

Elementary | junior high

A01-010S-Y01 Experiment Kit



Purpose

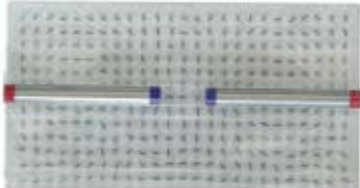
1. Cold and hot definition?
2. Is your hand warmer than mine?
3. Is it warmer under the sun?
4. Heat insulation?
5. Heat transfer?
6. Are objects expanded when heated
7. What substance can be attracted by magnet?
8. What is the difference between both of poles of magnet?
9. Magnetic line formed by a rod magnet
10. Magnetic line formed by a U-type magnet
11. Bar magnets attraction in series connection
12. Bar magnets repulsion in series connection
13. Bar magnets attraction in parallel connection
14. Bar magnets repulsion in parallel connection
15. Magnetic line of one pole
16. Magnetic line of a U-shaped magnet placed vertically
17. How does magnetic force work?
18. How to increase the magnetic field strength of a magnet?
19. Moon movements
20. Why do we only see one side of the moon all the time?
21. What causes a lunar eclipse?
22. Moon phases
23. Does air contain water vapor?
24. Cloud formation
25. Fog formation
26. Rain formation
27. Why would a balloon expand as it is carried up a mountain?
28. Why does a balloon get smaller when increasing the pressure in a sealed container?
29. Why it is difficult to cook in mountains?
30. Does a ray of light refract in water?
31. Does a ray of light refract through thick acrylic tiles?
32. Refraction through a prism
33. What is an open circuit?
34. When to turn off the lights?
35. Is a short circuit dangerous?
36. What is the importance of the fuse?
37. Why are home appliances connected in parallel?
38. Bulbs in series
39. Batteries in series
40. Batteries in parallel
41. Reflection of lights in a plane mirror
42. Reflection and focus determination of a convex mirror
43. Reflection and focus determination of a concave mirror
44. Refraction and focus determination of a convex lens
45. Refraction and focus determination of a concave lens
46. Eye imaging principle
47. Causes and correction of myopia
48. Causes and correction of hyperopia
49. How does a camera work?
50. Lens imaging principle
51. Do concave mirrors form a image?
52. Can levers save energy?
53. What is a fixed pulley?
54. What is a movable pulley?
55. How do pulleys save energy?
56. What causes day and night?
57. Why is the length of days different in different seasons?
58. Why do seasons change?
59. Do different latitudes have different day lengths?
60. Is electrical energy convertible to kinetic energy?
61. Is kinetic energy convertible to electrical energy?
62. Why is there an eclipse of the sun?
63. What causes a total eclipse of the sun?
64. What causes a partial eclipse of the sun?
65. What causes an annular eclipse of the sun?
66. What colors should you wear in the winter?
67. Can white light be formed by mixing RGB lights?
68. Effects of different colored lights on objects
69. Is shadow always black?
70. Why do colors become darker after color mixing?
71. Do colored lights become brighter after color mixing?
71. Do colored lights get brighter after blending?
72. Does the white light form a rainbow when passing through a prism?
73. Does a colored light form a rainbow when it passes through a prism?
74. Propagation of sound in water
75. Propagation of sound in air
76. Propagation of sound in vacuum
77. Do boys and girls have different heart rate
78. Do grownups and child have different heart rate
79. Does heart rate change after exercising?



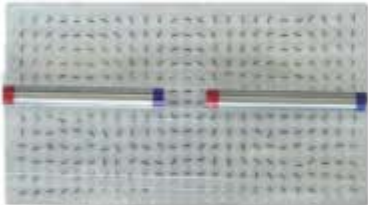
• The strength of a magnet



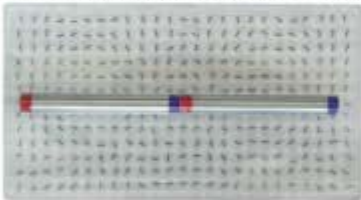
(Using a magnet)
A magnet bar attracts two iron bars



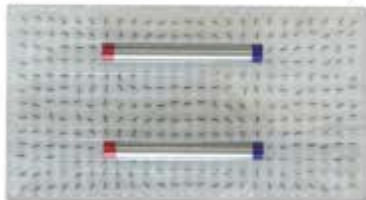
(Same pole repulsion)



(Different pole attraction)



(Combined attraction)



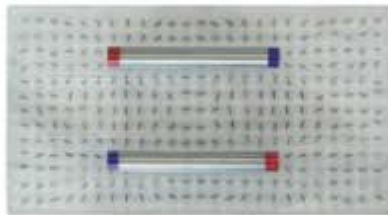
(Parallel repulsion)



(Parallel attraction)
Magnetic force of the combination of different poles is less than one magnet.



