

2009-10 Light and Optics 2

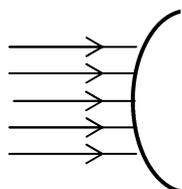
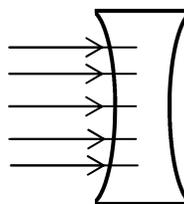
Yellow light



1. Yellow light is incident on a patch of magenta paint. Use the diagram at the right to decide what color the path looks like.

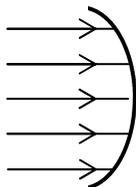
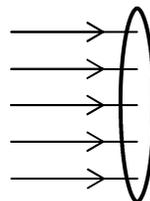
2. Why does each different element give off different colors of light?
3. Energy is put into a gas. Will the gas absorb or emit light at this point?
4. True or false: when electrons move up to higher energy levels, light is given off as photons.
5. We looked at the gas discharge tubes in the back of the room.
 - A. How did the spectral lines compare with each other?
 - B. Were we looking at spectral emission or absorption lines?
 - C. Were electrons moving up to or falling back from higher orbitals?

6. Use the lens at the right to answer the following.
 - A. Is it concave or convex?
 - B. Draw what will happen to the parallel light rays.
 - C. Is it convergent or divergent?
 - D. Does it have a real or virtual focal point?
 - E. Which side is real?



7. Use the mirror at the left to answer the following.
 - A. Is it concave or convex?
 - B. Draw what will happen to the parallel light rays.
 - C. Is it convergent or divergent?
 - D. Does it have a real or virtual focal point?
 - E. Which side is real?

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10. A. Does light reflect from or go thru a mirror? B. Does light reflect from or go thru a lens?
11. The light rays shine from a light on the left side of a mirror or lens.
 - A. The light rays will end up on which side of a mirror: left or right?
 - B. The light rays will end up on which side of a lens: left or right?
 - C. So, which side of a mirror is real?
 - D. Which side of a lens is real?
12. Concave mirror (CCM), convex mirror (CVM), concave lens (CCL), or convex lens (CVL)?

A. ___ Is divergent and reflects.	E. ___ Has a real focal point and reflects.
B. ___ The middle is thicker than the ends and refracts.	F. ___ Is divergent and the right side is real.
C. ___ Has a virtual focal point and the left side is real.	G. ___ Bends toward the light source and reflects.
D. ___ Is convergent and the right side is real.	

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Here's why we care about the real and virtual sides and focal points: we are going to use equations that have focal length (f) and the distance to the object (q). f is + if the focal point is real. f is - if the focal point is virtual. Also, if the image is virtual, then q is - and will be found on the virtual side of the device. If you don't put in the + or - when appropriate, you will calculate incorrectly. As for the object (p) (what we are looking at), it will ALWAYS be real and positive.

13. + or -?

- | | |
|---|---|
| A. ___ If the device is convergent. | E. ___ q if the image is on the right side of a mirror. |
| B. ___ q for an image on the left side of a mirror. | F. ___ q if on the right side of a lens. |
| C. ___ f for a concave mirror. | G. ___ p for a convergent mirror. |
| D. ___ f for a concave lens. | H. ___ f for a convex mirror. |

14. What stays the same as a wave passes from one material to another?

15. A 350nm light wave is traveling thru air.
 A. What is its speed?
 B. What is its frequency?

The light wave then passes into glass. Light travels in glass at a speed of 1.97×10^8 m/s.

- C. Calculate the wavelength of the light in water.

You may need your "Refraction Notes".

16. Why does light bend as it travels from one material to another?

17. What is the index of refraction for air? For water?

18. Calculate the speed of light in water.

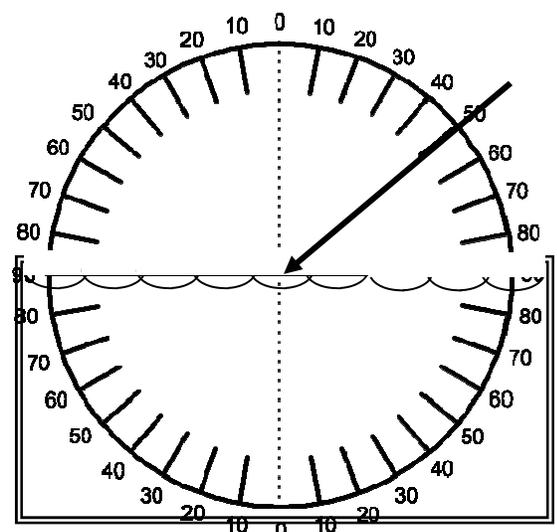
19. A new substance is found with an index of refraction of 2.22.
 A. Will light travel faster or slower in the new substance when compared to in air?
 B. What other substance will cause light to go even slower?
 C. What is speed of light in the new substance?

