Richard Hallstein - PHY 231C – Introductory Physics I – Virtual University(summer 05) 2
Exam1

Your code is:

Put your name here:

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

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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 = 6.67×10^{-11} Nm^2/kg^2
- $\sigma = 5.67 \times 10^{-8}$ 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: $I_{CM} = (1/2)MR^2$

4 pt Identify the statements as being either True or False.

▷ A dimensionally correct equation must be correct.
1. **A**◯ True **B**◯ False

▷ A dimensionally incorrect equation may be correct.
2. **A**◯ True **B**◯ False

12 pt
Choose the correct SI units for the function of x, v, a, t, and m given.

A. kg·m^2/s^2

B. kg·m/s^2

C. kg·m^2/s

D. kg·m/s

E. kg·m^2/s^3

F. kg·m^2

G. m/(s·kg)

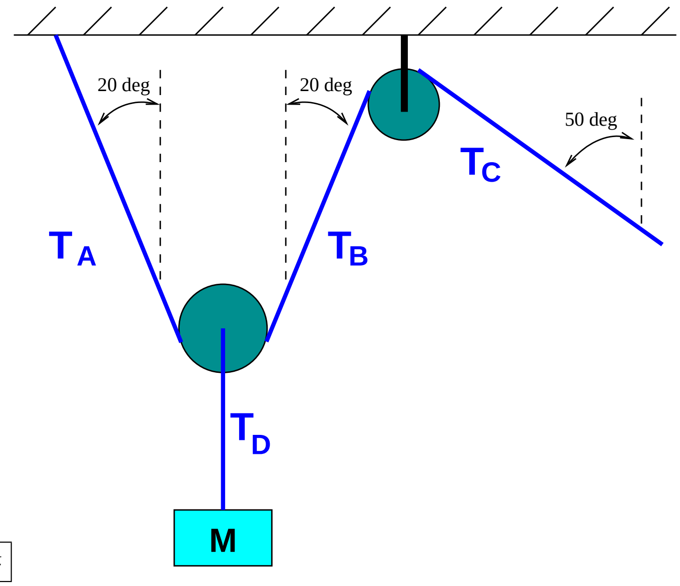
H. m/s^2

▷ v/m
3. **A**◯ A **B**◯ B **C**◯ C **D**◯ D **E**◯ E **F**◯ F **G**◯ G **H**◯ H

▷ a (acceleration)
4. **A**◯ A **B**◯ B **C**◯ C **D**◯ D **E**◯ E **F**◯ F **G**◯ G **H**◯ H

▷ mv
5. **A**◯ A **B**◯ B **C**◯ C **D**◯ D **E**◯ E **F**◯ F **G**◯ G **H**◯ H

▷ mv^2/t
6. **A**◯ A **B**◯ B **C**◯ C **D**◯ D **E**◯ E **F**◯ F **G**◯ G **H**◯ H



12 pt

Consider the pulley system above which is holding the mass M in equilibrium. Assume each pulley is massless.

▷ T_B is _______________________ T_C
7. **A**◯ equal to **B**◯ greater than **C**◯ less than

▷ $T_A + T_B$ is _______________________ T_D
8. **A**◯ equal to **B**◯ greater than **C**◯ less than

▷ T_A is _____________________ T_B.
9. **A**◯ equal to **B**◯ greater than **C**◯ less than

▷ T_D is _______________________ Mg
10. **A**◯ equal to **B**◯ greater than **C**◯ less than

You are correct. Your receipt is 154-1031

9 pt There are 1,609 meters in one mile. How far in miles would a schoolbus go in 3 hours, 10 minutes at 30 km/h?

11. **A**◯ 47 **B**◯ 59 **C**◯ 74 **D**◯ 92 **E**◯ 115 **F**◯ 144 **G**◯ 180 **H**◯ 225

9 pt An object, at the top of a very tall building, is released from rest and falls freely due to gravity. Neglect air resistance and calculate the distance which the object covers between times t$_1$ = 4.15 s and t$_2$ = 6.25 s after it is released.
(in `m`*)*

12. **A**◯ 4.55×10^1 **B**◯ 6.06×10^1 **C**◯ 8.05×10^1 **D**◯ 1.07×10^2 **E**◯ 1.42×10^2 **F**◯ 1.89×10^2 **G**◯ 2.52×10^2 **H**◯ 3.35×10^2

9 pt Two balls are thrown simultaneously with the same speed of 39 m/s. The first ball is thrown at an angle of 33° relative to the horizontal. The second ball is thrown at an angle of 57° relative to the horizontal. Select True or False for the following statements.

