**Australian Islamic College 2018**

**ATAR Chemistry Units 3 and 4**

**Task 4 (Weighting: 3%)**

**Acids and Bases Test**

Test Time: 40 minutes

Please do not turn this page until instructed to do so.

|  |  |
| --- | --- |
| **First Name** | **Surname** |
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| **Teacher** |
|  |

|  |  |
| --- | --- |
| **Mark / 31** | **Percentage** |
|  |  |

Equipment allowed: Pens, pencils, erasers, whiteout, rulers and non-programmable calculators permitted by the Schools Curriculum and Standards Authority.

**Special condition**: 2 marks will be deducted for failing to write your full name on this test paper.

Teacher help: Your teacher can only help you during your test in one situation.

If you believe there is a mistake in a question show your teacher and your teacher will tell you whether or not there is a mistake in the question and if appropriate, how to fix that mistake.

Questions must be answered in this booklet, in the spaces provided.

Total marks: 31

1. Write an ionic equation and observations for the following reactions.
   1. Sulfuric acid is added to solid iron(II) sulfite.

Ionic equation:

(1 mark)

Observations:

(2 marks; ½ each)

* 1. Ethanoic acid is added to solid copper(II) oxide.

Ionic equation:

(1 mark)

Observations:

(2 marks; ½ each)

1. Complete this table by naming each acid and classifying it as strong or weak. The first one has been done as an example.

(3 marks, 1 mark per correct row, no half marks)

|  |  |  |
| --- | --- | --- |
| **Formula** | **Name** | **Strong or Weak Acid** |
| **HNO3** | **Nitric Acid** | **Strong** |
| **H3PO4** |  |  |
| **H2SO3** |  |  |
| **H2C2O4** |  |  |

1. Give the formula of conjugate acid and conjugate base of the HS- ion.

(2 marks; 1 each)

* 1. Conjugate acid
  2. Conjugate base

1. When dissolved in water, ammonia produces a basic solution.
   1. Explain why ammonia does not fit the Arrhenius definition of a base.

(1 mark)

* 1. Explain why ammonia does fit the Brønsted-Lowry definition of a base. State the reaction between ammonia and water to demonstrate this.

(2 marks)

1. Pure water undergoes self-ionisation to a small extent.
   1. Write the reaction for the self-ionisation of water.

(1 mark)

* 1. Write the equilibrium expression for Kw, the equilibrium constant for the self-ionisation of water.

(1 mark)

* 1. The values of pH at two different temperatures are given below.

pH of pure water at 20oC = 7.083

pH of pure water at 100oC = 6.130

1. Determine [H3O+] at 20oC.

(2 marks)

1. Determine the percentage ionisation of pure water at 20oC.

(3 marks)

* 1. Based on Le Chatelier’s Principle and the information provided, is the self-ionisation of water an exothermic or endothermic process?

(1 mark)

1. List these pure substances in order of increasing pH.

(1 mark)

|  |  |
| --- | --- |
| **Substance** | **Ranking (1 to 7)** |
| 2 M KOH(aq) |  |
| H2O(l) |  |
| 2 M H2SO4(aq) |  |
| 1 M H2SO4(aq) |  |
| 1 M HCl(aq) |  |
| 0.5 M CH3COOH(aq) |  |
| 0.5 M NaOH(aq) |  |

1. Nitrous acid is a weak acid.
   1. The pH of a 0.100 M solution of nitrous acid (HNO2) is 2.200. Determine the Ka of nitrous acid.

(2 marks)

1. Thymol blue is an acid-base indicator that is red in very acidic solution and yellow in basic solution. The Ka of thymol blue is 2 x 10-2. Determine the pH at which thymol blue changes colour from red to yellow. Show your working.

(3 marks)

1. Some AlCl3 is dissolved in water.
   1. Describe the resulting solution.

(1 mark)

* 1. Will the resulting solution be acidic, basic or neutral? Write a reaction to justify your response.

(2 marks)

END OF TEST