Section 1.

1. moles of ammonia in 58.23g of NH_3 gas.

$$\text{moles} = \left(\frac{\text{Mass of Ammonia}}{\text{Relative molar Mass}}\right) = \left(\frac{58.23g}{17g/mole}\right) = \underline{\underline{3.425 moles}}$$

2. Moles of silver atoms found in 1.0 pound of silver

1 pound = 453.592g

$$\text{moles of silver} = \left(\frac{\text{mass of silver}}{\text{Relative molecular mass}}\right) = \left(\frac{453.592g}{107.8682g/mole}\right)$$

$$= \underline{4.205 \text{ moles}}$$

3. Mass of Zinc = (moles of Zinc × Relative molecular mass).

$$= (2.3 \text{moles} \times 65.38g/mol)$$

$$= \underline{\underline{150.37g}} \text{ of Zinc}$$

4. Grams of gold found in 2.00cm³ block of Gold.

$$D = \frac{m}{v} \; ; \quad \text{mass} = (\text{Density} \times \text{volume}).$$

$$= (19.3g/cm^3 \times 2.00cm^3)$$

$$= \underline{38.6g} \text{ of gold.}$$

5. moles of water found in 10.0ml of water

$$\text{mass of water} = (D \times v) = (0.998g/ml \times 10.0mL)$$

$$= 9.98g \text{ of water}$$

$$\text{moles of water} = \left(\frac{\text{mass}}{\text{Relative molecular mass}}\right)$$

$$= \frac{9.98g}{18g/mole} = 0.554 \text{ moles of water.}$$

6. moles of hydrogen atom found in 1.25 moles of water.

$$2H_2 + O_2 \longrightarrow 2H_2O$$

mole ratio of $H_2 : H_2O$

2 : 2.

Percentage of H_2 in water

$$\frac{2}{18} \times 100\%$$

11.11%

100% → 1.25 moles

11.11% → x

$$\frac{11.11\% \times 1.25 \text{ moles}}{100\%} = \underline{0.138 \text{ moles}}$$

7. Moles of Sulphate ions found in 0.85moles of sodium Sulphate.

100% of sodium Sulphate = 142g/mole
X 46g/mole.

$\frac{46g/mol}{142g/mo} \times 100\%$ = 32.39% of S~~odium~~ Sulphate ion.

100% → 0.85moles
32.39% X

$\frac{32.39\% \times 0.85\,moles}{100\%}$ = ~~0.275 moles of~~ 0.19 moles.

8. Moles of sodium ion found in 1.59 moles sodium phosphate Na_3PO_4.

100% = 163.94g/mol.
X 69g/mole

$\left(\frac{69g/mol \times 100\%}{163.94g/mol}\right)$ = 42.1%.

100% → 1.59 moles
42.1% X

$\left(\frac{42.1\% \times 1.59\,moles}{100\%}\right)$ = 0.265 moles of Sodium ion.

9. Moles of Nitrate ion are found in 25.6.g of $Zn(NO_3)_2$.

100% = 189.36g/mol
X 124g/moles

$\left(\frac{100\% \times 124g/mole}{189.36g/mole}\right)$ = 65.48%.

100% — 25.6g ~~mo~~
65.48% X

$\left(\frac{65.48\% \times 25.6g}{100\%}\right)$ = 16.76g of Nitrate.

Moles of Nitrate ion = $\left(\frac{16.76g/\cancel{mol}}{124g/mol}\right)$ = 0.135 moles of Nitrate ion.

10. Concentration of NaCl.

$12.5g \rightarrow 250.00 ml$

$\quad\;\; X \quad 1000 ml.$

$\left(\frac{12.5g \times 1000 ml}{250.00 ml}\right) = 50.$

$moles = \left(\frac{mass}{Rmm}\right)$

$= \left(\frac{12.5g}{58.5g/mol}\right) = \underline{0.2136 moles}$

$molarity = \left(\frac{moles \times 1000}{250}\right) = \left(\frac{0.2136 moles \times 1000 ml}{250 ml}\right)$

$= \underline{\underline{0.854M}}.$

11. concentration in Mg/ml of NaCl.

$concentration = \frac{moles}{volume}.$

$moles = \frac{12.5}{58.44} = 0.2138 g/mol.$

$concentration = \frac{0.2138 g/mol \times 1000}{250 ml} = 0.8556 Mg/ml$

12. concentration (in units % m/v)

mass = 12.5g NaCL

volume = 250 mL.

