3.6 Chemistry: Acids, Reactions and the Periodic Table: 1-hour Pack

Total Marks

ISEB CE 13+ Science (Chemistry) · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Carbon has an atomic number of 6 and a mass number of 12. State the number of electrons in a neutral atom of carbon.

(1)

---

2 Calculate the percentage by mass of O in SO_2. (Relative atomic masses: O = 16, S = 32.)

- ☐ A) 500%
- ☐ B) 25%
- ☐ C) 200%
- ☐ D) 50%
- ☐ E) 32%

---

3 Which of these solutions is an alkali?

- ☐ A) hydrochloric acid
- ☐ B) lemon juice
- ☐ C) sodium chloride solution
- ☐ D) nitric acid
- ☐ E) limewater

---

4 Which substance has the formula H_2O?

- ☐ A) water
- ☐ B) sodium hydroxide
- ☐ C) nitrogen gas
- ☐ D) sulfur dioxide
- ☐ E) hydrogen gas

© Revision Library | revisionlibrary.co.uk

5 A solution has pH 13. How would it be described?

- ☐ A) weakly acidic
- ☐ B) strongly alkaline
- ☐ C) strongly acidic
- ☐ D) weakly alkaline
- ☐ E) neutral

---

6 Which salt is made when sulfuric acid reacts with magnesium oxide?

- ☐ A) calcium sulfate
- ☐ B) magnesium nitrate
- ☐ C) magnesium sulfate
- ☐ D) magnesium chloride
- ☐ E) potassium sulfate

---

7 Tariq is about to carry out an experiment using concentrated sulfuric acid in the school laboratory. Name one piece of safety equipment Tariq should wear when handling the acid.

.....

.....

.....

(1)

---

8 Which of these solutions is an acid?

- ☐ A) pure water
- ☐ B) bleach
- ☐ C) limewater
- ☐ D) lemon juice
- ☐ E) ammonia solution

---

9 Which substance has the formula H_2SO_4?

- ☐ A) hydrogen gas
- ☐ B) carbon monoxide
- ☐ C) water
- ☐ D) sulfuric acid
- ☐ E) hydrochloric acid

© Revision Library | revisionlibrary.co.uk

10 A solution has pH 7. How would it be described?

- [ ] A) neutral
- [ ] B) weakly acidic
- [ ] C) weakly alkaline
- [ ] D) strongly acidic
- [ ] E) strongly alkaline

---

11 Which salt is made when hydrochloric acid reacts with magnesium?

- [ ] A) zinc chloride
- [ ] B) magnesium sulfate
- [ ] C) magnesium nitrate
- [ ] D) copper chloride
- [ ] E) magnesium chloride

---

12 The pH scale is used to measure how acidic or alkaline a solution is. A solution with pH 10 is ___

(1)

---

13 Calculate the relative formula mass of HNO_3. (Relative atomic masses: H = 1, N = 14, O = 16.)

- [ ] A) 31
- [ ] B) 63
- [ ] C) 62
- [ ] D) 79
- [ ] E) 64

---

14 Which of these solutions is an alkali?

- [ ] A) vinegar
- [ ] B) lemon juice
- [ ] C) sodium hydroxide solution
- [ ] D) sugar solution
- [ ] E) sodium chloride solution

© Revision Library | revisionlibrary.co.uk

15 Which substance has the formula NH_3?

- ☐ A) ammonia
- ☐ B) oxygen gas
- ☐ C) nitrogen gas
- ☐ D) methane
- ☐ E) water

---

16 A solution has pH 6. How would it be described?

- ☐ A) weakly alkaline
- ☐ B) weakly acidic
- ☐ C) strongly alkaline
- ☐ D) strongly acidic
- ☐ E) neutral

---

17 Which salt is made when hydrochloric acid reacts with sodium hydroxide?

- ☐ A) sodium sulfate
- ☐ B) calcium chloride
- ☐ C) potassium chloride
- ☐ D) sodium chloride
- ☐ E) sodium nitrate

---

18 A student measures the mass of zinc that dissolves when excess zinc is added to dilute hydrochloric acid over 60 seconds. She repeats the experiment three times, recording 2.5 g, 2.4 g and 3.2 g. Identify the anomalous result.

