AP Physics 2

SUMMER ASSIGNMENT – 2018

Welcome to AP Physics 2. Here is your Summer Assignment.

This assignment is different than some other AP Summer Assignments. I do not expect you to do any new topic learning. Instead, this is a review of the topics and skills you successfully developed in AP Physics 1 or Honors Physics. This way, we can start in right away with the new information in AP Physics 2. The questions are from other experienced APP teachers, and from Giancoli's Text.

The time it will take to do the assignment depends on your recall of the Physics principles from last year. Getting back to solving simultaneous equations will be necessary. For those of you who did not take APP1 last year, you might want to start sooner, and block out more time to go back to source material. For former APP1 students, I would make a broad estimate of a few full days, or several half-days.

You may be able to do this without text backup, but probably not. So, go back to reviewing the topics in your notes, on websites, etc. You may wish to go back to basics with Khan, Bozeman Science (AP Physics Essentials, not deep enough, but a good start), Flipping Physics, or other sites. Better yet, write me back, and I can arrange to meet you at GRHS to get you a copy of the text. You may still have access to Giancoli, 7e, through Schoology, for those of you who where in APP1 with me last year. I will try to get things posted in Schoology as soon as it is set up for next year.

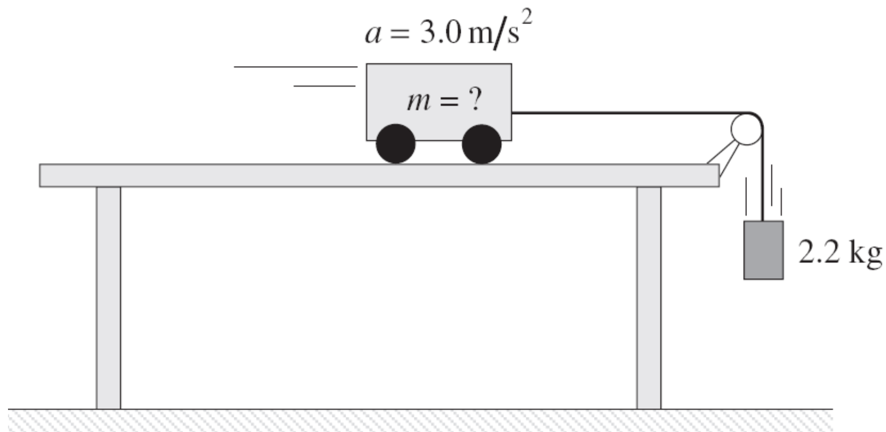
Topics noted in **{BOLD}** are key words and hints to consider.

If there are any challenging questions on the assignment, send me an email, and we can arrange a review by phone, email or an in-person meeting.

I'll collect the assignments on the first day of class for a grade, and we will have a quiz/test on these topics early on. So please make this a priority.

Show all work. Use units with all numbers, draw free body diagrams, using the convention of large dots for the objects, and force arrows leading away from the dot. Remember to convert to kg, m and s as the units. You may want to do a first pass on the problems on other paper, then transfer it to the document here. Electronic preparation of the response is acceptable, but show the work in a graphics application.

All questions refer to the diagram directly above or to the right of the diagram.



1. A cart of unknown mass is attached to a 2.2 kg mass hanging over the edge of a table as shown. The cart accelerates at 3.0 m/s^2. (Ignore friction.) What is the mass of the cart? **{Atwood Machine, Motion in 2-Dimensions, Newton's Laws}**

A. 1.2 kg

B. 5.0 kg

C. 6.6 kg

D. 7.2 kg

E. 8.4 kg

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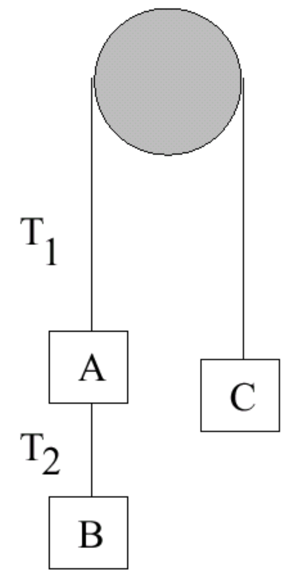
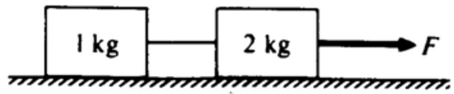
2. Three blocks, **A**, **B** and **C**, each of the same mass, m = 3 kg, are suspended from a frictionless pulley, by a light string, as shown. Find the acceleration of the system and the values of the tensions T_1 and T_2.
{Atwood Machine, Motion in 1 dimension}

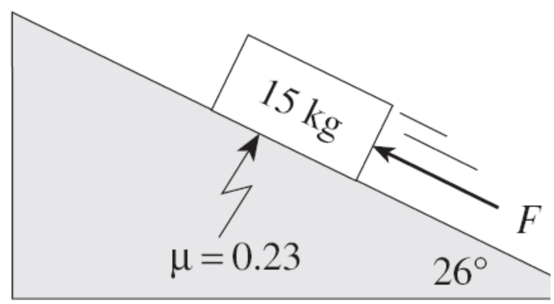


Acceleraton: ________________ T_1: __________ T_2: __________



3. When the frictionless system shown above is accelerated by an applied force of magnitude 100 N, what is the tension in the string between the blocks? **{Newton's 3rd Law}**

4. What force *F* applied parallel to the incline would make the 15 kg block shown below move at a constant speed up the incline? **{Gravity, trigonometry, friction, free body diagrams}**



5. A worker pulls horizontally on a rope that is attached to a 10-kg crate resting on a rough floor. The coefficients of static and kinetic friction are 0.5 and 0.3, respectively. The worker pulls with a force of 40 N. What is the frictional force exerted by the surface on the crate? **{Friction, free body diagrams, coefficients of friction, trick question}**

6. A 300-kg box rests on a platform attached to a forklift, shown above. Starting from rest at time = 0, the box is lowered with a downward acceleration of 1.5 m/s^2.

