**GRADE 9 ASSESSMENT TASKS: TERM 2**

**MATTER AND MATERIALS**

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| --- |
| **Subject:** Natural Sciences |
| **Strand: MATTER AND MATERIALS** |
| **Topic: Compounds ( periodic table, Names of compounds, chemical reactions)** |
| **Grade:** 9 |
| **Number of questions for exemplar:** |
| **Low order questions** | **Middle order questions:** | **High order questions**  |
|  |  |  |

**MULTIPLE CHOICE QUESTIONS**

1. Newlands arranged the elements in order of:
2. atomic mass
3. mass their first letter
4. atomic number
5. number of electrons
6. Mendeleev arranged the elements in order of:
7. atomic number
8. Relative atomic mass
9. their first letter
10. number of neutrons

1. Who predicted the properties of undiscovered elements using their table?
2. Newlands
3. Mendeleev
4. Dobereiner
5. Newton
6. In the modern periodic table the elements are arranged in order of:
7. atomic number
8. relative atomic mass
9. their first letter
10. the alphabet
11. In the modern periodic table the vertical columns are called:
12. periods
13. triads
14. Groups
15. Struts
16. In the modern periodic table:

A most elements are metals and are found on the right

B most elements are non-metals and are found on the right

C most elements are metals and are found on the left

D most elements are metalloids and are found on the left

1. Which elements are found in the blue shaded part of this periodic table?


A alkali metals

B halogens

C transition metals

D noble gases

8. Which elements are found in the blue shaded part of this periodic table?


A alkali metals

B halogens

C noble gases

D alkali earth metals

 **ANSWERS**

**1. Newlands arranged the elements in order of:**

Newlands arranged the elements in order of atomic mass.

**2. Mendeleev arranged the elements in order of:**

Mendeleev arranged the elements in order of relative atomic mass.

**3. Who predicted the properties of undiscovered elements using their table?**

Mendeleev predicted the properties of undiscovered elements using their table.

**4. In the modern periodic table the elements are arranged in order of:**

In the modern periodic table the elements are arranged in order of atomic number.

**5. In the modern periodic table the vertical columns are called:**

 In the modern periodic table the vertical columns are called groups.

**6. In the modern periodic table:**

 In the modern periodic table most elements are metals and are found on the left.

**7. Which elements are found in the blue shaded part of this periodic table?**


 Transition metals are found in the blue shaded part of this periodic table.

**8. Which elements are found in the blue shaded part of this periodic table?**


 Halogens are found in the blue shaded part of the periodic table.

**MULTIPLE CHOICE 2**

1. Compared to most other metals, what properties do the alkali metals have?

A low melting points and high densities

B low melting points and low densities

C high melting points and high densities

D high melting points and low densities

2. When sodium hydroxide dissolves in water, what sort of solution is formed?

 A acidic

B neutral

C alkaline

D

1. Which gas is produced when lithium reacts with water?

A hydrogen

B oxygen

C carbon dioxide

D

1. Which alkali metal is the most reactive out of lithium, sodium and potassium?

A lithium

B sodium

C potassium

D

1. Why is sodium stored under oil?

A to make it nice and slippery

B to keep it away from air and water

C it burns with an orange flame

D

1. Which alkali metal is the softest out of lithium, sodium and potassium?

A lithium

B sodium

C potassium

D

1. How many chlorine atoms are there in one chlorine molecule?

A one

B two

C seven

D

8. Which of the properties below best describe the halogens?

A good conductors of heat and electricity

B good conductors of heat but poor conductors of electricity

C poor conductors of heat and electricity

D

9. Which is the most reactive halogen?

 A fluorine

B chlorine

C iodine

D

10. Which of the statements below best describes the properties of the halogens as you go down group 7?

A The elements become less reactive and have lower melting points.

B The elements become less reactive and have higher melting points.

C The elements become more reactive and have higher melting points.

D

11. Fluorine is more reactive than chlorine. What will happen when chlorine is bubbled through a solution of sodium fluoride?

 A Chlorine will be displaced by fluorine in the reaction.

B Fluorine will be displaced by chlorine in the reaction.

 C Chlorine will not displace fluorine.

 D

12. Why is neon used in neon lights?

A It is coloured.

B It burns in air with a red flame.

C It gives off light when electricity passes through it.

D

13. Why is helium is used in balloons?

 A It is less dense than air.

B It is more dense than air.

C It has the same density as air.

D

14. Which is the densest noble gas?

 A neon

B Xenon

C radon

D

15. The noble gases are monatomic. What does this mean?

 A They exist as single atoms.

B They exist as pairs of atoms.

C They are radioactive.

D

**ANSWERS**

**1. Compared to most other metals, what properties do the alkali metals have?**

Compared to most other metals, alkali metals have low melting points and low densities.

**2. When sodium hydroxide dissolves in water, what sort of solution is formed?**

When sodium hydroxide dissolves in water, alkaline solution is formed.

**3. Which gas is produced when lithium reacts with water?**

Hydrogen gas is produced when lithium reacts with water.

**4. Which alkali metal is the most reactive out of lithium, sodium and potassium?**

 Potassium is the most reactive alkali metal out of lithium, sodium and potassium.

**5. Why is sodium stored under oil?**

Sodium is stored under oil to keep it away from air and water.

**6. Which alkali metal is the softest out of lithium, sodium and potassium?**

Potassium is the softest alkali metal out of lithium, sodium and potassium.

**7. How many chlorine atoms are there in one chlorine molecule?**

There are two chlorine atoms in one chlorine molecule.

**8. Which of the properties below best describe the halogens?**

The halogens are poor conductors of heat and electricity.

**9. Which is the most reactive halogen?**

Fluorine is the most reactive halogen.

**10. Which of the statements below best describes the properties of the halogens as you go down group 7?**

The elements become less reactive and have higher melting points' best describes the properties of the halogens as you go down group 7.

**11. Fluorine is more reactive than chlorine. What will happen when chlorine is bubbled through a solution of sodium fluoride?**

Chlorine will not displace fluorine when chlorine is bubbled through a solution of sodium fluoride.

**12. Why is neon used in neon lights?**

Neon is used in neon lights because it gives off light when electricity passes through it.

**13. Why is helium is used in balloons?**

 Helium is used in balloons because it is less dense than air.

**14. Which is the densest noble gas?**

Radon is the densest noble gas.

**15. The noble gases are monatomic. What does this mean?**

 Monatomic means they exist as single atoms.

**MULTIPLE CHOICE 3**

1. **Where are the transition metals found in the periodic table?**



A The section labelled A.

B The section labelled B.

C The section labelled C.

D

1. Why is steel used for building bridges?

A It rusts easily.

B It is expensive compared to most metals.

C It is strong.

D

3. Why is copper used in electricity cables?

A It is a good conductor of heat.

B It is a good conductor of electricity.

C It does not react with water.

D

4. Nickel chloride is green. Why might you expect this?

A Nickel is used in coins.

B Nickel does not react with water.

C Nickel is a transition metal.

D

1. Why is silver used for electrical contacts?

A It is a good conductor of electricity.

B It is expensive.

C It is very dense.

D

1. Why is gold used for jewellery?

A It is a good conductor of electricity.

B It stays shiny.

C It is not very dense.

D

**ANSWERS**Top of Form

**1. Where are the transition metals found in the periodic table?**


The transition metals are found in the section labelled B in the periodic table.

**2. Why is steel used for building bridges?**

Steel is used for building bridges because it is strong.

**3. Why is copper used in electricity cables?**

Copper is used in electricity cables because it is a good conductor of electricity.

**4. Nickel chloride is green. Why might you expect this?**

You would expect nickel to be green because it is a transition metal.

**5. Why is silver used for electrical contacts?**

Silver is used for electrical contacts because it is a good conductor of electricity.

**6. Why is gold used for jewellery?**

Gold is used for jewellery because it stays shiny.

