

THE BERWICKSHIRE HIGH SCHOOL

SCIENCES FACULTY

S2 CHEMISTRY - ACIDS AND ALKALIS

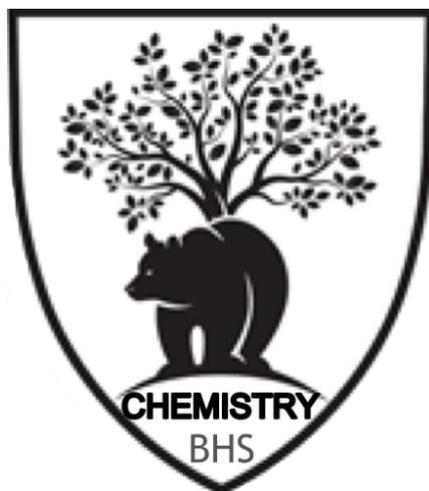


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PRACTICE TEST 1

SECTION 1 (5 MARKS)

Choose A, B, C or D.

1. A solution with pH 2 is best described as:
 - A neutral
 - B weakly alkaline
 - C strongly acidic
 - D strongly alkaline
2. Which gas is produced by the sparking of air in a car engine?
 - A carbon dioxide
 - B sulphur dioxide
 - C nitrogen dioxide
 - D carbon monoxide
3. Identify the oxide that **dissolves in water** (Data booklet: p.8 - Solubility table):
 - A copper oxide
 - B potassium oxide
 - C aluminium oxide
 - D lead oxide
4. What is the name of the salt made by reacting **sodium hydroxide** and **hydrochloric acid**?
 - A sodium nitrate
 - B sodium sulphate
 - C sodium chloride
 - D sodium carbonate
5. A bee sting is acidic. Which substance can neutralise it?
 - A vinegar
 - B lemon juice
 - C baking soda
 - D fizzy drink

SECTION 2 (15 MARKS)

1. A student attempted to dissolve three different oxides in water and measure the pH of the solutions made.

Name of oxide	pH of solution
carbon dioxide	4
potassium oxide	_____
aluminium oxide	couldn't be measured

- (a) Complete the table by suggesting a pH number the student could have obtained for **potassium oxide**. (1)
- (b) Explain why the pH of **aluminium oxide** could not be measured. (Data booklet: p.8 - Solubility table) (1)
2. Fish cannot survive in ponds if acid rain makes the pH too low.

Carbon dioxide makes rainwater slightly acidic but does not cause acid rain.

- (a) State the name of a gas that causes acid rain. (1)
- (b) To neutralise the acidic water, **40 g of lime** is added to the pond for every **square metre** of surface water.

Calculate the mass of lime needed **in g** for a pond with a surface area of **520 m²**. (1)

3. The pH values of some solutions are shown in the table.

Solution	pH
black coffee	7
red wine	3
bleach	10
rain water	6
detergent	8

- (a) Name the **two acids** in the table. (1)
- (b) Name the **neutral** solution. (1)
- (c) **On graph paper**, draw a **bar chart** to show the information in the table.
- Use appropriate scales to fill most of the graph paper.
 - Include a title and labelled axes. (2)

4. A student performed the following neutralisation reaction:



- (a) Circle the **salt** in the above equation. (1)
- (b) Name the acid the student must have used in this reaction. (1)

5. Fertilisers are important chemicals used by farmers.

- (a) Name the three essential elements that can be found in many fertilisers. (1)
- (b) Explain why farmers use fertilisers on their fields. (1)
- (c) A bag of fertiliser has a mass of **600 g**. It contains **35%** phosphate by mass.
Calculate the mass of phosphate in the bag in **g**. (1)
- (d) Some fertilisers contain calcium compounds. (Data booklet: **p.6 - Flame tests**)
Suggest a flame colour if a calcium compound is placed in a Bunsen flame. (1)
- (e) State the name of a **natural fertiliser**. (1)

PRACTICE TEST 1 - ANSWERS

SECTION 1 ANSWERS (5)

- 1 C
- 2 C
- 3 B
- 4 C
- 5 C

SECTION 2 MARKING (15)

1(a) Any pH **above 7** (e.g. 12/13/14 acceptable). (1)

1(b) Aluminium oxide is **insoluble** in water / does not dissolve, so no solution is formed to measure pH. (1)

2(a) **Sulphur dioxide** or **nitrogen dioxide** (nitrogen oxides acceptable). (1)

2(b) $520 \times 40 = 20\,800$ g (1)
(Allow 20.8 kg but still award 1 if correct conversion shown.)

