

Viscosity

- Viscosity
- Dynamic vs Kinematic Viscosity
- Newtonian Fluids
- Non-Newtonian Fluids
- Viscosity and Temperature
- Viscosity and Pressure
- Measuring Viscosity
- Importance of Viscosity



TeachWithFergy

Preview File

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- Some slides appear blank because they have been removed.
- Student versions have portions of the text removed which is given in the teacher version and appear as _____
- Other slides may have on them, this represents writing that has been removed.

Viscosity

- Property of fluids (_____)
- _____
 - Determined by
 - Friction between molecules/layers of fluid (_____)
 - High = _____
 - Low = _____
- Opposite: _____



Viscosity

- Fluids move as _____
- Viscosity is
 - Molecules of the same substance attract one another → _____
 - Some forces are _____



Viscosity

- “Thicker” fluids are _____ (e.g., honey)
- “Thinner” fluids are _____ (e.g., water)



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Viscosity

- Air (27°C): _____
- _____ (27°C): 0.020 mPa·s
- Carbon dioxide (25°C): _____
- _____ (25°C): 0.8902 mPa·s
- Mercury (25°C): _____
- _____ (37°C): 3-4 mPa·s
- _____ (25°C): 67.0 mPa·s
- Tar (20°C): _____



Viscosity

- _____ (25°C): 3 mPa·s
- Maple syrup (20°C): _____
- _____ (20°C): 5,000 mPa·s
- Honey (20°C): _____
- _____ (20°C): 50,000 mPa·s
- Mustard (25°C): _____
- _____ (25°C): 100,000 mPa·s
- Peanut butter (20°C): _____



Dynamic vs Kinematic Viscosity

- Viscosity covered so far is _____
 -
- Kinematic viscosity (ν): _____
 -
 - Units
 - m^2/s
 - Stokes (St): cm^2/s
 - Water (20°C): $\nu =$ _____ (cSt = mm^2/s)

Newtonian Fluids

- Newtonian fluids: _____
 - Viscosity constant with _____
 -
 - E.g., water, most gases, motor oil



Non-Newtonian Fluids

- Non-Newtonian fluids: _____
 - Viscosity changes with _____
 -
 - Some fluids become _____
 - Others become _____
 - E.g., house paint, nail polish, toothpaste, corn starch + water

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Non-Newtonian Fluids

- Toothpaste:
 - Stress applied by squeezing the tube →

 -



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Non-Newtonian Fluids

- :
 - January 15, 1919
 -
 - 21 people were killed, 150 injured
 -

Viscosity and Temperature

- Recall that our list of different viscosities included temperature
- _____
 - E.g., ...
- Temperature's effect is _____

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Viscosity and Temperature

- Gases
 - Viscosity _____ with increasing temperature
 - Molecules move around so fast that _____



Viscosity and Pressure

- Liquids
 - _____
 - Extreme pressure increases viscosity
- Gases
 - _____

Measuring Viscosity

- Viscometer
 - Capillary viscometer: _____
 - Rotational viscometer: _____
- Rheometer
 - Measure viscosity of _____
 - Capillary and rotational: work much like viscometers

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Importance of Viscosity

- Viscosity is used in many industries
 - Oils for _____
 - Fluids _____
 - Fluids _____
 - Need more power for higher viscosity



Importance of Viscosity

- Viscosity is also important in earth science
 - Different types of _____ have different viscosities and _____

