CH302 Quiz 6 Prep—Main Group I-IV Properties and Reactivity

1) Which of the following groups of atoms is correctly arranged in order of decreasing first ionization energy?

- **A.** Rb > K > Na
- **B.** Ge > As > Se
- **C.** In > Ge > P
- **D.** Cl > Br > I

2) Which of the following statements are true?

I. We can usually predict the valence of an element in Period 2 from the number of electrons in the valence shell and the octet rule.
II. Elements in Period 3 and higher periods can reach higher oxidation states and have higher valences.
III. Elements in Period 3 and higher periods have access to empty *p*-orbitals and can use them to expand their valence shells past the usual octet of electrons.
IV. Elements at the foot of the *s*-block also have variable valence. They can display the inert-pair effect and have an oxidation number 2 more than their group number suggests.

- **A.** I, II, III and IV
- **B.** I and II
- **C.** I, II and III
- **D.** II and III

3) Which of the following statements are true?

I. Hydrogen is the most abundant element in the universe.
II. Hydrogen is the most abundant element on Earth.
III. Hydrogen is the most abundant element in the human body.
IV. Most of the Earth's hydrogen is present as H_2 molecules.
V. Most of the Earth's hydrogen is present as water.
VI. Most of the Earth's hydrogen is present as hydrocarbons.
VII. Water is the only combustion product of hydrogen.

- **A.** I, II, III and VI
- **B.** I and V
- **C.** I, III, V and VII
- **D.** I, II, III, IV and VII

4) Lithium hydride reacts with water to produce an explosive gas. Magnesium metal reacts with hydrochloric acid to produce the same explosive gas. The gas is:

- **A.** Cl_2
- **B.** H_2
- **C.** O_2
- **D.** H_2O_2

5) Why does rubidium react much more vigorously with oxygen than lithium, sodium and potassium do?

- **A.** It has the largest atomic radius among the elements listed above.
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6) When NaH is added to water, hydrogen gas is produced. What will happen to the water as the reaction proceeds?

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7) In what way is magnesium the doorway to life?

- **A.** It is present in every chlorophyll molecule and hence enables photosynthesis to take place.
- **B.** It is the cation in the bones of our skeletons, the shells of shellfish, and the concrete, mortar, and limestone of buildings.
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8) Aluminum is very easily oxidized to Al^{3+}, yet it is corrosion resistant. What is the reason for that?

- **A.** Aluminum does not react with oxygen.
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9) What do graphite and boron nitride have in common?

I. Both have structures consisting of flat planes of hexagons.
II. Both conduct electricity.

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- **A.** I
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10) Which of the following are different allotropes of carbon?

- **A.** Graphite, mica, fullerite
- **B.** ^{12}C, ^{13}C, ^{14}C
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11) Identify which compound best fits each of the following descriptions:

I. Used to waterproof fabrics.
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- **A.** (I) silicones; (II) zircon; (III) mica
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- **B.** LiF
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15) What property of lithium makes the lithium-ion battery an excellent energy storage device?

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18) Aluminum metal is produced by

- **A.** reduction of Al_2O_3 with carbon.
- **B.** electrolysis of a molten mixture of alumina, Al_2O_3, and cryolite, Na_3AlF_6.
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20) Diborane has

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25) The compounds of which alkali metal are commonly used naturally and synthetically to add rigidity and strength to structures?

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- **A.** Bauxitolysis
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- **C.** Excedrin
- **D.** Midol
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- **A.** aluminum oxide
- **B.** calcium oxide
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Answer Key:

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Answer: C

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