

SHOW ALL THE explanations when asked HERE OR NO CREDIT WILL BE GIVEN.

Circle letter answers here and on the attached answer sheet.

This time you can use your book/notes and periodic table.

1. Given the series of ionization energies for an element X, which of the following statements is correct?

First ionization: 801 Second ionization: 2427 Third ionization: 3660 Fourth ionization: 25025 (kJ/mol)

I. This a group III element

II. The fourth ionization energy is greatest because atom has to remove electrons from the noble gas configuration in the process.

III. Ionization energies 1–3 increase because of the increasing charge of the ion **1 pt**

a. I only b. II only c. III only d. I and II only *e. I, II, and III

2. The formula that one would expect for calcium nitride is

*a. **Ca₃N₂**. b. Ca₂N₃. c. CaNO₂. d. Ca(NO₂)₂. e. Ca(NO₃)₂. **1pt**

Explain briefly what stable ions are expected to be formed for Ca and N by achieving a favorable electron configuration: Ca forms Ca ⁽⁺²⁾ ion with electron configuration [Ar]4s⁰ **1 pt**

N forms N ⁽⁻³⁾ ion with electron configuration [He] 2s² 2p⁶ **1pt**

3. How many electrons does a stable aluminum ion have? → , Al is Z=13, Al+3 is 13 - 3 = 10 e

a. 27 b. 24 c. 18 d. 13 *e. 10 **[1pt]**

Write electron configuration for Al atom and indicate which 3 electrons will be removed: _____

[Ne]3s²3p¹ - 3e on valence orbital → [Ne]3s⁰3p⁰ **[1pt]**

4. 1. Which of the series of elements listed below would have most nearly the same atomic radius?

a. **Sc, Ti, V, Cr** b. Na, K, Rb, Cs c. B, Si, As, Te d. F, Cl, Br, I
1pt e. Na, Mg, Al, Si

Explain briefly your choice: transition metals have the smallest variation in properties- all 10 e are on same d subshell **[1pt]**

5. Which of the following species is iso-electronic with Kr?

a. Xe b. K⁺ c. In³⁺ d. S²⁻ *e. Sr²⁺ **[1 pt]**

Write the electron diagram for this chosen element as neutral atom and show which electrons will be removed(or where they would be added) to give an ion: **Sr: [Kr] 5s² - 2 e → Sr²⁺: [Kr]5s⁰; In won't do because of d-electrons** **[1 pt]**

6. The electronic configuration of the gallium ion, Ga³⁺, is

a. 1s² 2s² 2p⁶ 3s² 3p⁶ 4s² 4p¹.
 b. 1s² 2s² 2p⁶ 3s² 3p⁶ 4s² 3d¹⁰ 4p¹.
 c. 1s² 2s² 2p⁶ 3s² 3p⁶ 4s² 3d¹⁰.
 *d. **1s² 2s² 2p⁶ 3s² 3p⁶ 3d¹⁰**. **[1pt]**
 e. 1s² 2s² 2p⁶ 3s² 3p⁶ 4s² 3d⁷ 4p¹.

7. A section of the periodic table with all identification features removed is shown below.

| | | |
|---|---|---|
| V | W | X |
| | Y | Z |

Which element has the smallest atomic radius?

a. V b. W *c. **X** d. Y e. Z **[1pt]**

Explain your logic. What two main factors affect the trends? - **n** - principal quantum number and **Z_{eff}** nuclear charge.