Molarity Practice Problems

6

1) How many grams of potassium carbonate are needed to make 200 mL of a 2.5 M solution?

conc

$2.5M = \frac{X \text{ moles } K_2CO_3}{.200L}$

$X = .50 \text{ moles } K_2CO_3$

$\frac{.50 \text{ moles } K_2CO_3}{1} \times \frac{138.21g}{1 \text{ mole}} = \boxed{69.11g \ K_2CO_3}$

2) How many liters of 4 M solution can be made using 100 grams of lithium bromide? LiBr

$\frac{100g}{1} \times \frac{1 \text{ mol}}{86.84g} = 1.15 \text{ mol}$

$4M = \frac{1.15 \text{ mol}}{X \ L}$

$X = \boxed{.286 \ L} = 286 \text{ mL}$

3) What is the concentration of an aqueous solution with a volume of 450 mL that contains 200 grams of iron (II) chloride?

$FeCl_2$

$\frac{200g}{1} \times \frac{1 \text{ mole}}{126.75g} = 1.58 \text{ mol}$

$M = \frac{1.58 \text{ mol}}{.450L} = \boxed{3.51M}$

* has a mistake in the question

4) How many grams of ammonium sulfate are needed to make ~~a 0.25 M~~ 250 mL solution at a concentration of 6 M?

$(NH_4)_2SO_4$ 28.02, 8.08, 32.07, 64.00 = 132.17

$6M = \frac{X}{.250L}$

$X = 1.5 \text{ moles}$

$\frac{1.5 \text{ moles}}{1} \times \frac{132.17g}{1 \text{ mole}} = \boxed{198.26g}$

5) What is the concentration of a solution with a volume of 2.5 liters containing 660 grams of calcium phosphate?

$Ca_3(PO_4)_2$ 120.24, 61.94, 128.00 = 310.18

$\frac{660g}{1} \times \frac{1 \text{ mole}}{310.18g} = 2.13 \text{ moles}$

$\frac{2.13 \text{ moles}}{2.5L} = \boxed{.85M}$

6) How many grams of copper (II) fluoride are needed to make 6.7 liters of a 1.2 M solution?

CuF_2 63.55, 38.00 = 101.55g

$1.2M = \frac{X \text{ moles}}{6.7L}$

$X = 8.04 \text{ moles}$

$\frac{8.04 \text{ moles}}{1} \times \frac{101.55g}{1 \text{ mole}} = \boxed{816.46g}$

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7) How many liters of 0.88 M solution can be made with 25.5 grams of lithium fluoride?

LiF

MW = 25.939 g/mol

$25.5\,g\left(\frac{1\ mol}{25.939\,g}\right) = 0.983\ mol$

$V = \frac{n}{M} = \frac{0.983\ mol}{0.88\ M} = \boxed{1.12\ L}$

8) What is the concentration of a solution that with a volume of 660 mL that contains 33.4 grams of aluminum acetate?

$Al^{+3}(C_2H_3O_2)_3$

$Al(CH_3COO)_3$

MW = 204.114 g/mol

$33.4\,g\left(\frac{1\ mol}{204.114\,g}\right) = 0.164\ mol$

$M = \frac{n}{V} = \frac{0.164\ mol}{0.660\ L} = \boxed{0.25\ M}$

9) How many liters of 0.75 M solution can be made using 75 grams of lead (II) oxide?

+2 -2
PbO

MW = 223.199 g/mol

$75\,g\left(\frac{1\ mol}{223.199\,g}\right) = 0.336\ mol\ PbO$

$V = \frac{n}{M} = \frac{0.336\ mol}{0.75M} = 0.448L = \boxed{0.45\ L}$

$M = \frac{n}{V}$

10) How many grams of manganese (IV) oxide are needed to make a 5.6 liters of a 2.1 M solution?

+4 -2
MnO_2

MW 86.936 g/mol

$n = MV = (2.1\ M)(5.6\ L) = 11.76\ mol$ *

$(11.76\ mol)\left(\frac{86.936\,g}{1\ mol}\right) = \boxed{1022.37\ g}$ practical application

11) What is the concentration of a solution with a volume of 9 mL that contains 2 grams of iron (III) hydroxide?

+3 -1
$Fe(OH)_3$

MW = 106.868 g/mol

$2\,g\left(\frac{1\ mol}{106.868\,g}\right) = 0.0187\ mol$

$M = \frac{0.0187\ mol}{0.009\ L} = \boxed{2.08\ M}$

12) How many liters of 3.4 M solution can be made using 78 grams of isopropanol (C_3H_8O)?

MW = 60.0969 g/mol

$78\,g\left(\frac{1\ mol}{60.096\,g}\right) = 1.298\ mol$

$V = \frac{n}{M} = \frac{1.298\ mol}{3.4\ M} = \boxed{0.38\ L}$

13) What is the concentration of a solution with a volume of 3.3 mL that contains 12 grams of ammonium sulfite?

$(NH_4)_2SO_3$

MW = 116.135 g/mol

$12\,g\left(\frac{1\ mol}{116.135\,g}\right) = 0.103\ mol$

$M = \frac{n}{V} = \frac{0.103\ mol}{0.0033\ L} = \boxed{31.21\ M}$

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button. Remember that once you have