1. A test mass used by the LISA Pathfinder mission is a cube of solid gold–platinum alloy, measuring 4.6 cm on a side and weighing 1.96 kg. Compute the cube's density, specific weight and specific gravity.

2. Air at 40°C and standard atmospheric pressure has a specific weight of 11.05 N/m^3. Calculate its density.

3. A storage vessel for gasoline (sg=0.68) is a vertical cylinder 10 m in diameter. If it is filled to a depth of 6.75 m, calculate the weight and mass of the gasoline.

4. A storage vessel for gasoline (sg=0.68) is a vertical cylinder 30 ft in diameter. If it is filled to a depth of 22 ft, calculate the number of gallons and weight of the gasoline.

5. Liquid ammonia has a specific gravity of 0.826. Calculate the volume in cm^3 that would weigh 5.0 lb.

6. What is the specific gravity of 38° API oil?

7. A hydraulic press that must exert a force of 4000 lbs operates with a 2 in diameter cylinder. Compute the required oil pressure.

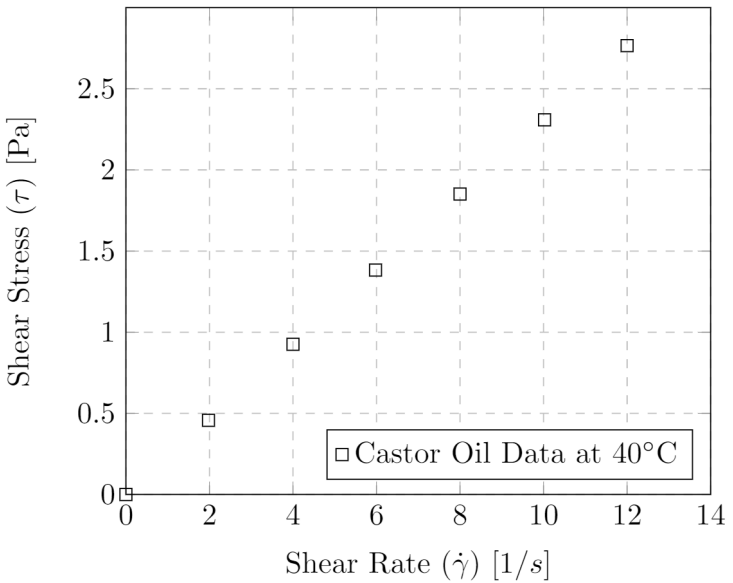
8. The maximum pressure a fluid power cylinder can sustain is 25.0 MPa. Compute the minimum diameter necessary for the piston to exert a force of 50 kN.

9. A hydraulic system operates using machine oil having a bulk modulus $K = 189,000$ psi. What is the percentage change in volume as the system pressure is increased from zero to 4000 psi?

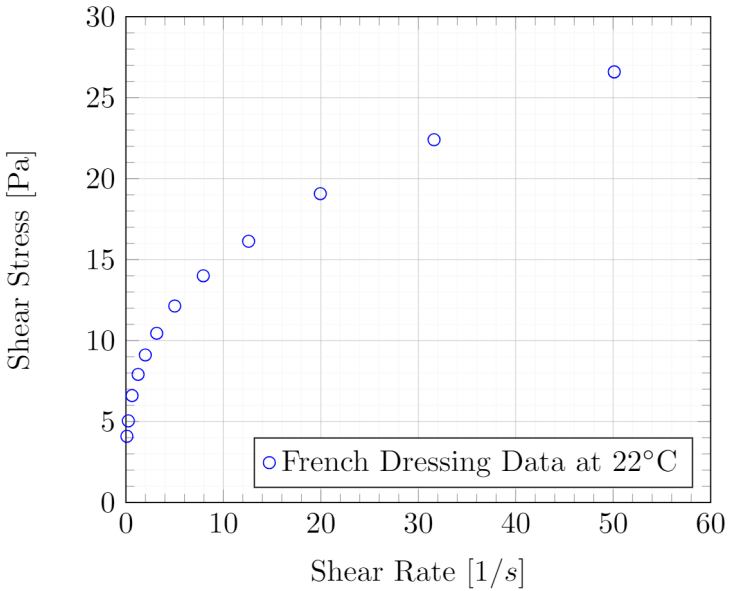
10. A hydraulic cylinder filled with water has an inside diameter of 1.0 in and a length of 2.0 ft. How many pounds of force must be applied to a piston at the end of the cylinder to compress the water by 0.25 in?

11. Convert a dynamic viscosity measurement of 2500 cP into $\mathrm{Pa} \cdot \mathrm{s}$.

12. Estimate the shear viscosity (in centipoise) of castor oil using the experimental viscometer data shown in the figure below.



13. The following three questions are based on the experimental viscometer data for French dressing shown in the figure below.



What best describes the viscous behavior of French dressing?

(a) Bingham

(b) Dilatant (shear thickening)

(c) Newtonian

(d) Pseudoplastic (shear thinning)

14. Estimate the apparent viscosity of French dressing (in centipoise) at a shear rate of $\dot{\gamma} = 10s^{-1}$.

15. Estimate the apparent viscosity of French dressing (in centipoise) at a shear rate of $\dot{\gamma} = 40s^{-1}$.