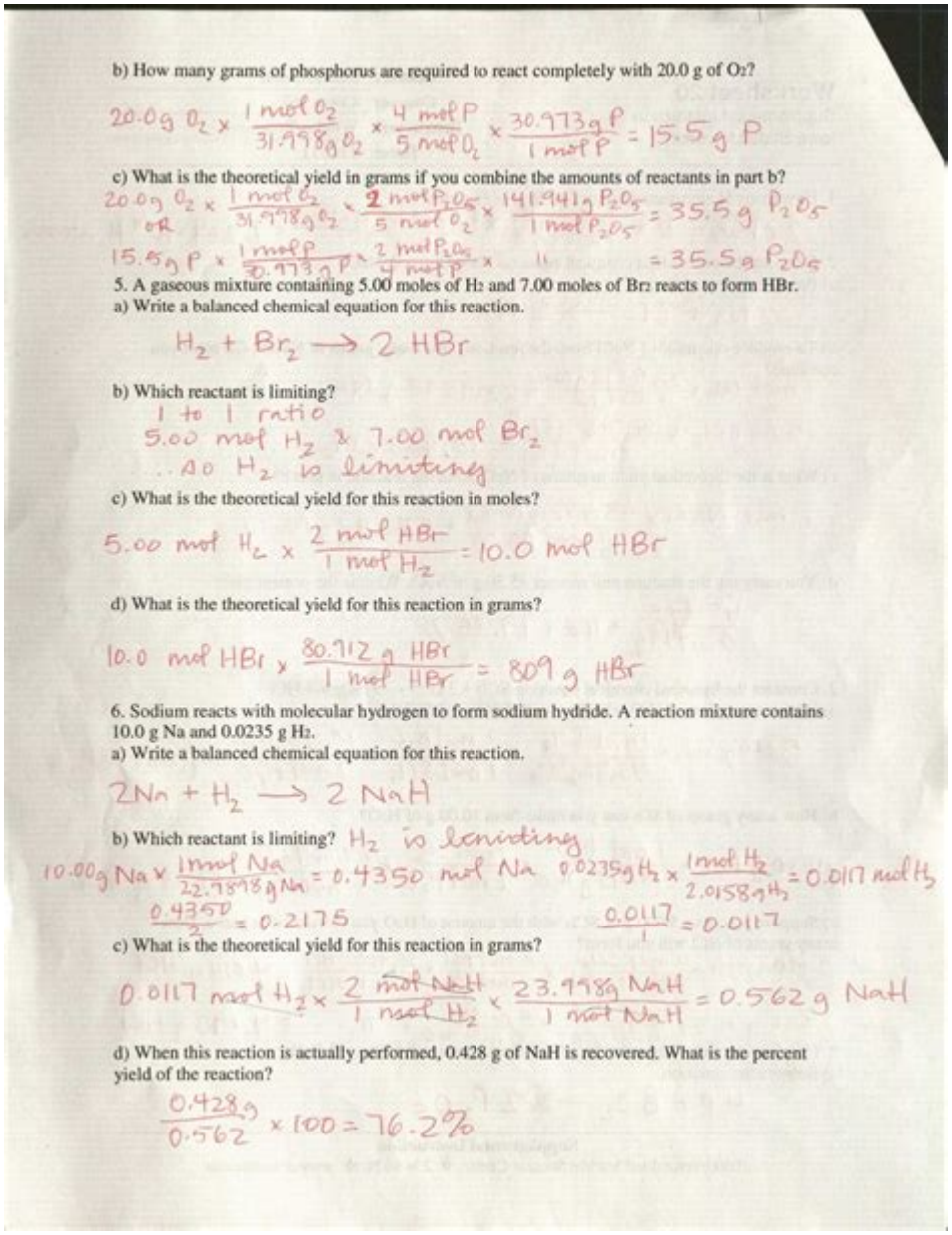
Periodic Trends Pogil Extension Questions



b) How many grams of phosphorus are required to react completely with 20.0 g of O_2?

$20.0\text{g } O_2 \times \frac{1\text{ mol } O_2}{31.998\text{g } O_2} \times \frac{4\text{ mol P}}{5\text{ mol } O_2} \times \frac{30.973\text{g P}}{1\text{ mol P}} = 15.5\text{g P}$

c) What is the theoretical yield in grams if you combine the amounts of reactants in part b?

