42.081 g/mol 53.064 g/mol

$$4\,C_3H_6 + 6\,NO \longrightarrow 4\,C_3H_3N + 6\,H_2O + N_2$$

propylene acrylonitrile

Calculate how many grams of acrylonitrile could be obtained from 651 kg of propylene, assuming there is excess NO present.

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1 - Convert 651 kg of propylene to moles using formula weight (and a kg to g conversion)
2 - Convert moles propylene to moles acrylonitrile using chemical equation.
3 - Convert moles acrylonitrile to mass using formula weight.

$42.081\,g\,C_3H_6 = mol\,C_3H_6$ | $4\,mol\,C_3H_6 = 4\,mol\,C_3H_3N$

$53.064\,g\,C_3H_3N = mol\,C_3H_3N$ | $kg = 10^3\,g$

$$651\,kg\,C_3H_6 \times \frac{10^3\,g}{kg} \times \frac{mol\,C_3H_6}{42.081\,g\,C_3H_6} \times \frac{4\,mol\,C_3H_3N}{4\,mol\,C_3H_6} \times \frac{53.064\,g\,C_3H_3N}{mol\,C_3H_3N} =$$

(1) (2) (3)

$$= \boxed{821000\,g\,C_3H_3N} \quad (821\,kg)$$

151.90 g/mol

$$10\,FeSO_4 + 2\,KMnO_4 + 8\,H_2SO_4 \rightarrow 5\,Fe_2(SO_4)_3 + 2\,MnSO_4 + K_2SO_4 + 8\,H_2O$$

How many mL of 0.250M potassium permangenate are needed to react with 3.36 g of iron(II) sulfate?

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1 - Convert 3.36g iron(II) sulfate to moles using formula weight.
2 - Convert moles iron(II) sulfate to moles potassium permangenate using chemical equation.
3 - Convert moles potassium permangenate to volume using molar concentration (0.250 M)

151.90 g $FeSO_4$ = mol $FeSO_4$ | 10 mol $FeSO_4$ = 2 mol $KMnO_4$ | 0.250 mol $KMnO_4$ = L

mL = 10^{-3} L

$$3.36\text{ g } FeSO_4 \times \frac{\text{mol } FeSO_4}{151.90\text{ g } FeSO_4} \times \frac{2\text{ mol } KMnO_4}{10\text{ mol } FeSO_4} \times \frac{\text{L}}{0.250\text{ mol } KMnO_4} \times \frac{\text{mL}}{10^{-3}\text{ L}} =$$

(1) (2) (3)

= **17.7 mL of 0.250 M $KMnO_4$**

Electrolytes and Ionic Theory

- electrolytes: substances that dissolve in water to form charge-carrying solutions

* Electrolytes form ions in solution - (ions that are mobile are able to carry charge!). These IONS can undergo certain kinds of chemistry!

IONIC THEORY

- the idea that certain compounds DISSOCIATE in water to form free IONS

What kind of compounds?

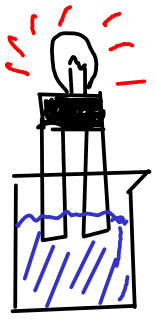
- Soluble ionic compounds
- Acids (strong AND weak)
- Bases (strong AND weak)

The ions formed may interact with each other to form NEW compounds!

Strong vs weak?

- If an electrolyte COMPLETELY IONIZES in water, it's said to be STRONG
- If an electrolyte only PARTIALLY IONIZES in water, it's said to be WEAK
- Both kinds of electrolyte undergo similar kinds of chemistry.

Ionic theory experiment



Simple conductivity tester: The stronger the electrolyte, the brighter the light.

SOME PURE COMPOUNDS (MOLECULAR AND IONIC)

DISTILLED WATER

No light. Pure water is a NONCONDUCTOR - it doesn't carry an appreciable electric current. (it's a neutral molecule)

SOLID SODIUM CHLORIDE

No light. Solid sodium chloride is a NONCONDUCTOR, since the ions in the solid are not free to move.

SOLID SUCROSE $C_{12}H_{22}O_{11}$

Like water, sucrose (a molecular compound) is a NONCONDUCTOR.

MOLECULAR AND IONIC SOLUTIONS

SODIUM CHLORIDE + WATER

Bright light. Sodium chloride - like other soluble ionic compounds - is an ELECTROLYTE. It breaks apart in water to form free ions that can carry charge.

SUCROSE + WATER

No light. Sucrose is a NONELECTROLYTE. Sucrose molecules do not break down in water to form ions. This is typical of most (but not all) molecular substances.

ACIDS

PURE (GLACIAL) ACETIC ACID

No light. Like water, acetic acid is a molecular substance and a nonconductor in the pure state.

ACETIC ACID + WATER

Dim light. Acetic acid is a WEAK ELECTROLYTE. Some acetic acid molecules react with water to form ions, allowing the solution to carry a current.

2M ACETIC ACID (AQUEOUS)

Somewhat dim light. Acetic acid is a weak electrolyte.

2M HYDROCHLORIC ACID (AQUEOUS)

Bright light. Hydrochloric acid is a strong electrolyte (or at least, stronger than acetic)