Name:

Your code is: AAAAAA

Put your name here:

Keep this exam **CLOSED** until advised by the instructor.

60 minute long closed book exam.

Fill out the bubble sheet: last name, first initial, student number, section number and **code**.

A two-sided 8.5 by 11 handwritten help sheet is allowed.

When done, hand in your **test** and your **bubble sheet**.

Thank you and good luck!

Possibly useful constants:

- g = 9.81 m/s^2
- G = 6.67$\times$10^{-11} Nm^2/kg^2
- σ = 5.67 $\times$ 10^{-8} W/(m^{2}K^4)
- R= 0.0821 L*atm/(mol*K) = 8.31 J/(mol*K)

Possibly useful Moments of Inertia:

- Solid homogeneous sphere: $I_{CM} = (2/5)MR^2$
- Thin spherical shell: $I_{CM} = (2/3)MR^2$
- Thin uniform rod, axis perpendicular to length: $I_{CM} = (1/12)ML^2$
- Solid homogeneous cylinder, axis through center of mass and parallel to length: $I_{CM} = (1/2)MR^2$

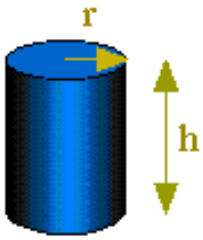
Useful information for Geometry:

- Volume of a sphere: $V = (4/3)\pi r^3$
- Volume of a cylinder: $V = \pi r^2 h$

7 pt There are 1,609 meters in one mile. How far in miles would a schoolbus go in 6 hours, 10 minutes at 90 km/h?

1.A◯ 184 **B**◯ 215 **C**◯ 252 **D**◯ 295
E◯ 345 **F**◯ 404 **G**◯ 472 **H**◯ 552

7 pt A right cylinder has a radius r of 13.7 mm and a height h of 31.2 mm. What is the volume of the cylinder in cm^3?



2.A◯ 1.84×10^1 **B**◯ 1.84×10^2 **C**◯ 1.84×10^3
D◯ 5.86×10^3 **E**◯ 1.84×10^4 **F**◯ 1.84×10^5
G◯ 1.84×10^6 **H**◯ 1.84×10^7

12 pt Consider A=67 m/s and B=8 kg·m/s. Identify if the operations below are possible or not. If an operation is possible, identify whether or not the correct answer is given.

▷ You can add A and B, and get 7.50×10^1 kg·m^2/s^2.
3. **A**◯ This operation is impossible
B◯ This operation is possible, but the answer is false
C◯ This is correct

▷ You can multiply A and B, and get 5.36×10^2 kg·m/s.
4. **A**◯ This operation is impossible
B◯ This operation is possible, but the answer is false
C◯ This is correct

▷ You can divide A by B, and get 8.38 kg^{-1}.
5. **A**◯ This operation is impossible
B◯ This operation is possible, but the answer is false
C◯ This is correct

8 pt Two balls are thrown simultaneously with the same speed of 26 m/s. The first ball is thrown at an angle of 31° relative to the horizontal. The second ball is thrown at an angle of 59° relative to the horizontal. Select True or False for the following statements.

▷ Both balls have the same acceleration during their flight.
6. **A**◯ True **B**◯ False

▷ The second ball has a higher speed at its maximum height.
7. **A**◯ True **B**◯ False

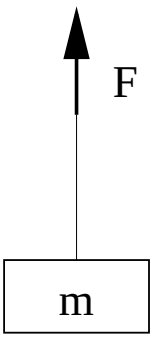
▷ Both balls have the same range.
8. **A**◯ True **B**◯ False

7 pt An artillery shell is launched on a flat, horizontal field at an angle of $\alpha = 44.3°$ with respect to the horizontal and with an initial speed of $v_0 = 314$ m/s. What is the horizontal distance covered by the shell after 4.29 s of flight?
(in `m`*)*

9.A◯ 7.25×10^2 **B**◯ 9.64×10^2 **C**◯ 1.28×10^3
D◯ 1.71×10^3 **E**◯ 2.27×10^3 **F**◯ 3.02×10^3
G◯ 4.01×10^3 **H**◯ 5.34×10^3

7 pt What is the height of the shell at this moment?
(in `m`*)*

10.A◯ 1.92×10^2 **B**◯ 2.79×10^2 **C**◯ 4.05×10^2
D◯ 5.87×10^2 **E**◯ 8.51×10^2 **F**◯ 1.23×10^3
G◯ 1.79×10^3 **H**◯ 2.59×10^3



7 pt

An m = 9.8 kg mass is suspended on a string which is pulled upward by a force of F = 101.5 N. (See figure.) If the upward velocity of the mass is 4.0 m/s right now, then what is the velocity 6.0 s later?
(in `m/s`*)*

11. **A**◯ 5.84 **B**◯ 7.31 **C**◯ 9.13
D◯ 1.14×10^1 **E**◯ 1.43×10^1 **F**◯ 1.78×10^1
G◯ 2.23×10^1 **H**◯ 2.79×10^1

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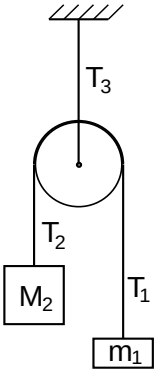
12 pt A frictionless, massless pulley is attached to the ceiling, in a gravity field of 9.81 m/s^2.