(a) Determine the upward force exerted by the horizontal platform on the box as it is lowered.

At time t = 0, the forklift also begins to move forward with an acceleration of 2 m/s^2 while lowering the box as described above. The box does not slip or tip over.

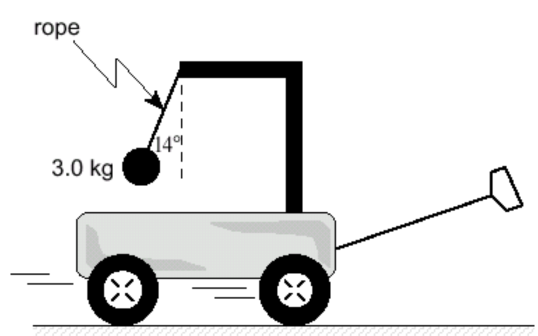
(b) Determine the frictional force on the box.

(c) Given that the box does not slip, determine the minimum possible coefficient of friction between the box and the platform.

{Motion in 2-Dimensions, Forces, Friction}

Answers: a): ___________ b): _____________ c): _____________

7. A 3.0 kg mass hangs at one end of a rope that is attached to a support on a child's wagon as shown in the diagram. The wagon is pulled to the right with a uniform acceleration. (You may ignore air resistance.) As a result, the mass makes a 14° angle with the vertical as shown.



a) Draw and label a free body diagram showing the forces acting on the mass
b) What is the acceleration of the wagon?
c) Make a sketch of the position of the mass whet the cart reaches a constant velocity of 6.5 m/s

{Free body diagrams, simultaneous equations, Newton's laws, trick question}

b): ____________

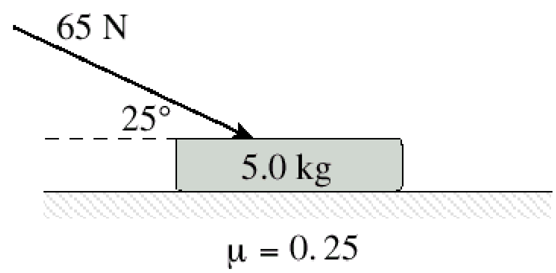
8. A 65 N force is applied to a 5.0 kg object as shown. The coefficient of kinetic friction between the object and the horizontal surface is 0.25.

(a) Draw and label a free body diagram showing the forces acting on the object.

(b) What is the normal force

(c) force of kinetic friction?

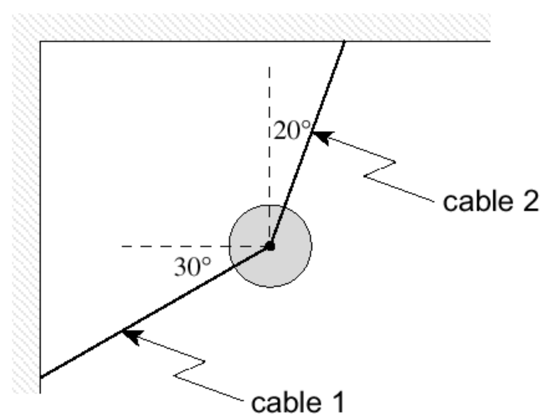
(d) What is the acceleration of the object?



{Friction, forces, trigonometry, coefficients of friction}

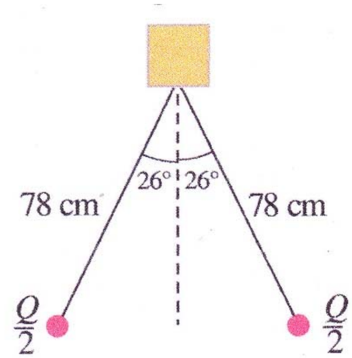
b): ____________ c): ______________ d): _______________

9. Tough one. A wrecking ball is suspended by two cables as shown. If the tension in cable 2 is 12000N, what is the *weight* of the wrecking ball? **{Tension, simultaneous equations, trigonometry, forces.}**



Weight: _____________

10. A large electroscope is made with "leaves" that are 78-cm long wires with tiny 21-g spheres at the ends. When charged, nearly all the charge resides on the spheres. If the wires each make a 26° angle with the vertical. What total charge Q must have been applied to the electroscope?



{Static charge, simultaneous equations, Coulomb's Law, forces}

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11. Take your best shot. Two small nonconducting spheres have a *total charge* of 90.0 μC. When placed 28.0 cm apart, the force each exerts on the other is 12.0 N and is repulsive. What is the charge on each? **{Electrostatic charges, Coulomb's Law. Simultaneous equations, quadratic equations}.**

The math here can get challenging, since the two charges are not necessarily equal. If after trying, you still have trouble with solving for both q_1 and q_2, there is still value in solving for the total charge, i.e., q_1q_2, and there will be much credit given for that partial solution.