Mechanics of fluids.

Aerodynamics of paper airplanes.

Task:

Design a paper airplane that will fly for at least 10 seconds.

Research:

1.You can find many models on the Internet as there are also competitions on the longest flying model.

Strategy and modelling:

1.Choose 3 models

2.Test them and improve so that you have one flying 10 seconds.

3.Record your improvement and the final test of your model.

Results:

1.Present the best model to your classmates.

For the teacher:

Materials pupils may need:

Sheets of paper, stopwatch, scissors, tape, paper clips, plasticine, glue.

Siphon model.

Task:

Explore the function of the siphon.

Research:

Draw a picture of the siphon you have at home under the sink. Note the fold of the waste pipe. This is very important for the function, there is always some water left in it, which prevents the penetration of odors from the pipe.

Strategy and modelling:

Cut off the top of the larger PET bottle. Drill a hole in the cap so that the plastic hose can be fitted. (Ask an adult to help you). Insert a hose about half a meter long and bend it as you observed on the siphon. Gradually pour water into the bottle and watch the water in the siphon behave. Will there still be a certain amount of water left in it?

Results:

Write down your observations and compare with classmates.

Materials pupils may need:

Plastic bottles, scissors, knife, or drill for cutting the opening in the cap (should be done by an adult) and plastic hose.

Testing Pascal's Law.

https://drive.google.com/drive/u/1/folders/1WTIf0ik1EVuNMVkuc-u-tNbVdKyqB_gc

Task:

Prepare equipment for testing Pascal's Law according to the video above.

Strategy and modelling:

Make picture of the design and put down material you will need. Ask parents or teacher to get them ready for you.

Procedure:

Hold the hollow cylinder in one hand and tighten the bottom to the cylinder with the other hand using a thread and then place the bottom cylinder in a container filled with water.

Hold the cylinder in the water in an upright position and release the thread. We observe that the bottom did not fall off the cylinder.

Carefully pour water into the cylinder until the moving bottom falls off. The bottom falls off just when the liquid levels in the container and in the cylinder are the same.

Explanation:

As the water pressure in the same depth acts in all direction, the pressure in upward direction holds the movable bottom on the cylinder. By pouring water into the cylinder, the hydrostatic pressure acts on the bottom in the opposite direction. When the fluid levels are at the same height, the magnitude of the hydrostatic pressure equals the magnitude of the upward pressure at the appropriate depth. The pressure equilibrium occurs, and the moving bottom falls off under its own weight.

Why do boats float?

Materials: modeling clay, paper clips, aquarium or other large bowl, 10, 20, 50 cents.

Procedure:

1.Use the same amount of modeling clay to make a shape, that will sink and float.

What is the difference?

2. Try different shapes that will float and test how much cent coins they hold before sinking.

3. How does the winner (the one that can bear the biggest load) differ from others?

How do rockets work?

Material: balloon, string, plastic straw, tape

Procedure:

1. Pull the string through the straw and attach both ends of the string e.g. to the door knobs that are some 3 meters apart.

2. Blow up the balloon and hold its neck.

3. Tape the balloon to the straw.

4. Leave the air blow out of the neck.

5. Observe how does balloon move.

Obsrevation:

When the balloon releases its air, it pushes on the outside air and the reaction of outside air is that it is pushing back on the air in the balloon and makes it move back.

Rockets use huge engines burning the fuel that comes out of the rocket and pushes the rocket in the opposite direction.

Measuring the pressure in tires (Task for you and some adult)

Material: car, ruler, papers

Procedure

$$p = \frac{F}{A} = \frac{mg\ (mass\ of\ the\ car - is\ in\ the\ car\ description)}{A - Area\ of\ all\ tyres}$$

1.Define the area with which the wheel touches the road

- Place 4 papers on the road around the tire
- Measure the lengths of the sides of the rectangle with the ruler
- Calculate the area of the rectangle
- Repeat the procedure for each tire.

2.Calculate the pressure $p = \frac{F}{A}$

3.Verify the pressure with pressure gauge.

4.Try to explain the difference between measured and calculated value of pressure.