Bottom of Form

Bottom of Form

Bottom of Form

1 Fill in the blanks with words from the box.

|  |  |  |  |
| --- | --- | --- | --- |
| **atom** | **atomic number** | **column** | **element** |
| **gold** | **Inert/ noble** | **Mendeleev**  | **metals** |
| **Non-metals** | **periodic** | **properties** | **symbol** |

All matter is composed of various elements. An \_\_\_\_\_\_\_\_\_(a)\_\_\_\_\_\_\_\_ is a form of matter that is composed of a single type of \_\_\_\_\_\_\_\_(b)\_\_\_\_\_\_\_\_\_. In 1869, Dmitri \_\_\_\_\_\_\_\_(c)\_\_\_\_\_\_\_\_\_ created the \_\_\_\_\_\_\_\_(d)\_\_\_\_\_\_\_\_\_ table to group the elements. Periodic tables usually show the element name, the element \_\_\_\_\_\_\_\_(e)\_\_\_\_\_\_\_\_\_, and the atomic number.

As you go across a row from left to right, the \_\_\_\_\_\_\_(f)\_\_\_\_\_\_\_\_\_\_ of the element increases. The atomic number is the same as the number of protons in the nucleus of an atom. As well, elements that have similar \_\_\_\_\_\_\_\_(g)\_\_\_\_\_\_\_\_\_ are placed in the same \_\_\_\_\_\_\_\_\_(h)\_\_\_\_\_\_\_\_.

For example, copper, silver, and \_\_\_\_\_\_\_(i)\_\_\_\_\_\_\_\_\_\_ all have similar properties and are all placed in column eleven of the periodic table. Elements on the left side of the table tend to have properties of \_\_\_\_\_\_\_\_\_\_(j)\_\_\_\_\_\_\_ and elements on the right side of the table tend to have properties of \_\_\_\_\_\_\_\_(k)\_\_\_\_\_\_\_\_\_. Elements in column 18, the last column on the left, are \_\_\_\_\_\_\_\_(l)\_\_\_\_\_\_\_\_\_ gases, which are gases that generally do not react with other elements.

a) **element**

b) **atom**

c) **Mendeleev**

d) **periodic**

e) **symbol**

f) **atomic number**

g) **properties**

h) **column**

i) **gold**

j) **metals**

k) **Non-metals**

l) **Inert/ noble**

Instructions:

Answer the questions with the proper information using your notes, textbook, and the periodic table.

1. Define a group. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What is a period? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What is the symbol for the following elements.
	1. Magnesium \_\_\_\_\_\_\_\_\_\_\_ b. Potassium \_\_\_\_\_\_\_\_\_\_\_\_

c. Iron \_\_\_\_\_\_\_\_\_\_\_\_ d. Copper \_\_\_\_\_\_\_\_\_\_\_\_

1. What are the names of the following elements.

a. C \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b. Cl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. Au \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ d. Si \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What period are the following elements in?

a. He \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b. Ge \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. Rb \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ d. I \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What group are the following elements?

a. Sulfur \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b. Ca \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. Iodine \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ d. Fe \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Give an element with the following characteristics.

a. Halogen \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b. Nobel gas\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. Alkali metal \_\_\_\_\_\_\_\_\_\_\_\_\_\_ d. Transition metal \_\_\_\_\_\_\_\_\_\_\_

e. Lanthanide series \_\_\_\_\_\_\_\_\_\_ f. Alkaline Earth metal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

g) Actenoids

**ANSWERS**

1. These are the elements that are found in the same column.

2. These are the elements that are found in the same row.

3a) Mg b) K c) Fe d) Cu

4a) Copper b) Chlorine c) Gold d) Silicon

5a) 1 b) 3 c) 5 d) 5

6a) 16 b) 2 c) 17 d) 8

7 a) Fluorine, Chlorine, ect,

 b) Helium, Neon, ect,

 c) Lithium, Sodium, ect,

 d) Copper, Iron, ect,

 e) Lanthanum, Cerium, etc,

 f) Beryllium, Magnesium, etc,

 g) Actinium, Thorium, etc,

 **Use your Periodic table to complete the worksheet.**

1. What is the atomic symbol for silver? Ag

2. What is the atomic mass of mercury? 200

3. Ni is the symbol for what element? Nickel

4. The element that has the atomic number 17 is? Chlorine (Cl)

5. List the symbols for two transition metals. Fe Cu

6. Cu, Ag, and Au are all in what group # 11

7. Name two noble gases Heluim, Neon, etc

8. Give the symbol for two halogens. F, Cl, Br, I

9. What is the symbol for element with atomic number 74? Tungsten

10. What is the atomic mass of copper? 63,5

11. What is the last element in period 4? Krypton (Kr)

For questions 12, label the following Key box as it should appear on your periodic table

12. What do the following represent:

6

C

12.01

12.1

12.2

12.3

**ANSWERS**

1. Ag

2. 200

3. Nickel

4. Chlorine (Cl)

5. Fe Cu

6. group # 11

7. Heluim, Neon, etc

8. F, Cl, Br, I

9. Tungsten (W)

10. 63,5 / 64

11. Krypton (Kr)

12.1 Atomic number

12.2 Symbol

12.3 Atomic mass

**Use a Periodic table to find the information asked for below:**

1. What is the atomic number of:

Calcium \_\_\_\_ **20**

Iron \_\_\_\_ **26**

Gold \_\_\_\_ **79**

Uranium \_\_\_\_ **92**

2. What is the Atomic mass of:

Calcium \_\_\_\_\_ **40**

Iron \_\_\_\_\_**56**

Uranium \_\_\_\_\_**238**

Copper \_\_\_\_\_**64**

3. How many protons do the following have?

Calcium \_\_\_\_\_ **20**

Gold \_\_\_\_\_**79**

Copper \_\_\_\_\_**29**

Iron \_\_\_\_\_**26**

4. How many electrons do the following have?

Gold \_\_\_\_\_**79**

Iron \_\_\_\_\_**26**

Copper \_\_\_\_**\_29**

Uranium \_\_\_\_\_**92**

5. Does mercury have more protons and electrons than tin? **YES**

6. Is mercury a heavier element than tin? **YES**

7. Does potassium have more electrons than neon? **YES**

8. Does hydrogen have more electrons than Uranium? **NO**

9. Which has more protons, sulfur or iodine? **Iodine**

10. Write the symbols or the names for each of these elements:

Chlorine \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Cl** Zn \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Zinc**

Copper \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Cu** Helium \_\_\_\_\_\_\_\_\_\_\_\_\_ **He**

Potassium \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **K** Iron \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Fe**

Silver \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Ag** P \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Phosphorus**

Na \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Sodium** Ne \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Neon**

Sn \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Tin** Mercury \_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Hg**

**ANSWERS**

|  |
| --- |
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|  | **Across**  **1** The lightest inert gas. (6) **4** The element we need to breathe. (6) **5** Alkaline metal in table salt. (6) **7** Inert gas used to make bright city lights. (4) **8** 2nd place in the Olympics. (6) **10** An important element in bones. (7) **13** A radioactive element often used in South African nuclear power stations. (7) **14** Poison gas in WWI. (8) **15** A famous poison that turns your tongue black. (7) **17** A metal discovered on a farm called Langlaagte in 1886 in the transvaal. (4) **18** The element diamonds are made from. (6) **19** This metal is used along with carbon to make steel. (4) |
| **Down**  **2** Heavy metal used in paints, batteries, and radiation shields. (4) **3** The most common element in the universe. (8) **6** A liquid metal that was used in thermometers. (7) **7** Most common element in the earth's atmosphere. (8) **9** A component of gunpowder that smells like rotten eggs. (7) **11** A metal used in foil. (World Spelling) (9) **12** A metal used in wires. (6) **15** The most common inert gas in the atmosphere. (5) **16** Element used to make semi-conductors (computer chips). (7) | C:\ScienceTeachers\physial science\atomman.jpg |
|  |  |  |  |  |