D. If the incident light has a wavelength of 20 nm in air, what is its wavelength in the new substance?

20. Light is traveling at 35° in air. It passes into glass.
 A. This angle is measured from where?
 B. What will be its angle in the glass?

21. Air passes from air into glass as shown at the right.
 A. Calculate its angle in the water.

- B. Draw its path in the water.
 C. Did the light bend toward or away from the normal?

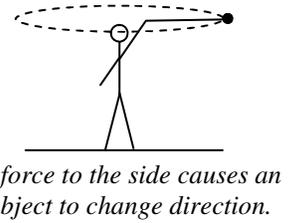
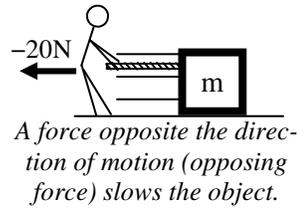
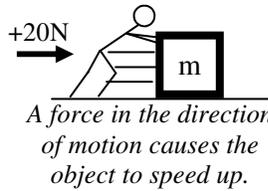


AND DO TAKS—2 easy pages.

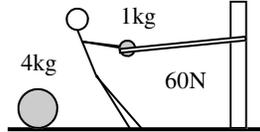
Day 27—Forces and Simple Machines

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.*



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

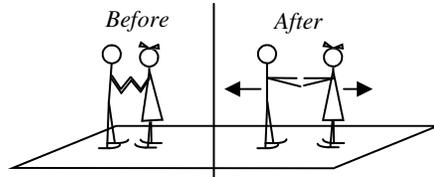


Given the same force the smaller mass will have more acceleration.

Force (in N) \rightarrow **$F = ma$** \leftarrow Acceleration (in m/sec^2)
↑ Mass (in kg)

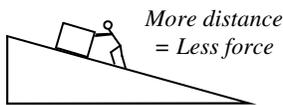
Force equals mass times acceleration.

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

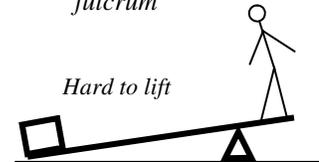
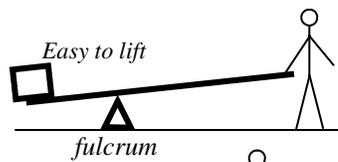


Even though you may think that Slim Jim pushes harder than Slim Kim, actually the force is equal on both. Kim moves faster because she has less mass. (See above.)

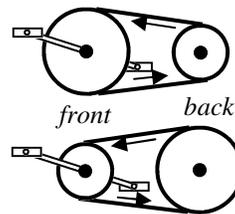
All simple machines reduce force by increasing distance.



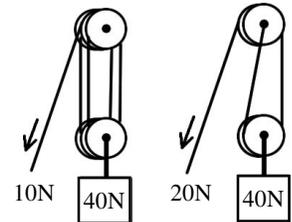
Incline planes (or ramps) work by spreading gravity over a greater distance.



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 your 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 star 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

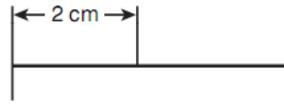
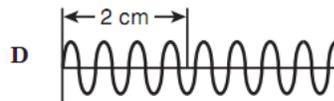
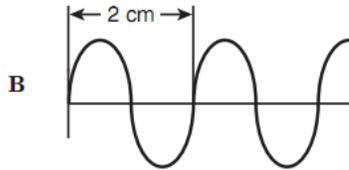
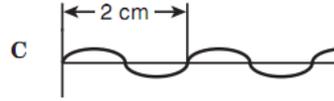
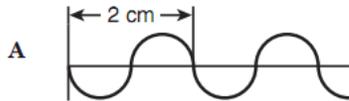


Diagram 1 represents a wave. Diagram 2 represents the composite wave formed when a second wave interferes with the original wave. Which of the following best represents the second wave?



A 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 —

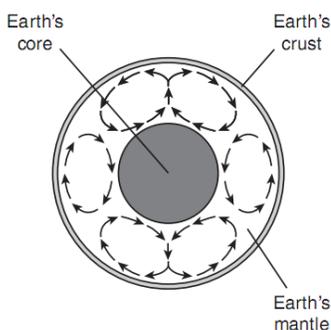
- A making nutrients for cells
- B holding cytoplasm within cells
- C regulating substances exiting cells
- D recognizing other cells

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