(1)

---

19 Calculate the percentage by mass of C in $CaCO_3$. (Relative atomic masses: C = 12, O = 16, Ca = 40.)

- ☐ A) 88%
- ☐ B) 1.2%
- ☐ C) 12%
- ☐ D) 24%
- ☐ E) 120%

© Revision Library | revisionlibrary.co.uk

20 Which of these solutions is an acid?

- ☐ A) oven cleaner
- ☐ B) sodium hydroxide solution
- ☐ C) potassium hydroxide solution
- ☐ D) sodium chloride solution
- ☐ E) citric acid

---

21 Which substance has the formula CH_4?

- ☐ A) nitrogen gas
- ☐ B) hydrogen peroxide
- ☐ C) copper oxide
- ☐ D) water
- ☐ E) methane

---

22 Which pH value belongs to a solution that is weakly alkaline?

- ☐ A) pH 5
- ☐ B) pH 13
- ☐ C) pH 10
- ☐ D) pH 14
- ☐ E) pH 1

---

23 Which salt is made when nitric acid reacts with sodium carbonate?

- ☐ A) sodium nitrate
- ☐ B) sodium chloride
- ☐ C) sodium sulfate
- ☐ D) copper nitrate
- ☐ E) zinc nitrate

---

24 Neutralisation reactions between acids and bases produce a salt and water. Sulfuric acid reacts with lithium hydroxide. Name the salt formed in this reaction.

.....

.....

.....

(1)

© Revision Library | revisionlibrary.co.uk

25 Calculate the percentage by mass of S in SO_2. (Relative atomic masses: O = 16, S = 32.)

- ☐ A) 200%
- ☐ B) 50%
- ☐ C) 32%
- ☐ D) 500%
- ☐ E) 5%

---

26 Which of these solutions is neutral?

- ☐ A) oven cleaner
- ☐ B) sodium hydroxide solution
- ☐ C) vinegar
- ☐ D) pure water
- ☐ E) citric acid

---

27 Which substance has the formula HNO_3?

- ☐ A) nitric acid
- ☐ B) hydrogen peroxide
- ☐ C) oxygen gas
- ☐ D) glucose
- ☐ E) ammonia

---

28 Which pH value belongs to a solution that is strongly alkaline?

- ☐ A) pH 2
- ☐ B) pH 1
- ☐ C) pH 8
- ☐ D) pH 13
- ☐ E) pH 4

---

29 Which salt is made when nitric acid reacts with zinc carbonate?

- ☐ A) calcium nitrate
- ☐ B) zinc nitrate
- ☐ C) zinc chloride
- ☐ D) sodium nitrate
- ☐ E) zinc sulfate

© Revision Library | revisionlibrary.co.uk

30 Complete the word equations for the reactions between each metal and an acid. Magnesium reacts with hydrochloric acid. Write the two products formed.

.....

.....

.....

(1)

---

31 Calculate the relative formula mass of $CaCl_2$. (Relative atomic masses: Cl = 35.5, Ca = 40.)

- ☐ A) 146.5
- ☐ B) 151
- ☐ C) 111
- ☐ D) 1110
- ☐ E) 75.5

---

32 Which of these solutions is an alkali?

- ☐ A) sugar solution
- ☐ B) nitric acid
- ☐ C) citric acid
- ☐ D) hydrochloric acid
- ☐ E) ammonia solution

---

33 Which substance has the formula $Ca(OH)_2$?

- ☐ A) copper oxide
- ☐ B) calcium hydroxide
- ☐ C) ammonia
- ☐ D) methane
- ☐ E) oxygen gas

