ACTIVE ASSESSMENTS

The following are a few examples of active assessment questions. The first 4 pages are simple demonstration questions where the students are asked to make a prediction about the demonstration and then explain their reasoning. Pages 5 and 6 are a first semester high school physics final that involved numerical type assessment questions

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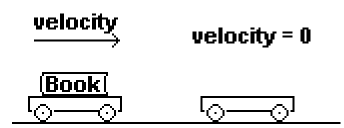
Part I - DEMONSTRATION QUESTIONS - Please answer these two questions on this sheet you may discuss the answers among your lab group BUT you do not all have to put down the same answer.

1. Dr. Willis will demonstrate crash a big lab cart into a small lab cart originally at rest as diagramed below. Which lab cart will experience the greatest force during the collision?



A) the big cart
B) the small cart
C) they will each feel the same force
D) more information is needed to make an accurate statement

EXPLAIN YOUR ANSWER BELOW

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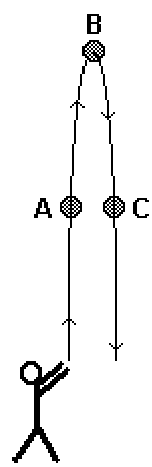
2. Dr. Willis will throw his *Gymnasticks* ball straight up. What is the direction of the balls **velocity** and **acceleration** when A) it is half way up to its highest point. B) when it is at its highest point? C) when is is half way back down?



A) up
B) down
C) there is no direction

EXPLAIN YOUR ANSWER BELOW

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3. Dr. Willis will roll his bowling ball across the floor. While the ball is moving across the floor, what is the direction of the acceleration acting on the bowling ball?

A) up
B) down
C) forward
D) backward
E) there is no acceleration

EXPLAIN YOUR ANSWER BELOW

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4. Dr. Willis will demonstrate two laboratory carts of different mass. The massive cart is rolled across the table and hits the other cart. During the collision, which cart will experience the greatest force

A) the massive cart
B) the light cart
C) they will each feel the same force
D) more information is needed to make an accurate statement

EXPLAIN YOUR ANSWER BELOW

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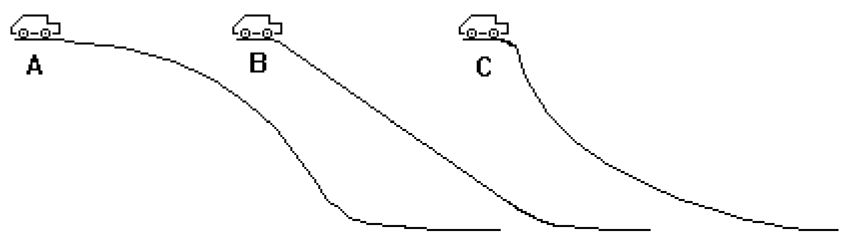
5. Given the three ramps below. If a frictionless Hot-Wheels car were released from the top of each ramp, in which case would it be going the fastest when it reached the bottom?



______ A) RAMP A
______ B) RAMP B
______ C) RAMP C
______ D) The speed would be the same at the bottom of all ramps
______ E) More information would be required to answer

EXPLAIN WHY YOU THINK YOUR ANSWER IS CORRECT.

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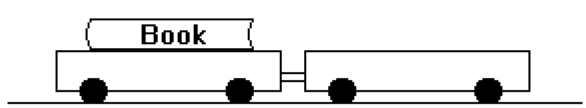
6. Dr. Willis will demonstrate two laboratory carts which will collide and then push apart from one another. During the push apart, which cart has the greatest change in momentum?



______ A) the heavy cart
______ B) the light cart
______ C) both carts have the same change in momentum
______ D) more information is needed to accurately predict

EXPLAIN WHY YOU THINK YOUR ANSWER IS CORRECT?

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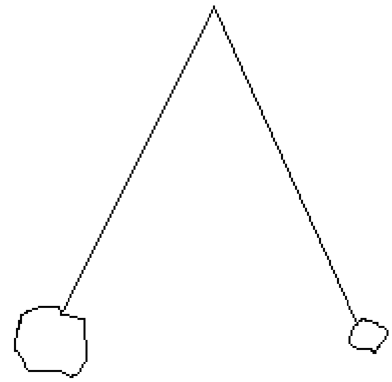
7. Dr. Willis will demonstrate two pendulum's connected to the same point. When each pendulum bob is drawn back the same distance and released, they will collide at the bottom. Which pendulum bob will experience the greatest force during the collision at the bottom?



