

1. Brass has a density of  $8.40 \text{ g/cm}^3$  and a specific heat of  $0.385 \text{ J/g}^\circ\text{C}$ . A  $15.2 \text{ cm}^3$  piece of brass at an initial temperature of  $163^\circ\text{C}$  is dropped into an insulated container with water initially at  $23^\circ\text{C}$ . If the final temperature of the brass-water mixture is  $50^\circ\text{C}$ , what is water mass? (specific heat of water  $4.18 \text{ J/g}^\circ\text{C}$ )

- a) 27.22   b) 35.24   c) 49.22   d) 52.52   e) 61.07



$m$  {

$$d = 8.40 \text{ g/cm}^3$$

$$c = 0.385 \text{ J/g}^\circ\text{C}$$

$$V = 15.2 \text{ cm}^3$$

$$T_i = 163^\circ\text{C}$$

$$T_f = 50^\circ\text{C}$$

$T_i = 23^\circ\text{C}$   
 $T_f = 50^\circ\text{C}$   
 $m = ?$   
 $c = 4.18$

$$d = \frac{m}{V}$$

$$m = d \times V$$

$$q_{\text{brass}} = -q_{\text{H}_2\text{O}}$$

$$m_{\text{brass}} \cdot c \cdot \Delta T = - (m \cdot c \cdot \Delta T)$$

$$m_{\text{brass}} = d \times V = 8.40 \times 15.2 \text{ cm}^3 = 127.68 \text{ g}$$

$$127.68 \times 0.385 \times (50 - 163) = - (m \times 4.18 \times (50 - 23))$$

$$5554.7 = m \times 112.86$$

$$m = \frac{5554.7}{112.86} = \underline{49.22 \text{ g}}$$

2. A 0.288 g sample occupies a volume of 131 mL at 24.8°C and 753 mmHg. What is the molecular weight of this sample?

- a) 54.18    b) 63.32    c) 71.09    d) 80.12    e) 45.27

$$m = 0.288 \text{ g}$$

$$V = \frac{131 \text{ mL}}{1000} = 0.131 \text{ L}$$

$$P = \frac{753 \text{ mmHg}}{760} = 0.99 \text{ atm}$$

$$T = 24.8^\circ\text{C} + 273 = 297.8 \text{ K}$$

$$M_{wt} = ?$$

$$R = 0.0821$$

$$PV = nRT$$

$$PV = \frac{m}{M_r} RT$$

$$M_r = \frac{mRT}{PV}$$

$$= \frac{0.288 \times 0.0821 \times 297.8}{0.99 \times 0.131}$$

$$M_{wt} = 54.18 \text{ g/mol}$$

3. Which is false for the neutralization reaction between  $\text{H}_2\text{SO}_4$  and  $\text{Al}(\text{OH})_3$ ?

- a) The produced salt is  $\text{Al}_2\text{SO}_4$      b)  $\text{H}_2\text{SO}_4$  exhibits acidic properties.  
 c)  $\text{Al}(\text{OH})_3$  exhibits basic (alkaline) properties.  
 d) 6 moles of water are produced in the consumption of 2 moles  $\text{Al}(\text{OH})_3$ .  
 e) 3 moles of  $\text{Al}(\text{OH})_3$  are required for the 2 mol of  $\text{H}_2\text{SO}_4$  consumption.

produces  
Salt +  $\text{H}_2\text{O}$   
 ↓  
 acidic comp  
pH = 7



4. What is the stoichiometric ratio of Ba(OH)<sub>2</sub> to HCl in an acid-base titration?

- a) 0.5    b) 1    c) 1.5    d) 2    e) 2.5



$$\frac{\text{Ba(OH)}_2}{\text{HCl}} = \frac{1}{2} = 0.5$$

$$\frac{\text{HCl}}{\text{Ba(OH)}_2} = \frac{2}{1} = 2$$

5. A 1.00 g sample of Ne(g) at 1 atm pressure and 27°C is allowed to expand into an evacuated vessel of 2.50 L volume. Does the gas do work? (Ne: 20.18 g/mol)

- a) -275.73    b) -120.45    c) 0    d) 120.45    e) 275.73

$$m = 1.00 \text{ g}$$

$$p = 1 \text{ atm}$$

$$T = 27^\circ \text{C}$$

$$V = 2.50 \text{ L}$$

$$w = ?$$

$$w = -P_{\text{ext}} \Delta V$$

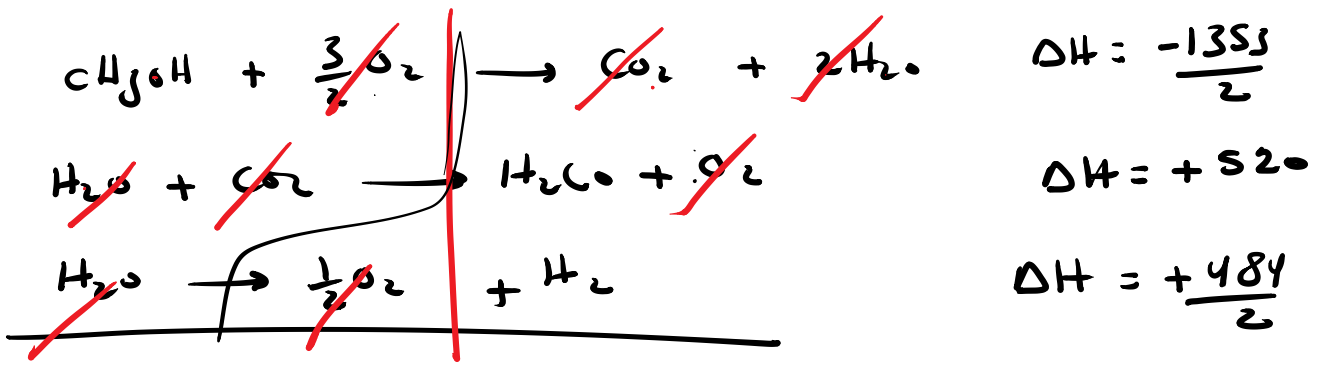
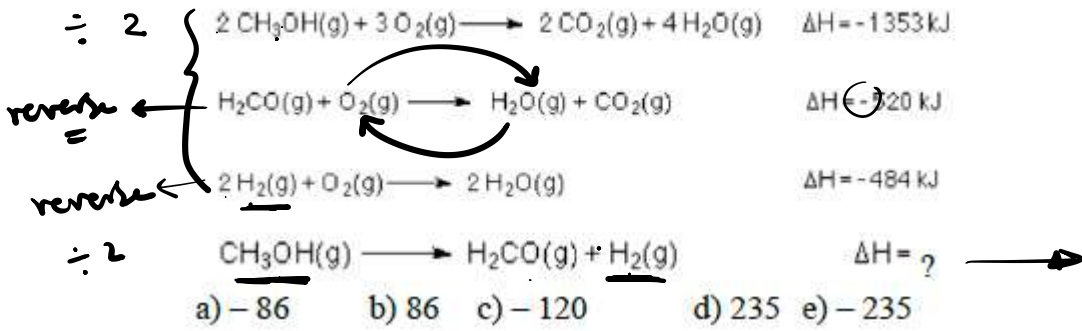
$$w = 0$$

$$P_{\text{ext}} = 0$$

adiabatic expansion

$$w = 0$$

6. By using the three reaction, find the last reactions  $\Delta H = ?$



**b**