**ANSWERS**

**Across**

 **1** The lightest inert gas. (6) **Helium**

 **4** The element we need to breathe. (6) **Oxygen**

 **5** Alkaline metal in table salt. (6) **Sodium**

 **7** Inert gas used to make bright city lights. (4) **Neon**

 **8** 2nd place in the Olympics. (6) **Silver**

 **10** An important element in bones. (7) **Calcium**

 **13** A radioactive element often used in nuclear power stations in South Africa. (7) **Uranium**

 **14** Poison gas in WWI. (8) **Chlorine**

 **15** A famous poison that turns your tongue black. (7) **Arsenic**

 **17** A metal discovered on a farm called Langlaagte in 1886 in the Transvaal (4) **Gold**

 **18** The element diamonds are made from. (6) **Carbon**

 **19** This metal is used along with carbon to make steel. (4) **Iron**

**Down**

 **2** Heavy metal used in paints, batteries, and radiation shields. (4) **Lead**

 **3** The most common element in the universe. (8) **Hydrogen**

 **6** A liquid metal that was used in thermometers. (7) **Mercury**

 **7** Most common element in the earth's atmosphere. (8) **Nitrogen**

 **9** A component of gunpowder that smells like rotten eggs. (7) Sulphur ( new spelling Sulfur)

 **11** A metal used in foil. (World Spelling) (9) **Aluminium**

 **12** A metal used in wires. (6) **Copper**

 **15** The most common inert gas in the atmosphere. (5) **Argon**

**16** Element used to make semi-conductors (computer chips). (7) **Silicon**

**ATOMS AND ELEMENTS**

1. Which of these is the smallest particle?

A an atom

B a molecule

C a speck of dust

D compound

2. Which of these is the correct symbol for magnesium?

A MG

B mg

C Mg

D M

3. Which statement about elements is correct?

A most elements are metals

B most elements are non-metals

C there are about the same number of metals and non-metals

D most elements are gases

4. Where are the metals found in the periodic table?

A on the left

B on the right

C scattered all over

D at the bottom

5. Which of the following is **not** a general property of metals?

A shiny

B good conductor of heat

C poor conductor of electricity

D malleable

6. Which of the following is **not** a general property of non-metals?

A brittle

B strong

C poor conductor of heat

D shiny

1. An element that sinks in water, and makes a ringing sound when hit. It is most likely to be:

A wood

B a non-metal

C an alloy

D a metal

**Atoms and elements**

**1 Which of these is the smallest particle?**

 The smallest particle is an atom.

**2 Which of these is the correct symbol for magnesium?**

 The symbol for magnesium is **Mg**.

**3 Which statement about elements is correct?**

 Most elements are metals.

**4 Where are the metals found in the periodic table?**

 Metals are found on the left of the periodic table.

**5 Which of the following is not a general property of metals?**

 A general property or metals is that they are **not** poor conductors of electricity.

**6 Which of the following is not a general property of non-metals?**

 A general property of non-metals is that they are **not** strong.

**7 An element sinks in water and makes ringing sound when hit. It is most likely to be:**

 An element that sinks in water and makes a ringing sound when hit is most likely to be a metal.

**1 Multiple choice questions**

1.1 Which one of the following represent an element that occurs in group 2,
 period 4 of the periodic table of elements?

 A Ca

 B Mg

 C Ca

 D Mg (1)

1.2. The total number of atoms contained in 5NaHCO**3**is ...

 A 20

 B 25

 C 30

 D 35 (1)

1.3 Which one of the following reaction equations is not balanced correctly?

 A 2Mg + O2 2MgO

 B Na + O2 Na2O

C 2Zn + 4HCl 2ZnCl2 + 2H2

 D Ca + 2H2O Ca(OH)2 + H2 (1)

1.4 The formulae for copper sulphate, table salt and ammonia is :

|  |  |  |  |
| --- | --- | --- | --- |
|  | Copper sulphate | Table salt | Ammonia |
| A | CuSO4 | NaCl | NH3 |
| B | CuS | NaI | HNO4 |
| C | CuSO4 | HCl | NH3 |
| D | Cu(OH)2 | NaCl | NO2 |

 (1)

1.5 In the Periodic Table, which is NOT a family of elements?

 A Alkali metals

 B Halogens

 C Noble gases

 D Nitrogen (1)

**2 One word answer type questions:**

Use one word to complete each of the following questions

2.1 Non metal oxides are also refer to as ...... oxides. (1)

2.2 Water, salt and ...... are the products which form when a carbonate reacts with an acid. (1)

2.3 ......... (Name of compound) turns clear lime water milky. (1)

2.4 Balance the following equation : (1)

2.5 The number of oxygen atoms represented by 15Ca(OH)2 is ...... (1)

**3 Matching Column type questions:**

 Choose the item from Column B that matches the description in Column A. Write down the number from Column A with the corresponding LETTER of your choice from Column B. 10x1= **[10]**

|  |  |  |
| --- | --- | --- |
| **Column A** |  | **Column B** |
| 3.1 | NON greenhouse gas, responsible for the formation of acid rain. | A | He |
| 3.2 | Ignites with a popping sound | B | 28 |
| 3.3 | Turns litmus paper blue | C | 27 |
| 3.4 | One of the products that forms when CaCO3 reacts with H2SO4 | D | SO2 |
| 3.5 | A nobel gas | E | S |
| 3.6 | Number of atoms in 4 molecules Na2SO4 | F | Fe2+ |
| 3.7 | Number of electrons in a neutral atom, containing 28 neutrons and 27 protons | G | H2 |
| 3.8 | \_\_\_\_ + oxygen gas ---> acidic oxide | H | Mg |
| 3.9 | An ion | I | NaOH |
| 3.10 | Burns with a blinding white flame in oxygen gas | J | CO2 |

**4 Answer the following questions in full sentences:**

4.1 Which three conditions must be met in order for atoms to combine? (3)

4.2 Two elements X and Y are represented by and. Use the attached Periodic
table and answer the following questions related to X and Y.

 Write down:

4.2.1 the NAME of the element represented by Y (1)

4.2.2 the chemical symbol of the element represented by X. (1)

4.2.3 mass number of X. (1)

 4.2.4 atomic number of Y. (1)

 4.2.5 the information that can be obtained from the mass number of Y (1)

4.2.6 a balanced chemical equation for the reaction between element Y
and oxygen gas. (2)

**ANSWERS**

**Matter and Material:**

1.1 A

1.2 C

1.3 B

1.4 A

1.5 D 5x1= (5)

2.1 Acidic

2.2 Carbon dioxide

2.3 Carbon dioxide

2.4 2

2.5 30 5x1= (5)

3.1 D (SO2)

3.2 G (H2)

3.3 I  (NaOH)

3.4 J  (CO2)

3.5 A (He)

3.6 B  (28)

3.7 C  (27)

3.8 E  (S)

3.9 F  (Fe2+)

3.10 H  (Mg) 10x1= (10)

4.1 The atoms must be close enough to each other.

 Enough energy must be available to start the reaction.

 A more stable compound must be formed**.** (3)

4.2.1 Magnesium  (1)

4.2.2 Oxygen (1)

4.2.3 Mass number(X) = 16 (1)

4.2.4 Atomic number (Y) = 12  (1)

4.2.5 Number of protons + neutrons  (1)

4.2.6 2Mg + O2 ---> 2MgO  (2)

**Compounds and mixtures**

Top of Form



1. How many different atoms are there in a compound?

A one

B always two

C two or more

D always five

2. Does this show an element, a mixture or a compound?



A compound

B mixture

C element

D alloy

3. Which statement about atoms and molecules is correct?

A elements always exist as separate atoms.

B elements always exist as pairs of atoms called molecules.

C elements and compounds can exist as molecules.

D elements

4. Is water an element, compound or mixture?

A element

B compound

C mixture

D none of the above

5. Which is the best way to get salt from salty water?

A evaporation

B filtration

C distillation

D sifting

6. Pure water can be separated from inky water by simple distillation. This is because:

A water and ink have different boiling points.

