Physics 2211 ABC Test form **431** Name _____
Fall 2014
Test 3 Recitation Section (see back of test):_____

A

1) Print your name, test form number (above), and nine-digit student number in the section of the answer card labeled "STUDENT IDENTIFICATION".

2) Bubble your test form number (**ABOVE**) in columns 1-3, skip column 4, then bubble in your student number in columns 5-13.

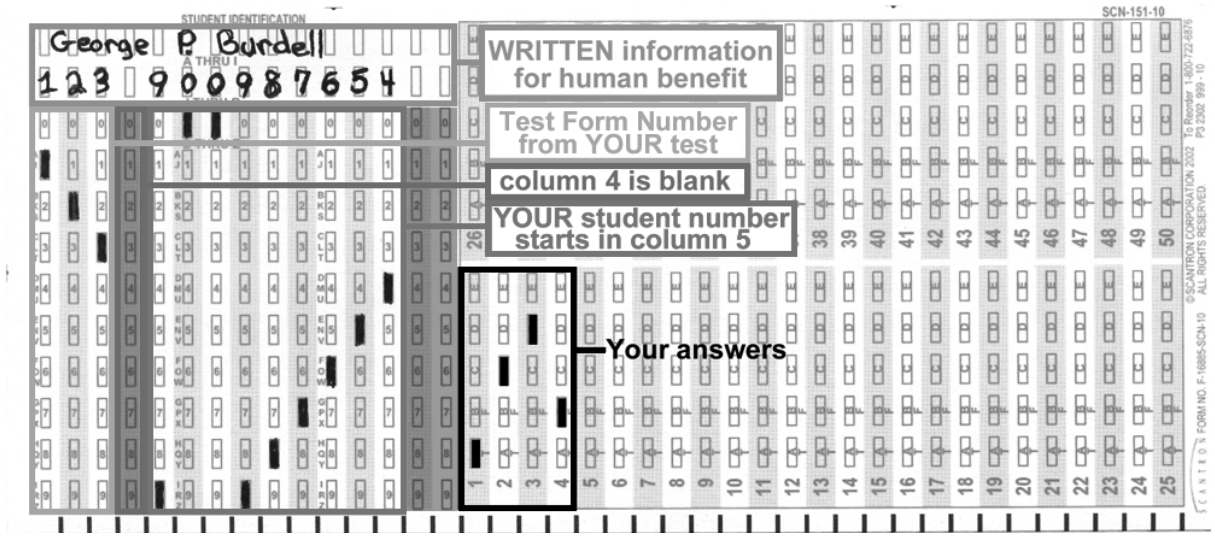
3) For each free-response question, show all relevant work supporting your answer. **Clearly box or underline your final answer.** "Correct" answers which are not supported by adequate calculations and/or reasoning will be counted wrong.

4) For each multiple-choice question, select the answer most nearly correct, **circle this answer on your test**, and bubble it in on your answer card. **Show all relevant work on your quiz.**

5) Be prepared to present your Buzzcard as you turn in your test. Scores will be posted to WebAssign after they have been been graded. **Quiz grades become final when the next quiz is given.**

6) You may use a simple scientific calculator capable of logarithms, exponentials, and trigonometric functions. **Programmable engineering calculators with text or graphical capabilities are not allowed. Wireless devices are prohibited.**

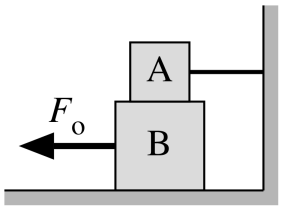
Your test form is: 431



Our next test will be on Monday, October 27!

The following problem will be hand-graded. Show all your work for this problem. Make no marks and leave no space on your answer card for it.

[I] Block A, having mass m, is placed on block B, having mass $2m$, which in turn rests on the floor. The surfaces of both blocks and the floor are rough, and all are made of the same material. An ideal cord securely attaches block A to the nearby wall. When block B is pulled to the left by an applied force of magnitude F_o, it remains stationary.

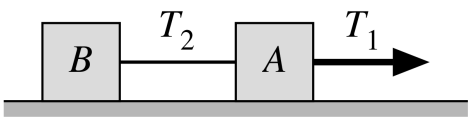


(A) *(8 points)* Draw a free body diagram for each of the blocks, and then identify all Third Law force pairs in your diagram.

(B) *(12 points*) The force applied to block B is gradually increased, and it is found that block B will begin to slip when the applied force exceeds the value $F_1 = 3mg$ (i.e. when the applied force equals the total weight of the two blocks combined). Determine the coefficient of static friction between the surfaces.

The following problem will be hand-graded. Show all your work for this problem. Make no marks and leave no space on your answer card for it.

[II] Blocks A and B have equal masses m = 4.0 kg, and are connected via an ideal cord of length L = 50 cm. The cord can sustain a maximum tension T_2 = 24 N before it will break. The coefficients of kinetic friction for the two blocks are μ_A= 0.25 and μ_B= 0.50.

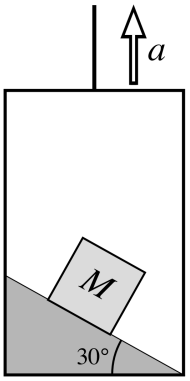


(A) *(8 points)* What maximum pulling force T_1 can be applied to block A without breaking the cord attached to block B?

(B) *(12 points*) If block A is pulled with a force T_3 that is half the pulling force T_1 found in Part A, what will be the tension in the cord connecting block B to block A? [Hint: it is not 12 N!]

The following problem will be hand-graded. Show all your work for this problem. Make no marks and leave no space on your answer card for it.

