Using a #2 pencil, darken the balloon on the answer sheet corresponding to the best answer.

\[ \frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \quad PV = nRT \quad R = 0.0821 \text{ L atm/mol K} \quad 1 \text{ atm} = 760 \text{ torr} \]

**Benzene:**
- Heat of fusion is 128 J/g
- Heat of vaporization is 398 J/g
- \( q = mC\Delta T \)
- \( C_{benzene} = 1.749 \text{ J/g°C} \)

61. A sample of gas trapped in a syringe has a pressure of 2.00 atm when the volume is 25.0 mL. What is the volume if the pressure is 2.50 atm?
   - a. 20.0 mL
   - b. 31.3 mL
   - c. 50.0 mL
   - d. 10.0 mL
   - e. 12.5 mL

62. What is the pressure when 12.0 moles of neon gas at 90.0 K has a volume of 6.0 L?
   - a. 3.69 atm
   - b. 14.8 atm
   - c. 88.7 atm
   - d. 548 atm
   - e. 6.76 \times 10^2 atm

   \[ \frac{PV = nRT}{V} = \frac{nRT}{V} = \frac{(12 \text{ mol})(0.0821 \text{ L atm/mol K})(90 \text{ K})}{6.0 \text{ L}} = 1.8 \text{ atm} \]

63. Which will have dipole-dipole intermolecular forces acting between molecules in a sample of the gas?
   - a. methane, CH₄
   - b. chloroform, CHCl₃
   - c. hydrogen chloride, HCl
   - d. all of the above

64. How much heat is needed to vaporize 15.0 g of liquid benzene, at its boiling point of 80.1°C, to form benzene vapor?
   - a. 8.53 J
   - b. 26.2 J
   - c. 1920 J
   - d. 2101 J
   - e. 5930 J

\[ \text{Heat} = m \cdot C \cdot \Delta T \]

65. What mass of sodium fluoride, NaF, is needed to prepare 250 mL of a solution that is 3.0 % w/v?
   - a. 83 g
   - b. 7.5 g
   - c. 1.3 g
   - d. 3.15 g
   - e. 0.18 g

\[ (250 \text{ mL})(\frac{3.0}{100 \text{ mL}}) = 7.5 \text{ g} \]

66. How much heat is produced when 0.050 moles of potassium bromide are formed in this reaction?

\[ 2 \text{ K} (s) + \text{ Br}_2 (l) \rightarrow 2 \text{ KBr} (s) \quad \Delta H = -188.4 \text{ kcal} \quad \text{exothermic} \]

   - a. 9.4 kcal
   - b. 3.7 kcal
   - c. 0.26 kcal
   - d. 1.7 kcal
   - e. 94 kcal

\[ (0.050 \text{ mol KBr})(\frac{188.4 \text{ kcal}}{2 \text{ mol KBr}}) = 4.71 \text{ kcal} \]
Using a #2 pencil, darken the balloon on the answer sheet corresponding to the best answer.

\[ \frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \quad PV = nRT \quad R = 0.0821 \text{ L atm/mol K} \quad 1 \text{ atm} = 760 \text{ torr} \]

<table>
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</tr>
</thead>
</table>

61. The pressure on a sample of gas with fixed volume is 40.0 torr when the temperature is 8.00 K. What is the temperature when $P$ is 50.0 torr?

a. 6.40 K  b. 10.0 K  c. 320. K  d. 400. K  e. 12.5 K

\[ \frac{P_1}{T_1} = \frac{P_2}{T_2} \quad T_2 = \frac{P_2}{P_1} T_1 = \frac{50 \text{ torr}}{40 \text{ torr}} (8 \text{ K}) \]

\[ T_2 = 10 \text{ K} \]

62. What is the temperature when 7.50 moles of argon gas have a pressure of 3.0 atm and the volume is 6.00L?

a. 0.812 K  b. 11.1 K  c. 29.2 K  d. 45.7 K  e. 183 K

\[ PV = nRT \quad T = \frac{PV}{nR} \]

\[ T = \frac{(3 \text{ atm})(6 \text{ L})}{(7.5 \text{ mol})(0.0821 \text{ L atm/mol K})} \]

\[ T = 29.2 \text{ K} \]

63. Which will have only London Dispersion forces acting between molecules in a sample of the gas?

a. methane, CH\(_4\)  

\( \text{non polar} \)

b. methanol, CH\(_3\)OH  

c. ammonia, NH\(_3\)

d. a and b  

e. b and c

64. How much heat must be removed to completely freeze 5.00 g of liquid benzene at its melting point? Note: The melting point for pure benzene is 5.5°C?

a. 1980 J  

\( \text{Liq} \rightarrow \text{solid at mp} \)

\( \text{no change in temp.} \)

\( \text{ent of heat is from heat of fusion.} \)