B water evaporates leaving the ink particles behind.

C ink evaporates leaving the water behind.

D

7. What is the correct order for obtaining salt from a mixture of sand and salt?

A dissolving in water - filtration - evaporation

B evaporation - filtration - dissolving in water

C filtration - dissolving in water – evaporation

D

8. Which method is usually used to separate coloured substances from each other?

A simple distillation

B evaporation

C chromatography

D

9. Which of these four metals is the most reactive: potassium, iron, calcium or gold?

A potassium

B iron

C gold

D calcium

10. Which of these four metals is the least reactive: iron, copper, zinc or platinum?

A iron

B copper

C platinum

D zinc

11. Copper and oxygen react to form which compound?

A copper oxygen

B copper oxide

C carbon dioxide

D copper chloride

**answers :**

**Compounds and mixtures**

**1 How many different atoms are there in a compound?**

 There are two or more atoms in a compound

**2 Does this show an element, a mixture or a compound**?



 This diagram shows an element.

**3 Which statement about atoms and molecules is correct?**

 Elements and compounds can exist as molecules.

**4 Is water an element, compound or mixture?**

 Water is a compound.

**5 Which is the best way to get salt from salty water?**

 Evaporation is the best way to get salt from salty water.

**6 Pure water can be separated from inky water by simple distillation. This is because:**

 Pure water can be separated from inky water by simple distillation because water evaporates leaving the ink particles behind.

**7 What is the correct order for obtaining salt from a mixture of sand and salt?**

 The correct order is: dissolving in water - filtration - evaporation

**8 Which method is usually used to separate coloured substances from each other?**

 Chromatography is usually used to separate coloured substances from each other.

**9 Which of these three metals is the most reactive: potassium, iron or gold?**

 Of these three metals, potassium is the most reactive.

**10 Which of these three metals is the least reactive: iron, copper or platinum?**

 Of these three metals, platinum is the least reactive.

**11 Copper and oxygen react to form which compound?**

 Copper Oxide

**Write the chemical formula for each of the following compounds:**

|  |  |
| --- | --- |
| Water |  |
| Carbon dioxide |  |
| Sodium chloride |  |
| Lithium hydroxide |  |
| Lithium oxide |  |
| Lithium phosphate |  |
| Sodium nitrite |  |
| Sodium sulphate |  |
| Sodium hydroxide |  |
| Sodium bicarbonate |  |
| Sodium carbonate |  |
| Sodium phosphate |  |
| Ammonium chloride |  |
| Potassium permanganate |  |
| Potassium chlorate |  |
| Potassium sulphite |  |
| Potassium carbonate |  |
| Magnesium oxide |  |
| Magnesium chloride |  |
| Magnesium carbonate |  |
| Magnesium phosphate |  |
| Magnesium sulphate |  |
| Magnesium sulphite |  |
| Magnesium hydroxide |  |
| Magnesium nitrate |  |
| Aluminium chloride |  |
| Aluminium fluoride |  |
| Aluminium bromide |  |
| Aluminium iodide |  |
| Aluminium oxide |  |
| Aluminium nitrate |  |
| Aluminium hydroxide |  |
| Aluminium phosphate |  |
| Aluminium sulphate |  |
| Hydrogen chloride (hydrochloric acid) |  |
| Hydrogen sulphate (sulphuric acid) |  |
| Hydrogen nitrate (nitric acid) |  |
| Acetic acid |  |
| Copper-II-sulphate |  |
| Zinc-II-chloride |  |
| Iron-III-oxide |  |
| Iron-II-oxide |  |
| Silver nitrate |  |
| Oxygen |  |
| Hydrogen |  |
| Nitrogen |  |
| Flourine |  |
| Chlorine |  |
| Bromine |  |
| Iodine |  |
| Argon |  |
| Sulphur-IV-oxide (Sulphur dioxide) |  |
| Calcium hydroxide |  |
| Hydrogen peroxide |  |
| Manganese dioxide |  |
| Sodium oxide |  |
| Copper-II-oxide |  |
| Iron-II-sulphide |  |
| Mercuric oxide |  |

**Exercise 2 MEMO**

Write the chemical formula for each of the following compounds:

|  |  |
| --- | --- |
| Water | H2O |
| Carbon dioxide | CO2 |
| Sodium chloride | NaCl |
| Lithium hydroxide | LiOH |
| Lithium oxide | Li2O |
| Lithium phosphate | Li3PO4 |
| Sodium nitrite | NaNO3 |
| Sodium sulphate | Na2SO4 |
| Sodium hydroxide | NaOH |
| Sodium bicarbonate | NaHCO3 |
| Sodium carbonate | Na2CO3 |
| Sodium phosphate | Na3PO4 |
| Ammonium chloride | NH4Cl |
| Potassium permanganate | KMnO4 |
| Potassium chlorate | KClO3 |
| Potassium sulphite | K2SO3 |
| Potassium carbonate | K2CO3 |
| Magnesium oxide | MgO |
| Magnesium chloride | MgCl2 |
| Magnesium carbonate | MgCO3 |
| Magnesium phosphate | Mg3(PO4)2 |
| Magnesium sulphate | MgSO4 |
| Magnesium sulphite | MgSO3 |
| Magnesium hydroxide | Mg(OH)2 |
| Magnesium nitrate | Mg(NO3)2 |
| Aluminium chloride | AlCl3 |
| Aluminium fluoride | AlF3 |
| Aluminium bromide | AlBr3 |
| Aluminium iodide | AlI3 |
| Aluminium oxide | Al2O3 |
| Aluminium nitrate | Al(NO3)3 |
| Aluminium hydroxide | Al(OH)3 |
| Aluminium phosphate | AlPO4 |
| Aluminium sulphate | Al2(SO4)3 |
| Hydrogen chloride (hydrochloric acid) | HCl |
| Hydrogen sulphate (sulphuric acid) | H2SO4 |
| Hydrogen nitrate (nitric acid) | HNO3 |
| Acetic acid | CH3COOH |
| Copper-II-sulphate | CuSO4 |
| Zinc-II-chloride | ZnCl2 |
| Iron-III-oxide | Fe2O3 |
| Iron-II-oxide | FeO |
| Silver nitrate | AgNO3 |
| Oxygen | O2 |
| Hydrogen | H2 |
| Nitrogen | N2 |
| Flourine | F2 |
| Chlorine | Cl2 |
| Bromine | Br2 |
| Iodine | I2 |
| Argon | Ar |
| Sulphur-IV-oxide (Sulphur dioxide) | SO2 |
| Calcium hydroxide | Ca(OH)2 |
| Hydrogen peroxide | H2O2 |
| Manganese dioxide | MnO2 |
| Sodium oxide | Na2O |
| Copper-II-oxide | CuO |
| Iron-II-sulphide | FeS |
| Mercuric oxide | HgO |

**Name the following compounds / molecules:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| O2 |  |  | H2SO4 |  |
| NaCl |  |  | KmnO4 |  |
| Cl2 |  |  | ZnCl2 |  |
| HCl |  |  | Na2O |  |
| HgO |  |  | MgCl2 |  |
| NaOH |  |  | MgO |  |
| CuO |  |  | K2O |  |
| CuSO4 |  |  | HNO3 |  |
| Al2O3  |  |  | FeS |  |
| CaCl2  |  |  | Ca (OH)2 |  |
| H2O |  |  | (NH4)2SO4 |  |
| H2 |  |  | CaCO3 |  |
| SO2 |  |  | AgNO3 |  |

