Chapter Summary Worksheet

Chapter 5 Acid–base equilibria

Print out and complete this worksheet to generate a summary for Chapter 5.

1 The hydrogen ion concentration in mol dm^{-3} of four solutions is shown below. Which will have the highest pH?

- ☐ **A** 1.0×10^{-5}
- ☐ **B** 3.0×10^{-5}
- ☐ **C** 3.0×10^{-7}
- ☐ **D** 1.0×10^{-7}

2 When mixed in suitable proportions, which of the following pairs of solutions will **not** form a buffer solution?

- ☐ **A** hydrochloric acid and sodium hydroxide
- ☐ **B** methanoic acid and sodium hydroxide
- ☐ **C** ammonia and ammonium sulfate
- ☐ **D** carbon dioxide and sodium hydrogencarbonate

3 Which of the following statements is **not** true?

- ☐ **A** In an acidic solution, the concentration of H^+ ions is greater than that of OH^- ions.
- ☐ **B** A neutral aqueous solution is always pH 7.
- ☐ **C** The pK_a value of a weak acid is smaller than the pK_a value of a weaker acid.
- ☐ **D** Even in the most acidic aqueous solutions, there are some OH^- ions.

4 Which of the following statements is true?

- ☐ **A** diluting a solution of a weak acid will decrease its pH
- ☐ **B** diluting a solution of a strong base will increase its pH
- ☐ **C** diluting a buffer solution will not alter its pH
- ☐ **D** diluting a solution of a weak acid will alter the pH more than diluting a solution of a strong acid

5 Which indicator would be suitable for a titration of the weak acid hydrogen fluoride with sodium hydroxide?

- ☐ **A** bromophenol blue, pK_{ind} = 4.0
- ☐ **B** methyl red, pK_{ind} = 5.1
- ☐ **C** thymol blue, pK_{ind} = 8.9
- ☐ **D** alizarin yellow, pK_{ind} = 12.5

6 Which is the conjugate acid of the OH^- ion?

- ☐ **A** H_3O^+
- ☐ **B** H_2O
- ☐ **C** O^{2-}
- ☐ **D** NaOH

7 Which correctly defines a buffer solution?

- ☐ **A** Its pH does not alter when small amounts of acid or alkali are added.
- ☐ **B** It resists a change in pH when acid or alkali is added.
- ☐ **C** It resists a change in pH when small amounts of acid or alkali are added.
- ☐ **D** It is made from a weak acid and its conjugate base.

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8 Which is the hydroxide ion concentration of a solution of pH 2?

- ☐ **A** zero, as acid solutions do not contain OH^- ions
- ☐ **B** 1.0×10^{-12} mol dm^{-3}
- ☐ **C** 0.01 mol dm^{-3}
- ☐ **D** 0.30 mol dm^{-3}

9 Concentrated nitric and sulfuric acids react according to the equation:

$$HNO_3 + H_2SO_4 \rightleftharpoons H_2NO_3^+ + HSO_4^-$$

This reaction shows that:

- ☐ **A** sulfuric acid is a stronger acid than nitric acid
- ☐ **B** nitric acid is a stronger acid than sulfuric acid
- ☐ **C** both HNO_3 and H_2SO_4 are acids
- ☐ **D** neither is acting as an acid in this reaction

10 In the titration of ammonia solution with a solution of hydroiodic acid, HI, the pH at the end point will be approximately:

- ☐ **A** 9
- ☐ **B** 7, because all salts are neutral
- ☐ **C** 7, because ammonia is a weak base and hydroiodic acid is a weak acid
- ☐ **D** 5

11 When 0.20 g of the strong acid benzenesulfonic acid (molar mass 158.1 g mol^{-1}) is dissolved in water and made up to 100 cm^3, the pH of the solution is:

- ☐ **A** 1.90
- ☐ **B** 2.70
- ☐ **C** 2.90
- ☐ **D** 4.90

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