[III] A block of mass M = 12 kg rests on a *slanted* elevator floor that makes an angle of 30° below the horizontal. The coefficient of static friction between the block and floor of μ_s = 0.75. When the elevator is accelerating upward with a magnitude a = 1.5 m/s^2, the block does not slip along the floor.

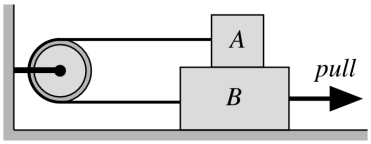


In this problem, it will be advantageous to choose coordinate axes based on the acceleration vector, not the slanted floor!

(A) *(8 points)* What is the friction force acting on the block?

(B) *(12 points)* What is the apparent weight of the block as it accelerates upward? (That is, what is the perpendicular force that a spring scaled placed beneath the block would register?)

The next two questions involve the following situation:
Wooden block A is stacked on wooden block B, and an ideal cord passes over a pulley to connect the blocks as shown at right. Block B is then pulled to the right with sufficient force to cause it to slip along the ground.



Question value 4 points

(1) According to the Third Law, What force is paired with the upward normal force by the ground on the bottom of block B?

(a) The gravitational force down on block B.

(b) The weight of *both* blocks A and B, down on block B.

(c) A downward normal force by block B on the ground.

(d) The downward normal force by block A on block B

(e) The downward normal force by block B on block A.

Question value 4 points

(2) What pair of <u>horizontal</u> "Third Law" forces act on the two blocks?

(a) Tension to the left on block B and Tension to the right on block A.

(b) Static friction to the right on block B and to the left on block A.

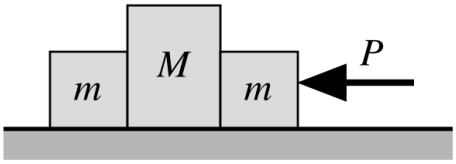
(c) Kinetic friction to the right on block B and to the left on block A.

(d) Kinetic friction to the left on block B and to the right on block A.

(e) Tension to the left on block B and also to the left on block A.

Question value 8 points

(3) Three blocks lie at rest on a frictionless surface. When a horizontal push of magnitude P is applied from the right, what is the magnitude of the net force acting on block M?



(a) $PM/(M + 2m)$

(b) P

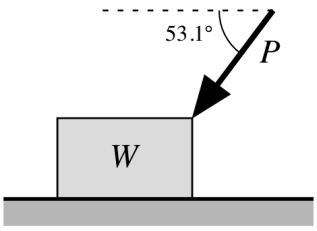
(c) $2Pm/M$

(d) $Pm/(M + 2m)$

(e) $PM/2m$

Question value 8 points

(4) A block having weight W = 8 N rests on a horizontal surface where the coefficient of static friction μ_s = 0.50. When an applied force P = 5 N is applied to the block at a 53.1° downward angle as shown, the block does not move. What is the friction force acting on the block at this time?



(a) 6 N

(b) 3 N

(c) 2 N

(d) 4 N

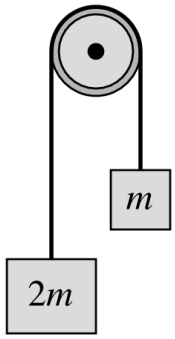
(e) 5 N

some useful trig:

cos(53.1°) = 3/5
sin(53.1°) = 4/5
tan(53.1°) = 3/4

Question value 8 points

(5) Two blocks having masses *2m* and *m* are hung from a pulley as shown at right. The cord connecting the blocks is massless and unstretchable. When the blocks are released from rest, what will be the tension in the cord?



(a) $3mg$

(b) mg

(c) $\frac{4}{3}mg$

(d) $\frac{3}{2}mg$

(e) $2mg$

Question Value 8 points

(6) In an amusement park ride called the "Drop of Doom", passengers are strapped into an open seat, and hoisted by a cable to a height *H* above the ground. The cable is then allowed to go slack and passengers drop in free fall for a distance $3/5\,H$, at which point the cable is placed under constant tension to brake them to a stop as they fall the final $2/5\,H$. If a passenger's true weight is represented by *W*, what will be his *percieved* weight while the tension is slowing him down? [Hint: start by doing some kinematics.]

(a) 1.67 *W*

(b) 2.00 *W*

(c) 0.67 *W*

(d) 1.33 *W*

(e) 2.50 *W*

PHYS 2211 ABC Recitation TA and Room Assignments

Tests will be returned in recitation, in the week *after* the test. In order to ensure that you receive your test back as soon as possible, please enter your recitation section from the table above (G01–G10) on the front of this test.

	Clough 125	Clough 127	Clough 131	Clough 325
WEDNESDAY				
12:05 – 12:55 pm	A01 Shi, Chao			
1:05 – 1:55 pm				B01 Shi, Chao
2:05 – 2:55 pm	C01 Liberi, Brandon			A06/B02 Shi, Chao
3:05 – 3:55 pm				B05/C06 Ravipati, Akshay
4:05 – 4:55 pm		A05/C07 Strauss, Hunter		C02 Shi, Chao
5:05 – 5:55 pm	A02 Zhou, Jiarun	B06 McMahon, Brian		
THURSDAY				
12:05 – 12:55 pm	B03 Liberi, Brandon			
1:05 – 1:55 pm		C03 Kosaraju, Raj		
2:05 – 2:55 pm	B08 Kharbouch, Adel	A03 Lall, Siddharth		
3:05 – 3:55 pm		A07/B07 Lall, Siddharth	C04 Tao, Liangyu	
4:05 – 4:55 pm	A08/C08 Tao, Liangyu			
5:05 – 5:55 pm	C09 Zhou, Jiarun	A04/B09 Strauss, Hunter		
6:05 – 6:55 pm	B04/C05 Minderman, John			