Chemistry 141 Name key

Dr. Cary Willard

Quiz 1a (20 points) February 4, 2014

1. (6 points) Let a small circle represent an atom of one type or element and a small square represent an atom of a second type or element. Make a drawing of
	1. A pure substance (a compound) composed of the two elements (in a one-to two ratio).

* 1. A heterogeneous mixture composed of the two elements.

1. (6 points) Mercury is often used in thermometers. The mercury sits in a bulb on the bottom of the thermometer and rises up a thin capillary as the temperature rises. Suppose a mercury thermometer contains 4.854 g of mercury and has a capillary that is 0.200 mm in diameter. How far does the mercury rise in the capillary when the temperature changes from 0.0oC to 25.0 oC? The density of mercury at these temperatures is 13.596 g/cm3 and 13.534 g/cm3, respectively.

1st find the total volume of mercury at each temperature

$$V\left(0℃\right)=4.854 g Hg×\frac{1 cm^{3}Hg}{13.596 g Hg}=0.3570 cm^{3}Hg$$

$$V\left(25℃\right)=4.854 g Hg×\frac{1 cm^{3}Hg}{13.534 g Hg}=0.3586 cm^{3}Hg$$

2nd find volume change when the mercury is heated

$$∆V=0.3586 cm^{3}Hg-0.3570 cm^{3}Hg=0.0016 cm^{3}Hg$$

3rd find additional length of thermometer filled by this increased volume (mercury rise).

$$area of column=πr^{2}=π\left(0.0100 cm\right)^{2}=3.14 ×10^{-4}cm^{2}$$

$$length=\frac{0.0016 cm^{3}Hg}{3.14 ×10^{-4}cm^{2}}=5.1 cm$$

1. (8 points) Suppose you design a new thermometer called the X thermometer. On the GC scale the boiling point of water is 147oGC and the freezing point of water is 15oGC. At what temperature will the readings on the Celsius and GC thermometers be the same?

147oGC

15oGC

132oGC

100oC

0oC

100oC

XoGC

1st determine how many oGC above the freezing point of water

 XoGC is (X-15)oGC above the freezing point of water

2nd Convert oGC into oC and oCC

$$\left(X-15\right)°GC×\frac{100℃}{132°GC}=Y℃ above FP=Y℃ (Adding 0℃ changes nothing)$$

3rd Set oGC = oC and solve for X

$$\left(X-15\right)°GC×\frac{100℃}{132°GC}=X℃ $$

$$\left(X-15\right)°GC=\left(\frac{132°GC}{100℃}\right)X℃=\left(1.32\right)X°GC$$

$$-15°GC=\left(1.32X-1X\right)°GC=\left(0.32\right)X°GC$$

$$X°GC=\frac{-15°GC}{0.32}=-47°GC=-47℃$$

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Quiz 1b (20 points) February 4, 2014

1. (6 points) Let a small circle represent an atom of one type or element and a small square represent an atom of a second type or element. Make a drawing of
	1. A pure substance (a compound) composed of the two elements (in a one-to two ratio).

* 1. A heterogeneous mixture composed of the two elements.

1. (6 points) Mercury is often used in thermometers. The mercury sits in a bulb on the bottom of the thermometer and rises up a thin capillary as the temperature rises. Suppose a mercury thermometer contains 5.854 g of mercury and has a capillary that is 0.200 mm in diameter. How far does the mercury rise in the capillary when the temperature changes from 0.0oC to 25.0 oC? The density of mercury at these temperatures is 13.596 g/cm3 and 13.534 g/cm3, respectively.

1st find the total volume of mercury at each temperature

$$V\left(0℃\right)=5.854 g Hg×\frac{1 cm^{3}Hg}{13.596 g Hg}=0.4306 cm^{3}Hg$$

$$V\left(25℃\right)=5.854 g Hg×\frac{1 cm^{3}Hg}{13.534 g Hg}=0.4325 cm^{3}Hg$$

2nd find volume change when the mercury is heated

$$∆V=0.4325 cm^{3}Hg-0.4306 cm^{3}Hg=0.0019 cm^{3}Hg$$

3rd find additional length of thermometer filled by this increased volume (mercury rise).

$$area of column=πr^{2}=π\left(0.0100 cm\right)^{2}=3.14 ×10^{-4}cm^{2}$$

$$length=\frac{0.0019 cm^{3}Hg}{3.14 ×10^{-4}cm^{2}}=6.0 cm$$

1. (8 points) Suppose you design a new thermometer called the X thermometer. On the GC scale the boiling point of water is 162oGC and the freezing point of water is 25oGC. At what temperature will the readings on the Celsius and GC thermometers be the same?

162oGC

25oGC

137oGC

100oC

0oC

100oC

XoGC

1st determine how many oGC above the freezing point of water

 XoGC is (X-15)oGC above the freezing point of water

2nd Convert oGC into oC and oCC

$$\left(X-25\right)°GC×\frac{100℃}{137°GC}=Y℃ above FP=Y℃ (Adding 0℃ changes nothing)$$

3rd Set oGC = oC and solve for X

$$\left(X-25\right)°GC×\frac{100℃}{137°GC}=X℃ $$

$$\left(X-25\right)°GC=\left(\frac{137°GC}{100℃}\right)X℃=\left(1.37\right)X°GC$$

$$-25°GC=\left(1.37X-1X\right)°GC=\left(0.37\right)X°GC$$

$$X°GC=\frac{-25°GC}{0.37}=-67°GC=-67℃$$