

## Physical Science -- Pressure Problems

Name \_\_\_\_\_

Use the equations  $P = F/A$ ,  $F = P \cdot A$ ,  $A = F/P$ ,  $Q = m \cdot \Delta T \cdot C_p$

Heat of Fusion (or Vaporization)  $\times$  mass = Amount of energy (Q)

**Show your work.** Each problem is 5 points and follows our usual scheme.

1. Your brand new car weighs 16,170 N and you need to get your first oil change. You pull it onto the hydraulic lift, which has an area of  $5005 \text{ cm}^2$ . The mechanic applies a force to a small piston that has an area of  $65 \text{ cm}^2$ . What force does he apply to lift your car?
2. Find the pressure applied to the floor, **in Pascals**, by a freshmen girl's high-heeled shoe. The heel has an area of  $0.42 \text{ cm}^2$  and the girl weighs 503 N (about 110 pounds).
3. What is the force water applies to your hand when you dive to bottom of a swimming pool? Assume your hand has an area of  $0.008 \text{ m}^2$  and the water pressure is 120,000 Pa.
4. How much energy is needed to melt a 12 gram gold coin? The heat of fusion for gold is 62,800 J/kg.
5. Your water pipes froze last night and you are in need of a shower. What is the **total** energy needed to first melt 8.5 kg of snow, then raise its temperature to  $65 \text{ }^\circ\text{C}$  for your shower? The specific heat of water is  $4186 \text{ J/kg} \cdot \text{ }^\circ\text{C}$ , the heat of fusion is 334,000 J/kg and the heat of vaporization is 2,260,000 J/kg.