INSTRUCTIONS: Use a soft, #2 pencil. Your marks must be dark to be counted correctly.
Bubble in Form A on your Scantron Form

Write your perm number and bubble in your perm number. Correct perm = 2 points!

Each question is worth 3 points, you will not lose more than 3 points for incorrect answers.
You may work out the problems and write your answers on this quiz. Turn in the Scantron form only. Keep the quiz so you can check your work and your answers later. The answers to the quiz will be posted on the web.

1. Consider the following reaction: \( A + 2B \rightarrow 3C + D \)

If 3.0 mol of A is mixed with 5.0 mol of B and the reaction produces 6.0 mol of C? What is the percent yield of this reaction?

- a) 71 %
- b) 67 %
- c) 75 %
- d) 90 %
- e) 80 %

\[
\begin{align*}
3 \text{ mol } A & \quad \frac{3C}{1 \text{ mol } A} = 9 \text{ mol } C \\
5 \text{ mol } B & \quad \frac{3C}{2 \text{ mol } B} = 7.5 \text{ mol } C \\
\frac{6.0}{7.5} \times 100 & = 80 \%
\end{align*}
\]

2. When aqueous solutions of \( \text{Na}_2\text{SO}_4 \) and \( \text{Pb(NO}_3\text{)}_2 \) are mixed, \( \text{PbSO}_4 \) precipitates. 125 mL of 0.50 M \( \text{Pb(NO}_3\text{)}_2 \) is mixed with 200 mL of 0.25 M \( \text{Na}_2\text{SO}_4 \). Calculate the final concentration of \( \text{Pb}^{2+} \) in solution after the reaction goes to completion.

- a) 0.10 M
- b) 0.039 M
- c) 0.31 M
- d) 0.078 M
- e) 0.19 M

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\begin{align*}
Pb^{2+} + \text{SO}_4^{2-} & \rightarrow Pb\text{SO}_4 (s)
(0.50 \text{ mol L}^{-1}) (0.125 \text{ L}) & = 0.0625 \text{ mol Pb}^{2+}
(0.25 \text{ mol L}^{-1}) (0.200 \text{ L}) & = 0.050 \text{ mol SO}_4^{2-}
0.0625 - 0.050 & = 0.0125 \text{ mol Pb}^{2+}
0.0125 \div 0.325 \text{ L} & = 0.038 \text{ M}
\end{align*}
\]

3. From the information given in problem 2, calculate the final concentration of \( \text{NO}_3^- \) in solution after the reaction goes to completion.

- a) 0.19 M
- b) 0.25 M
- c) 0.38 M
- d) 1.0 M
- e) 0.31 M

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\begin{align*}
Pb(\text{NO}_3)_2 & \rightarrow Pb^{2+} + 2 \text{NO}_3^-
\left[\text{NO}_3^-\right] & = 2 \left(0.5 \text{ M} \right) \left(\frac{125 \text{ mL}}{325 \text{ mL}}\right) = 0.38 \text{ M}
\end{align*}
\]
4. Consider three identical flasks filled with different gases.

- **Flask A** contains H₂ (g) at 100 torr and 0°C.
- **Flask B** contains N₂ (g) at 250 torr and 0°C.
- **Flask C** contains CO (g) at 760 torr and 0°C.

In which flask do the molecules have the greatest average speed?

- a) Flask A
- b) Flask B
- c) Flask C
- d) All are the same

5. Uranium hexafluoride is a solid at room temperature, but boils at 45°C. Determine the density of uranium hexafluoride at 80°C and 730 torr. The molar mass of UF₆ is 352 g/mol.

- a) 0.085 g/L
- b) 51.5 g/L
- c) 11.7 g/L
- d) 0.019 g/L
- e) 12.9 g/L

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\frac{n}{V} = \frac{P}{RT} = \frac{0.96 \text{ atm}}{0.08206 \text{ L atm mol}^{-1} \text{K}^{-1} (353 \text{ K})} = 0.033 \text{ mol L}^{-1}
\]

6. A 275.0 mL sample of O₂ is collected over water at 60.0°C. The total pressure is 755 torr. What is the volume of the O₂ at STP? (The vapor pressure of water at 60°C is 149 torr).

- a) 244 mL
- b) 224 mL
- c) 333 mL
- d) 180 mL
- e) none of these

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P_{\text{tot}} = P_{\text{H₂O}} + P_{\text{O₂}}
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P_{\text{O₂}} = 755 - 149 \text{ torr} = 606 \text{ torr}
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v₂ = v₁ \frac{P₁}{P₂} \frac{T₂}{T₁}
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v₂ = 275.0 \text{ mL} \left( \frac{606 \text{ torr}}{760 \text{ torr}} \right) \left( \frac{373 \text{ K}}{333 \text{ K}} \right)
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v₂ = 180 \text{ mL}
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