---

34 Which pH value belongs to a solution that is strongly acidic?

- ☐ A) pH 14
- ☐ B) pH 13
- ☐ C) pH 2
- ☐ D) pH 10
- ☐ E) pH 8

© Revision Library | revisionlibrary.co.uk

35 Which salt is made when sulfuric acid reacts with iron?

- [ ] A) iron(II) sulfate
- [ ] B) zinc sulfate
- [ ] C) magnesium sulfate
- [ ] D) sodium sulfate
- [ ] E) calcium sulfate

---

36 Calculate the relative formula mass of $CaCO_3$. (Relative atomic masses: C = 12, O = 16, Ca = 40.)

- [ ] A) 68
- [ ] B) 88
- [ ] C) 140
- [ ] D) 112
- [ ] E) 100

---

37 Which of these solutions is an alkali?

- [ ] A) citric acid
- [ ] B) lemon juice
- [ ] C) sodium chloride solution
- [ ] D) oven cleaner
- [ ] E) nitric acid

---

38 Which substance has the formula SO_2?

- [ ] A) sodium hydroxide
- [ ] B) calcium hydroxide
- [ ] C) water
- [ ] D) sulfur dioxide
- [ ] E) oxygen gas

© Revision Library | revisionlibrary.co.uk

39 Which pH value belongs to a solution that is neutral?

- [ ] A) pH 7
- [ ] B) pH 8
- [ ] C) pH 2
- [ ] D) pH 10
- [ ] E) pH 13

---

40 Which salt is made when hydrochloric acid reacts with zinc oxide?

- [ ] A) magnesium chloride
- [ ] B) zinc chloride
- [ ] C) sodium chloride
- [ ] D) zinc nitrate
- [ ] E) zinc sulfate

---

41 Sodium has an atomic number of 11 and a mass number of 23. Calculate the number of neutrons in an atom of sodium.

(1)

---

42 Calculate the relative formula mass of MgO. (Relative atomic masses: O = 16, Mg = 24.)

- [ ] A) 400
- [ ] B) 56
- [ ] C) 40
- [ ] D) 24
- [ ] E) 64

---

43 Which of these solutions is an acid?

- [ ] A) bleach
- [ ] B) sodium hydroxide solution
- [ ] C) oven cleaner
- [ ] D) pure water
- [ ] E) sulfuric acid

© Revision Library | revisionlibrary.co.uk

44 Which substance has the formula H_2?

- ☐ A) nitric acid
- ☐ B) magnesium oxide
- ☐ C) hydrogen peroxide
- ☐ D) sulfur dioxide
- ☐ E) hydrogen gas

---

45 Which pH value belongs to a solution that is weakly alkaline?

- ☐ A) pH 13
- ☐ B) pH 9
- ☐ C) pH 5
- ☐ D) pH 6
- ☐ E) pH 1

---

46 Which salt is made when sulfuric acid reacts with zinc oxide?

- ☐ A) zinc chloride
- ☐ B) potassium sulfate
- ☐ C) zinc nitrate
- ☐ D) zinc sulfate
- ☐ E) copper sulfate

---

47 The pH scale is used to measure how acidic or alkaline a solution is. A solution with pH 5 is ___

(1)

© Revision Library | revisionlibrary.co.uk

48 A newly discovered element, X, is a solid at room temperature. It reacts vigorously with water, producing a gas that pops with a lit splint. It also reacts with chlorine to form an ionic compound with the formula XCl.

Using your knowledge of the periodic table and group trends, suggest which group of the periodic table element X belongs to, and justify your answer. Your answer should include a word equation for the reaction of X with water.

