SAFETY BAY SENIOR HIGH SCHOOL

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SUBJECT ACIDS AND BASES - CHEM II

SURNAME ANSWERS

OTHER NAMES _____

DIRECTIONS:

1. USE A '2B'. 'B' OR 'HB' PENCIL. DO NOT USE A BALLPOINT OR INK PEN.
2. MARK THE BOXES IN THE FOLLOWING WAY [A] [■] [C] [D].
3. PLEASE ENTER YOUR SURNAME OR STUDENT NUMBER IN THE BOXES AS DIRECTED BY YOUR SUPERVISOR.
4. GIVE ONLY ONE ANSWER FOR EACH QUESTION. IF YOU CHANGE YOUR MIND ERASE YOUR MARK COMPLETELY AND THEN MARK YOUR NEW ANSWER. MORE THAN ONE ANSWER WILL INVALIDATE THE ANSWER.
5. YOUR ANSWER SHEET WILL BE COLLECTED SEPARATELY BY THE SUPERVISOR AT THE END OF THE EXAMINATION.

1 [A] [B] [C] [D]	11 [A] [B] [C] [D]	21 [A] [B] [C] [D]
2 [A] [B] [C] [D]	12 [A] [B] [C] [D]	22 [A] [B] [C] [D]
3 [A] [B] [C] [D]	13 [A] [B] [C] [D]	23 [A] [B] [C] [D]
4 [A] [B] [C] [D]	14 [A] [B] [C] [D]	24 [A] [B] [C] [D]
5 [A] [B] [C] [D]	15 [A] [B] [C] [D]	25 [A] [B] [C] [D]
6 [A] [B] [C] [D]	16 [A] [B] [C] [D]	26 [A] [B] [C] [D]
7 [A] [B] [C] [D]	17 [A] [B] [C] [D]	27 [A] [B] [C] [D]
8 [A] [B] [C] [D]	18 [A] [B] [C] [D]	28 [A] [B] [C] [D]
9 [A] [B] [C] [D]	19 [A] [B] [C] [D]	29 [A] [B] [C] [D]
10 [A] [B] [C] [D]	20 [A] [B] [C] [D]	30 [A] [B] [C] [D]

Short answer.

1. Explain the difference between a polyprotic acid and a monoprotic acid. (1 mark)

P - Acid that reacts with H_2O to form more than one hydrogen ion per molecules.

M - can only form one hydrogen ion.

2. Explain what is meant by the Arrhenius model of acids. (2 marks)

Acids ionise in H_2O to produce ~~hydrogen~~ ions which combine with water to produce hydronium ions

~~Bases produce hydroxide ions.~~

3. Apply the Arrhenius model to explain what happens to sulphuric acid when it is added to water.

Use formulae and equation styles to do this. (4 marks)

Sulfuric acid dissociates breaking into parts. ①

Sulfuric acid ionises to produces 2 hydrogen ions in water. ①

$H_2SO_4(l) \longrightarrow SO_4^{2-}(aq) + 2H^+(aq)$ ①

Donation of 2 protons.

$H_2SO_4 + 2H_2O \rightarrow SO_4^{2-} + 2H_3O^+$ ①

4. A student has 25 mL of a 0.10 mol L^{-1} hydrochloric acid solution. How much water must be added to prepare a 0.025 mol L^{-1} solution? (2 marks)

$C_1V_1 = C_2V_2$

$C_1 = 0.10 \quad V_1 = 25 \quad V_2 = ? \quad C_2 = 0.025$

$V_2 = \dfrac{C_1 \times V_1}{C_2}$

$= \dfrac{0.1 \times 25}{0.025}$

$= 100\,mL.$

5. Write a balanced equation **and** an ionic equation for the reaction that occurs when sulphuric acid is added to potassium hydroxide solution. (4 marks)

$H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$ (2)

$H^+(aq) + SO_4^{2-}(aq) + K^+(aq) + OH^-(aq) \rightarrow K^+(aq) + SO_4^{2-}(aq) + H_2O(l)$ (2)

$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$ (2)

6a. What products are formed when a solution of hydrochloric acid is added to a solution of sodium hydrogen carbonate? (1 mark)

Sodium chloride, water and carbon dioxide.

b. Write a balanced **and** an ionic equation for this reaction. (4 marks)

$HCL + NaHCO_3 \rightarrow NaCL + H_2O + CO_2$ (1)

$HCL(aq) + NaHCO_3(aq) \rightarrow NaCl(aq) + H_2O(l) + CO_2(g)$

$H^+(aq) + CL^-(aq) + HCO_3^-(aq) + Na^+(aq) \rightarrow Na^+(aq) + Cl^-(aq) + H_2O(l) + CO_2(g)$ (2)

$H^+(aq) + HCO_3^-(aq) \rightarrow H_2O(l) + CO_2(g)$ (1)

or

$H_3O^+(aq) + HCO_3^-(aq) \rightarrow 2H_2O(l) + CO_2(g)$ (1)

7. Calculate the volume of 0.500molL^{-1} of hydrochloric acid (HCl) that reacts completely with 25.0 molL^{-1} calcium hydroxide ($Ca(OH)_2$). (4 marks)

$Ca(OH)_2(aq) + 2HCl(aq) \rightarrow CaCl_2(aq) + 2H_2O(l)$ (1)

$n(Ca(OH)_2) = cV = 0.100 \times 0.0250$ (1)
$= 0.00250$ mol

mole ratio $\frac{n(\text{unknown})}{n(\text{known})} = \frac{2}{1}$

$n(HCl) = 0.00250 \times \frac{2}{1} = 0.00500$ mol (1)

$V(HCl) = \frac{n}{c} = \frac{0.00500}{0.500} = 0.0100$ L (1)
or 10.0 mL

8. Rank the following according to their property mentioned. (1 mark)

0.10 mol L^{-1} $HCl_{(aq)}$, 0.20 mol L^{-1} $NaOH_{(aq)}$, 0.10 mol L^{-1} $H_2SO_{4(aq)}$,

pH

Lowest H_2SO_4 HCl NaOH Highest