

HW02 - Water, Acids & Bases II

Question 1	7 pts
Select all seven strong acids below:	
<input type="checkbox"/> HF	_____
<input type="checkbox"/> HCl	_____
<input type="checkbox"/> HI	_____
<input type="checkbox"/> HBr	_____
<input type="checkbox"/> H ₂ SO ₄	_____
<input type="checkbox"/> HAt	_____
<input type="checkbox"/> HClO ₄	_____
<input type="checkbox"/> HNO ₃	_____
<input type="checkbox"/> NaOH	_____
<input type="checkbox"/> HClO	_____
<input type="checkbox"/> HClO ₃	_____

Question 2	5 pts
What is the pH of a 0.044 M HI solution?	
Note: Report your answer to two sig figs (pH = X.XX)	
<input type="text"/>	

Question 3	5 pts
What is the [OH ⁻] when 0.0023 moles of Ca(OH) ₂ are placed in 654 mL water? Assume complete dissociation of Ca(OH) ₂ .	
<input type="radio"/> 0.0035 M	_____
<input type="radio"/> .0070 M	_____
<input type="radio"/> 2.15 M	_____
<input type="radio"/> 3.5 x 10 ⁻⁶ M	_____
<input type="radio"/> 12.0 M	_____

Question 4	5 pts
Use the data here (https://gchem.cm.utexas.edu/data/section2.php?target=ka-kb-constants.php) to rank the following weak acids from weakest to strongest .	
HIO	_____
CH ₃ COOH	_____
HCN	_____
HF	_____
HNO ₂	_____
<input type="radio"/> HIO < HCN < CH ₃ COOH < HNO ₂ < HF	_____
<input type="radio"/> HCN < HIO < CH ₃ COOH < HNO ₂ < HF	_____
<input type="radio"/> HNO ₂ < HF < HIO < HCN < CH ₃ COOH	_____
<input type="radio"/> HF < HNO ₂ < CH ₃ COOH < HCN < HIO	_____

Question 5	5 pts
A 0.5 M sample of a weak acid, HA ₁ , has a pH = 4.24. A 0.5 M sample of another weak acid, HA ₂ , has a pH = 5.66. Which weak acid has the larger K _a value?	
<input type="radio"/> HA ₂	_____
<input type="radio"/> HA ₁	_____
<input type="radio"/> Both will have the same value of K _a	_____

Question 6	5 pts
The generic weak acid HA has a percent ionization equal to 10.8% at a 0.025 M concentration. What is the pH?	
Note: Report your answer to two sig figs (pH = X.XX)	
<input type="text"/>	

Question 7	3 pts
Which of the following represents a generic neutralization reaction of a strong acid and strong base?	
<input type="radio"/> Acid + Base → Salt + Water	_____
<input type="radio"/> Acid + Base → Weak Base + Water	_____
<input type="radio"/> Acid + Base → Weak Acid + Water	_____
<input type="radio"/> Acid + Base → Acid + Water	_____
<input type="radio"/> Acid + Water → Base + Salt	_____
<input type="radio"/> Base + Water → Acid + Salt	_____

Question 8	5 pts
Consider the classic strong acid/base neutralization reaction of hydrochloric acid (HCl) and sodium hydroxide (NaOH) from HW 01.	
$\text{HCl(aq)} + \text{NaOH(aq)} \rightarrow \text{NaCl(aq)} + \text{H}_2\text{O(l)}$	
How many mL of 0.0448 M NaOH are needed to neutralize 32.0 mL of 0.0291 M HCl ?	
<input type="radio"/> 36.3 mL	_____
<input type="radio"/> 20.8 mL	_____
<input type="radio"/> 24.8 mL	_____
<input type="radio"/> 33.7 mL	_____
<input type="radio"/> 27.1 mL	_____
<input type="radio"/> 49.3 mL	_____

Question 9	5 pts
A titration experiment is set up to fully neutralize a strong acid (HCl) using a strong base (NaOH). The HCl has a concentration of 0.01 M and a volume of 100 mL. The NaOH also has a concentration of 0.01 M. What volume of NaOH is needed to fully neutralize the HCl?	
<input type="radio"/> 50 mL	_____
<input type="radio"/> 200 mL	_____
<input type="radio"/> 100 mL	_____
<input type="radio"/> 250 mL	_____
<input type="radio"/> 20 mL	_____
<input type="radio"/> 500 mL	_____