**Exercise 3 Memo**

Name the following compounds / molecules:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| O2 | Oxygen |  | H2SO4 | Sulphuric acid |
| NaCl | Sodium chloride |  | KmnO4 | Potassium permanganate |
| Cl2 | Chlorine |  | ZnCl2 | Zinc chloride |
| HCl | Hydrochloric acid |  | Na2O | Sodium oxide |
| HgO | Mercuric oxide |  | MgCl2 | Magnesium chloride |
| NaOH | Sodium hydroxide |  | MgO | Magnesium oxide |
| CuO | Copper oxide |  | K2O | Potassium oxide |
| CuSO4 | Copper sulphate |  | HNO3 | Nitric acid |
| Al2O3  | Aluminium oxide |  | FeS | Iron sulphite |
| CaCl2  | Calcium chloride |  | Ca (OH)2 | Calcium hydroxide |
| H2O | Water |  | (NH4)2SO4 | Ammonium sulphate |
| H2 | Hydrogen |  | CaCO3 | Calcium carbonate |
| SO2 | Sulphus dioxide |  | AgNO3 | Silver nitrate |

**Exercise 4**

**Write down the chemical equation for the following word equations. Balance each of the equations derived from the word equation.**

1. Sodium reacts with oxygen to produce Sodium oxide
2. Magnesium reacts with oxygen to produce Magnesium oxide
3. Sulphur reacts with oxygen to produce Sulphur dioxide
4. Zinc reacts with hydrochloric acid to produce Zinc chloride and hydrogen
5. Magnesium reacts with hydrochloric acid to produce Magnesium chloride and hydrogen
6. Calcium carbonate reacts with hydrochloric acid to produce Calcium chloride, carbon dioxide and water
7. Copper oxide reacts with sulphuric acid to produce Copper sulphate and water
8. Sodium hydroxide reacts with hydrochloric acid to produce Sodium chloride and water
9. Iron reacts with sulphur to produce Iron sulphide
10. Mecuric oxide decomposes into Mercury and oxygen

**Exercise 4 Memo**

1. Sodium + oxygen  Sodium oxide

 4 Na + O2  2 Na2O

1. Magnesium + oxygen  Magnesium oxide

 2 Mg + O2  2MgO

3. Sulphur + oxygen  Sulphur dioxide

 S + O2  SO2

4. Zinc + hydrochloric acid  Zinc chloride + hydrogen

 Zn + 2HCl  ZnCl2 + H2

5. Magnesium + hydrochloric acid  Magnesium chloride + hydrogen

 Mg + 2HCl  MgCl2 + H2

1. Calcium carbonate + hydrochloric acid  Calcium choride + carbon dioxide + water

 CaCO3 + 2 HCl  CaCl2 + CO2  + H2O

1. Copper oxide + sulphuric acid  Copper sulphate + water

 CaO + H2SO4  CuSO4 + H2O

1. Sodium hydroxide + hydrochloric acid  Sodium chloride + water

 NaOH + HCl  NaCl + H2O

1. Iron + sulphur  Iron sulphide

 Fe + S  FeS

10. Mecuric oxide  Mercury + oxygen

 2HgO  2Hg + O2



****

****

****

**Classwork / Homework**

1. What is the substance called that consists of only one kind of atom?

2. What is the substance called that consist of two kinds of atoms?

3. Give the two main divisions on the periodic table.

4. What are the ................... on the periodic table called?

 4.1 the horizontal rows -

 4.2 the vertical rows -

5. Which of the following are correct?

 5.1 CA cA Ca ca

 5.2 CL cL cl Cl

6. Name two elements on the Periodic Table found in the liquid phase.

7. Name two examples of gasses that are chemically inactive.

8. Name any three elements found in the gaseous phase.

9. What criterion is used to classify elements in a particular group?

10. When elements react with one another in a certain ratio, what is formed?

**ANSWERS**

1. ***elements***

2. ***molecules***

3. **metals and non-metals**

4. What are the ................... on the periodic table called?

 4.1 the horizontal rows - ***periods***

 4.2 the vertical rows - ***groups***

5. Which of the following are correct?

 5.1 **Ca**

 5.2 **Cl**

6. . ***Bromine , Mercury***

7. ***Helium(He), Neon(Ne), Argon (Ar), Kripton(Kr), Xenon(Xe), Radon (Rn) or All the noble gasses or all elements in group 8 or 18***

8. ***Hydrogen (H2), Nitrogen (N2), Oxygen(O2), Fluorine (F2), Chlorine (Cl), Helium(He), Neon(Ne), Argon (Ar), Kripton(Kr), Xenon(Xe), Radon (Rn)***

9. ***Increasing atomic number which will determine electron distribution.***

10. ***compound***

**Classwork / Homework**

1. To which group of elements does hydrogen belong:

Metals, Non – Metals or Metalliods.

1. Give the name of the Group, on the Periodic Table, that the following elements belong to:

2.1 Calcium

2.2 Iron

1. Give the name of the group, on the Periodic Table, to which each of the following elements belong .

3.1 Magnesium

3.2 Copper

2.3 Argon

3.4 Bromine

4. Give the symbol of:

4.1.1 the first metal on the Periodic Table

 4.1.2 the first non – metal on the periodic Table

 4.1.3 two halogens that are gasses

 4.1.4 the halogen that is a liquid

 4.1.5 a metalloid in period 3

**Classwork / Homework**

**ANSWERS**

1. ***Non – metals***

2.1 ***Alkali – earth metals***

2.2 ***Transition metals***

3.1 ***Alkali – earth metals***

3.2 ***Transition elements***

2.3 ***Noble gasses***

3.4 ***Halogens***

4.

4.1.1 ***Li***

 4.1.2 ***H2***

4.1.3 ***F and Cl***

 4.1.4 ***Br***

 4.1.5 ***Si***

**Consider the first 18 elements in the periodic table. From these elements, choose the element that matches the following requirements:**

1. The most reactive metal -

2. A non-metal that can form four bonds -

3. A yellow solid that is a non-metal -

4. A noble gas with two protons –

5. The lightest alkali metal -

6. A member of the alkali earth metals with 12 neutrons -

7. A metalloid in group III -

8. A gas in period 2 that is used in combustion reactions -

9. A semiconductor in period 3 -

10. Its diatomic molecules forms the most abundant gas in the atmosphere –

11. A halogen in period 3 -

12. A yellowish gas that forms an ion with a -1 charge -

13. A light, silvery metal with a valency of 3 -

14. An element with 4 protons -

15. The element with the smallest atoms -

16. A non-metal that is a liquid at room temperature -

**Answers**

1. *Sodium (Na)*

2. *Carbon(C)*

3. S*ulphur (S)*

4. *Neon(Ne)*

5. *Lithium (Li)*

6. *Magnesium (Mg)*

7. *Silicon (Si)*

8. *Oxygen (O2)*

9. *Silicon (Si)*

10. *Oxygen (O)*

11. *Chlorine (Cl)*

12. *Chlorine (Cl)*

13. *Aluminium (Al)*

14. *Carbon (C)*

15. *Hydrogen(H)*

16. *Bromine (Br)*

1. Calculate how many atoms there are in each of the following compounds? **E.g. K2Cr2O7 has two K atoms, two Cr-atoms and seven O-atoms = 11 atoms**

