**Quiz 9A**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. Name three properties of a solid (3 points):

Answer will vary.

|  |  |
| --- | --- |
| Compound | Melting Point (°C) |
| HI | -50.8 |
| HBr | -88.5 |
| HCl | -114.8 |
| HF | -83.1 |

1. Explain the observed trend in the melting points of the alkyl halogens. Why is HF atypical (5 points)?

As the molecular mass increases from Cl to I, the greater the London-dispersion forces present, which will increase the boiling point as observed. However, HF is the only compound listed that has the ability to form hydrogen bonds, which explains the anomaly in the trend.

1. In an experiment, zinc and excess hydrochloric acid reacted and 243 mL of hydrogen gas was collected at 30 °C. The barometric pressure was 767.0 mm Hg. At a water temperature of 30 °C the partial pressure of the water vapor is 31.8 torr (12 points).
	1. What is the partial pressure of hydrogen gas in mm Hg?

$$P\_{total}=P\_{H\_{2}O}-P\_{H\_{2}}⇒P\_{H\_{2}}=P\_{total}-P\_{H\_{2}O}$$

$$P\_{H\_{2}}=767.0 mm Hg-31.8 torr×\frac{1 mm Hg}{1 torr}=735.2 mm Hg$$

* 1. Write the balanced chemical equation.

Zn (s) + 2 HCl (aq) → ZnCl2 (aq) + H2 (g)

* 1. What mass of zinc reacted with excess hydrochloric acid?

$$PV=nRT⇒n\_{H\_{2}}=\frac{P\_{H\_{2}}V\_{H\_{2}}}{RT\_{H\_{2}}}$$

$$n\_{H\_{2}}=\frac{(735.2 mm Hg)(243 mL)}{\left(0.08206\frac{L atm}{mol K }\right)\left(30+273\right)K}×\frac{1 atm}{760 mm Hg}×\frac{1 L}{1000 mL}$$

$$n\_{H\_{2}}=\frac{(735.2 mm Hg)(243 mL)}{\left(0.08206\frac{L atm}{mol K }\right)(303 K)}×\frac{1 atm}{760 mm Hg}×\frac{1 L}{1000 mL}$$

$$n\_{H\_{2}}=0.009454184 mol H\_{2}×\frac{1 mol Zn}{1 mol H\_{2}}×\frac{65.832 g Zn}{1 mol Zn}$$

$$n\_{H\_{2}}=0.622387824 g Zn≈0.622 g Zn$$