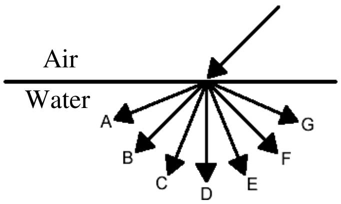
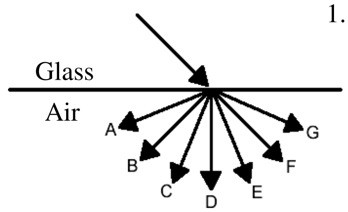
B-day: Due Wed., April 21
A-day: Due Thurs., April 22

2009-10 Light 4





1. Use the diagrams at the left for the following:
   A. Does light travel faster in air or water?
   B. Does light travel faster in glass or air?
   C. For both diagrams write "fast" and "slow" in the correct material.
   D. For each diagram write "normal" and "SP" for straight path next to the correct letter.
   E. Decide for each diagram the correct path that light will take.

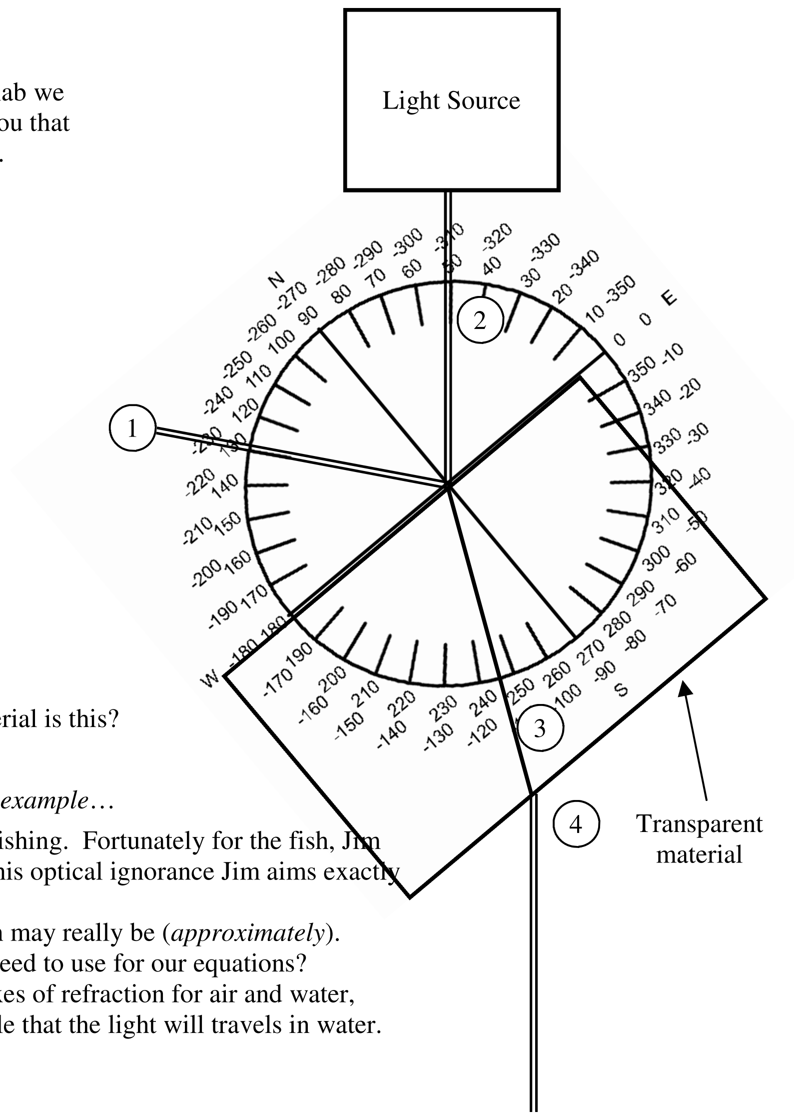
2. When light passes from a fast to a slow medium (material) does light bend toward or away from the normal?