$Molarity = \left(\frac{moles \times Volume}{1000}\right)$

$moles\ of\ NaCl. = \left(\frac{12.5g}{58.5g/mole}\right) = 0.214 moles.$

$Concentration = \left(\frac{0.214 moles \times 250 mL}{1000 mL.}\right)$

$= \underline{0.053 Moles/Litre}.$

13)

$M = \frac{\text{moles}}{\text{litres}} \times 1000$

$1.2 = \frac{x}{0.5L} \times 1000$

$\frac{0.5 \times 1.2}{1000} = x.$

6.0×10^{-4}

$\text{moles} = \frac{\text{mass}}{\text{R.A.M.}}$

$6.0 \times 10^{-4} = \frac{x}{58.44.}$

$x = 0.035$ grams.

14)

$M = \frac{\text{moles}}{\text{Litres}} \times 1000$

$0.75 = \frac{x}{0.25} \times 1000$

$\frac{0.75 \times 0.25}{1000} = x.$

$\text{moles} = 1.875 \times 10^{-4}$

$\text{moles} = 1.875 \times 10^{-4} \times 180$

$= 0.03375$ grams.

15) $\frac{15g}{100mL} \times 150mL = 22.5g$

$= 22.5$ grams.

16) a) $\text{moles} = \frac{1.2 \times 0.025}{1000} = 3.0 \times 10^{-5}$

b) $\text{moles} = \frac{0.025 \times 2.5}{1000} = 6.25 \times 10^{-5}$

(a) has more sodium ions than (b)

17) 100ml of 25% of solute A.

17 50.0ml of 1.5M NaCl

18) 100ml of 25% of solute A.

19) a) 14% glucose solution

20) 15.5% of glucose = 15.5×10 = 155g/L

180 gram → 1000ml
155gram → ?

$$\frac{155\times1000}{180} = \underline{\underline{861.1}}$$

21) 0.5115M → %(m/v).
multiply by 10.
5.115%.

22). $0.682mg/ml = \frac{x}{25.5ml}$.

$x = 0.682mg/ml \times 25.5 =$

$\frac{17.391mg.}{1000}$

0.017391g

23) $\frac{0.000g}{0.0021L} \times 10 = 33.33\%(w/v)$

24) $g =$ moles x R.A.M.

0.012×166.00

$= 1.992g.$

$\frac{1.992g}{0.1L} \times 10 = 199.2\%.$

25) a. $8.5g/L = \frac{a}{0.5L}.$

~~0~~$8.5 \times 0.5 = 4.25g.$

moles $= \frac{4.25g}{58.44}$

$= 0.073$ moles.

26) 4.25grams.

27) ~~8.5g/~~

$8.5g/L = \frac{x}{0.075}$

$x =$ ~~x~~8.5×0.075

$= 0.6375g.$

moles $= \frac{0.6375}{58.44}$

$= 0.0109$ moles

28). $8.5g/L = \frac{x}{0.002}$.

$x = 8.5 \times 0.002$

$= 0.017$ grams.

29). $4.5\% \times 10 = 45g/L$

45g → ~~1000~~ 1000ml

? → ~~0.25~~ 250ml

$\frac{45g \times \cancel{0.}250ml}{\cancel{1000}\ 1000mL}$

28). $8.5g/L = \frac{x}{0.002}$

$x = 8.5 \times 0.002$

$= 0.017$ grams.

29). $4.5\% \times 10 = 45g/L$

45g → 1000ml

? → 250ml

$\frac{45g \times 250ml}{1000mL}$

$= 11.25$ grams.

30). Grams of vit c.

1 floz = 29.574ML

16 floz

$\left(\frac{16floz \times 29.57mL}{1floz}\right)$

473.12ML.

120mg → 236 mL

? → 473.12 mL

$= \left(\frac{120mg \times 473.12mL}{236mL}\right) = 240.57$ Mg

mass in g $= \left(\frac{240.57mg}{1000}\right) = \underline{0.24057}g$

31) $0.0852\text{ moles} \rightarrow 1000\text{ml}$

$? \rightarrow 100\text{ml}$

$$\frac{0.0852 \times 100}{1000} = 8.52 \times 10^{-3}\text{ moles}$$

32) $0.0852 \rightarrow 1L$

$? \rightarrow 0.28l$

0.0852×0.25

$= 0.23856\text{ moles.}$

$\text{grams} = 0.23856 \times 176.14.$

$= 42.02\text{ grams.}$

33.

100mg convert to g. $= \left(\frac{100mg}{1000}\right) = 0.1g$ Moles of NaCl $= \left(\frac{0.1g}{58.5g/mol}\right)$

$= 1.7094 \times 10^{-3}$ moles $\times 1000$ to convert to millimoles

$= 1.7094$ millimoles.

