S.2 Acids, Bases & pH

Practice Worksheet — name: _____ date: _____

SECTION A — MULTIPLE CHOICE

A1. A solution turns universal indicator orange. Its approximate pH is:

- (A) 1
- (B) 4
- (C) 7
- (D) 10

A2. The salt produced when magnesium reacts with sulfuric acid is:

- (A) Magnesium sulfide
- (B) Magnesium sulfate
- (C) Magnesium chloride
- (D) Magnesium nitrate

A3. Farmers add lime (calcium hydroxide) to fields because:

- (A) It is a fertiliser providing nitrogen
- (B) It neutralises excess acidity in the soil
- (C) It kills insects
- (D) It increases the water content of soil

SECTION B — SHORT ANSWER

B1. Write the word equation for the reaction between hydrochloric acid and sodium hydroxide, and name the type of reaction. [2 marks]

B2. Describe a test to distinguish between dilute hydrochloric acid and sodium carbonate solution using only universal indicator. [3 marks]

B3. An indigestion tablet contains calcium carbonate. Explain, with a word equation, how it relieves excess stomach acid, and state one observation. [4 marks]

ANSWER KEY

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Section A

A1: 4 — Universal indicator runs red (strong acid, pH 1–2), orange/yellow (weak acid, pH 3–6), green (neutral, 7), blue (weak alkali) to purple (strong alkali). Orange sits in the weak-acid range — vinegar territory.

A2: Magnesium sulfate — Sulfuric acid always produces sulfates (plus hydrogen gas with a metal): $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$. Match the salt family to the parent acid: -chloride, -sulfate, -nitrate.

A3: It neutralises excess acidity in the soil — Many crops grow poorly in acidic soil. Calcium hydroxide is a base, so it neutralises the acid and raises the soil pH towards neutral — applied chemistry, and a favourite Criterion D context.

Section B

B1: Hydrochloric acid + sodium hydroxide → sodium chloride + water. This is neutralisation — an acid and an alkali producing a salt and water.

B2: Add universal indicator to a sample of each. The hydrochloric acid turns red/orange (pH below 7), while the sodium carbonate solution turns blue/purple (alkaline, pH above 7). The colours identify which is which immediately.

B3: Calcium carbonate neutralises the hydrochloric acid in the stomach: calcium carbonate + hydrochloric acid → calcium chloride + water + carbon dioxide. The CO_2 produced explains the observed fizzing (and burping). The stomach pH rises towards a comfortable level.