3(a) **Red wine** and **rain water** (1)

3(b) **Black coffee** (1)

3(c) Bar chart: 1 mark for **title + labelled axes + sensible scale**, 1 mark for **correct plotting**. (2)

4(a) Circle **calcium nitrate**. (1)

4(b) **Nitric acid**. (1)

5(a) **Nitrogen, phosphorus, potassium** (accept spelling variations). (1)

5(b) Any valid: replace nutrients removed when crops are harvested / help crops grow bigger / help crops grow quicker / increase yield. (1)

5(c) 35% of 600 g = $0.35 \times 600 = 210$ g. (1)

5(d) **Orange-red** / brick red. (1)

5(e) Any valid: manure / compost / seaweed (or other suitable). (1)

PRACTICE TEST 2

SECTION 1 (5 MARKS)

Choose A, B, C or D.

1. A neutral solution has a pH of:
 - A 0
 - B 5
 - C 7
 - D 14
2. Which household substance is most likely alkaline?
 - A vinegar
 - B lemon juice
 - C bleach
 - D fizzy drink
3. Which statement about dilution is correct?
 - A Diluting an acid makes it more acidic.
 - B Diluting an alkali makes its pH move towards 7.
 - C Diluting an acid makes its pH move away from 7.
 - D Dilution changes the type of acid into an alkali.
4. Hydrochloric acid produces salts called:
 - A nitrates
 - B sulphates
 - C chlorides
 - D carbonates
5. A base that dissolves in water forms a(n):
 - A salt
 - B alkali
 - C oxide
 - D acid

SECTION 2 (15 MARKS)

1. The table shows pH results after adding different oxides to water. (Data booklet: p.8 - Solubility table)

Oxide added to water	Observation	pH
carbon dioxide	dissolves	4
magnesium oxide	dissolves slowly	_____
copper oxide	does not dissolve	pH stayed 7

- (a) Suggest a pH value for the solution made using **magnesium oxide**. (1)
- (b) Explain why the pH stayed 7 when copper oxide was added. (1)
2. Acid rain damages statues and buildings made of limestone.
- (a) State the name of a gas that causes acid rain. (1)
- (b) A loch has a surface area of **310 m²**. Lime is added at **55 g per m²**.

Calculate the mass of lime needed in **g**. (1)

3. The pH values of some solutions are shown in the table.

Solution	pH
orange juice	4
shampoo	6
pure water	7
toothpaste solution	9
oven cleaner	13

- (a) Name the **two acids** in the table. (1)
- (b) Name the **neutral** solution. (1)
- (c) **On graph paper**, draw a **bar chart** to show the information in the table.
- Use appropriate scales to fill most of the graph paper.
 - Include a title and labelled axes. (2)

4. A student neutralised an acid using an alkali.



- (a) Name the **salt** in the above equation. (1)
- (b) Name one product (other than the salt) that is always formed in neutralisation reactions. (1)

5. Fertilisers can be natural or man-made.

- (a) State what is meant by a fertiliser. (1)
- (b) Give one reason why very soluble fertilisers can be a problem for the environment. (1)
- (c) A gardener uses **450 g** of a fertiliser. The fertiliser is **20% nitrogen compounds** by mass.

Calculate the mass of nitrogen compounds used in **g**. (1)

- (d) State the name of a **natural fertiliser**. (1)
- (e) Man-made fertilisers are often made by neutralisation.
State one acid and one base that could be used to make **magnesium nitrate**. (1)

PRACTICE TEST 2 - ANSWERS

SECTION 1 ANSWERS (5)

- 1 C
- 2 C
- 3 B
- 4 C
- 5 B

SECTION 2 MARKING (15)

- 1(a) Any pH **above 7** (e.g. 8-11 reasonable; allow 9/10). (1)
- 1(b) Copper oxide is **insoluble** / does not dissolve, so it does not form an acidic or alkaline solution; water remains neutral (pH 7). (1)
- 2(a) **Sulphur dioxide** or **nitrogen dioxide** (nitrogen oxides). (1)
- 2(b) $310 \times 55 = 17\,050$ g (1)
(Allow 17.05 kg if shown.)
- 3(a) **Orange juice** and **shampoo** (pH 6 is acidic). (1)
- 3(b) **Pure water** (1)
- 3(c) Bar chart: 1 mark for **title + labelled axes + sensible scale**, 1 mark for **correct plotting**. (2)
- 4(a) Circle **potassium sulphate**. (1)
- 4(b) **Water** (1)
- 5(a) A fertiliser is a chemical (or substance) added to soil to help crops/plants grow bigger/faster by providing nutrients. (1)
- 5(b) Any valid: washes into rivers/streams; poisons aquatic life; causes algae growth/eutrophication; damages ecosystems. (1)
- 5(c) 20% of 450 g = $0.20 \times 450 = 90$ g. (1)
- 5(d) manure / compost / seaweed (or other suitable). (1)
- 5(e) Acid: **nitric acid**. Base: **magnesium oxide/magnesium hydroxide/magnesium carbonate** (any one). (1)

CHALLENGE TEST 1

SECTION 1 (5 MARKS)

Choose A, B, C or D.