3. A. How many seconds are there in a minute? B. How many seconds are there in an hour?

   C. What is the speed of light? D. So, how far can light travel in an hour?

From the "Refraction" notes:

4. Calculate the speed of light in ice (*follow the example*).

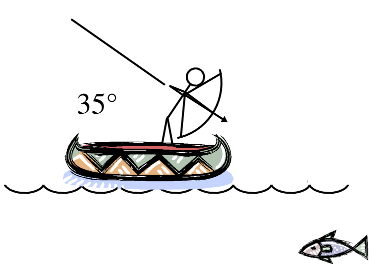


5. The diagram at the right is from the index of refraction lab we did in class. I have provided a protractor for those of you that do not have one. The different light rays are numbered.
   A. Which light ray is the incident ray?
   B. What is the angle of incidence?
   C. Which ray is the reflected ray?
   D. What is the angle of reflection?
   E. How do these angles compare?

      (*This is ALWAYS the case. This is known as the "Law of Reflection".)*
   F. Which ray is the ray that refracts inside the block?
   G. For Snell's Law, what is θ_1?
   H. What is θ_2?
   I. What is n_1?
   J. Calculate the index of refraction for this material.

   K. Using the table of indexes of refractions, what material is this?

Now let's try a different example…



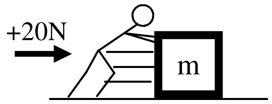
6. Slim Jim decides to go fishing. Fortunately for the fish, Jim forgets his physics. In his optical ignorance Jim aims exactly where he SEES the fish.
   A. Draw where the fish may really be (*approximately*).
   B. What angle do we need to use for our equations?
   C. You know the indexes of refraction for air and water, so calculate the angle that the light will travels in water.

2 pages of TAKS

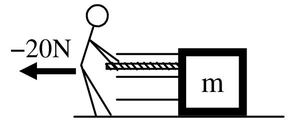
Day 27—Forces and Simple Machines

Newton's Three Laws:

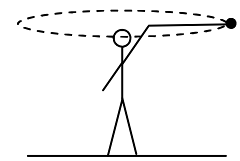
Law 1: Law of Inertia: *Objects keep going in a straight line at constant speed unless acted on by an unbalanced force.*



A force in the direction of motion causes the object to speed up.

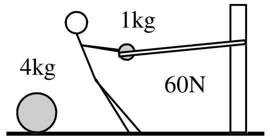


A force opposite the direction of motion (opposing force) slows the object.



A force to the side causes an object to change direction.

Law 2: F = ma. Forces cause acceleration; mass resists acceleration.



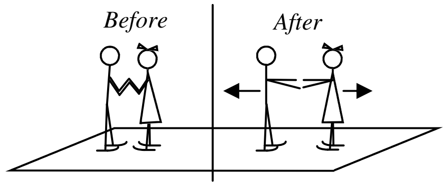
Given the same force the smaller mass will have more acceleration.

Force (in N) → **F = ma** ← Acceleration (in m/sec^2)

Mass (in kg)

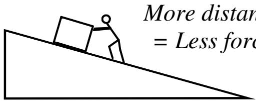
Force equals mass times acceleration.

Law 3: Equal and Opposite Forces. For every action there is an equal and opposite reaction.

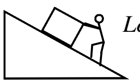


Even though you may think that Slim Jim pushes harder than Slim Kim, actually the force is equal on both. Kim moves faster because she has less mass. (*See above*.)

All simple machines reduce force by increasing distance.



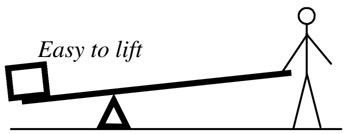
More distance = Less force



Less distance = More force

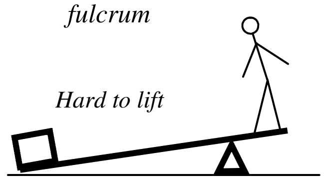
Incline planes (or ramps) work by spreading gravity over a greater distance.

Easy to lift

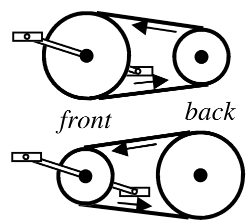


fulcrum

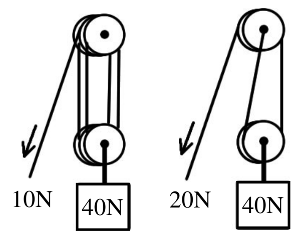
Hard to lift



Levers multiply force when the fulcrum is closer to the object.