A) the large bob
B) the small bob
C) they will each feel the same force
D) more information is needed to make an accurate statement

EXPLAIN YOUR ANSWER BELOW

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8. Dr. Willis will throw a ball up into the air, let it come to a stop, and then fall back down. When the ball stops at its highest point just before starting to come back down, what is the direction of the acceleration acting on the ball?

A) up
B) down
C) forward
D) backward
E) there is no direction because there is no acceleration

EXPLAIN YOUR ANSWER BELOW

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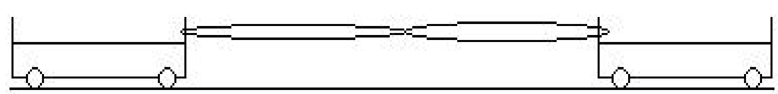
9. When the two carts are pulled together by the rubber band, which will have the greatest kinetic energy?



_______A) the heavy cart because it has the greatest mass
_______B) the light cart because it goes the fastest
_______C) both carts will have the same energy because they have the same momentum
_______D) more information is needed to make an accurate prediction

EXPLAIN WHY YOU THINK YOUR ANSWER IS CORRECT

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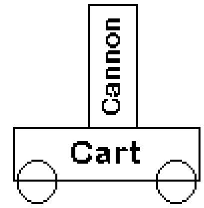
10. Dr. Willis will demonstrate a cannon mounted vertically on a free rolling laboratory cart. Dr. Willis will give the cart a push, and as it rolls across the table he will fire the cannon. Where will the cannon ball land?



A) Behind the cart and cannon
B) On top of the cart and cannon
C) In front of the cart and cannon
D) There is insufficient information to accurately predict where the cannon ball will land

EXPLAIN YOUR ANSWER BELOW

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1. Mr. Willis is wearing a flashy "flashing" tie. It operates on an electric battery of course. Are the light bulbs in Mr. Willis's tie most likely connected in a series or a parallel electrical circuit?

_____ A. Series
_____ B. Parallel
_____ C. More information would be required

EXPLAIN YOUR REASONING BELOW

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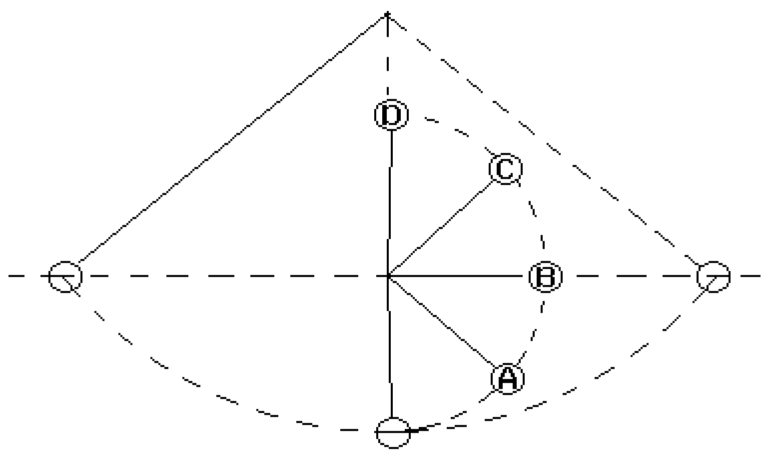
2. If the pendulum is pulled back to its original starting position and released, how far will the pendulum swing after it strikes the rod?

______ A) point A
______ B) point B
______ C) point C
______ D) point D

EXPLAIN YOUR REASONING



PHYSICS SEMESTER PHYNAL

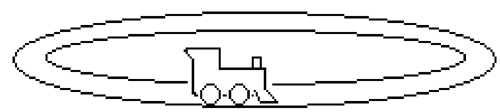
First Semester - January 19XX

Welcome to the wonderful world of the Physics Olympics. Your semester test in physics will be six laboratory problems. Your text and any other reference material in the lab will be acceptable to use. However, you may not discuss any of the problems with other students before or during the test. This is a "Blow-It-By-Yourself" test.

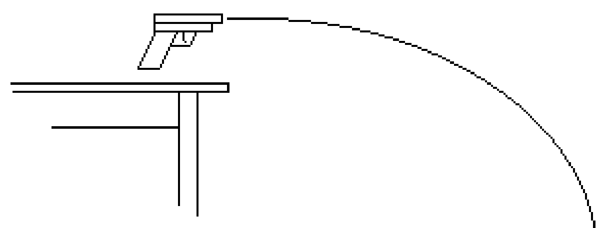
Only one student is allowed at each station at a time. To make sure each student has a chance, students will be allowed only 3 minutes at a time at a station. This should be enough time if you know what you are doing, so be prepared BEFORE you go to a station. To keep things orderly, sign up on the board before-hand so everyone will know who is up next and we can all avoid arguments. You may go to a station more than once, but not in succession, AND students who have not been at a station have priority.