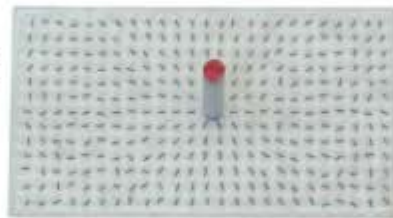
(Parallel repulsion)
Magnetic force of the combination of same pole is greater than one magnet.



(Parallel attraction)



(Magnetic line of a U-shaped magnet - horizontal)



(Magnetic line of single-pole)

Observe the magnetic field lines of the plane magnetic field. In addition to the mentioned experiments, we can also put the magnets in different places to observe the magnetic lines.



(Magnetic line of a U-shaped magnet - vertical)

Observe the magnetic field lines of the plane magnetic field. In addition to the mentioned experiments, we can also put the magnets in different places to observe the magnetic lines.

• Leverage experiment



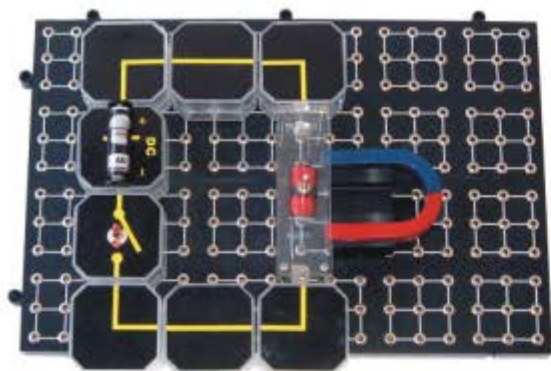
• Axle experiment



• Pulley experiment

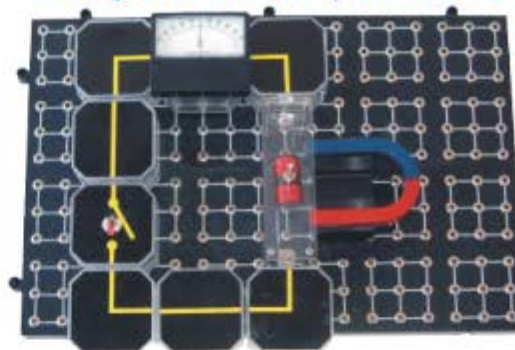


• DC motor experiment



A solenoid coil generates magnetic field, so that the iron rod becomes an electromagnet. The electromagnet rotates when powered by the magnetic force. We change the current direction, and the electromagnet still rotates in the magnetic field.

• DC generator experiments



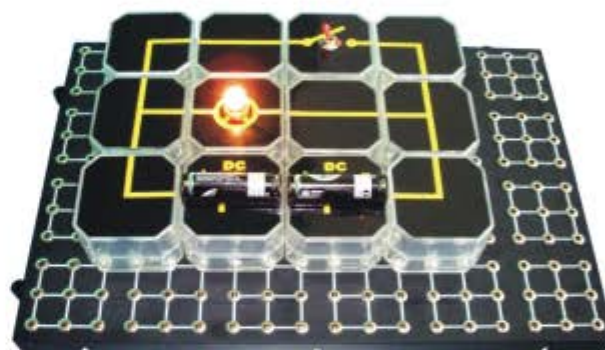
When the coils rotates quickly, the pointer will deflects slightly, which means the current is generated. The faster the coils twirls, the greater the current.

• Basic circuit principle experiment



Experiment A : Open circuit and broken circuit

When the circuit forms a complete circuit, the battery sends the current to the circuit. So, when turning the switch on, the bulbs works because the current flows through the circuit.



Experiment B : Short circuit

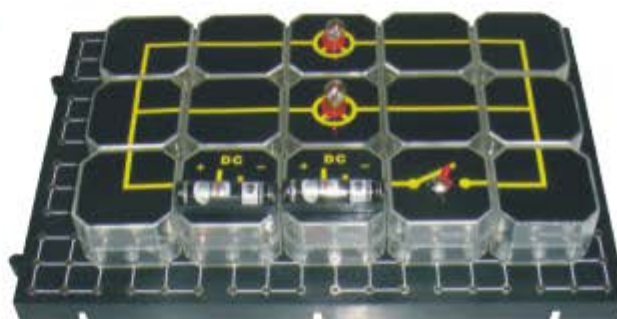
When there are two or more paths in the circuit, if the resistance value of one of two paths is close to zero, the current will pass through the path of least resistance. If the switch is on, the current passes through the path with no bulbs, the bulb doesn't work because there is no flow of current through the bulb; if the switch is off, the path of the bulb will be the only path, so the bulb works.

