

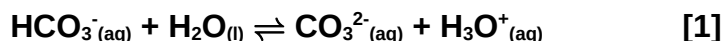
**Year 12 Chemistry**  
**Assessment 3: Validation Test**  
**Practical Work 1%, Validation Test 4%.**  
**Working Time: 35 minutes**

**Student Name:** \_\_\_\_\_

**Total Marks for validation test** \_\_\_\_\_ /

**Questions:**

- 1) You washed the wells of your reaction plate in distilled water before beginning your experiment. Despite this water being distilled, it may be slightly acidic because of dissolved atmospheric carbon dioxide. The reactions occurring in this instance are the same as those involved in the acidification of the oceans. Write a series of three reactions to show the production of hydronium ions when carbon dioxide dissolves in water. **[3 marks]**



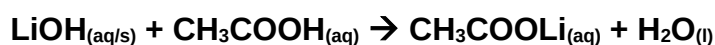
- 2) Write the equations for the acid - base neutralisation reactions that would produce the following salts. Also specify whether the acids and bases used in each instance are strong or weak. **[10 marks, 2 marks per question]**

**Marking [1] for equation, balanced and with correct state symbols. No half marks. For some questions alternative state symbols may be acceptable. OK if arrow is wrong type. [1/2] for correct classification of each acid and base.**

**OK to use a metal oxide instead of a metal hydroxide as the base.**

- a) Lithium ethanoate

Acid - base reaction to make this salt

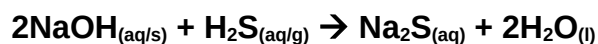


State whether the reactants are strong or weak acids or bases.

**Strong base      Weak acid**

b) Sodium sulfide

Acid - base reaction to make this salt

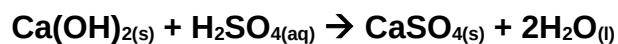


State whether the reactants are strong or weak acids or bases.

**Weak acid   Strong base**

c) Calcium sulfate

Acid - base reaction to make this salt



**Ca(OH)<sub>2</sub> and CaSO<sub>4</sub> cannot be aqueous.**

State whether the reactants are strong or weak acids or bases.

**Strong acid   Strong base**

d) Ammonium nitrate

Acid - base reaction to make this salt

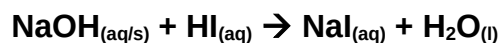


State whether the reactants are strong or weak acids or bases.

**Strong acid   Weak base**

e) Sodium iodide

Acid - base reaction to make this salt

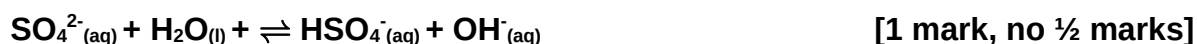
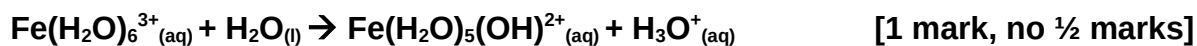


State whether the reactants are strong or weak acids or bases.

**Strong acid   Strong base**

3) A small amount of iron(III) sulfate was dissolved in water. When two drops of universal indicator were added the solution turned red.

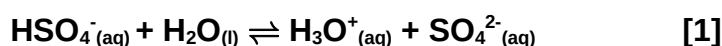
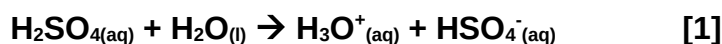
- a) Write (a) hydrolysis reaction/s for any ion/s in the iron(III) sulfate that react with water. Note that in water iron(III) ions become hydrated to form iron(III) hexahydrate ions. [2 marks]



- b) Explain what the universal indicator turning red tells you about iron(III) sulfate. [1 mark]

$K_a > K_b$  or similar answer.

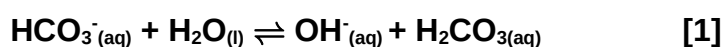
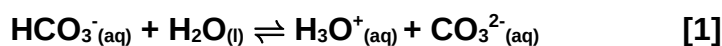
- 4) Write the two Bronsted-Lowry reactions for the two-step ionisation of the diprotic acid sulfuric acid. Referring to one of these equations, explain why, despite being the anion of a strong acid, the sulfate ion is slightly basic. [3 marks]



The second reaction is reversible. Therefore, the sulfate ion has the potential to act as a base by reaccepting a proton. [1]

OR the sulfate ion is the conjugate base of a weak acid so it is therefore a weak base [1].

- 5) Write the hydrolysis reaction/s what would occur if sodium hydrogen carbonate was dissolved in water. [2 marks]



6) Classify each of these as a strong base, strong acid, weak acid, weak base, acidic salt, basic salt or neutral salt. **[1 mark each = 7 marks]**

- a.  $\text{Li}_2\text{C}_2\text{O}_4$       **Basic salt**
- b.  $\text{CaO}$       **Strong base**
- c.  $\text{NH}_4\text{NO}_3$       **Acidic salt**
- d.  $\text{KNO}_2$       **Basic salt**
- e.  $\text{FeCl}_3$       **Acidic salt**
- f.  $\text{NaH}$       **Strong base**
- g.  $\text{HBr}$       **Strong acid**