OPTIONAL Q's

(9)

	$H_2CO_3 \rightarrow$	H^+ +	HCO_3^-
I	0.00125	Ø	Ø
C	−x	+x	+x
E	0.00125 − x	x	x
5%	0.00125	x	x
Ans.	0.00125	2.29×10^{-5}	2.29×10^{-5}

$$\frac{[H^+][HCO_3^-]}{[H_2CO_3]}$$

$$4.2 \times 10^{-7} = \frac{(x)(x)}{0.00125}$$

$$x = 2.29 \times 10^{-5}$$

	$HCO_3^- \rightarrow$	H^+ +	CO_3^{2-}
I	0.00125	Ø	Ø
C	−x	+x	+x
E	0.00125 − x	x	x
5%	0.00125	x	x
Ans.	0.00125	2.45×10^{-7}	2.45×10^{-7}

$$\frac{[H^+][CO_3^{2-}]}{[HCO_3^-]}$$

$$4.8 \times 10^{-11} = \frac{(x)(x)}{0.00125}$$

$$x = 2.45 \times 10^{-7}$$

total $[H^+] = (2.29 \times 10^{-5}) + (2.45 \times 10^{-7})$

$= 2.31 \times 10^{-5}$ M

$pH = -\log(2.31 \times 10^{-5}) = \boxed{4.64}$

*

$0.00125 + (2.45 \times 10^{-7}) = 1.25 \times 10^{-3}$

$pH = -\log(1.25 \times 10^{-3}) = \boxed{2.90}$

↳ Q says to do strong + ICE ... so this answer is based on that but technically that is the wrong way to do it. will fix next year!

(10)

$$\frac{20\text{mL}}{1000\text{mL}} \left| \frac{1\text{L}}{1\text{L}} \right| \frac{0.00125 \text{ mol } HNO_3}{} = 2.5 \times 10^{-5} \text{ mol } HNO_3$$

$$\frac{30\text{mL}}{1000\text{mL}} \left| \frac{1\text{L}}{1\text{L}} \right| \frac{0.00125 \text{ mol } KOH}{} = 3.75 \times 10^{-5} \text{ mol } KOH$$

$HNO_3 + KOH \rightarrow H_2O + KNO_3$ 1:1 ratio

3.75×10^{-5} mol OH^- − 2.5×10^{-5} mol H^+

1.25×10^{-5} mol OH^- left

total volume = 20 + 30 = 50mL = 0.05 L

$$[OH^-] = \frac{1.25 \times 10^{-5} \text{ mol}}{0.05 \text{ L}} = 2.5 \times 10^{-4} \text{ M}$$

$pOH = -\log(2.5 \times 10^{-4}) = 3.60$

$pH = 14 - pOH = 14 - 3.6 = \boxed{10.39}$