\( (5.00 \text{ g})(128 \text{ J/g}) = 640 \text{ J} \)

b. 1640 J  

c. 3520 J  

d. 25.6 J  

e. 48.1 J

65. What mass of lithium fluoride, LiF, is needed to prepare 350.0 g of a solution that is 4.00 % w/w?

a. 4.0 g  

\( \text{4.8 g solid} \)

\( \text{350.0 g solution} \)

b. 3.73 g  

c. 140. g  

d. 87.5 g  

e. 1.04 g

66. How much heat is released when 0.65 moles of NO gas decompose in this reaction?

\[ 2 \text{NO} (g) \rightarrow \text{N}_2 (g) + \text{O}_2 (g) \quad \Delta H = -43.0 \text{ kcal} \]

\[ \text{exothermic} \]

a. 86 kcal  

b. 66 kcal  

c. 0.26 kcal  

d. 22 kcal  

e. 4 kcal

\[ (0.65 \text{ mol NO})(43 \text{ kcal/2 mol NO}) = 13.975 \text{ kcal} \]

\[ 2\text{NO} \rightarrow \text{N}_2 + \text{O}_2 + 43 \text{kcal} \]
Using a #2 pencil, darken the balloon on the answer sheet corresponding to the best answer.

\[ P_1V_1/T_1 = P_2V_2/T_2 \quad PV = nRT \quad R = 0.0821 \text{ L atm/mol K} \quad 1 \text{ atm} = 760 \text{ torr} \]

**Benzenene:**
- Heat of fusion is 128 J/g
- Heat of vaporization is 398 J/g
- \( q = m \Delta H/T \)
- \( C_{\text{benzene}} = 1.749 \text{ J/g}^\circ \text{C} \)

61. A sample of gas trapped in a syringe has a pressure of 3.00 atm when the volume is 25.0 mL. What is the pressure if the volume is 15.0 mL?
   - a. 0.20 atm
   - b. 20 atm
   - c. 0.56 atm
   - d. 1.00 atm
   - e. 1.80 atm
   - \( P_1V_1 = P_2V_2 \)
   - \( P_2 = \frac{P_1V_1}{V_2} = \frac{(3 \text{ atm})(25 \text{ mL})}{15 \text{ mL}} \)
   - \( P_2 = 5 \text{ atm} \)

62. What is the volume when 3.95 moles of krypton gas at 90.0 K have a pressure of 5.00 atm?
   - a. 5.84 L
   - b. 0.0180 L
   - c. 9.35 L
   - d. 146 L
   - e. 55.5 L
   - \( PV = nRT \)
   - \( V = \frac{nRT}{P} = \frac{(3.95 \text{ mol})(0.0821 \text{ L atm/mol K})(90 K)}{5 \text{ atm}} \)
   - \( V = 5.837 \text{ L} \)

63. Which is (are) capable of hydrogen bonding interactions?
   - a. methanol, CH₃OH
   - b. ammonia, NH₃
   - c. chloroform, CHCl₃
   - Yes, must be polar and have H-O, H-N, H-F bonds.
   - d. a and b
   - e. all of the above

64. How much heat is released when 3.00 g of benzene vapor condenses at its boiling point? Note: the boiling point for benzene is 80.1°C.
   - a. 384 J
   - b. 1190 J
   - c. 420 J
   - d. 672 J
   - e. 926 J
   - \( (3.00 \text{ g})(\frac{395.5 \text{ J}}{\text{ g}}) = 1185 \text{ J} \)

65. What mass of sodium fluoride, NaF, is needed to prepare 350 mL of a solution that is 4.00 % w/v?
   - a. 1.7 g
   - b. 7.5 g
   - c. 1.1 g
   - d. 88 g
   - e. 14 g
   - \( \text{mass} = \frac{\text{mass} \% \times \text{volume}}{100} \)
   - \( (350 \text{ mL})(\frac{4 \text{ g}}{\text{mol}}) = 14 \text{ g} \)

66. How much heat is needed to decompose 1.2 moles of copper (II) oxide, CuO, in this reaction?
   - \( 4 \text{ CuO (s)} \rightarrow 2 \text{ Cu}_2\text{O (s)} + \text{ O}_2 (g) \)
   - \( \Delta H = 68.8 \text{ kcal} \)
   - \( \text{a. 83 kcal} \)
   - \( \text{b. 21 kcal} \)
   - \( \text{c. 280 kcal} \)
   - \( \text{d. 57 kcal} \)
   - \( \text{e. 17 kcal} \)
   - \( 4 \text{ CuO} + 68.8 \text{ kcal} \rightarrow 2 \text{ Cu}_2\text{O} + \text{ O}_2 \)
   - \( (1.2 \text{ mol CuO})(\frac{68.8 \text{ kcal}}{4 \text{ mol CuO}}) = 20.64 \text{ kcal} \)