▷ The first ball has a lower speed at its maximum height.
13. **A**◯ True **B**◯ False

▷ The second ball has a greater range than the first ball.
14. **A**◯ True **B**◯ False

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

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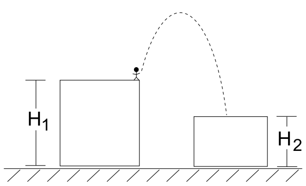
9 pt A boy standing on top of a building throws a small ball from a height of $H_1 = 49.0$ m. (See figure.) The ball leaves with a speed of 26.9 m/s, at an angle of 65.0 degrees from the horizontal, and lands on a building with a height of $H_2 = 11.0$ m. Calculate for how long the ball is in the air. (Neglect air friction, and use g = 9.81 m/s^2.)



(in `s`*)*

16.A◯ 2.55 **B**◯ 3.18 **C**◯ 3.98
D◯ 4.97 **E**◯ 6.22 **F**◯ 7.77
G◯ 9.71 **H**◯ 1.21×10^1

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9 pt A fireman, 24.6 m away from a burning building, directs a stream of water from a ground level fire hose at an angle of 47.0° above the horizontal. If the speed is 43.2 m/s, at what height will the stream of water hit the building?
(in `m`*)*

17.A◯ 1.68×10^1 **B**◯ 1.96×10^1 **C**◯ 2.30×10^1
D◯ 2.69×10^1 **E**◯ 3.14×10^1 **F**◯ 3.68×10^1
G◯ 4.30×10^1 **H**◯ 5.03×10^1

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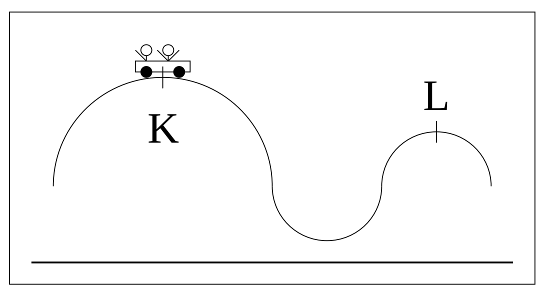
9 pt Identify the statements as being either True or False.

▷ Two blocks are released from the top of a building. One falls straight down while the other slides down a smooth ramp. If all friction is ignored, the block that went straight down will have a smaller speed when it reaches the bottom than the block that went down the ramp will have when it reaches the bottom.
18. **A**◯ True **B**◯ False

▷ A train moves at a constant speed of 60 mph. A cannon is stationed on a flatcar moving with the train. The cannon has a muzzle velocity of 120 mph. If the gunner aims the cannon straight up and fires a cannonball, the kinetic energy of the cannonball at its highest point will be zero.
19. **A**◯ True **B**◯ False

▷ A force of 5.0 N is applied to a 20 kg mass on a horizontal frictionless surface. As the speed of the mass increases at a constant acceleration, the power delivered to it by the force increases.
20. **A**◯ True **B**◯ False

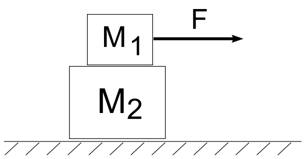
On a roller coaster ride the total mass of the cart - with passengers included - is 280 kg. Peak **K** is at 43.5 m above the ground, peak **L** is at 28.0 m. The speed of the cart at **K** is 17.8 m/s, at **L** it is 12.8 m/s. (The wheel mechanism on roller coaster carts always keeps the carts safely on the rail.)



9 pt How much energy is lost due to friction between the two peaks?
(in `J`*)*

21.A◯ 4.67×10^4 **B**◯ 5.47×10^4 **C**◯ 6.40×10^4
D◯ 7.49×10^4 **E**◯ 8.76×10^4 **F**◯ 1.02×10^5
G◯ 1.20×10^5 **H**◯ 1.40×10^5

| *9 pt* | Two masses M_1=3.00kg and M_2=7.10kg are stacked on top of each other as shown in the figure. The static coefficient of friction between M_1 and M_2 is μ_s=0.370. There is no friction between M_2 and the surface below it. What is the maximum horizontal force that can be applied to M_1 without M_1 sliding relative to M_2?



(in N*)*

22.A ◯ 8.41 **B** ◯ 9.50 **C** ◯ 1.07×10^1
D ◯ 1.21×10^1 **E** ◯ 1.37×10^1 **F** ◯ 1.55×10^1
G ◯ 1.75×10^1 **H** ◯ 1.98×10^1