$1.7094mm \rightarrow 236.6 ML$

$X \quad 1000 ML$

$$\left(\frac{1.7094mm \times 1000 ML}{236.6 ML}\right) = 7.24 \text{ mEq/L}.$$ of sodium. Ion.

34. Concentration in mEq/L of Sodium Ion.

1 Floz = 29.5735 ML.

16Floz + .

$$\left(\frac{16 Floz \times 29.5735 ML}{1 Floz}\right) = 473.176 ML$$

$1.7094mm \rightarrow 473.176 ML$

$X \quad 1000 ML$

$$\left(\frac{1.7094 \times 1000 ML}{473.176 ML}\right) = 3.612 \text{ mEq/L}$$

35. Concentration of Potassium in mEq/L.

mass of K $= \left(\frac{100mg}{1000}\right) = 0.1g$ of K moles $= \left(\frac{0.1g}{75.5g/mole}\right)$

$= \left(1.325 \times 10^{-3} \text{ moles} \times 1000\right) = 1.325$ millimoles.

$1.325 mm \rightarrow 250 ML$

$X \quad 1000 ML$

$$\left(\frac{1.325mm \times 1000 ML}{250 ML}\right) = 5.298 \text{ mEq/L}.$$ of K^+

Concentration of Mg^{2+} in mEq/L.

$\left(\frac{100mg}{1000}\right) = 0.1g$ of MgCl. moles $= \left(\frac{0.1g}{59.5g/mole}\right) = 1.681\times10^{-3}$ moles

$(1.681\times10^{-3} \times 1000) = 1.681$ millimoles

1.681mm → 236.6 ML
X 1000 ML

$\left(\frac{1.681mm \times 1000\ ML}{236.6ML}\right) = (7.103~~\times10~~ \times 2$ ions of Mg)

$= \underline{\underline{14.21\ mEq/L}}$ of Mg^{2+}

37. milligrams of Na^+
Concentration = 20.0 mEq/L

20.0 MEq/L → 1000 ML
X 10 ML

$(0.2$ millimoles $\times 10^{-3})$ moles
2.0×10^{-4} moles

mass in g $= (2.0\times10^{-4}$ moles $\times 58.5g/mole)$
$\underline{\underline{0.0117\ g}}$ of NaCl.

mass in milligrams $= (0.0117\times1000) = \underline{\underline{11.7\ mg}}$

38. concentration of Ca^+.
20.0 mEq/L → 1000ML
X 10 ML

$\left(\frac{0.2\ mm}{1000}\ ~~\times1000~~\right) = 2.0\times10^{-4}$ moles

mass in g $= \left(2.0\times10^{-4}\right.$ moles $\times 5~~9~~.5g/mole$) $= (0.0151g \times 1000)$ mg

$\left(\frac{15.1mg}{2}\right.$ of $\left.Ca^{2+}\right) = 7.55$ Mg.

39.

39. Mass in Mg of Calcium ions in a Pint of blood.

$\left(\frac{5.0 mEq/L}{2}\right) = 2.5$ mEq/L. 2.5 mEq/L → 1000 ML

X 473 ML

$\left(\frac{1.1825 \text{ millimoles}}{1000}\right) = 1.1825 \times 10^{-3}$ moles.

mass $= (1.182 \times 10^{-3}$ moles $\times 75.5$ g/mole$)$

$= (89.27 \times 10^{-3}$ g $\times 1000) = \underline{89.27}$ Mg of Ca.

40. Moles Mg^{2+} required to make 2.5 mEq/L.

$\left(\frac{2.5 mEq/L}{2}\right) = 1.25$ mEq/L. 1.25 mEq/L → 1000 ML

100 ML

= 0.125 millimoles.

$\left(\frac{0.125}{1000}\right) = 1.25 \times 10^{-4}$ moles of Mg^{2+}.

mass in g $= (1.25 \times 10^{-4} \times 59.5$ g/mole$) = \underline{7.439} \times 10^{-3}$ g

41. milliliters of stock solution (1.5M) needed.

$M_1V_1 = M_2V_2$

$\frac{1.5M \times V_1}{1.5M} = \frac{0.05M \times 250ML}{1.5M}$

$V_1 = \underline{8.33 ML}$.

42. milliliters of 0.6M stock solution needed.

$M_1V_1 = M_2V_2$

$0.6M \times V_1 = 3.0M \times 10.0ML$

$V_1 = \left(\frac{3.0M \times 10ML}{0.6M}\right)$

$= \underline{50.0ML}$.