$20.0\text{g } O_2 \times \frac{1\text{ mol } O_2}{31.998\text{g } O_2} \times \frac{2\text{ mol } P_2O_5}{5\text{ mol } O_2} \times \frac{141.941\text{g } P_2O_5}{1\text{ mol } P_2O_5} = 35.5\text{g } P_2O_5$

OR

$15.5\text{g P} \times \frac{1\text{ mol P}}{30.973\text{g P}} \times \frac{2\text{ mol } P_2O_5}{4\text{ mol P}} \times \text{11} = 35.5\text{g } P_2O_5$

5. A gaseous mixture containing 5.00 moles of H_2 and 7.00 moles of Br_2 reacts to form HBr.

a) Write a balanced chemical equation for this reaction.

$H_2 + Br_2 \longrightarrow 2\,HBr$

b) Which reactant is limiting?

1 to 1 ratio

5.00 mol H_2 & 7.00 mol Br_2

∴ H_2 is limiting

c) What is the theoretical yield for this reaction in moles?

$5.00\text{ mol } H_2 \times \frac{2\text{ mol HBr}}{1\text{ mol } H_2} = 10.0\text{ mol HBr}$

d) What is the theoretical yield for this reaction in grams?

$10.0\text{ mol HBr} \times \frac{80.912\text{ g HBr}}{1\text{ mol HBr}} = 809\text{ g HBr}$

6. Sodium reacts with molecular hydrogen to form sodium hydride. A reaction mixture contains 10.0 g Na and 0.0235 g H_2.

a) Write a balanced chemical equation for this reaction.

$2Na + H_2 \longrightarrow 2\,NaH$

b) Which reactant is limiting? H_2 is limiting

$10.00\text{g Na} \times \frac{1\text{mol Na}}{22.9898\text{g Na}} = 0.4350\text{ mol Na}$ $0.0235\text{g } H_2 \times \frac{1\text{mol } H_2}{2.0158\text{g } H_2} = 0.0117\text{ mol } H_2$

$\frac{0.4350}{2} = 0.2175$ $\frac{0.0117}{1} = 0.0117$

c) What is the theoretical yield for this reaction in grams?

$0.0117\text{ mol } H_2 \times \frac{2\text{ mol NaH}}{1\text{ mol } H_2} \times \frac{23.998\text{g NaH}}{1\text{ mol NaH}} = 0.562\text{g NaH}$

d) When this reaction is actually performed, 0.428 g of NaH is recovered. What is the percent yield of the reaction?

$\frac{0.428\text{g}}{0.562} \times 100 = 76.2\%$

Periodic trends pogil extension questions are an essential aspect of understanding the behavior of elements in the periodic table. These questions help deepen students' comprehension of periodic trends such as atomic radius, ionization energy, electronegativity, and electron affinity. In this article, we will explore the significance of these questions, how they relate to periodic trends, and provide examples to enhance understanding. By the end of this exploration, students will be better equipped to tackle challenges related to periodic trends and apply their knowledge in practical situations.

Understanding Periodic Trends

Periodic trends refer to the predictable patterns observed in the properties of elements as one moves across or down the periodic table. These trends arise due to the atomic

structure of the elements, particularly the arrangement of electrons. Some of the most significant periodic trends include:

- **Atomic Radius:** The distance from the nucleus to the outermost electron shell.
- **Ionization Energy:** The energy required to remove an electron from an atom in its gaseous state.
- **Electronegativity:** The tendency of an atom to attract electrons in a chemical bond.
- **Electron Affinity:** The energy change that occurs when an electron is added to a neutral atom.

Understanding these trends is crucial for predicting the behavior of elements in chemical reactions and for grasping the underlying principles of chemistry.

The Importance of Pogil Activities

Pogil (Process Oriented Guided Inquiry Learning) activities are designed to promote collaborative learning and critical thinking among students. These activities focus on guiding students through inquiry-based learning, which allows them to construct their understanding of complex concepts, such as periodic trends.

In the context of periodic trends, pogil extension questions serve several purposes:

1. Encourage Critical Thinking

Pogil extension questions require students to analyze and interpret data related to periodic trends. By engaging with these questions, students learn to think critically about the relationships between different properties of elements.

