TELESCOPES: STARS IN YOUR EYES, AN OPTICAL ODYSSEY

GOALS:

1. Understand the structure and operation of different types of telescopes and, How light enters and follows a path until we see a magnified image?

Maksutov.

Newtonian reflector

Short refractor

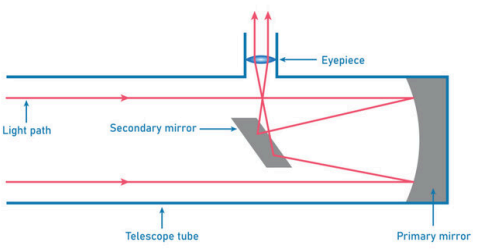
2. Develop observation and decoding skills: By using the Newtonian telescope to read an English sentence written on a piece of paper, students will practice their observation and decoding skills.
3. Understand the characteristics of an astronomical mount: Participants will learn the differences between an astronomical mount and a tripod for photography.
4. Learn about polar coordinates and stationing a telescope: It will be explained why it is necessary to station the telescope and how this relates to polar coordinates.
5. Understand the rotation of the Earth and its impact on astronomy: Participants will learn what the manual fine adjustment controls are for and how they relate to the Earth's rotation.
6. Moon Observation: If conditions allow, participants will have the opportunity to observe the Moon through the telescope.

Materials:

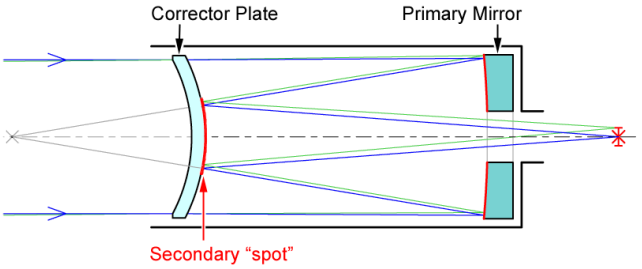
- Telescope Maksutov 127/1500
- Newtonian reflector telescope 114/900
- 80/400 Short Refractor Telescope
- Mount
- Eyepieces
- Baader solar filters

Developing the experiment.

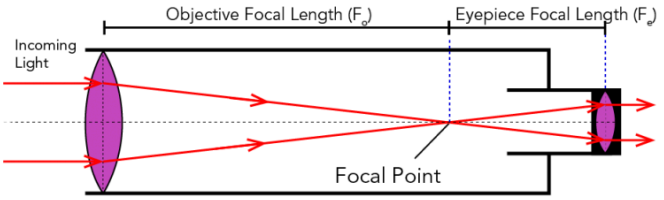
1. Assemble the mount so you can see how it is done.
   We will point it to North Star because as the Earth rotates this Star is the only one that remains fixed in the northern hemisphere, it allows us to rotate the mount to avoid the movement of the stars and them from moving out of focus.
2. Set up the Newtonian reflector tube. It uses a large concave mirror (the primary mirror) to collect and focus the light. This light is reflected towards a smaller flat mirror (the secondary mirror) which deflects it towards the eyepiece where the magnified image can be observed.



3. Set up Maksutov catadioptric. Remind, it uses a meniscus corrective lens on the front of the telescope to eliminate spherical aberrations. Light enters this lens, is reflected from a concave primary mirror to a secondary mirror, and then directed to the eyepiece for observation.



4. Set up a Short refractor (Keplerian). It consists of a divergent lens (magnifying glass) called the objective located at the end of a tube and another smaller divergent lens located at the opposite end known as the eyepiece.



5. We will place the Newtonian on its tripod and you will be able to see something written on a piece of paper located on a wall. We will be asked to decipher the phrase in English.

Estimated duration: 20 minutes

DROWNED ALUMINUM: CAN THE ALUMINUM FOIL SWIM?

GOALS:

1. Understand density and buoyancy: Participants will learn that density is a specific property of materials and that it determines whether an object floats or sinks in a fluid. By trying to make a sphere out of aluminum foil and seeing if it floats or sinks, participants will be able to see how the density of aluminum compares to that of water.
2. Explore Archimedes' Principle. By making a boat out of aluminum foil, participants will be able to see how an object can float in water despite being made of a material that is denser than water. This will help them understand Archimedes' principle, which says that an object immersed in a fluid experiences a buoyant force equal to the weight of the fluid it displaces.
3. Observe thermal expansion. By heating the aluminum foil with a lighter, students will be able to observe how the heat causes the aluminum to expand, because of the heat (transmitted Energy) a thermal expansion occurs, in consequence matter changes shape, area, and volume while the temperature increases.

Materials:

- Aluminum foil
- Cellulose from a sheet of paper
- Glue
- Hammer
- Alcohol burner
- Beakers
- Electronic scales
- Ruler

Develop:

1. Crumple a piece of aluminum and try to make it into the tightest sphere possible. Is this ball denser than water? How could you check?

2. Make a little boat with aluminum foil.
   Does this boat float or sink?
3. By throwing a ring from a soda can into the water. Does this ring float or sink?
4. Stick a piece of paper to the aluminum and place it on the metal side of the burner flame. Describe what is happening.

Estimated duration: 20 minutes

THE SECRET OF THE PURPLE PAPER:

DECIPHERING THE MYSTERIES OF C VITAMIN

GOALS:

1. Understand oxidation-reduction reactions: Participants will learn about redox reactions, how they occur and their importance in chemistry.

2. Apply theory to practice: Participants will have the opportunity to see a redox reaction in action with the iodine clock reaction.

3. Learn about C vitamin: Participants will learn about C vitamin, its presence in different juices and how it can be detected.

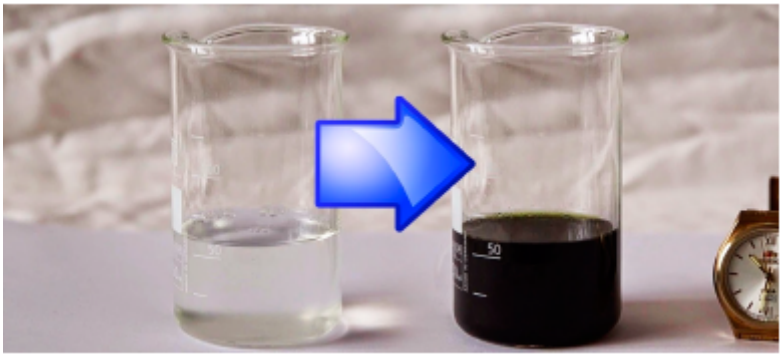
Materials:

- Natural and commercial juices
- C Vitamin pill (if it is possible)
- Lugol
- Powdered starch
- Hydrogen peroxide
- Beakers
- Rod
- Brushes
- Sheets of paper

Develop.

1. Paint the entire sheet of paper with Betadine (povidone-iodine 5%)
   Describe what is happening. Which color can you observe in the paper?
   Can you explain why?
2. Dip the brush in each juice and pass it over the paper.
   Does the paper color change? Why does this occur?
3. With one of the C vitamin samples, paint an entire paper and let it dry.
   Describe what is happening.
   When the paper is completely dry, using another brush dipped in a solution of hydrogen peroxide and starch, write a sentence on the paper.
   Wait for a minute and describe what happens. Could you explain why?

It is called a clock reaction because it is not immediate and takes a time that depends on the concentration of the substances.



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Estimated duration: 20 minutes