Question 10	5 pts
Barium hydroxide is a strong base that dissociates based on the following reaction:	
$\text{Ba(OH)}_2(\text{aq}) \rightarrow \text{Ba}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq})$	
What volume of 0.005 M HCl (strong acid) is needed to fully neutralize a 500 mL 0.005 M Ba(OH) ₂ solution?	
<input type="radio"/> 1.00 L	_____
<input type="radio"/> 500 mL	_____
<input type="radio"/> 1.00 mL	_____
<input type="radio"/> 750 mL	_____
<input type="radio"/> 250 mL	_____
<input type="radio"/> 2.50 L	_____

Question 11	5 pts
What is the pH at the equivalence point of a titration involving a strong acid titrant and strong base analyte?	
<input type="radio"/> pH = 7	_____
<input type="radio"/> pH < 7	_____
<input type="radio"/> pH > 7	_____

Question 12	5 pts
What is the pH at the equivalence point of a titration involving a strong acid titrant and a weak base analyte?	
<input type="radio"/> pH = 7	_____
<input type="radio"/> pH < 7	_____
<input type="radio"/> pH > 7	_____

Question 13	5 pts
What is the pH at the equivalence point of a titration involving a strong base titrant and a weak acid analyte?	
<input type="radio"/> pH > 7	_____
<input type="radio"/> pH = 7	_____
<input type="radio"/> pH < 7	_____

Question 14	5 pts
Neutralizing an olympic size swimming pool is conceptually very similar to performing a massive titration experiment. Suppose a 700 thousand gallon swimming pool has a pH = 9.33 which is a bit too high for swimming. Calculate how many gallons of 10 M HCl (strong acid) it will take to neutralize the swimming pool to pH = 7. Report your answer to exactly 2 significant figures.	
<input type="text"/>	

Question 15	5 pts
What atmospheric component is responsible for the natural acidity of rain?	
<input type="radio"/> Carbon dioxide	_____
<input type="radio"/> Sulfuric acid	_____
<input type="radio"/> Ozone	_____
<input type="radio"/> Oxygen	_____

Question 16	5 pts
Which two methods can be used to make sea water drinkable?	
<input type="checkbox"/> distillation	_____
<input type="checkbox"/> osmosis	_____
<input type="checkbox"/> reverse osmosis	_____
<input type="checkbox"/> flocculation	_____

Question 17	5 pts
The pH of rain water falling through an unpolluted atmosphere is closest to...	
<input type="radio"/> 4.8	_____
<input type="radio"/> 5.4	_____
<input type="radio"/> 7.0	_____
<input type="radio"/> 8.7	_____

Question 18	5 pts
Most aquatic life in lakes cannot survive in water with a pH less than...	
<input type="radio"/> 5	_____
<input type="radio"/> 7	_____
<input type="radio"/> 8	_____
<input type="radio"/> 14	_____

Question 19	5 pts
The acid neutralizing capacity of a lake or stream most often derives from the presence of _____ in the surrounding soil or rock.	
<input type="radio"/> CaCO ₃	_____
<input type="radio"/> HNO ₃	_____
<input type="radio"/> NaOH	_____
<input type="radio"/> H ₃ O ⁺	_____

Question 20	5 pts
When Lake Travis is full, it holds about 369 billion gallons. If we pretend that Lake Travis has a neutral pH (pH = 7), approximately how many moles of H ⁺ are present in the lake?	
1 gal = 3.785 L	
<input type="radio"/> 1.40 x 10 ⁵ moles	_____
<input type="radio"/> 3.69 x 10 ⁴ moles	_____
<input type="radio"/> 3.69 x 10 ⁹ moles	_____
<input type="radio"/> 1.39 x 10 ⁸ moles	_____
<input type="radio"/> 138 moles	_____
<input type="radio"/> 4.65 x 10 ⁸ moles	_____
<input type="radio"/> 1.00 x 10 ⁻⁷ moles	_____