

ANSWER KEY

MCQ (10 pts), FRQ (40 pts), HANDS-ON (50 pts)

MCQ (1 pt per problem, no penalties for wrong answers)

- |      |       |
|------|-------|
| 1. C | 6. A  |
| 2. D | 7. E  |
| 3. D | 8. B  |
| 4. C | 9. A  |
| 5. B | 10. B |

FRQ (pts specified next to questions, the last significant digit may be off by 1 and still get the pts)

1. **1 pt** for (volume and pressure are inversely proportional at a constant temperature) or ( $PV = k$  at a constant temperature) or ( $P_1V_1 = P_2V_2$  at a constant temperature)

**2 pts** for (increasing volume decreases particle interaction with the walls, decreasing pressure) or (decreasing volume increases particle interaction with the walls, increasing pressure)
2. **1 pt** for (pressure and temperature are directly proportional at a constant volume) or ( $P = kT$  at a constant volume) or ( $P_1/T_1 = P_2/T_2$  at a constant volume)

**2 pts** for (increasing temperature increases particle speed, increasing particle interaction with the walls and therefore pressure) or (decreasing temperature decreases particle speed, decreasing particle interaction with the walls and therefore pressure)
3. **1 pt** for (volume and temperature are directly proportional at a constant pressure) or ( $V = kT$  at a constant pressure) or ( $V_1/T_1 = V_2/T_2$  at a constant pressure)

**2 pts** for (increasing temperature makes molecules collide harder and push each other apart, increasing volume) or (decreasing temperature makes molecules collide with less force and decreases the distance the molecules are pushed apart, decreasing volume)
4. **1 pt** for (the Ideal Gas Law approximates the behavior of gases under different conditions) or (the Ideal Gas Law is the derivative of Boyle's, Gay-Lussac's, Charles' and Avogadro's laws) or ( $PV = nRT$ )

**1 pt** for (volume of particles is disregarded because it is miniscule compared to the container volume)

**1 pt** for (particles do not possess potential energy and do not face intermolecular attractions or repulsions) or (particles only have kinetic energy and do not face intermolecular attractions or repulsions)

**1 pt** for (particles travel in a continuous and random motion)

**1 pt** for (collisions between gas particles are completely elastic and kinetic energy is not lost or gained)

**1 pt** for (all particles' average kinetic energies are the same) or (kinetic energy is proportional to temperature of the gas)

**1 pt** for (good conditions are low pressure and high temperature)

5. **2 pts** for (correct process, concentration of 0.342 M) or (0.342 M) or (0.342 mol/L)  
**0.5 pts** for correct units  
**0.5 pts** for 3 significant figures
6. **1 pt** for (they do) or (yes)  
**2 pts** for (they mix because of the random motion of the molecules)
7. **2 pts** for (0.63 N)  
**0.5 pts** for correct units  
**0.5 pts** for 2 significant figures
8. **2 pts** for (0.39 N)  
**0.5 pts** for correct units  
**0.5 pts** for 2 significant figures
9. **2 pts** for (1.1 g/cm<sup>3</sup>)  
**0.5 pts** for correct units  
**0.5 pts** for 2 significant figures
10. **2 pts** for (0.498 L)  
**0.5 pts** for correct units  
**0.5 pts** for 3 significant figures
11. **2 pts** for (8.9 atm)  
**0.5 pts** for correct units  
**0.5 pts** for 2 significant figures
12. **2 pts** for (5.6)  
**0.5 pts** for no units  
**0.5 pts** for 2 significant figures

LAB (last significant digit may be off by 4 unless otherwise specified with \*\*)

Station 1 (14 pts)

1. **3 pts** for (2 g/mL), has to be exactly 2 \*\*  
**0.5 pts** for units  
**0.5 pts** for 1 significant figure
2. **3 pts** for (2), has to be exactly 2 \*\*  
**0.5 pts** for no units  
**0.5 pts** for 1 significant figure
3. **3 pts** for (0.1 N), has to be exactly 0.1 \*\*  
**0.5 pts** for units  
**0.5 pts** for 1 significant figure
4. **2 pt** for (water displacement)

Station 2 (20 pts)

1. **2 pts** for (2.7 g/cm<sup>3</sup>)  
**0.5 pts** for units  
**0.5 pts** for 2 significant figures
2. **2 pts** for (0.51 g/cm<sup>3</sup>)  
**0.5 pts** for units  
**0.5 pts** for 2 significant figures
3. **2 pts** for (1.5 g/cm<sup>3</sup>)  
**0.5 pts** for units  
**0.5 pts** for 2 significant figures
4. **0.5 pts** for (A)  
**3 pts** for (A: 0.060 N)  
**0.5 pts** for (C)  
**3 pts** for (C: 0.50 N)  
**0.5 pts** for units  
**0.5 pts** for 2 significant figures

Station 3 (9 pts)

1. **3 pts** for (0.23 N), has to be exactly 0.23 \*\*  
**0.5 pts** for units  
**0.5 pts** for 2 significant figures
2. **3 pts** for (1.3 g/mL), has to be exactly 1.3 \*\*  
**0.5 pts** for units  
**0.5 pts** for 2 significant figures
3. **1 pt** for (light corn syrup)

Station 4 (7 pts)

1. **3 pts** for a gas that has a molar mass of 27.00-28.50 g/mol; examples: CO, ethene/ethylene, N<sub>2</sub>
2. **2 pts** for (A<C<B)
3. **2 pts** for (all the same)