To receive full credit you must neatly record your data for each experiment. You will need to show you work in an organized manner so that it is obvious how you were attempting to solve the problem. Since there are two sets of apparatus for each problem you should note on your paper if you worked at station A or B. To help with the grading, please box you answers.

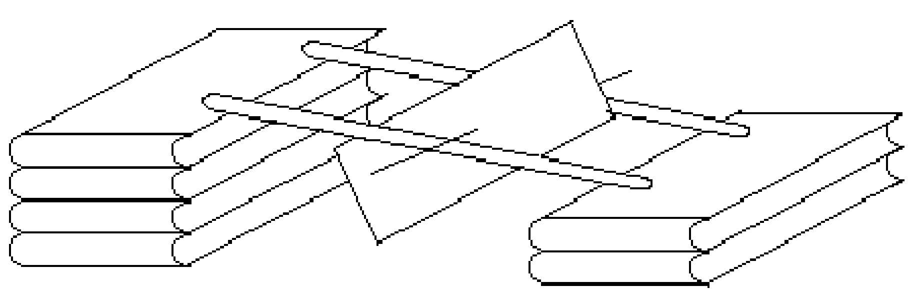
☐ I. Calculate the centripetal force acting on Mr. Willis's Choo-choo.



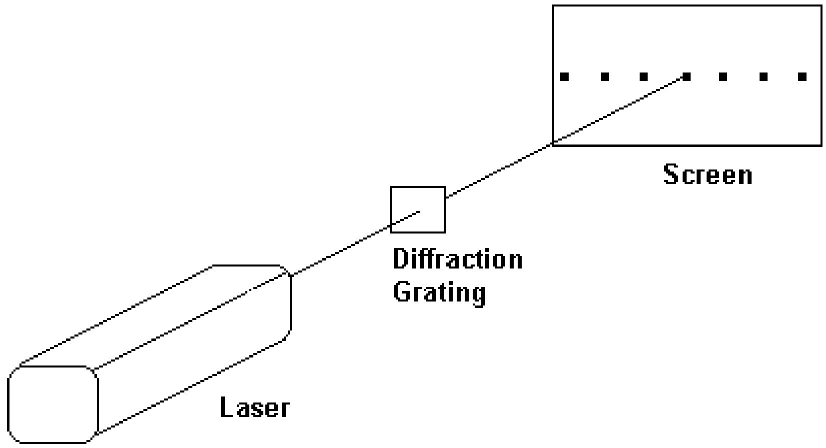
☐ II. Fire the cannon and calculate how fast the projectile was moving horizontally, by measuring the position of the cannon and where the projectile landed.



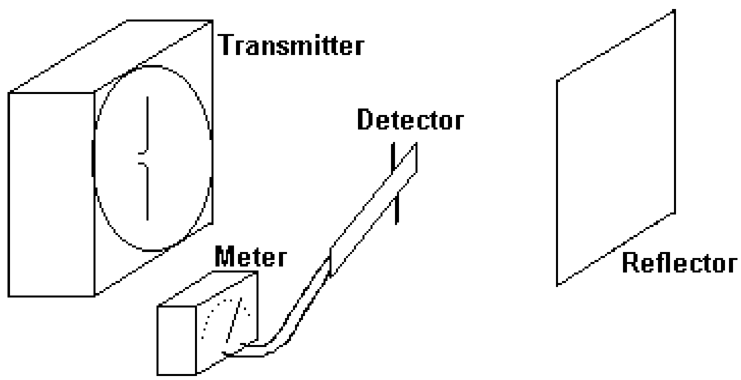
☐ III. Galileo rolled a ball down an incline to “dilute” the motion so that he could show that falling objects accelerate. Measure the acceleration of Mr. Willis's super-duper diluting apparatus.



☐ IV. In 1801, Thomas Young proved that light had wave properties by doing his now famous two slit experiment. Repeat his experiment, using a laser with a wavelength of 6.33×10^{-7} meters, to measure the distance between the slits on the diffraction grating. A diffraction grating is very similar to the double slits used in Young's experiment except, instead of having only two slits, it has thousands.



☐ V. Measure the wavelength produced by Mr. Willis's microwave apparatus by reflecting it off a metal plate as shown. Calculate the velocity of the microwaves. You may use the frequency of the microwaves that is written on the top of the transmitter for any calculations.



☐ VI. There are four weights hanging from the force table. Calculate the mass of the unknown weight. You may not use a balance for this one, try vectors. (P.S. - the diagram is not to scale. You will have to make all your own measurements.)