(6)

---

49 Calculate the relative formula mass of H_2O. (Relative atomic masses: H = 1, O = 16.)

- ☐ A) 180
- ☐ B) 19
- ☐ C) 18
- ☐ D) 17
- ☐ E) 34

---

50 Which of these solutions is neutral?

- ☐ A) sodium chloride solution
- ☐ B) lemon juice
- ☐ C) limewater
- ☐ D) citric acid
- ☐ E) sulfuric acid

---

51 Which substance has the formula NaOH?

- ☐ A) carbon dioxide
- ☐ B) methane
- ☐ C) ammonia
- ☐ D) sodium hydroxide
- ☐ E) copper oxide

© Revision Library | revisionlibrary.co.uk

52 Which pH value belongs to a solution that is weakly acidic?

- [ ] A) pH 14
- [ ] B) pH 8
- [ ] C) pH 6
- [ ] D) pH 9
- [ ] E) pH 10

---

53 Which salt is made when sulfuric acid reacts with zinc carbonate?

- [ ] A) magnesium sulfate
- [ ] B) copper sulfate
- [ ] C) zinc nitrate
- [ ] D) zinc chloride
- [ ] E) zinc sulfate

---

54 Calculate the relative formula mass of CO. (Relative atomic masses: C = 12, O = 16.)

- [ ] A) 28
- [ ] B) 40
- [ ] C) 16
- [ ] D) 280
- [ ] E) 44

© Revision Library | revisionlibrary.co.uk

55 Which of these solutions is an alkali?

- ☐ A) sulfuric acid
- ☐ B) bleach
- ☐ C) pure water
- ☐ D) sodium chloride solution
- ☐ E) vinegar

---

56 The periodic table arranges all the known chemical elements in a grid.

(a) State the name given to the horizontal rows of the periodic table. **(1)**

(b) State the name given to the vertical columns of the periodic table. **(1)**

(c) State which side of the periodic table (left or right) the metals are found on. **(1)**

(d) State which side of the periodic table (left or right) the non-metals are found on. **(1)**

© Revision Library | revisionlibrary.co.uk

Mark scheme · 3.6 Chemistry: Acids, Reactions and the Periodic Table: 1-hour Pack

