**1.Complete these sentences about** the **Periodicity. Use the words in the box:**

proton, group, giant molecular, repeat, periods, increases, periodic trends, giant metallic, remains the same, closer, negative, decrease, outermost, smaller, remove, harder, attraction, ionic compounds, increases, shielding, giant molecular, close, falls off, simple molecular, increases, greater, decrease, non-metal oxides, basic compounds

\_\_\_\_\_(1)in the Periodic Table are rows of elements whose \_\_\_\_\_(2)electrons are in the same principal quantum shell. The atoms of neighboring members differ by one \_\_\_\_(3)and one electron. As atomic number increases, the properties of the elements show trends which \_\_\_\_(4)themselves in each Period of the Periodic Table. These trends are known as\_\_\_\_ \_\_\_\_(5). A column of elements thus arranged is called a\_\_\_\_\_(6).

Atomic radii \_\_\_\_\_(7)across a period due to increasing nuclear charge. This means electrons are pulled \_\_\_\_\_(8) to the nucleus, making the atomic radius\_\_\_\_\_(9).

\_\_\_\_\_\_(10)ions are much smaller than their atoms. \_\_\_\_\_(11)ions are slightly larger than their atoms.

The first ionisation energy of an element is the energy required to \_\_\_\_\_(12)one electron from each of a mole of free gaseous atoms of that element. A high ionization energy means there is a high \_\_\_\_\_\_(13)between the electron and the nucleus and so more energy is needed to remove the electron. The greater the number of protons, the \_\_\_\_\_(14)the attraction of the electrons to the nucleus and the \_\_\_\_(15) it is to remove the electrons. Attraction \_\_\_\_ \_\_\_(16) very rapidly with distance. An electron \_\_\_\_(17) to the nucleus will be much more strongly attracted than one further away. As the number of electrons between the outer electrons and the nucleus\_\_\_\_(18), the outer electrons feel less attraction towards the nuclear charge. This lessening of the pull of the nucleus by inner shells of electrons is called\_\_\_\_\_(19). The first ionisation energy \_\_\_\_\_(20)across a period because the nuclear charge increases but the shielding\_\_\_ \_\_\_ \_\_\_(21).

Electronegativity \_\_\_\_\_(22) across period due to  
increasing number of outer electrons.

Across a period, the structures of the elements change from\_\_\_ \_\_\_(23), through \_\_\_\_ \_\_\_\_(24)to\_\_\_\_ \_\_\_\_(25). Group 18 elements consist of individual atoms. There is a gradual \_\_\_\_\_(26) in metallic character in crossing a period. Electrical conductivity \_\_\_\_\_(27)from sodium to aluminium as the number of delocalized electrons per atom increases.

Across a period, the oxides of Period 3 elements  
change from \_\_\_\_ \_\_\_\_(28)with ionic bonding through to \_\_\_\_ \_\_\_\_(29)in the centre of the period (Group 14) with silicon, going on to acidic covalently bonded simple molecules of the\_\_\_\_ \_\_\_\_(30). Aluminium oxide (in Group 13) is\_\_\_\_\_(31), exhibiting both basic and acidic behavior. Across a period, the chlorides of Period 3 elements change from \_\_\_\_ \_\_\_\_(32)that dissolve in water to \_\_\_\_ \_\_\_\_(33) that are hydrolyzed by water,  
releasing fumes of hydrogen chloride and leaving an acidic solution.

**2.Complete the tables about properties of period 3 elements using words: decreases, decreases, zero and others**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Properties | Na | Mg | Al | Si | P (white) | S | Cl | Ar |
| Atomic size |  |  |  |  |  |  |  |  |
| First ionization energy |  |  |  |  |  |  |  |  |
| Electronegativity |  |  |  |  |  |  |  |  |
| Melting and boiling point |  |  |  |  |  |  |  |  |
| Electrical conductivity |  |  |  |  |  |  |  |  |
| Bonding |  |  |  |  |  |  |  | **-** |