• Bulbs in series and parallel connection experiment



(Bulbs in series connection experiment)

Two light bulbs and batteries connected in series and observe brightness of the lamp.

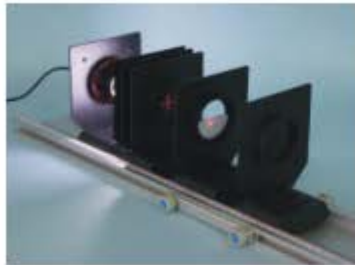


(Bulbs in parallel connection experiment)

Two light bulbs and batteries connected in parallel and observe brightness of the lamp.



(Myopia and hyperopia correcting lens set)



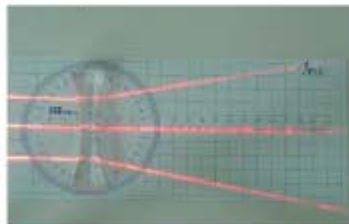
(Concave mirror imaging experiment)

A real image is formed when the actual light rays reflect off the surface and converge to one point.



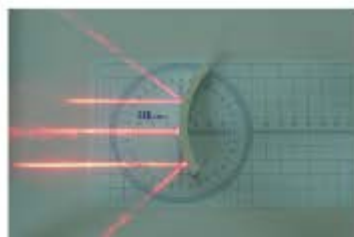
(Convex lens imaging experiment)

A real image is formed when the actual light rays refract off the surface and converge to one point.



(Determination of a convex lens focus)

When the parallel light passes through a convex lens, the refracted light intersects the focus.

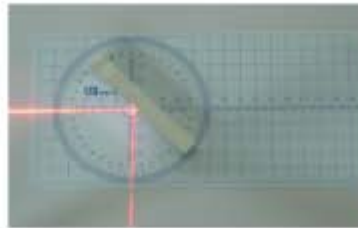


(Reflection of concave mirror)

When the parallel light passes through a concave mirror, the reflected light intersects the focus.



(Basic optical lens set)



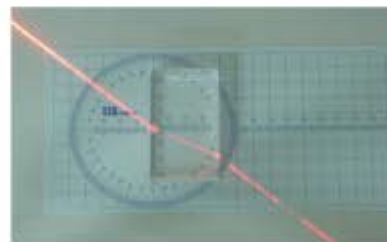
(Plane mirror reflection)

Verify the law of reflection: the angle of incidence equals the angle of reflection. Verify the principle of optical lever: when the plane rotates θ degree, the rotation of the reflected light is 2θ .



(Right-angle prism refraction)

After the parallel light passes through a prism, the light is still parallel.



(Refraction of light in a plane parallel plate)

Light changes speed as it moves from one medium to another,

$$n = \frac{\sin i}{\sin r}$$

i : λ angle r : refraction angle

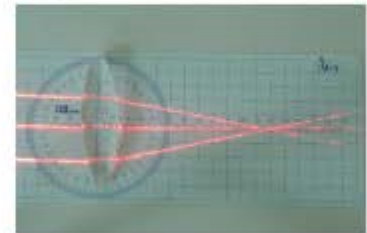


(Refractive index set)



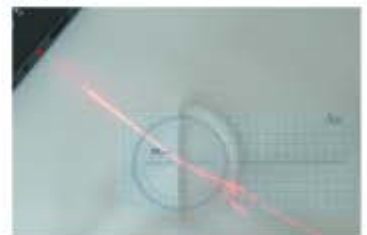
(Reflection of concave mirror)

When the parallel light passes through a concave mirror, the reflected light intersects the focus.



(Determination of a convex lens focus)

When the parallel light passes through a convex lens, the refracted light intersects the focus.

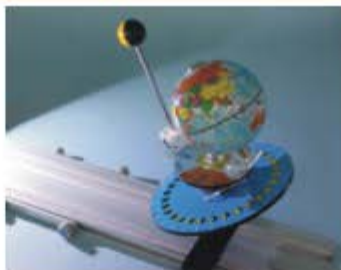


(Light refraction in a sink)

When light passes from air into water (from a less dense to a more dense substance), the light is refracted (or bent) towards the normal.



