WASHINGTON LATIN PUBLIC CHARTER SCHOOL
CHEMISTRY 2019-20

UNIT 5A PRACTICE TEST – CHEMICAL REACTIONS I: ACIDS AND BASES

Answer all questions
Recommended time = 50 minutes
BAHATI NJEMA!

Name:	
Score for Q1 - 3 (open response)	/25
Score for Q4 – 10 (multiple choice)	/10
Bonus (Submits quiz on time and in correct format)	/5

SECTION A – OPEN RESPONSE

1. Neutralization reactions are reactions between acids and bases to produce salts. They have a variety of uses, including making different salts.

(a) Write balanced symbol equations for the following neutralization reactions and name the salt produced:

(i) Reactants:	magnesium hydroxide and hydrochloric acid	6
Symbol equation:		
Name of salt:		
(ii) Reactants:	iron (II) carbonate and sulfuric acid	
Symbol equation:		
Name of salt:		

(b) State a useful application of reaction (a) (i) — 1

(c) The salt produced in reaction (a) (ii) is very useful in the treatment of anaemia. Give brief practical details of how you would use reaction (a) (ii) to obtain a pure solid sample of the salt. — 3

TOTAL 10

2. The acidity or alkalinity of a solution can be captured in a single number, by using a logarithmic scale called the pH scale.

The acidity of alkalinity of a solution can also be determined by using acid-base indicators. Two common indicators are methyl orange and phenolphthalein. The colors and end-point pH ranges of these indicators is shown in the table below:

Indicator	Color 1	End-point pH range	Color 2
methyl orange	pink	2.9 – 4.6	yellow
phenolphthalein	colorless	8.3 – 10.0	purple

A sample of rainwater was analysed and found to have a pH of 5.

(a) Calculate the concentration of H^+ ions and the concentration of OH^- ions in the sample of rainwater. Show your working.

$[H^+]$ (in mol/L)	3
[OH-] (in mol/L)	

	(b)	A few drops of methyl orange and phenolphthalein were added separately to two samples of the rainwater. State the color shown by:		
		methyl orange		
		phenolphthalein		2
			TOTAL	5

3.	Nitric acid, HNO_3, is a strong acid. Nitrous acid, HNO_2, is a weak acid. Both acids are neutralized by calcium oxide according to the following equations: Nitric acid: $2HNO_3 + CaO \rightarrow Ca(NO_3)_2 + H_2O$ Nitrous acid: $2HNO_2 + CaO \rightarrow Ca(NO_2)_2 + H_2O$			
	(a)	Explain the difference between a strong acid and a weak acid.		
				2
	(b)	Write ionic equations to show what happens to nitric acid and nitrous acid in water:		
		nitric acid		
		nitrous acid		3
	(c)	Rubi poured 50 mL of 1 mol/L nitric acid into a boiling tube. She then added CaO powder gradually to the boiling tube until the acid had been completely neutralized. She then repeated the experiment with 50 mL of 1 mol/L nitrous acid.		
		(i)	Calculate the maximum mass of CaO which would dissolve in the nitric acid solution.	
		(ii)	State one similarity Rubi would observe when repeating the experiment using the nitrous acid solution.	
		(iii)	State one difference Rubi would observe when repeating the experiment using the nitrous acid solution.	
				5
			TOTAL	10

SECTION B – MULTIPLE CHOICE

Do not answer these questions on this document. Click on the answer sheet provided at the end of the questions.

4.	When aluminium carbonate reacts with hydrochloric acid, the formula of the salt produced is	
	A	H_2CO_3
	B	Cl_2CO_3
	C	Al_3Cl
	D	$AlCl_3$
	E	AlH_3
		1

5.	Ammonium nitrate is a dangerous explosive and an important fertilizer. It can be easily prepared in a neutralization reaction by mixing	
	A	NH_3 and HNO_3
	B	HCl and CuO
	C	HNO_3 and $Ca(NO_3)_2$
	D	NH_3 and NaOH
	E	H_2SO_4 and HNO_3
		1

6.	Ammonia is a weak base. In an aqueous solution of ammonia, approximately 1% of ammonia molecules react with water to form OH^- ions. The pH of 0.1 mol/L ammonia solution is approximately	
	A	2
	B	3
	C	11
	D	12
	E	13
		2

7.	Which of the following solutions has the lowest pH?	
	A	0.001 mol/L HCl
	B	0.001 mol/L NaOH
	C	pure water
	D	a solution containing 1×10^{-12} mol/L H^+ ions
	E	a solution containing 1×10^{-12} mol/L OH^- ions
		2

Questions 8 – 10

25 mL of standard solution of sodium carbonate (0.5 mol/L) was placed in a conical flask. Two drops of methyl orange indicator were added and a solution of sulfuric acid (of unknown concentration) was gradually added from a burette. When 18.3 mL of the sulfuric acid had been added, the indicator changed color.

8.	The formula of the salt produced in this reaction is:	
	A	Na_2CO_3
	B	Na_2SO_4
	C	H_2SO_4
	D	Na_2CO_3
	E	K_2SO_4
		1

9.	At the equivalence point of this titration, the indicator will change from	
	A	orange to yellow
	B	pink to yellow
	C	yellow to orange
	D	yellow to pink
	E	orange to pink
		1

10.	The molarity of the sulfuric acid used in this titration is	
	A	0.34 mol/L
	B	0.68 mol/L
	C	1.37 mol/L
	D	3.4 mol/L
	E	6.83 mol/L
		2