1.1 NH3

1.2 NaOH

1.3 H2SO4

1.4 3H2O

1.5 2HNO3

1.6 KMNO4

1.7 NH4NO3

1.8Mg(NO2)2

1.9 Pb(NO3)2

1.10 Na2CO3

**Answers**

1.1 ***1 N; 3 H - 4 atoms***

1.2 ***1Na; 1O; 1H - 3 atoms***

1.3 ***2H; 1S; 4O - 7 atoms***

1.4 ***6H; 3O - 9 atoms***

1.5 ***2H; 1N; 6O - 9 atoms***

1.6 ***1K; 1Mn; 4O - 6 atoms***

1.7 ***1N; 4H; 1N; 3O - 9 atoms***

1.8 ***1Mg; 2N; 4O - 7 atoms***

1.9 ***1Pb; 2N; 6O - 9 atoms***

1.10 ***2Na ; 1C; 3O - 6 atoms***

1. Write the **names** for the following compounds.

1.1 Na2CO3

1.2 CuCO3

1.3 KClO3

1.4 ZnSO4

1.5 MgO

1.6 H2SO4

1.7 Pb(NO3)2

1.8 Fe2O3

1.9 NaNO2

1.10 K2Cr2O7

***Answers***

***1.1 Sodium carbonate***

1.2 ***Copper carbonate***

1.3 ***Pottasiumchlorate***

1.4 ***Zinc sulphate***

1.5 ***Magnesium oxide***

1.6 ***Hydrogen sulphate***

1.7 ***Lead nitrate***

1.8 ***Iron (II) oxide***

1.9 ***Sodium nitrite***

1.10 ***Potasium dichromate***

1. Write down the **chemical formulae** for the following:

1.1. Sodium chloride

1.2 Magnesium sulphate

1.3 Aluminium oxide

1.4 Hydrogen chloride

1.5 Copper carbonate

 1.6 Iron (II) oxide

1.7. Iron (III) oxide

1.8 Potassium permanganate

1.9 Lithium oxide

1.10 Potassium nitrate

***Answers***

1.1. ***NaCl***

1.2 ***MgSO4***

1.3 ***Al203***

1.4 ***HCl***

1.5 ***CuCO3***

1.6 ***FeO2***

1.7 ***Fe2O3***

1.8 ***KmnO4***

1.9 ***Li2O***

***1.10 KNO3***

We sometimes use **common names** for chemical substances. Complete the table by providing answers for numbers 1 – 16.

|  |  |  |
| --- | --- | --- |
| **Formula** | **Chemical name** | **Common name** |
| H2O | (1) | (2) |
| (3) | (4) | Hydrocloric acid |
| HNO3 | (5) | (6) |
| (7) | (8) | Table salt |
| (9) | (10) | Marble,limestone, chalk |
| (11) | Copper sulphate | Blue vitriol |
| (12) | (13) | Epsom salts |
| (14) | (15) | Smelling salts |
| CH3COOH | Ethanoic acid | (16) |

**ANSWERS**

1. ***Hydrogen oxide***  2. ***water***

3. ***HCl*** 4. ***Hydrogen chloride***

5. ***Hydrogen nitrate***  6. ***Nitric acid***

7. ***NaCl*** 8. ***Sodium chloride***

9. ***CaCO3***  10. ***Calcium carbonate***

11***. CuSO4*** 12. ***MgSO4***

13. ***Magnesium sulphate***  14. ***NH3CO3***

15. ***Ammonium carbonate*** 16. ***Acetic acid or vinegar***

1.1 Which one of the following is an example of a metal oxide?

A. O2

B. CO2

C. H2O

D. CuO

* 1. Magnesium burns in oxygen. What is its colour of the flame?



1. Brick red
2. Purple
3. Blinding white
4. Red

1.3 A chemical reaction is taken place in each of the following test tubes

1 2 3 4

 Zn + HCl ZnO + HCl ZnCO3 + HCl Zn + H2SO4

1.3 Zinc chloride is formed in

 A test tube 1.

 B test tubes 2 and 3.

 C test tubes 1, 2 and 3.

 D test tube 4.

1.1.13.2 Hydrogen gas is released in test tubes …..

 A 1 & 2

 B 1 & 3

 C 2 & 4

 D 1 & 4

1. When Magnesuim and iron were heated in oxygen, they both ignited with a flame. The reactions can be described as follows:

 a) Magnesium + Oxygen Magnesium oxide

 b) Iron + oxygen Iron oxide

One or more of the following reactions could be observed.

 A iron does not burn when heated in oxygen
B magnesium burnt with a white blinding light

 C both magnesium and iron form a black oxide

 D both burn with brick red colour

Use the provided information to answer the following questions:

1.1 What is the colour of the flame with which magnesuim burns in oxygen? (1)

 **magnesium burnt with a white blinding light**

1.2 Would you describe the reaction between magnesuim and oxygen gas as
endothermic or exothermic? Explain your answer. (3)

1.3 Write down a BALANCED CHEMICAL FORMULA FOR these reactions. (2)

 a) Magnesium + Oxygen Magnesium oxide

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 b) Iron + oxygen Iron oxide

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1.4 Give the **NAME** and **DESCRIBE** the physical properties of the products formed in both reactions. (2)

1.5 How would you be able to test for the presence of the PRODUCT in the
glass cylinder? (2)

**ANSWERS**

2. Nompumelelo bought a can of Wax Seal to spray the parts underneath her car.

The body of a car is made from steel. Steel contains iron.



2.1 What is the function of this Wax Seal? (1)

 2.2 Which two substances needed for rusting to occur? (2)

2.3 Mention three other ways of preventing rust. (3)

**ANSWERS**

2.1 Helps to prevent parts of the car from rusting. (1)

2.2 Iron and oxygen. (2)

2.3 - rusting (1)

 - coating/electroplating/ galvanizing  (1)

 - keep iron in try conditions

3.1 The diagrams below shows four test tubes with iron nails in different conditions. Study the information provided and answer the questions that follow.



 a. Test tube A: a nail in boiled water covered by oil

 b. Test tube B: a nail in salt water

 c. Test tube C: a nail win test tube with air only

 d. Test tube D: a nail partly submerged in calcium chloride crystals

3.1.1 Which of the nails will rust easily? Give a reason. (3)

3.1.2 What is an independent variable in this experiment? (1)

3.1.3 Predict what will happen in each beaker (A, B, C, D). (8)

**ANSWERS**

3.1.1. The nail in test tube B✓ **OR** the nail in salt water.

Because the salt solution helps rusting to be faster / increases rusting ✓
(***OR*** *speeds up the oxidation process*) (2)

3.1.2 The different physical conditions. (1)

3.1.3 **Test Tube A**: Rusting - slowly✓ because oil prevents oxygen from the air entering-

 the water, preventing oxidation✓

**Test tube B:** Rusting - quickly 🗸because salt will speed-up✓ the oxidation reaction

**Test Tube C:** The iron nail will rust at a moderate pace.✓ Oxygen from the air

will be in contact✓ with iron but the moisture concentration will be low.

**Test tube D:** Rusting on the nail will be minimal/no rusting 🗸because calcium
 chloride will absorb all moisture✓ from the air inside the test tube. (4 x 2 = 8)

 **[12]**

**5.** **Scientific investigation**

 Julianne and Thabo are investigating temperature changes in chemical reactions. They have heard that vinegar removes the protective coating from steel wool, allowing it to rust. When iron combines with oxygen, heat is released. They use a Styrofoam cup with a lid to investigate this report.

 Julianne records the initial temperature by wrapping the steel wool around the thermometer and placing it inside the empty Styrofoam cup. She records the temperature after 2 min. Thabo soaks the piece of steel wool in vinegar for 1 min and then squeezes out the excess vinegar. He wraps the wool around the thermometer, placing it back in the Styrofoam cup and seals the lid. He records the temperature after 15 min. The temperature has increased from 22 °C to 26 °C.

5.1 Suggest a suitable hypothesis for this investigation. (1)

5.2 What is the independent variable? (1)

5.3 What is the dependent variable? (1)

5.4 What conditions must remain constant for this experiment to be accurate? (1)

5.5 Write a balanced equation to show that iron reacts with oxygen to form iron oxide.(3)

5.6 Is this reaction endothermic or exothermic? Give a reason for your answer. (2)

5.7 Write a suitable conclusion to this experiment. (2)

5.8 Predict what would occur if Julianne used pure oxygen instead of air in this reaction? (2)

5.9 Name ONE exothermic reaction that is used in everyday life and a benefit of its use. (2)

**ANSWERS**

5.1 Iron reacts with oxygen in an exothermic reaction. OR any other relevant
 hypothesis✓ ✓ (2)

5.2 Time ✓ (1)

5.3 Temperature of the reaction✓ (1)

5.4 Temperature of the room (✓) OR: Pressure (✓) (2)

5.5 Fe + O2→ 2FeO ✓✓✓ (3)

5.6 Exothermic reaction. ✓ The temperature of the reaction increased, therefore
 energy was released. ✓ (2)

5.7 The temperature of the reaction increases, therefore iron reacts with oxygen in an exothermic reaction. ✓✓ (2)

5.8 Temperature increase would be greater (✓✓) AND/OR Faster (2)

5.9 Combustion of petrol in motor engines. (✓) Enables people to travel between destinations. (✓) OR:The combustion of coal.(✓) Produces electricity for everyday life. (✓)Or any other plausible example. (✓✓) (2)

**REACTION OF METALS WITH OXYGEN**

**1. Which groups do magnesium, iron and copper come from?**

Magnesium is group 2, iron is group 8 and copper is group 11.

