

UNIT 5A – CHEMICAL REACTIONS I (ACIDS AND BASES)

WASHINGTON LATIN PUBLIC CHARTER SCHOOL
CHEMISTRY 2019-20

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

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.			
	Complete the following table to show the names and formulas of different acids, bases and salts:			
	Name	formula	acid, base or salt?	
	calcium oxide	CaO	base	
	hydrochloric acid	HCl	acid	
	calcium chloride	CaCl ₂	salt	
	copper sulfate	CuSO ₄	salt	
	sulfuric acid	H ₂ SO ₄	acid	
	copper carbonate	CuCO ₃	base	
				5
	(a)	Complete the following symbol equations for neutralization reactions:		
		(i)	CaO + 2HCl → CaCl ₂ + H ₂ O	3
		(ii)	CuCO ₃ + H ₂ SO ₄ → CuSO ₄ + CO ₂ + H ₂ O	
	(b)	Farmers often use reaction (a) (i). What for?		
		They spread CaO on fields to reduce the acidity of soil		1
(c)	You carried out a very similar reaction to (a) (ii) in the lab. After mixing the acid and the base together, what two steps did you take to get pure solid sample of the salt?			
	Step 1	filtered (to remove the base)	2	
	Step 2	heated (to remove the water)		
TOTAL			11	

UNIT 5A – CHEMICAL REACTIONS I (ACIDS AND BASES)

2.	The acidity or alkalinity of a solution can be captured in a simple number called the pH.			
	A sample of rainwater was analysed and found to have a pH of 5. A sample of bathroom cleaner was analysed and found to have a pH of 13. A sample of pure water was also analysed.			
	Complete the following table:			
	Sample	pH		acid, neutral or alkaline?
	Bathroom cleaner	5		acid
Rainwater	13	alkaline		
Pure water	7	neutral		
TOTAL			4	

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: $2\text{HNO}_3 + \text{CaO} \rightarrow \text{Ca}(\text{NO}_3)_2 + \text{H}_2\text{O}$ Nitrous acid: $2\text{HNO}_2 + \text{CaO} \rightarrow \text{Ca}(\text{NO}_2)_2 + \text{H}_2\text{O}$		
	(a)	What is the difference between a strong acid and a weak acid?	
		A strong acid completely breaks up in water to give H^+ ions A weak acid slightly breaks up in water to give H^+ ions	
	(b)	Christian poured 50 mL of 1 mol/L nitric acid into a boiling tube. He then added CaO powder gradually to the boiling tube until the acid had been completely neutralized. He then repeated the experiment with 50 mL of 1 mol/L nitrous acid. He noticed one major similarity and one major difference between the two reactions.	
	(ii)	State one similarity Christian would observe when repeating the experiment using the nitrous acid solution.	
		Both acids would dissolve the same amount of CaO	
(iii)	State one difference Christian would observe when repeating the experiment using the nitrous acid solution.		
	The strong acid (HNO_3) would dissolve the CaO much faster		
TOTAL			4

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 iron carbonate reacts with nitric acid, the name of the salt produced is	
	A	sodium chloride
	B	nitric carbonate
	C	iron nitrate (iron nitrate + nitric acid \rightarrow iron nitrate + CO₂ + H₂O)
1		

5.	A solution of washing soda has a pH of 9. It could be described as:	
	A	strongly acidic (pH 0 – 3)
	B	neutral (pH = 7)
	C	weakly alkaline (pH 8-10)
1		

6.	Which of the following solutions has the lowest pH?	
	A	1 mol/L sodium hydroxide (alkaline, so high pH – 14)
	B	vinegar (acidic, so low pH – 3)
	C	pure water (neutral, so pH = 7)
1		

UNIT 5A – CHEMICAL REACTIONS I (ACIDS AND BASES)

Questions 7 – 9

25 mL of a 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.

Methyl orange is pink in acidic conditions and yellow in alkaline conditions.

7.	The formula of the salt produced in this reaction is:	
	A	Na ₂ CO ₃ (this is the original base)
	B	Na ₂ SO ₄ (this is the salt)
	C	H ₂ SO ₄ (this is the original acid)
1		

8.	At the equivalence point of this titration, the indicator will change from	
	A	orange to yellow
	B	pink to yellow
	C	yellow to pink (it's changing from alkali → acid)
1		

9.	Use the formula $C_2 = \frac{C_1 V_1}{V_2}$ to answer this question. The molarity of the sulfuric acid used in this titration is	
	A	0.34 mol/L
	B	0.37 mol/L
	C	0.68 mol/L ($C_2 = 0.5 \times 25 / 18.3 = 0.68$ mol/L)
2		

[Go to the answer sheet](#)