



**SCIENCE OLYMPIAD**  
— AT THE —  
**UNIVERSITY OF FLORIDA**

Northern Regional: January 19<sup>th</sup>, 2019

# Density Lab B Test

**Name(s):** \_\_\_\_\_

**Team Name:** \_\_\_\_\_

**School Name:** \_\_\_\_\_

**Team Number:** \_\_\_\_\_

**Rank:** \_\_\_\_\_

**Score:** \_\_\_\_\_

## Written Test

- 1) All of the below are types of densities except (5 points)
  - a) Mass Density
  - b) Number Density
  - c) Area Density
  - d) Volume Density
- 2) Which of the following exhibits Boyle's Law? (5 points)
  - a)  $P_1V_1 = P_2V_2$
  - b)  $P_1/T_1 = P_2/T_2$
  - c)  $PV = nRT$
  - d)  $V_1/T_1 = V_2/T_2$
- 3) How many atoms are in 3 moles of a substance? (5 points)
  - a)  $24.023 \times 10^{23}$  atoms
  - b)  $1.81 \times 10^{24}$  atoms
  - c) 23 atoms
  - d)  $6.023 \times 10^{23}$  atoms
- 4) If the temperature of a container doubled, what would have happened to the pressure of the gas inside the container? (5 points)
  - a) Halved
  - b) Doubled
  - c) Quadrupled
  - d) Nothing
- 5) What factors affect density? (5 points)
  - a) Pressure
  - b) Temperature
  - c) Both A and B
  - d) None of the above
- 6) Water is more dense as a solid. (5 points)
  - a) True
  - b) False
- 7) Pascal is the SI Unit for pressure. (5 points)
  - a) True
  - b) False
- 8) The acceleration due to gravity on Earth is 9.8 m/s. (5 points)
  - a) True
  - b) False
- 9) Salt water is more dense than deionized water. (5 points)
  - a) True
  - b) False

- 10) By Archimedes' principle, the buoyant force is equal to the weight of fluid displaced. (5 points)
- True
  - False
- 11) What is the Archimedes Principle? (5 points)
- 12) What is the molarity of a solution containing 18.9 grams of  $\text{RuCl}_3$  in enough water to make 1.00 L of solution? (5 points)
- 13) What is the density (in g/ L) of 1 mole of a gas with a molar mass of 60 g/mol at 0.75 atm and 27 degrees Celsius? (5 points)
- 14) What is the molality of a solution with 69 grams of NaCl in 987 grams of water? (5 points)
- 15) If you filled a cube shaped box with 10.0 inch edge with water, and then solid cylinder with a 4.00 inch diameter and 4.00 inch height was submerged in the water it, what would be the displacement of the water? (5 points)
- 16) What is molality of a 1000 kg solution with a 2.0 M? (5 points)
- 17) Define buoyancy/ buoyant force. (5 points)
- 18) The molality of a solution is 6.0m at 25 degrees Celsius. What is the molality at 100 degrees Celsius? (5 points)
- 19) Find the mass density of a sphere that has a 10 m diameter. (5 points)
- 20) How is molality affected by temperature? If temperature increases, what happens to molality? If temperature decreases, what happens to molality? (5 points)

### **Hands- On Task**

- 21) Given a small bag of Skittles, determine the number density of the green Skittles in the bag. (10 points)
- 22) Given a small box, determine the mass density of the green skittles in the box. (10 points)