Problem Set #3 2019-2020

1. a $6 \cdot 12 + 12 \cdot 1 + 6 \cdot 16 = 180\ g/mole$

↑ 6 Carbons ↑ 12 Hydrogens ↑ 6 Oxygens

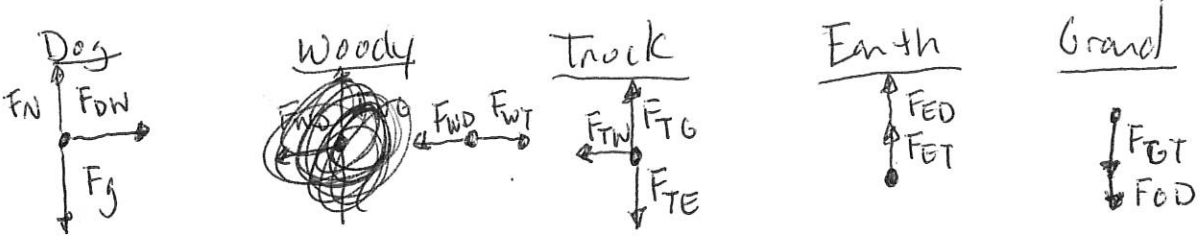
$$\frac{2.78\ moles}{1\ mole} \left| \frac{180\ g}{200\ g} \right| \frac{1\ cup}{} = 2.5\ cups$$

b. $$\frac{2.78\ moles}{1\ mole} \left| \frac{6.022 \times 10^{23}\ molecules}{} \right. = 1.67 \times 10^{24}\ molecules$$

2.

$F_N = F_{DG}$

$F_g = F_{DE}$



F_{DG}, F_{GD} F_{WD}, F_{DW}

F_{TG}, F_{GT} F_{TW}, T_{WT}

F_{ET}, F_{TE}

F_{ED}, F_{DE}

3. $F_{net} = 1,500N = 400N + 300N + 250N + X$

$1,500N = 950N + X$

$550N = X$

4. male mass = 80 kg
female mass = 55 kg
female acceleration = $8\ m/s^2$

Equal and opposite forces

$F_{mf} = -F_{fm}$

$F_{mf} = 80 \cdot a_m = -55 \cdot 8$

$\frac{80 \cdot a_m}{80} = \frac{440}{80}$

$a_m = 5.5\ m/s^2$

5. Total mass of astronaut

$65 + 40 = 105\ kg$

Weight on Earth: $F_g = m \cdot g = 105 \cdot 9.8 = 1029\ N$

Weight on Mars: $F_g = \frac{GMm}{r^2} = \frac{6.67 \times 10^{-11} \cdot 6.4 \times 10^{23} \cdot 105}{(3.4 \times 10^6)^2}$

$= 387.7\ N$

The astronaut weighs ~641 N less