Question 1

6 (oe) **B1**

Answer: 6

Question 2

D (50%) **B1**

Answer: D) 50%

Question 3

E (limewater) **B1**

Answer: E) limewater

Question 4

A (water) **B1**

Answer: A) water

Question 5

B (strongly alkaline) **B1**

Answer: B) strongly alkaline

Question 6

C (magnesium sulfate) **B1**

Answer: C) magnesium sulfate

Question 7

Safety goggles (oe) **B1**

Answer: Safety goggles

Question 8

D (lemon juice) **B1**

Answer: D) lemon juice

Question 9

D (sulfuric acid) **B1**

Answer: D) sulfuric acid

Question 10

A (neutral) **B1**

Answer: A) neutral

Question 11

E (magnesium chloride) **B1**

Answer: E) magnesium chloride

Question 12

Alkaline (oe) **B1**

Answer: Alkaline

Question 13

B (63) **B1**

Answer: B) 63

Question 14

C (sodium hydroxide solution) **B1**

Answer: C) sodium hydroxide solution

Question 15

A (ammonia) **B1**

Answer: A) ammonia

Question 16

B (weakly acidic) **B1**

Answer: B) weakly acidic

Question 17

D (sodium chloride) **B1**

Answer: D) sodium chloride

Question 18

3.2 g (oe) **B1**

Answer: 3.2 g

Question 19

C (12%) **B1**

Answer: C) 12%

Question 20

E (citric acid) **B1**

Answer: E) citric acid

Question 21

E (methane) **B1**

Answer: E) methane

Question 22

C (pH 10) **B1**

Answer: C) pH 10

Question 23

A (sodium nitrate) **B1**

Answer: A) sodium nitrate

Question 24

Lithium sulfate (oe) **B1**

Answer: Lithium sulfate

Question 25

B (50%) **B1**

Answer: B) 50%

Question 26

D (pure water) **B1**

Answer: D) pure water

Question 27

A (nitric acid) **B1**

Answer: A) nitric acid

Question 28

D (pH 13) **B1**

Answer: D) pH 13

© Revision Library | revisionlibrary.co.uk

Question 29

B (zinc nitrate) **B1**

Answer: B) zinc nitrate

Question 30

Magnesium chloride and hydrogen (oe) **B1**

Answer: Magnesium chloride and hydrogen

Question 31

C (111) **B1**

Answer: C) 111

Question 32

E (ammonia solution) **B1**

Answer: E) ammonia solution

Question 33

B (calcium hydroxide) **B1**

Answer: B) calcium hydroxide

Question 34

C (pH 2) **B1**

Answer: C) pH 2

Question 35

A (iron(II) sulfate) **B1**

Answer: A) iron(II) sulfate

Question 36

E (100) **B1**

Answer: E) 100

Question 37

D (oven cleaner) **B1**

Answer: D) oven cleaner

Question 38

D (sulfur dioxide) **B1**

Answer: D) sulfur dioxide

Question 39

A (pH 7) **B1**

Answer: A) pH 7

Question 40

B (zinc chloride) **B1**

Answer: B) zinc chloride

Question 41

12 (oe) **B1**

Answer: 12

Question 42

C (40) **B1**

Answer: C) 40

Question 43

E (sulfuric acid) **B1**

Answer: E) sulfuric acid

Question 44

E (hydrogen gas) **B1**

Answer: E) hydrogen gas

Question 45

B (pH 9) **B1**

Answer: B) pH 9

Question 46

D (zinc sulfate) **B1**

Answer: D) zinc sulfate

Question 47

Acidic (oe) **B1**

Answer: Acidic

Question 48

Level 1 Basic, isolated statements about one property of element X, with little or no link to a specific group of the periodic table. Little or no attempt at a word equation. **1-2**

Level 2 Some relevant properties of X are linked to Group 1, with a reasonable attempt at the word equation for the reaction with water, though the justification may be incomplete. **3-4**

Level 3 A clear, well-reasoned identification of Group 1, supported by at least two linked pieces of evidence (reactivity with water, the gas produced, the 1:1 ratio in XCl), together with a fully correct word equation, using accurate scientific vocabulary throughout. **5-6**

Indicative content:

- Element X reacts vigorously with water, producing a gas that pops with a lit splint; this gas is hydrogen, and vigorous reaction with water displacing hydrogen is characteristic of a very reactive metal.
- Element X forms an ionic compound XCl, a 1:1 ratio with chlorine, showing X has a combining power (valency) of +1, consistent with Group 1 elements, which always form 1+ ions.
- Element X is a solid at room temperature, consistent with the Group 1 alkali metals, which are all solids at room temperature.
- The vigorous reaction with water is typical of Group 1 (alkali metals), which react much more vigorously with water than Group 2 metals.
- Word equation: X + water -> X hydroxide + hydrogen (e.g. $2X + 2H_2O \rightarrow 2XOH + H_2$).
- Overall conclusion: element X most likely belongs to Group 1, the alkali metals.

Question 49

C (18) **B1**

Answer: C) 18

Question 50

A (sodium chloride solution) **B1**

Answer: A) sodium chloride solution

Question 51

D (sodium hydroxide) **B1**

Answer: D) sodium hydroxide

© Revision Library | revisionlibrary.co.uk

Question 52

C (pH 6) **B1**

Answer: C) pH 6

Question 53

E (zinc sulfate) **B1**

Answer: E) zinc sulfate

Question 54

A (28) **B1**

Answer: A) 28

Question 55

B (bleach) **B1**

Answer: B) bleach

Question 56

(a) periods, cao **B1**

(a) Answer: Periods

(b) groups, cao **B1**

(b) Answer: Groups

(c) left, cao **B1**

(c) Answer: Left

(d) right, cao **B1**

(d) Answer: Right

© Revision Library | revisionlibrary.co.uk