Mass M_2 is greater than mass m_1. The quantities T_1, T_2, T_3 and g are magnitudes. Select greater than, less than or equal to.

▷ $m_1g + M_2g$ is _____ T_3
12. **A**◯ Greater than **B**◯ Less than
C◯ Equal to

▷ T_1 is _____ T_2.
13. **A**◯ Greater than **B**◯ Less than
C◯ Equal to

▷ M_2g is _____ T_2.
14. **A**◯ Greater than **B**◯ Less than
C◯ Equal to

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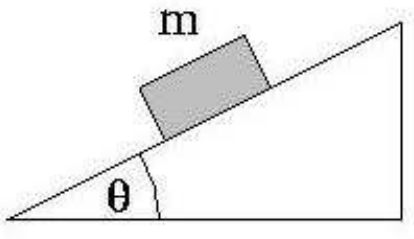
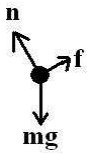
6 pt The block on the incline shown in the diagram below is observed moving DOWN the incline.



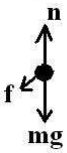
A



B

C

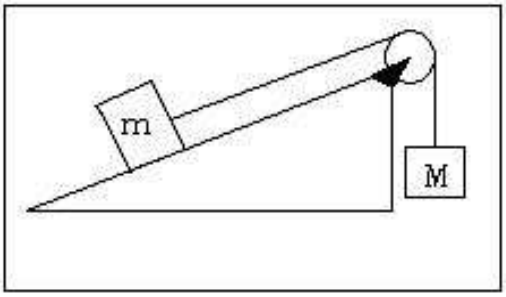
D



▷ Which free-body diagram most accurately depicts all forces acting on the block as it moves DOWN the incline? (f represents a frictional force, n a normal force, m the mass of the block and g the acceleration due to gravity)

15 **A**◯ **B**◯ **C**◯ **D**◯

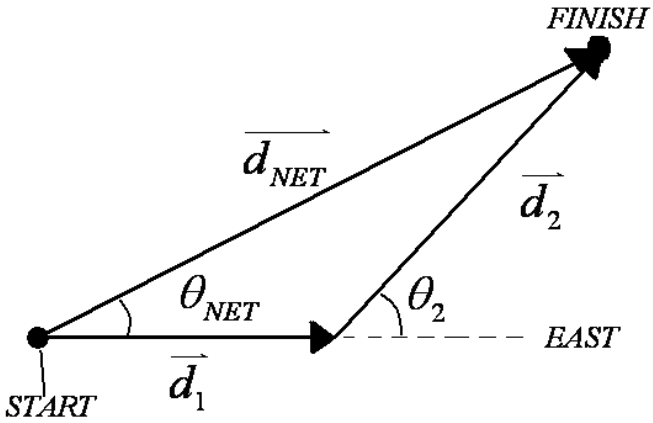
7 pt A 9.650 kg block is on a ramp and is attached to a 1.374 kg mass by a light string as shown in the diagram below. The string passes over a pulley and the ramp is inclined at an angle of 15 degrees aith reaspect to the horizontal.



If the block on the ramp is moving **DOWN** the ramp at constant velocity, what is the coefficient of kinetic friction between the block on the ramp and the ramp?

16.A◯ 0.016 **B**◯ 0.022 **C**◯ 0.029 **D**◯ 0.039
E◯ 0.051 **F**◯ 0.068 **G**◯ 0.091 **H**◯ 0.121

Sam walks due east at a speed of 1.15 m/s for 458 seconds, turns and walks θ_2=37.3 ° north of east at a speed of 1.15 m/s for 706 seconds. Sam's trip is depicted in the diagram below.



7 pt What total distance did Sam walk from start to finish? *(in* `m`*)*

17.A◯ 439 **B**◯ 637 **C**◯ 923 **D**◯ 1339
E◯ 1941 **F**◯ 2814 **G**◯ 4081 **H**◯ 5917

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7 pt What is the magnitude of Sam's total displacement relative to the staring position? *(in* `m`*)*

18.A◯ 540 **B**◯ 719 **C**◯ 956 **D**◯ 1272
E◯ 1691 **F**◯ 2249 **G**◯ 2992 **H**◯ 3979

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6 pt Relative to the starting position, in what direction (θ_{NET} measured north of east) did Sam finish the walk? *(in* `deg`*)*

19.A◯ 20.5 **B**◯ 21.1 **C**◯ 21.6 **D**◯ 22.2
E◯ 22.8 **F**◯ 23.3 **G**◯ 23.9 **H**◯ 24.5