2. Foster Collaboration

These questions often require group work, which promotes communication and teamwork. Students can share different perspectives and collectively arrive at a more comprehensive understanding of the trends.

3. Enhance Retention

Engaging with pogil extension questions helps reinforce knowledge. When students actively participate in their learning process, they are more likely to retain the information.

Examples of Periodic Trends Pogil Extension Questions

To illustrate the application of pogil extension questions, here are several examples that focus on key periodic trends:

Atomic Radius

1. Compare the atomic radius of lithium (Li) and sodium (Na). What trend do you observe, and what is the reason for this trend?
- As you move down group 1 of the periodic table, the atomic radius increases due to the addition of electron shells.

2. Explain why the atomic radius of chlorine (Cl) is smaller than that of sulfur (S).
- Chlorine has more protons than sulfur, leading to a greater effective nuclear charge that pulls the electrons closer to the nucleus.

Ionization Energy

1. Describe the trend in ionization energy as you move from left to right across a period. What are the underlying reasons for this trend?
- Ionization energy generally increases across a period due to the increasing nuclear charge, which attracts electrons more strongly.

2. How does the ionization energy of magnesium (Mg) compare with that of aluminum (Al)? What explains the trend?
- The ionization energy of magnesium is higher than that of aluminum because the additional electron in aluminum is in a higher energy sublevel (3p), which is further from the nucleus and experiences greater shielding.

Electronegativity

1. Why do elements in the upper right corner of the periodic table (excluding the noble gases) have higher electronegativity values than those in the lower left?
- Elements in the upper right have a greater ability to attract electrons due to their higher nuclear charge and smaller atomic radius.

2. How does the electronegativity of fluorine (F) compare to that of iodine (I)? What trend does this illustrate?
- Fluorine has a higher electronegativity than iodine, illustrating the trend that electronegativity decreases down a group due to increased distance from the nucleus and greater shielding.

Electron Affinity

1. Discuss the trend in electron affinity as you move across a period. What factors contribute to this trend?
- Electron affinity generally becomes more negative across a period, meaning elements are more likely to gain electrons due to increased nuclear charge.

2. Compare the electron affinity of chlorine (Cl) with that of argon (Ar). Why is there a significant difference?
- Chlorine has a negative electron affinity, indicating it readily accepts an electron, while argon, being a noble gas, has a positive electron affinity, indicating it does not favor gaining an electron due to its stable electron configuration.

Conclusion

In conclusion, **periodic trends pogil extension questions** are invaluable tools for enhancing students' understanding of the periodic table's elements and their properties. By engaging in activities that promote collaboration and critical thinking, students can develop a deeper comprehension of atomic structure and the factors influencing elemental behavior. As they work through examples and explore various trends, they will not only strengthen their grasp of chemistry concepts but also gain the skills necessary to tackle more complex scientific inquiries in the future. Embracing pogil strategies in the classroom can transform learning, making it more interactive and effective, ultimately preparing students for success in their academic and professional pursuits.

Frequently Asked Questions

What are periodic trends and why are they important in chemistry?

Periodic trends refer to patterns observed in the periodic table, such as atomic radius, ionization energy, and electronegativity. They are important because they help predict the chemical behavior and reactivity of elements based on their position in the periodic table.

How does atomic radius change across a period and down a group?

Atomic radius decreases across a period from left to right due to increasing nuclear charge, which pulls electrons closer to the nucleus. It increases down a group as additional electron shells are added, increasing the distance between the nucleus and the outermost electrons.

What is the relationship between ionization energy and

electronegativity in periodic trends?

Generally, ionization energy and electronegativity both increase across a period and decrease down a group. This is because elements that hold onto their electrons tightly (high electronegativity) also require more energy to remove an electron (high ionization energy).

Why do metals tend to have lower ionization energies compared to nonmetals?

Metals tend to have lower ionization energies because they have fewer valence electrons and are more willing to lose them to achieve a stable electron configuration. Nonmetals, on the other hand, have higher ionization energies as they tend to gain electrons to fill their outer shell.

How can understanding periodic trends aid in predicting the properties of compounds?

Understanding periodic trends allows chemists to predict how different elements will interact and bond with each other, which in turn helps in anticipating the properties of the resulting compounds, such as stability, reactivity, and polarity.

Periodic Trends Pogil Extension Questions

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