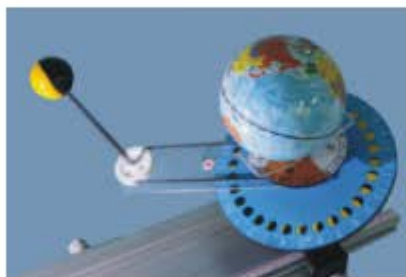
The seasons result from the Earth's axis being tilted to its orbital plane; it deviates by an angle of approximately 23.5 degrees, so seasons change. Locations on similar latitudes have similar day lengths where as different latitudes have different day lengths.



Moon phases are caused by changes in the moon's position relative to the sun and Earth as it revolves around Earth.



A solar eclipse occurs when the moon gets between Earth and the sun.



The moon makes one rotation monthly. That happens to also be the time it takes for the moon to complete one revolution around the Earth. Therefore, we only see that same side.



Full moon is a lunar phase that occurs when the moon is on the opposite side of the Earth from the sun.



Thermal insulating foam



White objects reflect all visible light, where black objects absorb all visible light. So it's better to wear black clothing to stay warm in winter.



Put a balloon in a sealed container



Decrease the pressure in the sealed container, so the temperature drops, and the balloon gets bigger.

• Cloud Formation

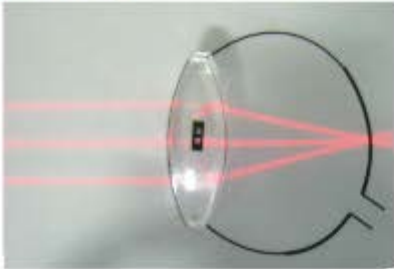


Increase the pressure in the sealed container till the lid bounces off, at the meanwhile, clouds can be formed when humid air meets cooled air.

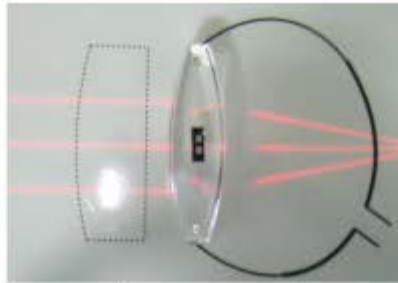
• Boiling point experiment



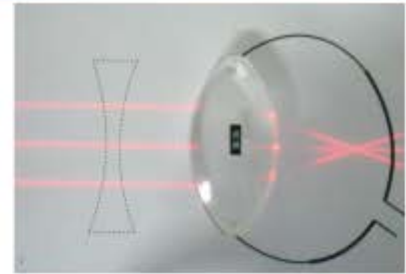
Pour approximately 80°C of the water in the bottle, and decrease the pressure. The temperature remains the same but the water begins to boil.



(Human eye imaging theory)
Light is focused on the retina



(Hyperopia)
Hyperopia occurs when light rays focus behind the retina because the eye is too short.



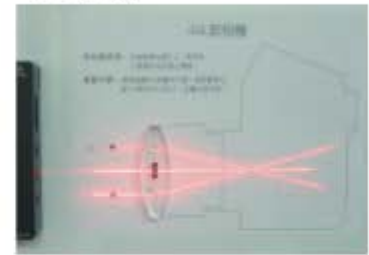
(Myopia)
Myopia occurs when light rays focus in front of the retina because the eye is too long



(Hyperopia correction)
Use convex lenses to gather light source on the retina.

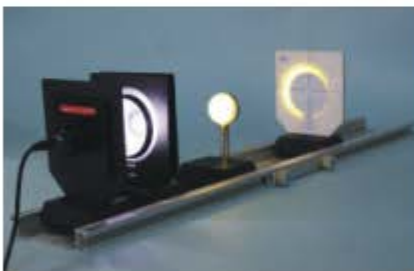


(Myopia: Cause and correction)
Use concave lenses to focus light source on the retina.



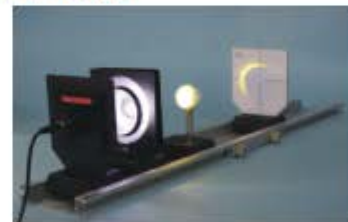
(Camera theory)
The light from the subject is refracted by the convex lens, and focused on the film or digital receptor inside the camera.