(This is important as elements in the same group will react similarly. In these reactions, the elements that react with oxygen are all **metals**. If you are not convinced of this, find them on the Periodic Table. Can you see that they are all found in the region occupied by the metals?)

**2. Where are metals located on the Periodic Table?**

.On the left.

**3. The names of the products formed when a metal reacts with oxygen have something in common. Name the products, and give an example.**

Metal oxides eg. magnesium oxide, iron oxide, copper oxide.

1. Read the sentences and fill in the missing words. Write the missing word on the line below. (9)

a) A chemical reaction where a compound and oxygen react during burning to form a new product is called a \_\_\_\_\_\_\_\_\_\_reaction.

b) Magnesium + *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* magnesium oxide

c) \_\_\_\_\_\_\_\_\_\_+ oxygen iron oxide

d) copper + oxygen \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) Another word for iron oxide is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

f) Metal that is covered by a thin layer of zinc and zinc oxide is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_metal.

g) The gradual destruction of materials metals by chemical reaction with the environment is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

h) When the air in a specific area contains moisture mixed with acid or salt, we refer to the area as having a\_\_\_\_\_\_\_\_\_\_\_\_\_ climate.

i) The product of the reaction between a metal and oxygen is called an \_\_\_\_\_\_\_\_\_

2. List three materials that can be used to protect iron or steel from corrosion. [3 marks]

**210**

**ANSWERS**

1. a) combustion √

b) oxygen √

c) Iron√

d) copper oxide √

e) rust√

f) galvanised √

g) corrosion / rusting / oxidation √

h) corrosive √

i) metal oxide √

2. List three materials that can be used to protect iron or steel from

corrosion.

• paint √

• chromium √

• zinc √





1.1 When sodium metal reacts with oxygen gas to form sodium oxide, a balanced

chemical equation will be…

A SO + O SO2

B 4Na + O2 2Na2O

C 2Na2 +O2 Na2O

 D Na + O2 Na2O

1.2 Which product is formed when a metal burns in oxygen?

A an oxide which is a base

B hydroxide which is an acid when dissolved in water

C an oxide which dissolves in water to form an acid.

 D hydroxide which is neutral when dissolved in water

|  |
| --- |
| * 1. Write down balanced equations for the following reactions.
 |
| * + 1. Magnesium + Oxygen Magnesium oxide (2)
 |
|  |
| * + 1. Sulphuric acid + sodium hydroxide Sodium sulphate + water (2)
 |

|  |
| --- |
| **Subject:** Natural Sciences |
| **Strand: MATTER AND MATERIALS** |
| **Topic REACTION OF NON METALS WITH OXYGEN** |
| **Grade:** 9 |
| **Number of questions for exemplar:** |
| **Low order questions** | **Middle order questions:** | **High order questions**  |
|  |  |  |

**REACTION OF NON-METALS WITH OXYGEN**

 **The reaction between sulfur and oxygen**

In the following activity we are going to review word equations, picture equations and chemical equations, using the reaction between sulfur and oxygen as our context.

Using the following equation, **sulfur + oxygen** **sulfur dioxide,** answer the following questions:

1. In which group is sulphur found on the Periodic Table?

2. What are the reactants of this reaction? Write their names and symbols.

3. What is the product of the reaction? Write its name and formula.

4. Now, use the formulas of the reactants and products to write a chemical equation.

5. When is a reaction balanced?

6. Is your reaction above balanced? Why do you say so?

7. Draw a picture equation for the reaction.

**ANSWERS:**

1. What group is sulfur in on the Periodic Table?

*Group 16*

2. What are the reactants of this reaction? Write their names and formulas.

*Sulfur (S) and oxygen (O2)*

3. What is the product of the reaction? Write its name and formula.

*Sulfur dioxide (SO2)*

4. Now, use the formulas of the reactants and products to write a chemical equation.

*S + O2 SO2*

5. When is a reaction balanced?

*When both sides of the reaction have the same number of the same types of atoms.*

6. Is your reaction above balanced? Why do you say so?

*The reaction is balanced because it has the same number of S and O atoms on either side of the equation.*

7. In the picture equation for the reaction shown above, the colours are not important as long as all atoms of the same element have the same colour. In the example, the sulfur atoms are yellow and the oxygen atoms are red.

. 

.

1. Fill in the missing words in these sentences. Write the word on the line below. [5 marks]

a) A substance that will react readily with many other substances is called a\_\_\_\_\_\_\_\_\_\_\_ substance.

b) Substances that do not react with other substances and do not change into other compounds are called\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

c) When a non-metal reacts with oxygen the product of the reaction is a\_\_\_\_\_\_\_\_\_\_\_\_\_

d) When a compound reacts with oxygen, we say it has become\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Write a short paragraph (3 or more sentences) to explain what you understand each of the following terms to mean, in your own words.

a) systematic name

b) preservative

c) non-renewable energy source [3 x 3 = 9 marks]

**ANSWERS**

1. *a) reactive*

*b) unreactive or inert*

*c) non-metal oxide*

*d) oxidised*

2. Write a short paragraph (3 or more sentences) to explain what you understand each of the following terms to mean, in your own words. [3 x 3= 9 marks]

a) systematic name

*Learner's paragraph should contain at least the following ideas:*

*• The systematic name of a compound is the name that is recognised by IUPAC.*

*• IUPAC refers to the International Union of Pure and Applied Chemistry.*

*• The systematic name of any given compound should be unique so that the compound cannot be confused with any other compound.*

b) preservative

*Learner's paragraph should contain at least the following ideas:*

*• A preservative is a chemical compound that is added to a product(such as a foodstuff or a beverage) to make it last longer.*

*• Most preservatives are poisonous to microorganisms, but are added in such small quantities that they are not harmful to humans.*

*• SO2 is used as a preservative in many foods, including dried fruit and wine.*

c) non-renewable energy source

*Learner's paragraph should contain at least the following ideas:*

*• Non-renewable energy sources refer to sources that can be used up, such as fossil fuels.*

*• Coal, oil and natural gas are examples of non-renewable fuels.*

*• The energy in these energy sources comes from the energy stored in plants and other living organisms that were fossilised over millions of years.*

4.3 Sulphur powder is heated with a Bunsen burner until it starts to burn.

The sulphur is then lowered into a glass cylinder filled with pure oxygen gas.
A small amount of water is present in the bottom of the container.