1. Which pH value shows the **most alkaline** solution?
 - A 8
 - B 10
 - C 12
 - D 6
2. Which pair of gases can cause acid rain?
 - A carbon dioxide and oxygen
 - B sulphur dioxide and nitrogen dioxide
 - C helium and argon
 - D nitrogen and hydrogen
3. Which statement is correct?
 - A Metal oxides that dissolve in water produce acids.
 - B Non-metal oxides that dissolve in water produce alkalis.
 - C Metal oxides that dissolve in water produce alkalis.
 - D Insoluble oxides always make water acidic.
4. Nitric acid produces salts called:
 - A nitrates
 - B sulphates
 - C chlorides
 - D hydroxides
5. Which is an example of useful neutralisation?
 - A rusting of iron
 - B toothpaste neutralising plaque acid
 - C evaporation of water
 - D dissolving sugar in tea

SECTION 2 (15 MARKS)

1. A student adds different oxides to water.

Oxide	Solubility in water (Data booklet: p.8)	pH result
sulphur dioxide	dissolves	3
sodium oxide	dissolves	_____
zinc oxide	insoluble	pH stayed 7

- (a) Suggest a pH result for **sodium oxide**. (1)
- (b) Explain why the pH stayed 7 when zinc oxide was used. (1)

2. A small reservoir has a surface area of **1 250 m²**.
Lime is added at **35 g per m²** to neutralise acid rain.

Calculate the mass of lime needed in **kg**. (2)

3. The pH values of some solutions are shown in the table.

Solution	pH
cola drink	3
milk	6
sea water	8
hand soap solution	10
battery acid	1

- (a) Name **two acids** in the table. (1)
- (b) Which solution is **most acidic**? (1)
- (c) **On graph paper**, draw a **bar chart** to show the information in the table.
- Use appropriate scales to fill most of the graph paper.
 - Include a title and labelled axes. (2)

4. A student makes a salt by neutralisation.



- (a) Name the acid used. (1)
- (b) State the general word equation for neutralisation. (1)

5. Fertilisers and world food production.

- (a) State the three essential elements for healthy plant growth. (1)
- (b) A fertiliser label states: “**phosphate makes up 56% of the mass**”. Calculate the mass of phosphate in a **750 g** bag in **g**. (1)
- (c) Some fertilisers make soil too acidic. State one way a farmer could reduce the acidity of soil. (1)
- (d) State one environmental problem caused by very soluble fertilisers. (1)
- (e) Calcium compounds are sometimes added to soil. (Data booklet: **p.6 - Flame tests**) Suggest a flame colour for calcium ions. (1)

CHALLENGE TEST 1 - ANSWERS

SECTION 1 ANSWERS (5)

- 1 C
- 2 B
- 3 C
- 4 A
- 5 B

SECTION 2 MARKING (15)

1(a) Any pH **above 7** (e.g. 12/13/14). (1)

1(b) Zinc oxide is **insoluble** / does not dissolve, so no acidic/alkaline solution forms; water remains neutral (pH 7). (1)

$$2. \quad 1\,250 \times 35 = 43\,750 \text{ g (1)}$$

Convert to kg: $43\,750 \text{ g} \div 1000 = \mathbf{43.75 \text{ kg}}$ (1)

(If answer left in g, award max 1.)

3(a) Any two acids: **battery acid, cola drink, milk** (pH 6 is acidic). (1)

3(b) **Battery acid** (pH 1). (1)

3(c) Bar chart: 1 mark for **title + labelled axes + sensible scale**, 1 mark for **correct plotting**. (2)

4(a) **Hydrochloric acid**. (1)

4(b) **acid + alkali** → **salt + water** (accept acid + base → salt + water). (1)

5(a) **Nitrogen, phosphorus, potassium**. (1)

5(b) 56% of 750 g = $0.56 \times 750 = \mathbf{420 \text{ g}}$. (1)

5(c) Add **lime** / add a basic compound to neutralise acidity. (1)

5(d) Any valid: washed into rivers; harms/poisons aquatic life; eutrophication; algae blooms. (1)

5(e) **Orange-red** / brick red. (1)