• What causes an annular eclipse of the sun?



An annular solar eclipse happens when the moon is slightly too far from the earth for its disk to block out the entire disk of the sun.

• What causes a partial eclipse of the sun?



An eclipse occurs at those times when the moon moves into a position of direct alignment with the sun and the Earth.



White light can be formed by mixing red, green, and blue lights.



If you block all three lights, you get a black shadow.



White light is passed through the prism, it gets broken into seven colors of rainbow.

• Specification

1. Bottle 250CC x2
2. Rubber Stopper x2
3. Bottle Holder: two acrylic plates thickness 6mm
4. Electronic thermometer x2
LED display, Accuracy: 0.1 °C,
5. Copper and Aluminum Testing Bar x 2,
 ϕ 6mm, length :200mm
6. Black and White Cover x2
7. Foam Insulation Cylinder Set x1
8. Ring Expansion Set x1: ball with a handle x1,
ring with a handle x1
9. Balloon : with rubber stopper x1
10. Dual-use Pump, acrylic ϕ 35mm X length 360mm
Scale-printed Intake valve and exhaust valve on
both sides; valve prevents countercurrent gas.
11. Measured-pressure Rubber Stopper x1
12. Silicone Tube x1
13. Buzzer Set: with two plastic zipper bags x1
14. Sound Set: with headphones and a voice
amplifier x1
15. Bar Magnet ϕ 10mm, length 75mm, x2
16. U-shaped Magnet x1
17. U-shaped magnet : with copper, iron, aluminum,
plastic, wooden sticks each 50mm.
18. Small Compass x1
19. Iron Bar x3 ϕ 10mm length 100mm
20. Magnetic Field Device Set: containing 325
needles
Size: 100mm X 200mm For concatenation and.
21. Bar Magnet Holder x1
22. Breadboard: a total of 216 holes, representing
24 contacts
size 350mmX240mmX20mm , can be used for
series and parallel connections x1
23. I-shaped Connector x4
24. L-shaped Connector x4
25. T-shaped Connector x4
26. Battery Connector x2
27. Circuit Switch Connector x2
28. Bulb Holder Connector x3
29. External Voltage Connector x1
30. External Current Connector x1
31. Motor Coil and Brush Set x1
32. Fan x1
33. Galvanometer x1
34. Small Bulb DV 3.8V/0.3A x3
35. AA Battery x2
36. Fuse Connector x1
37. Aluminum Track x2
2 tracks can be connected
Size:100mmX350mmX20mm
38. Plastic Slide Implement x 5
Size:70X55X20mm.
39. Adjustable Metal Slide Implement x 3
40. Convex Lens with a Handle---- F: +50
mm---- F: +100 mm
41. LED Lamp with a Handle - power : DV
3V/3W
42. White Screen with Scale+ -50mm
43. Cross Screen with a Handle - Black
44. Half-screen with a Handle x1
45. Concave Mirror with a Handle - F +100
mm
46. Round Hole Grating with a Handle x1
47. Red Filter x1
48. Blue Filter x1
49. Green Filter x1
50. Yellow Filter x1
51. Prism 25 X25X50mm x1
52. Prism Holder x1
53. Parallel Laser Light: three parallel laser
beams with individual switch Power:
DV 3V.
54. Semi-circular Sink a ϕ 20mmX24mm :
sand-grinding bottom x1
55. Cylindrical Parallel Prism ϕ 70mmX40
mmX18mm : sand-grinding bottom x1
56. Cylindrical Right Prism x1
 ϕ 60mmX60mmX18mm
57. Cylindrical Plane Mirror x1
58. Cylindrical Concave and Convex
Mirror x1
59. Cylindrical Convex Lens x1
60. Cylindrical concave lensX1
61. Normal Eye Lens
62. Myopia Lens
63. Myopic Correction Lens
64. Hyperopia Lens
65. Hyperopia Correction Lens
66. Normal Eye Teaching Board x1
67. Myopia Teaching Board x1
68. Hyperopia Teaching Board x1
69. Camera Theory Teaching Board x1
70. Irradiation Plate x1
71. Parts Storage Box x3
72. Moon and Earth Device x1
73. Screen Fixed Bar x2
74. Balancing Lever x1
75. Axle x1
76. Iron Bar ϕ 10mmX350mm x2
77. Single Pulley x 2,
Balanced Weight x1
78. Hook Weight x7
79. Hook Connector x2
80. Cross Connector x1
81. Aluminum Storage
Case x2

