_k = \mu_k N$	$\tan 30^\circ = \sqrt{3}/3$
$\vec{F} = m\vec{a}$	$g = 9.8\text{m/s}^2$	$f_s \leq \mu_s N$	$\tan 60^\circ = \sqrt{3}$
$\sin(A \pm B) = \sin(A)\cos(B) \pm \sin(B)\cos(A)$	$\vec{v}_{avg} = \frac{\vec{r}_f - \vec{r}_i}{\Delta t}$	$\vec{a}_{avg} = \frac{\vec{v}_f - \vec{v}_i}{\Delta t}$	(f = final, i = initial)

1. A right circular cylinder with a radius of 2.3 cm and a height of 1.4 cm has a total surface area of:

   (1) 5.3×10^{-3} m^2 (2) 3.2×10^{-3} m^2 (3) 2.0×10^{-3} m^3 (4) 1.7×10^{-3} m^2 (5) 7.4×10^{-3} m^2

2. Suppose A = BC, where A has the dimension L/M and C has the dimension L/T. Then B has the dimension:

   (1) T/M (2) L^2/TM (3) TM/L^2 (4) L^{2}T/M (5) M/L^{2}T

3. Over a short interval near time $t = 0$ the coordinate of an automobile in meters is given by $x(t) = 27t - 4.0t^3$, where t is in seconds. At the end of 1.0 s the acceleration of the auto is:

   (1) -24 m/s^2 (2) 4.0 m/s^2 (3) -4.0 m/s^2 (4) -12 m/s^2 (5) 27 m/s^2

4. A projectile is shot vertically upward with a given initial velocity. It reaches a maximum height of 100 m. If, on a second shot, the initial velocity is doubled then the projectile will reach a maximum height of:

   (1) 400 m (2) 141.4 m (3) 200 m (4) 241 m (5) 70.7 m

5. A vector has a magnitude of 12. When its tail is at the origin it lies between the positive x axis and the negative y axis and makes an angle of 30° with the x axis. Its y component is:

   (1) -6 (2) $-6/\sqrt{3}$ (3) 6 (4) $6/\sqrt{3}$ (5) 12

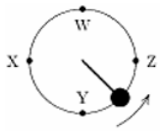
6. If $\vec{A} = (2m)\hat{\imath} - (3m)\hat{\jmath}$ and $\vec{B} = (1m)\hat{\imath} - (2m)\hat{\jmath}$ then $\vec{A} - 2\vec{B} =$

(1) $(1m)\hat{\jmath}$ (2) $(-1m)\hat{\jmath}$ (3) $(4m)\hat{\imath} - (7m)\hat{\jmath}$ (4) $(4m)\hat{\imath} + (1m)\hat{\jmath}$ (5) $(-4m)\hat{\imath} + (7m)\hat{\jmath}$

7. Two vectors lie with their tails at the same point. When the angle between them is increased by 20° the magnitude of their vector product doubles. The original angle between them was about:

(1) 18° (2) 0° (3) 25° (4) 45° (5) 90°

8. An object, tied to a string, moves in a circle at constant speed on a horizontal surface as shown. The direction of the displacement of this object, as it travels from W to X is:



(1) ↙ (2) ↑ (3) ↓ (4) ← (5) ↗

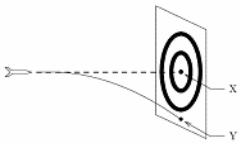
9. A large cannon is fired from ground level over level ground at an angle of 30° above the horizontal. The muzzle speed is 980m/s. Neglecting air resistance, the projectile will travel what horizontal distance before striking the ground?

(1) 85km (2) 8.5km (3) 43km (4) 4.3km (5) 170km

10. A stone thrown from the top of a tall building follows a path that is:

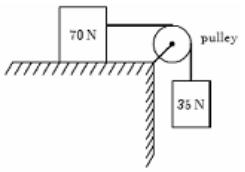
(1) parabolic (2) made of two straight line segments (3) hyperbolic (4) circular (5) a straight line

11. A dart is thrown horizontally toward X at 20m/s as shown. It hits Y 0.1 s later. The distance XY is:



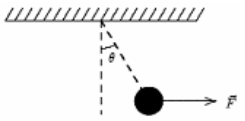
(1) 0.05m (2) 1m (3) 0.5m (4) 0.1m (5) 2m

12. A 70-N block and a 35-N block are connected by a string as shown. If the pulley is massless and the surface is frictionless, the magnitude of the acceleration of the 35-N block is:



(1) 3.3 m/s^2 (2) 1.6 m/s^2 (3) 4.9 m/s^2 (4) 6.7 m/s^2 (5) 9.8 m/s^2

13. A 1.00-N pendulum bob is held at an angle θ from the vertical by a 2.00-N horizontal force F as shown. The tension in the string supporting the pendulum bob (in newtons) is:

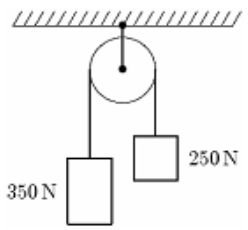


(1) 2.24 (2) $2/\cos\theta$ (3) $\cos\theta$ (4) 1 (5) none of these

14. A car moves horizontally with a constant acceleration of 3m/s^2. A ball is suspended by a string from the ceiling of the car. The ball does not swing, being at rest with respect to the car. What angle does the string make with the vertical?

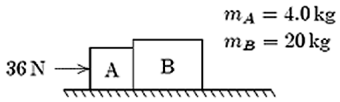
(1) 17° (2) 35° (3) 52° (4) 73° (5) Cannot be found without knowing the length of the string

15. Two blocks, weighing 250N and 350N, respectively, are connected by a string that passes over a massless pulley as shown. The tension in the string is:



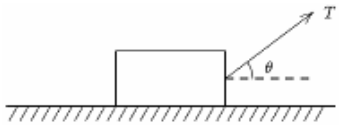
(1) 290N (2) 210N (3) 410N (4) 500N (5) 4900N

16. Two blocks (A and B) are in contact on a horizontal frictionless surface. A 36-N constant force is applied to A as shown. The magnitude of the force of A on B is:



(1) 30N (2) 6.0N (3) 29N (4) 1.5N (5) 36N

17. A block of mass m is pulled along a rough horizontal floor by an applied force $\vec{T}$ as shown. The vertical component of the force exerted on the block by the floor is:

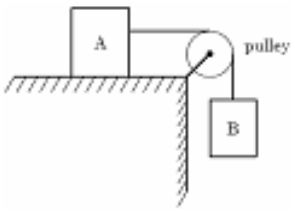


(1) $mg - T\sin\theta$ (2) $mg - T\cos\theta$ (3) $mg + T\cos\theta$ (4) mg (5) $mg + T\sin\theta$

18. A 5.0-kg crate is on an incline that makes an angle of 30° with the horizontal. If the coefficient of static friction is 0.5, the maximum force that can be applied up the plane and parallel to it without moving the crate is:

(1) 46N (2) 3.3N (3) 30N (4) 0 (5) 55N

19. Block A, with a mass of 50 kg, rests on a horizontal table top. The coefficient of static friction is 0.40. A horizontal string is attached to A and passes over a massless, frictionless pulley as shown. The smaller mass m_B of block B, attached to the dangling end, that will start A moving when it is attached to the other end of the string is:



(1) 20 kg (2) 30 kg (3) 40 kg (4) 50 kg (5) 70 kg

20. A 1000-kg airplane moves in straight fight at constant speed. The force of air friction is 1800N. The net force on the plane is:

(1) zero (2) 11800N (3) 1800N (4) 9800N (5) none of these