

Chem Review Questions - Peter Bailey

An evil robot, who for some reason does not know chemistry kidnaps you and then explains they will only let you go if you answer all of the grade 11 chemistry questions it has.

1) The robot, requires the chemicals FeCl_3 and HNO_3 , however the bottles are only labeled with their names, provide all possible names for both compounds so they can obtain the ones they need

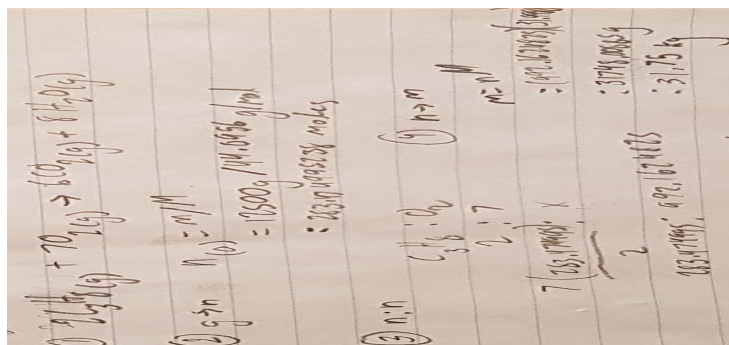
Answer: Ferric Chloride or Iron (III) Chloride and Nitric Acid or Nitric (V) Acid

2) You are told there is 5.00 g of water in a cup, in order to test your chemistry skills the robot requires you to tell it how many moles of H_2O there are.



Answer: 2.78×10^{-1} moles

3) The robot's pet dragon ignites some propane using 12.5 kg of Oxygen. Now the robot needs to replace all of the lost propane, how much propane, in kg, was used in the combustion?



Answer: 31.8 Kg was used in the reaction

4) The robot requires a fresh coat of paint, Aluminum Chloride is a chemical found in many paints and so it reacts 5.00 moles of Aluminum with 6.50 moles of Chlorine. The

evil robot asks you to tell it the mass of the Aluminum Chloride created so that it knows if it has enough, it also demands to know how many moles of the XS is remaining.



$$n_{\text{XS remaining}} = n_{\text{XS}} - n_{\text{XS used}}$$

$$= 5.00 - 4.333$$

$$= 0.667 \text{ moles remaining}$$

LR: XS
3:2
6.5: 4.333

Answer: 578g of Aluminum Chloride created and 0.667 moles of XS remaining

5) After having burned all that propane the dragon is feeling very thirsty however it can only drink salt water that has a salt concentration of 2.15 moles/L The robot prepares a drink with 132 g of salt in 300 mL of water and asks if his dragon can drink it and demands that you show your steps to make sure that you are not lying.

① $n = m/M$
 $= (132\text{g}) / (58.4428\text{g/mol})$
 $= 2.258618684 \text{ moles}$

② $v = 300/1000$
 $= 0.300 \text{ L}$

③ $C = n/v$
 $= \frac{2.258618684}{0.300}$
 $= 7.5287 \text{ mol/L}$
 $= 7.53 \text{ mol/L}$

Answer: No the dragon can't drink it as the salt concentration is 7.53 moles/L

6) In an effort to make the water potable for his dragon the robot dilutes the salt water by diluting the solution to a volume of 1.05 L. What is the new concentration?

$C_1 = 7.53 \text{ mol/L}$
 $V_1 = 0.300 \text{ L}$
 $V_2 = 1.05 \text{ L}$

$C_1V_1 = C_2V_2$

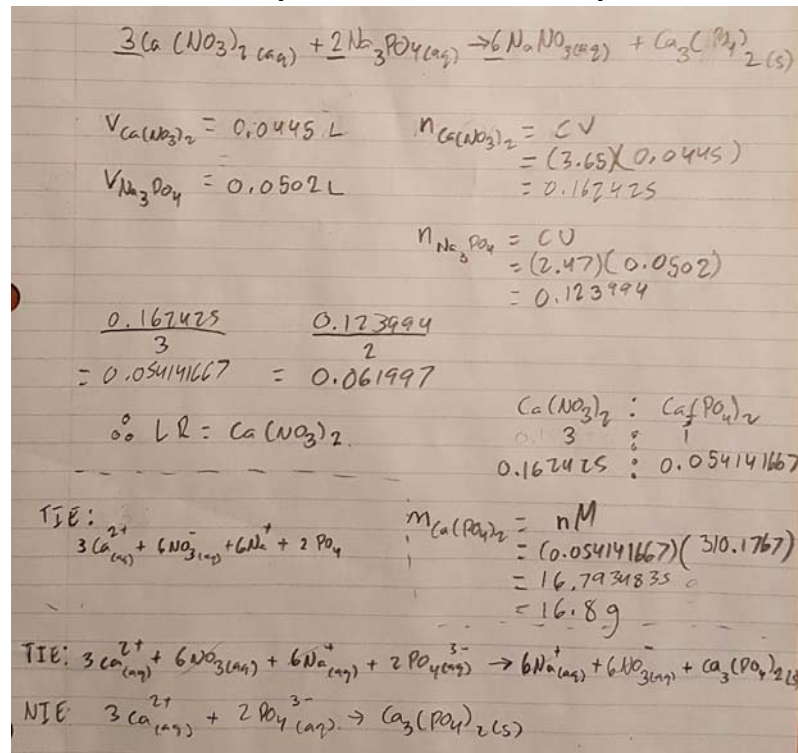
$(7.53)(0.300) = C_2(1.05)$

$C_2 = 2.15 \text{ mol/L}$

Answer: The new concentration is 2.15 moles/L meaning it is potable for the dragon