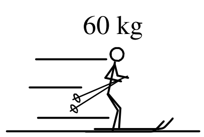
Gears are levers on wheels. Think of the axle like the fulcrum. The bigger front wheel is far from the fulcrum and uses less force, but moves slower.



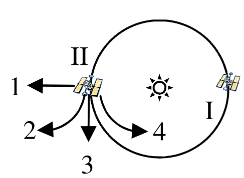
Pulleys multiply force thru support ropes. More ropes = less force to lift the object. Think of each rope like an arm lifting up. More ropes = more help.

1. If you did not wear a seatbelt what would happen to your body if you car were to stop suddenly?

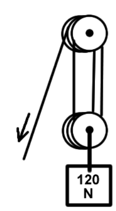
2. A. Which way does Slim Jim have to push to move forward?
   B. If Jim pushes on the poles with 120 N of force, with how much force do the poles push back?
   C. If Jim is 60 kg, what is his acceleration?
   D. If Jim had more mass, would he accelerate more or less?
   E. If Jim stops pushing, what will happen and why?

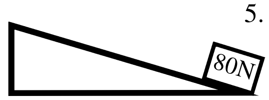


3. A satellite moves around a star.
   A. At position I draw the direction of its velocity (v) and force (F).
   B. Which path would it take if the start disappeared at II?



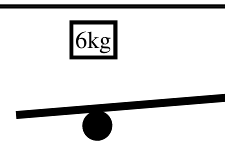
4. A. Name the simple machine.
   B. How much force is necessary to lift the object?
   C. To make it easier to lift, how should it be modified?

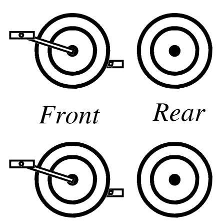




5. A. Name the simple machine.
   B. How would you make it easier to move the object up?

6. A. Name the simple machine.
   B. Which side would you put the object on to make it easy to lift?





7. A. Use lines to connect the gears to make it easy to go up a hill.
   B. Connect the bottom set of gears to make the rear gear move faster than the front gear.

Diagram 1:
Original Wave

Diagram 2:
Composite Wave

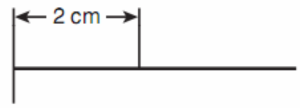
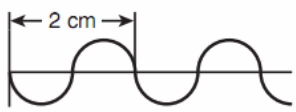
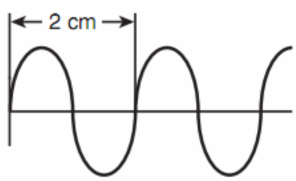
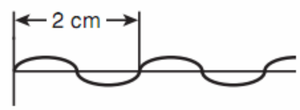
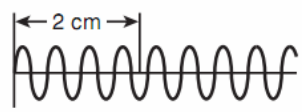


Diagram 1 represents a wave. Diagram 2 represents the composite wave formed when a second wave interferes with the original wave. Which of the following best represents the second wave?

A 

B 

C 

D 

A motor produces less mechanical energy than the energy it uses because the motor —

F gains some energy through motion

G stores some energy as electrons

H converts some energy into heat and sound

J uses some energy to increase in mass

Cell membranes perform all the following functions except —

A making nutrients for cells

B holding cytoplasm within cells

C regulating substances exiting cells

D recognizing other cells

Which of the following properties causes attraction between molecules of liquid water?

A Acidity

B Polarity

C Density

D Viscosity

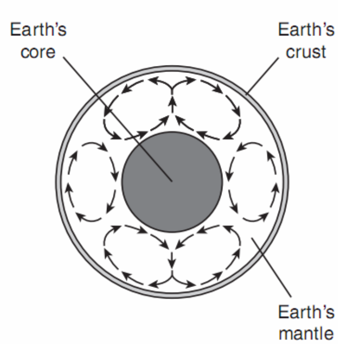
Which of the following is a characteristic of most bacterial infections but not of a viral infection?

F It can cause multiple symptoms.

G It can affect different people differently.

H It can be spread by inhalation.

J It can be treated with an antibiotic.



Molten rock rises in Earth's mantle and then sinks back toward the core in a circular pattern, as shown in the diagram. This method of heat transfer is known as —

F conduction

G vibration

H radiation

J convection