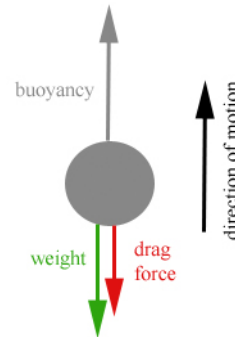


## INTRODUCTION TO ENVIRONMENTAL ENGINEERING

## QUIZ #3

1. (4 points) How do weight, buoyancy and drag forces equilibrate one another on a buoyant particle, such as an oil droplet rising to the surface of a lake? Make a sketch showing which forces are directed upward and downward. Also, which is necessarily the largest of the three?

Sketch of forces:



Largest force is: **The buoyancy force**

2. (5 points) True or false?

**T** The Cunningham slip factor takes into account that the fluid surrounding the settling particle is not really continuous but made of molecules. **True by definition.**

**T** The settling speed in air of a 0.06 mm particle of density 1 g/cm<sup>3</sup> is about 0.1 m/s. **See Figure 4.B.4, reading size above and speed to the left.**

**F** Henry's Law governs the net transfer of a substance between gas and water. **Henry's Law governs equilibrium, precisely when there is zero net transfer. Furthermore, not any gas but air specifically.**

**F** Considering tabulated values of the Henry's Law constant, we can conclude that carbon monoxide is less volatile than carbon dioxide. **CO is more volatile than CO<sub>2</sub> because its Henry's Law value  $H$  (= 1000 atm/M) is greater than that of CO<sub>2</sub> (= 29 atm/M).**

**T** If given enough time, 5 mg of BOD in water will eventually consume 5 mg of dissolved oxygen. **True by definition of BOD.**

3. (3 points) Why do better fish, such as trout and salmon, prefer cold waters?

**Answer: These better types of fish need more oxygen, and the level of dissolved oxygen is higher in colder water.**

4. (3 points) Cite 6 different ways by which humans use or consume water.

**Answer: Drinking, food preparation, washing (body, dishes & clothes), growing crops (irrigation), industrial processes, recreation (swimming, boating)**