43. Molality of $KIO_3 = \left(\frac{0.535g}{214g/mole}\right) = 2.5\times10^{-3}$ moles.

2.5×10^{-3} moles $\rightarrow$ 250 ML

X 1000 ML

$M_1 = \underline{\underline{0.01M}}$

$M_1V_1 = M_2V_2$.

$(0.01M \times 20ML = M_2 \times 150ML)$

$M_2 = \left(\frac{0.01 \times 20ML}{150ML}\right)$

$= \underline{\underline{1.33\times10^{-3}M}}$

44. $M_1V_1 = M_2V_2$.

$(5.0ML \times 1.5M = 250ML \times M_2)$

$\left(\frac{5.0ML \times 1.5M}{250ML}\right) = 0.03M$.

moles = $\underline{\text{Molarity} \times \text{Volume (L)}} = \left(\frac{0.03M \times 250ML}{1000ML}\right)$

$= 7.5\times10^{-3}$ moles.

Mass = (moles × Relative molecular mass)

$(7.5\times10^{-3}\text{ moles} \times 58.5 g/mole)$.

$= 0.4\underline{\underline{38}}8g$ of NaCl.

Session 6.

45. PH of an acidic solution with $[H^+] = 1.3 \times 10^{-4} M$.

$PH = -\log[H^+]$

$= -\log[1.3 \times 10^{-4} M)$. $= \underline{\underline{3.89}}$.

46. PH of basic solution with $[H^+] = 2.75 \times 10^{-12} M$.

$PH = -\log[H^+]$

$= -\log\{2.75 \times 10^{-12} M] = 11.56$.

47. PH of basic solution if $POH = 3.77$.

$[OH^-] = 10^{-POH}$. $[H^+][OH^-] = 1 \times 10^{-14}$.

$= 10^{-3.77}$. $H^+ = \left(\frac{1 \times 10^{-14}}{1.698 \times 10^{-4}}\right) = 5.89 \times 10^{-11}$

$= 1.698 \times 10^{-4}$.

$PH = -\log[H^+]$

$= -\log[5.89 \times 10^{-11}) = \underline{\underline{10.23}}$.

48. POH of basic solution g the $[OH^-] = 0.0125M$.

$POH = -\log[OH^-]$

$= -\log[0.0125M)$.

$= \underline{\underline{1.903}}$

49. PH of a basic solution g the $[OH^-] = 0.0125M$.

$pOH = -\log[OH^-]$

$= -\log[0.0125M)$

$= 1.903$.

$PH = 14 - pOH$ $= \underline{\underline{12.09}}$

$= 14 - 1.90$

50. PH of 50.0ML of 0.01M HCL strong acid solution.

$PH = -\log[H^+]$

$= -\log[0.01M] = \underline{\underline{2}}.$

51. PH of ~~22×10^{-4}M Ca~~ 25ML of 0.1M H_2SO_4 strong Acid solution.

$PH = -\log[H^+]$

$= -\log[0.1M] = 1.$

52. PH 2.2×10^{-4}M $Ca(OH)_2$ strong base solution.

$PH = -\log[H^+]$

$= -\log[2.2\times10^{-4}] = 3.66.$

$PH = (14 - 3.66) = \underline{\underline{10.34}}.$

53. concentration of a monoprotic Acid

$PH = 1.42.$

$PH = -\log[H^+]$

$\frac{1.42}{-\log} = \frac{-\log[H^+]}{-\log}$

$[H^+] = 26.30M \qquad = 26M.$

54.

$M_1V_1 = M_2V_2$

$(26.30M \times 20.0ML = 15.5ML \times M_2)$

$M_2 = \left(\frac{26.30M \times 200ML}{15.5ML}\right) = 33.94M.$

$PH = -\log[H^+]$

$= -\log[33.94M)$

$= \underline{\underline{1.53}}.$

55.

$PH = 11{\cdot}40$

$PH = -\log[H^+]$

$$\frac{11{\cdot}40}{-\log} = \frac{-\log[H^+]}{-\log}$$

$= 2{\cdot}51 \times 10^{11}$

$= \underline{\underline{2{\cdot}5 \times 10^{11}}}\,M$

56.

$M_1V_1 = M_2V_2$

$(2{\cdot}5 \times 10^{11}M \times 20mL = M_2 \times 15{\cdot}5mL)$

$$M_2 = \left(\frac{2{\cdot}5 \times 10^{11}M \times 20mL}{15{\cdot}5\,mL}\right) = 3{\cdot}23M$$

$PH = -\log[H^+]$

$= -\log[3{\cdot}23M)$

$PH = 0{\cdot}51$