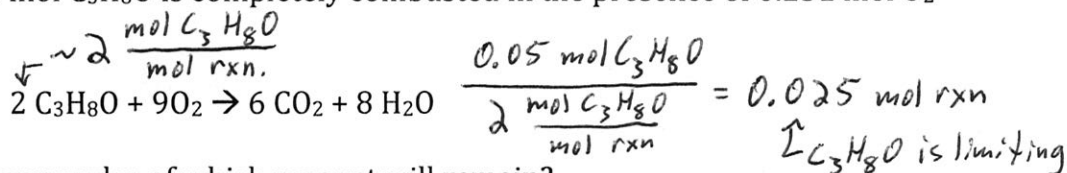


1) When 0.05 mol C_3H_8O is completely combusted in the presence of 0.231 mol O_2 according to:



how many moles of which reagent will remain?

$$\text{remaining } O_2 = 0.231 \text{ mol} - 9 \frac{\text{mol}}{\text{mol}} \cdot 0.025 \text{ mol} = 0.006 \text{ mol } O_2$$

$$\frac{0.231 \text{ mol } O_2}{9 \frac{\text{mol } O_2}{\text{mol rxn}}} = 0.02567 \text{ mol rxn}$$

2) How many moles of sucrose are present in 1 L of a sugar-water solution that is 15% sucrose by weight and has a density of 1058 kg/m³? FW(sucrose) = 342.3 g/mol, FW(water) = 18.015 g/mol.

$$1 \text{ L total} \cdot 1058 \frac{\text{g}}{\text{L}} \cdot \frac{0.15 \text{ g suc}}{\text{g total}} \cdot \frac{1}{342.3 \frac{\text{g suc}}{\text{mol suc}}} = 0.464 \text{ mol sucrose}$$

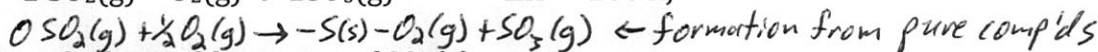
3) Given the volume of a cylinder is $V = \pi r^2 h$ (r is the radius of its base and h is its height), calculate the slopes of V vs. r (first blank) and V vs. h (second blank):

$$dV = \frac{\partial V}{\partial r} dr + \frac{\partial V}{\partial h} dh$$

$$\frac{\partial V(r,h)}{\partial r} = 2\pi r h \quad \frac{\partial V(r,h)}{\partial h} = \pi r^2$$

4) For changes that maintain $dV = 0$, then $dh =$ $-\frac{2\pi r h}{\pi r^2} dr = -\frac{2h}{r} dr$

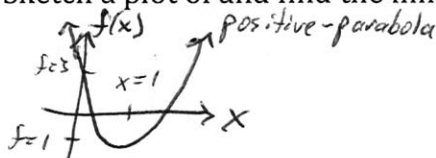
5) Given:



Calculate the heat of formation of $SO_3(g)$:

$$\Delta H_f = \frac{1}{2}(-200 \text{ kJ}) - (+300 \text{ kJ}) = -400 \text{ kJ}$$

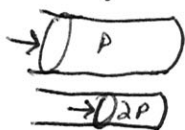
6) Sketch a plot of and find the minimum of the function: $f(x) = 2x^2 - 4x + 3$



$$\frac{df}{dx} = 4x - 4 = 0 \text{ at } x = 1$$

(1, 1) is the minimum

7) What kinds of information might be necessary to find the volume of a gas if its pressure is doubled by means of mechanical compression?



initial pressure, volume, temp., # moles?

final pressure, volume, temp., # moles?

- path between initial & final states? ...