**3. Are these statements about Periodicity True or False?**

|  |  |  |
| --- | --- | --- |
| № | Statements | True / False |
| 1 | Periods in the Periodic Table are rows of elements whose outermost electrons are in the same principal quantum shell. |  |
| 2 | The atoms of neighbouring members differ by one neutron and one electron |  |
| 3 | First ionisation energies tend to decrease across a period. |  |
| 4 | Atomic radii decrease across a period due to decreasing nuclear charge |  |
| 5 | Positive ions are much smaller than their atoms. |  |
| 6 | Across a period, the structures of the elements change from individual atoms, through giant molecular to simple molecular. |  |
| 7 | Across a period, the chlorides of Period 3 elements change from ionic compounds that dissolve in water to covalent compounds that are hydrolysed by water, releasing fumes of hydrogen chloride and leaving an acidic solution |  |
| 8 | A column of elements thus arranged is called a row. |  |
| 9 | There is a gradual decrease in metallic character in crossing a period |  |
| 10 | Electronegativity increases across the period |  |
| 11 | Melting and boiling point decreases from Al to Si |  |
| 12 | Melting and boiling point increases from P to S |  |
| 13 | Electrical conductivity is zero from Si to Ar |  |
| 14 | Electrical conductivity decreases from Na to Al |  |

**4. Read the clues and complete the crossword:**

**Across (→):**

1. ……increases from sodium to aluminium as the number of delocalized electrons per atom increases (2 words)

2. …a period, the structures of the elements change from giant metallic, through giant molecular to simple molecular

3. ionisation energies tend to…. across a period

6. The atoms of neighbouring members differ by one… and one electron (and usually by one or more neutrons)

9. Atomic radii…. across a period due to increasing nuclear charge

11. There is a gradual decrease in …… character in crossing a period

**Down (↓):**

4. Compounds that can act as both acids and bases

5. Positive ions are much ……than their atoms.

6. the repeating patterns in the physical and chemical properties of the elements across the periods of the Periodic Table.

7. A column of elements

8. …… size– decreases across the period

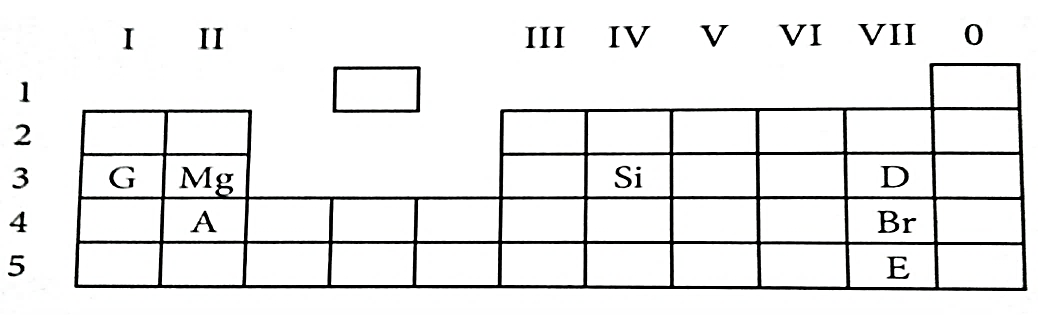
10. row of elements whose outermost electrons are in the same principal quantum shell

12. Negative ions are slightly…..than their atoms

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 6 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 2 |  |  |  |  | 5 |  |  |  |  |  |  |  | 10 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 7 |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 3 |  |  |  |  | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  | 11 |  |  |  | 12 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



5. Structured exam question

Below is an outline of a part of the periodic table with magnesium [Mg], silicon [Si] and bromine [Br] in their correct positions. Letters represent the positions of four other elements. When answering the following questions, use these letters as the symbols of the elements. You are not expected to identify the elements.

**a) i)** Give the symbols of TWO elements that are in the same group.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_[1]**

**ii)** Element **W** has an electronic configuration of 2.8.6. Place **W** in its correct position in the table above. [1]

**iii)** Give the electronic configuration of **Si** and name the element.

Electronic configuration: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ [2]

**b) i)** Both magnesium and **A** react with water. Which element would you expect to react more vigorously? Provide an explanation for your answer.

Element: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Explanation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ [3]

**ii)** Write a balanced chemical equation for the reaction between magnesium and water.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_[2]

**iii)** Apart from its reaction with water, state TWO other reactions that are typical of **A**.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_[2]

**c) i)** Elements **G** and **D** are both in Period 3. What can you deduce about the electronic structure of their atoms?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_[1]

**ii)** Draw lines to show how EACH element shown in Period 3 would be classified. [2]

**D**

**G**

**metal**

**semi-metal**

**Mg** Mg

**Si**

**non-metal**

**iii)** State THREE ways in which magnesium and **D** differ in their physical properties.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[3]

**iv)** Both **G** and magnesium react with hydrochloric acid. Which is element would you expect to react more vigorously? Provide an explanation for your answer.

Element: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Explanation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_[3]

**v)** Write a balanced chemical equation for the reaction between magnesium and hydrochloric acid.