7) Using its X-Ray scanner, the robot notices that you have very weak bones because you haven't been drinking your milk, it decides to react 44.5 mL of Calcium Nitrate at a concentration of 3.65 moles/L with 50.2 mL of Sodium Phosphate at a concentration of 2.47 moles/L in order to produce a the precipitate Calcium Phosphate which is often

used as a supplement to strengthen bones. What is the mass of the precipitate? Write a total dissociated equation and net ionic equation.

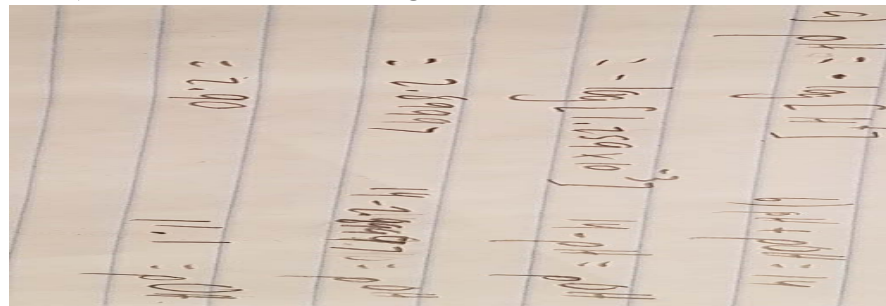


Answer: Mass of precipitate = 16.8g. TIE & NIE demonstrated above

8) The robot is off to play hockey and brings some Gatorade with him. The gatorade package tells you that it has a Hydrogen ion concentration of 1.259×10^{-3} moles/L.

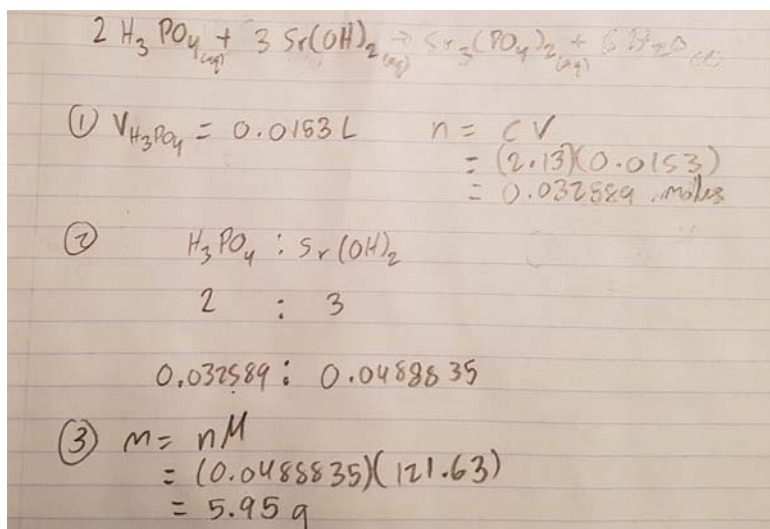
A) What is the pH of the gatorade

B) What is the pOH of the gatorade?



Answer: The pH is 2.90 and the pOH is 11.1

9) The evil robot has finished his use with you but instead of letting you go he begins to lower you down into a pit filled with the base $\text{Sr}(\text{OH})_2$, you quickly grab a 15.3 mL bottle of the acid H_3PO_4 at a concentration of 2.13 moles/L. How many grams of the $\text{Sr}(\text{OH})_2$ can be neutralised?



Answer: 5.43g can be neutralised

10) The robot decides to use its "gasinator" ray gun on you, turning you into Krypton difluoride gas (KrF_2). You are quickly entombed in a box occupying 3.00 L at 40.0°C , 105 kPa What is your mass (Mass of the gas)?

$V = 3.00 \text{ L}$ $P = 105 \text{ kPa}$ $T = 40.0^\circ\text{C}$
 $= 313.15^\circ\text{K}$

① $PV = nRT$ ② $m = nM$
 $n = \frac{PV}{RT}$
 $= \frac{(105)(3.00)}{(8.314)(313.15)}$
 $= 0.120989621$

$= (0.120989621)(121.79)$
 $= 14.7 \text{ g}$

Answer: The mass of the Krypton difluoride is 14.7g

11) The dragon breathes fire and heats up the box just enough so that the pressure is too great and it explodes. You know that the pressure required to break that box was 212.6 kPa, what temperature in celsius was the dragons fire when the box burst?

$$\begin{array}{ll} P_1 = 105 \text{ kPa} & P_2 = 212.6 \text{ kPa} \\ T_1 = 313.15^\circ\text{K} & T_2 = ? \end{array}$$
$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$
$$\frac{105}{313.15} = \frac{212.6}{T_2}$$
$$T_2 = 634.05^\circ\text{K}$$
$$T_2 = 360.9^\circ\text{C}$$

Answer: The dragon's fire was 361°C

At last you have finally escaped the evil robot's clutches as you float gently away into the atmosphere.