Sulphur (S)

Oxygen gas (O2)

Glasscylinder

Product dissolved in water

4.3.1 Write down all the observations that can be made. (2)

4.3.2 Write down the balanced equation for the reaction that takes place while the

 sulphur is burning. (2)

4.3.3 Name the gas that is liberated as a product during this combustion reaction that dissolves in

 the water at the bottom of the glass cylinder:

4.4 You are now expected to test the solution formed in question 4.3 - at the bottom of the cylinder for acid/base properties. Explain how you will conduct this test and also what you expect to find. (4)

4.5 Write down the balanced equation for the reaction that takes place in question 4.4. (2)

4.6 Small pieces of zinc metal are placed in a test tubes filled with diluted hydrochloric acid.

Gas is liberated

4.6.1 Write down the NAME and FORMULA for the gas that is liberated. (2)

4.6.2 Write down a balanced chemical equation for the reaction that takes place in the test tube. **(2)**

**ANSWERS**

. 4.3.1 Sulfur burns with a bright blue flame. ✓

 A suffocation gas is liberated ✓ (2)

4.3.2 S + O2 ---> SO2✓✓ (2)

4.4 Dip pieces of blue and pink litmus paper into the solution. ✓

 The pink litmus paper will show no colour change. ✓The blue litmus paper will change to pink. ✓The pink colour is proof that the solution is an acid. ✓ (4)

4.5 SO2  + H2O ---> H2SO3 ✓✓ (2)

4.6.1 Hydrogen gas , (H2) ✓✓ (2)

4.6.2 Zn + 2HCl ---> ZnCl2  + H2✓✓ (2)

**Acids and bases and metals - test**

Top of Form

1. What does this hazard symbol mean?


2. Corrosive
3. irritant
4. Harmful
5. Which of these acids is most likely to be dangerous?
6. citric acid
7. carbonic acid
8. hydrochloric acid
9. Which statement about bases is true?
10. they are all alkalis
11. they can neutralise acids
12. they are all soluble
13. Which statement about alkalis is true?
14. they are all bases
15. they cannot neutralise acids
16. they are all insoluble
17. What happens to litmus paper in acidic solutions?
18. red litmus turns blue
19. blue litmus turns red
20. yellow litmus turns green
21. Universal indicator solution is usually green to begin with. What does this mean?
22. it is acidic
23. it is alkaline
24. it is neutral
25. A liquid has a pH of 7.5 - what does this mean?
26. it is weakly acidic
27. it is weakly alkaline
28. it is neutral
29. A liquid has a pH of 1 - what does this mean?
30. it must be sodium hydroxide solution
31. it is strongly acidic
32. it is weakly acidic
33. What products are formed when a metal oxide reacts with an acid?
34. a salt only
35. a salt and water
36. a salt, water and carbon dioxide
37. What products are formed when a metal carbonate reacts with an acid?
38. a salt only
39. a salt and water
40. a salt, water and carbon dioxide
41. Farmers use lime to neutralise their soils. What sort of substance is lime?
42. a base
43. an acid
44. a sharp tasting drink
45. Which acid could be used to make ammonium nitrate (a type of fertiliser)?
46. hydrochloric acid
47. sulfuric acid
48. nitric acid
49. Which salt is made when copper oxide and sulfuric acid react together?
50. copper sulfate
51. copper sulfuroxide
52. copper sulphide
53. Which gas is produced when magnesium reacts with hydrochloric acid?
54. carbon dioxide
55. oxygen
56. hydrogen

**ANSWERS Acids and bases and metals - Test memo**

1 What does this hazard symbol mean?



 This symbol means corrosive.

**2 Which of these acids is most likely to be dangerous?**

 Hydrochloric acid is the most likely to be dangerous.

**3 Which statement about bases is true?**

Bases can neutralise acids.

**4 Which statement about alkalis is true?**

 Alkalis are all bases.

**5 What happens to litmus paper in acidic solutions?**

 Blue litmus paper turns red in an acidic solution.

**6 Universal indicator solution is usually green to begin with. What does this mean?**

 Green indicates that universal indicator solution is neutral.

**7 A liquid has a pH of 7.5 - what does this mean?**

 A pH above 7 means that the liquid is alkaline.

**8 A liquid has a pH of 1 - what does this mean?**

 A pH of 1 means that the liquid is strongly acidic.

**9 What products are formed when a metal oxide reacts with an acid?**

 A salt and water are formed when a metal oxide reacts with an acid.

**10 What products are formed when a metal carbonate reacts with an acid?**

 When a metal carbonate reacts with an acid, a salt, water and carbon dioxide are formed.

**11 Farmers use lime to neutralise their soils. What sort of substance is lime?**

 Lime is a base.

**12 Which acid could be used to make ammonium nitrate (a type of fertiliser)?**

 Nitric acid could be used to make ammonium nitrate.

**13 Which salt is made when copper oxide and sulfuric acid react together?**

 When copper oxide and sulfuric acid react together, copper sulfate is formed.

**14 Which gas is produced when magnesium reacts with hydrochloric acid?**

 Hydrogen is produced when magnesium reacts with hydrochloric acid. Bottom of Form

Bottom of Form

Bottom of Form

Bottom of Form

Bottom of Form

1. Which of the following chemical equations correctly represents the reaction between calcium hydroxide and hydrochloric acid?

 A. Ca(OH)2 (aq) + 2 HCℓ (aq) → CaCℓ2 (aq) + 2 H2O (ℓ)

 B. Ca(OH)2 (aq) + HCℓ (aq) → CaCℓ (aq) + H2O (ℓ)

 C. Ca(OH)2 (aq) + HCℓ (aq) → CaCℓ2 (aq) + H2O (ℓ)

 D. Ca(OH)2 (aq) + 2 HCℓ (aq) → CaCℓ2 (aq) + 2 H2 (g) + O2 (g)

2. When Thabo had heartburn, his mother gave him a solution of ENO. Heartburn stopped because ENO\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the stomach.



 A increases acids

 B increases alkaline

 C neutralises acids

 D releases gases

7 This means the pH value ENO should be….

 A between 1 and 7

 B equal to 7

 C less than 1

 D more than 7

9 Why is the Universal indicator the most recommended indicator?

 A does not change colour at all

 B only work in an acid

 C it is homemade

 D it covers a wide range of pH values

1. Metal with metal carbonate. Which ionic compound is formed when Calciumcarbonate dissoves in water?
2. Ca+.

B. CO2.

C. CO32-

 D. CaO

1.1.14 Bromothymol blue is an indicator which is green in a neutral solution; yellow in an acidic solution and blue in an alkaline solution.

1 2 3

MgO + water CO2 + water SO2 + water

When the indicator is added to each of the the solutions the correct combination in terms of colour is represented by…………..

|  |  |  |  |
| --- | --- | --- | --- |
| Solution | Test tube 1 | Test tube 2 | Test tube 3 |
| A | Yellow | Blue | Blue |
| B | Blue | Blue | Yellow |
| **C** | Blue | Green | Yellow |
| D | Blue | Yellow | Yellow |

1.1.15 Which one of the following unbalanced reactions represents a neutralization reaction?

A Hg + O2🡺HgO

B Na + H2O 🡺NaOH + H2O

**C** Ca(OH)2  + HCl🡺 CaCl2 + H2O

D C + O2🡺CO2

Acid with metal hydroxide

Few drops of hydrochloric acid are added into calcium carbonate in a flask. Bubbles of gases are seen escaping while small clear liquid droplets are seen dripping through the delivery tube .

A clear white salt is formed at the bottom of test tube.



**Ca CO3**

3.1.1 Name the salt formed. (1)

3.1.2 What are these liquid droplets called? (1)

3.1.3 What is a test for this gas? (2)

 3.1.4 Write down balanced chemical formula for this chemical reaction. (3)

ANSWER

***QUESTION 3:***

3.1.1Calciumchloride/CaCl2 (1)

3.1.2 Water/H2O (1)

3.1.3 Carbon dioxide turns clear lime🗸 water milky🗸 (2)

3.1.4. CaCO3 + 2HCl 🗸🡺 CaCl2 + CO2 + H2O🗸🗸 (3)

**[07]**

4.7 Pink litmus paper remains pink when submersed in an unknown solution. Does this

 observation confirms without any doubt that the solution is acidic? Explain your answer. (4)

4.8 Will a strong acid like hydrochloric acid turn into a weak acid when diluted with water?

 Explain your answer. (4)

**ANSWERS**

4.7 No, ✓ The pink litmus will also remain pink in a neutral solution. ✓ You need to test the solution with a piece of blue litmus✓ (Blue litmus will turn pink in an acidic solution) to confirm that the initial solution was indeed acidic. ✓ (4)

4.8 A strong acid, e.g. hydrochloric acid dissociates to a large degree in water to furnish a high concentration of hydronium ions (H3O+) in solution. ✓✓

 A **diluted** strong acid has a lower concentration H3O+ ions per volume, ✓but still dissociates to a large degree and remains a strong acid. ✓ (4)