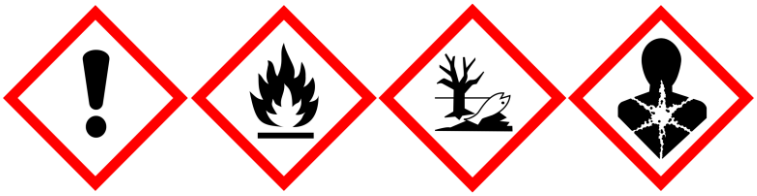
Student experiment (5th - 10th grade)	**Distillation of crude oil**	**Time:** max. 20 min.

Safety:

safety glasses
extractor hood



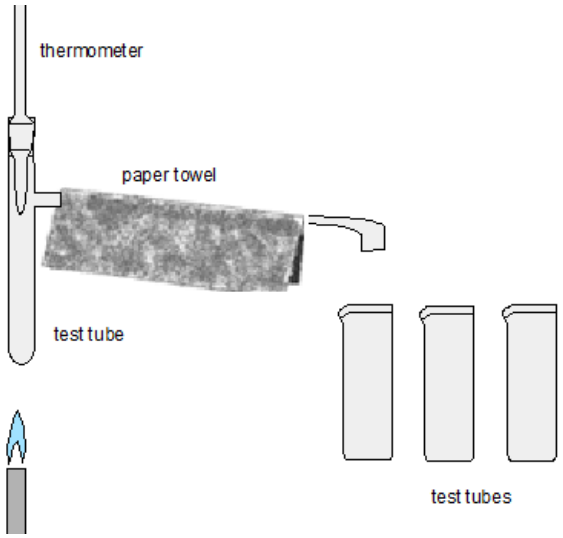
Instruments:

- test tube with side attachment
- holed stopper with thermometer (150°C)
- glass wool
- 2 retort sleeves with clamps
- L-shaped glass tube
- rubber tube
- 3 test tubes with stoppers
- test tube rack
- fire-resistant mat
- paper towel
- Bunsen burner

Chemicals:

- crude oil substitute (mix of n-pentane, n-hexane, n-heptane, n-octane, n-nonane; H: 225-361f-304-373-315-336-411; P:210-240-273-301+330-331-302+352-403+235)

Experiment:



- Add 4 ml of the crude oil substitute to a test tube with a side attachment. Also stack about 2 cm of glass wool in the bottom of the test tube to avoid splashing (in the case that the test tube breaks).
- Construct the apparatus according to the above diagram. Make sure to moisten the paper towel. Be sure that the test tube can be firmly closed using the stopper with the thermometer.

Experiment:

- After the apparatus is properly built, light the Bunsen burner and slowly heat the crude oil. Make sure that the paper towel is held constantly moist!
- Once a temperature of 70°C is reached, change test tubes and seal the first tube with a stopper. Repeat twice more. The second test tube will be used to catch the 70 – 100°C fractions and the third to collect the last fraction from 100 – 150°C.

Observations:

Crude oil is composed of various substances, which boil at different temperatures. This allows us to divide it into different fractions, which have different properties.

Results:

The first noticeable difference between the fractions is their color. Depending on the composition of the crude oil, the last fraction can be either black or brownish, but in any case darker than the clear fractions.
The various fractions also differ in their physical properties. Distillation yields fractions containing hydrocarbons with different boiling points. Since shorter hydrocarbon chains boil at lower temperatures due to weaker van der Waals forces acting between them, we can assume that the first fraction is primarily composed of short-chain substances. Likewise, we can conclude that the higher-boiling third fraction contains mostly longer hydrocarbon chains, since they attract one another more strongly. This also has an effect on viscosity, since longer hydrocarbons chains have (among other things such as getting tangled up with one another) a higher level of inner friction due to stronger van der Waals attractions between the. This makes them more viscous ("thicker") than short-chain hydrocarbons. The ignition point is also lower for short-chain hydrocarbons than for long-chain substances. We can predict that the first fraction distilled will be flammable at room temperature, whereas the third will probably require higher temperatures to ignite.

Disposal:

The distillation remains and three fractions must be disposed of in the container for organic, halogen-free solvents.
The glass wool should be placed in the solids collection container.
