Demonstrate understanding of equilibrium principles in aqueous systems survey

This shows what has come up over the last 7 years. It might not be 100% comprehensive or 100% accurate as many questions cover multiple ideas but will be a good start.

Content	2021	2020	2019	2018	2017	2016	2015	2014
Write equation for equilibrium occurring in a saturated solution	✓	✓	✓	✓	✓ x 2		✓	✓
Write K_s expression (AB, AB_2 or A_2B)	✓	✓	✓	✓	✓	✓	✓	✓
Calculate s from K_s for AB_2 or AB type solid	✓	✓	✓	✓	✓		✓	✓
Calculate s from K_s for AB_2 type solid and give conc. of $[A^{2+}]$ and $[B^-]$			✓					✓
Calculate the solubility for AB_2 type solid at a given pH		✓						
Calculate mass of sparingly soluble solid that will dissolve to make saturated soln.						✓		
Predict if a precipitate will form when unequal volumes of solutions are mixed	✓	✓	✓	✓				
Predict if a precipitate will form when a mass of solid is added to a solution								✓
Show that a ppt. will form when unequal or equal volumes of solutions are mixed						✓	✓	
Predicting if a ppt will form; pH used to calculate $[OH^-]$			✓					
Explaining the effect on solubility of a sparingly soluble solid: common ion	✓			✓	✓			
Calculate the concentration of an ion on addition of a common ion	✓				✓			
Explaining the effect on solubility of a sparingly soluble solid: complex ion		✓	✓			✓		
Equation for formation of complex ion: May be with OH^- (@ high pH)		✓	✓	✓		✓		✓
Explaining the effect on solubility of a sparingly soluble solid: low pH / H_3O^+		✓		✓	✓		✓	✓
Equations to show effect on solubility of a sparingly soluble solid: low pH / H_3O^+		✓		✓	✓		✓	✓
Calculate 'new' conc of OH^- in solution due to addition of a common ion			✓					
pH range of a buffer solution (given a pK_a value)		✓		✓				
Identify which of 2 buffer solutions has lower pH based on pK_a values			✓					
Explaining how buffers resist changes in pH on addition of small amounts of H_3O^+ or OH^-	✓	✓						✓
Writing equations to show addition of OH^- to a buffer solution			✓					✓
Writing equations to show addition of H_3O^+ to a buffer solution		✓		✓				

Content		2020	2019	2018	2017	2016	2015	2014
Buffer pH calculation: addition of given mass of solid (assume no vol. change)		✓		✓				
Buffer pH calculation: mass of solid to make given pH (assume no vol. change)	✓							✓
Buffer pH calculation; ratio of RCOONa & RCOOH / NH_3 & NH_4^+ / F^-/HF			✓		✓		✓	
Explaining whether a buffer will be more effective on addition of H_3O^+ or OH^-		✓	✓	✓	✓		✓	
Explaining the effect on pH if a buffer solution is diluted with water	✓		✓					
Reading a volume off a titration curve to find a buffer solution of a specified pH				✓				
Write an equation for the reaction of HF with water (recall HF is a weak acid)					✓			
Write equation for the reaction of a given WA with water								✓
Write equation for the reaction of HBr with water (recall HBr is a strong acid)					✓			
Write an equation for the reaction of RNH_2 with water						✓		
Write equations for dissolving and reaction of RNH_3Cl with water							✓	
Ranking solutions in order of (decreasing) pH		✓						
Justifying ranking solutions in order of (decreasing) pH		✓						
Explaining pH and electrical conductivity of solutions from pH & conductivity info.							✓	
Comparing pH and electrical conductivity of solutions from pK_a information	✓							
Calculate concentration of a salt from its pH		✓						
Calculate pH of an acidic salt solution RNH_3Cl							✓	
List all the species present in a solution of a basic salt RCOONa		✓						
List / justify species present in a weak acid solution in order of dec. conc.	✓							✓
Compare pHs of two weak acids of same concentration from pK_a values (no calc)								✓
List / justify species present acidic salt RNH_3Cl (aq) in order of dec. conc.						✓	✓	
List all the species in a solution halfway to equivalence point volume			✓			✓		
Explain significance of pH in a solution halfway to EP volume / buffering ability			✓			✓		✓
Calculate the pH of a solution of basic salt RCOONa		✓		✓				
Select indicator most suited to identify the EP	✓		✓		✓			

Content		2020	2019	2018	2017	2016	2015	2014
Justify choice of indicator / consequences of using other indicators	✓		✓					
Explain / evaluate electrical conductivity of solutions (SA and WA)					✓			
Explain / evaluate electrical conductivity of solutions (SA and basic salt)		✓						
Explain / evaluate electrical conductivity of solutions (WA and acidic salt)			✓					
Explain / evaluate electrical conductivity of solutions (WB and acidic salt)				✓				✓
Calculate the concentration of a weak acid from K_a and $[H_3O^+]$ / pH	✓		✓		✓			
Calculate the pH of a weak base from concentration and pK_a(BH^+) or K_a(BH^+					✓	✓		
Calculate the conc. of a weak base from pH and K_a(BH^+) value								✓
Calculate the pH at the equivalence point of a titration curve	✓	✓	✓	✓		✓		
Explain why pH of titration curve of WB/SA is not at pH 7						✓	✓	
Listing all the species at equivalence point in decreasing concentration order				✓			✓	
Listing all the species at equivalence point (order not needed)					✓			✓
Calculate the pH at a volume past the equivalence point of a titration curve	✓		✓				✓	
Calculate the pH at a volume before the EP of a titration curve (not @pH = pK_a)					✓			
Compare/contrast pH at equivalence point given K_a values of different WA		✓			✓		✓	
Explain why, after EP, the pH of solution added is different from its original pH	✓							

Spare rows for any that have been missed.