

HOMEWORK #5

- *This homework is due by the beginning of class on April 6. The problems cover material from chapters 9 and 10.*
- *You will need a calculator and lots of scrap paper.*
- *Answers are to be recorded on a scantron that you will turn in. You may keep the questions (i.e., these sheets).*
- *You may (should) use your book. You may even work with other students. However, you should not copy the answers of other students. Since the exams are multiple choice, the homeworks are also exam prep, and so you need to be able to work these problems yourself. If you do not apply yourself to the homework and do your own work, you are not likely to perform well on the exams.*

1. A uniform pressure of $7.0 \times 10^5 \text{ N/m}^2$ is applied to all six sides of a copper cube. What is the percentage change in volume of the cube? (for copper, $B = 14 \times 10^{10} \text{ N/m}^2$)
 - a. $2.4 \times 10^{-2} \%$
 - b. $0.4 \times 10^{-2} \%$
 - c. $8.4 \times 10^{-2} \%$
 - d. $0.5 \times 10^{-3} \%$
2. The quantity “pressure” expressed in terms of the fundamental quantities (mass, length, time) is equivalent to:
 - a. MLT^{-1} .
 - b. $\text{ML}^{-1}\text{T}^{-2}$.
 - c. $\text{M}^2\text{L}^{-1}\text{T}^{-3}$.
 - d. a dimensionless quantity.
3. When water freezes, it expands about nine percent. What would be the pressure increase inside your automobile engine block if the water in there froze? (The bulk modulus of ice is $2.0 \times 10^9 \text{ Pa}$, and $1 \text{ atm} = 1.0 \times 10^5 \text{ Pa}$.)
 - a. 18 atm
 - b. 270 atm
 - c. 1 080 atm
 - d. 1 800 atm

4. By what factor is the total pressure greater at a depth of 850 m in water than at the surface where pressure is one atmosphere? (water density = $1.0 \times 10^3 \text{ kg/m}^3$, 1 atmosphere pressure = $1.01 \times 10^5 \text{ N/m}^2$, and $g = 9.8 \text{ m/s}^2$)
- 100
 - 83
 - 74
 - 19
5. A piece of aluminum has density 2.70 g/cm^3 and mass 775 g. The aluminum is submerged in a container of oil of density 0.650 g/cm^3 . A spring balance is attached with string to the piece of aluminum. What reading will the balance register in grams (g) for the submerged metal?
- 960 g
 - 775 g
 - 588 g
 - 190 g
6. As ice floats in water, about 10% of the ice floats above the surface of the water. If we float some ice in a glass of water, what will happen to the water level as the ice melts?
- The water level will rise 10% of the volume of the ice that melts.
 - The water level will rise, but not as much as the 10% indicated in answer A.
 - The water level will remain unchanged.
 - The water level will become lower.
7. Think of Bernoulli's equation as it pertains to an ideal fluid flowing through a horizontal pipe. Imagine that you take measurements along the pipe in the direction of fluid flow. What happens to the sum of the pressure and energy per unit volume?
- It increases as the pipe diameter increases.
 - It decreases as the pipe diameter increases.
 - It remains constant as the pipe diameter increases.
 - No choices above are valid.
8. An ideal fluid, of density $0.90 \times 10^3 \text{ kg/m}^3$, flows at 6.0 m/s through a level pipe with radius of 0.50 cm. The pressure in the fluid is $1.3 \times 10^5 \text{ N/m}^2$. This pipe connects to a second level pipe, with radius of 1.5 cm. Find the speed of flow in the second pipe.
- 54 m/s
 - 18 m/s
 - 0.67 m/s
 - 0.33 m/s

9. A hole is poked through the metal side of a drum holding water. The hole is 18 cm below the water surface. What is the initial speed of outflow?
- 1.9 m/s
 - 2.96 m/s
 - 3.2 m/s
 - 3.5 m/s
10. How much air must be pushed downward at 40.0 m/s to keep an 800-kg helicopter aloft?
- 98.0 kg/s
 - 196 kg/s
 - 294 kg/s
 - 392 kg/s
11. 88°F is how many degrees Celsius?
- 31
 - 49
 - 56
 - 158
12. An automobile gas tank is filled to its capacity of 15.00 gallons with the gasoline at an initial temperature of 10°C. The automobile is parked in the sun causing the gasoline's temperature to rise to 60°C. If the coefficient of volume expansion for gasoline is $9.6 \times 10^{-4}/\text{C}^\circ$, what volume runs out the overflow tube? Assume the change in volume of the tank is negligible.
- 1.74 gallons
 - 1.18 gallons
 - 0.72 gallons
 - 0.30 gallons
13. An ideal gas is confined to a container with constant volume. The number of moles is constant. By what factor will the pressure change if the absolute temperature triples?
- 1/9
 - 1/3
 - 3.0
 - 9.0
14. Two ideal gases, X and Y, are thoroughly mixed and at thermal equilibrium in a single container. The molecular mass of X is 9 times that of Y. What is the ratio of root-mean-square velocities of the two gases, $v_{X, \text{rms}}/v_{Y, \text{rms}}$?
- 9/1
 - 3/1
 - 1/3
 - 1/9