

Exam

Name _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The first ionization energies of the elements _____ as you go from left to right across a period of the periodic table, and _____ as you go from the bottom to the top of a group in the table. 1) _____

- A) increase, increase
- B) increase, decrease
- C) decrease, increase
- D) decrease, decrease
- E) are completely unpredictable

2) The _____ have the most negative electron affinities. 2) _____

- A) alkali metals
- B) chalcogens
- C) halogens
- D) alkaline earth metals
- E) transition metals

3) In general, as you go across a period in the periodic table from left to right: 3) _____

- (1) the atomic radius _____;
- (2) the electron affinity becomes _____ negative; and
- (3) the first ionization energy _____.

- A) decreases, increasingly, increases
- B) decreases, decreasingly, increases
- C) increases, increasingly, decreases
- D) increases, increasingly, increases
- E) decreases, increasingly, decreases

4) In general, as you go across a period in the periodic table from left to right: 4) _____

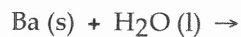
- (1) the atomic radius _____;
- (2) the electron affinity becomes _____ negative; and
- (3) the first ionization energy _____.

- A) decreases, increasingly, increases
- B) increases, increasingly, decreases
- C) decreases, decreasingly, increases
- D) increases, increasingly, increases
- E) decreases, increasingly, decreases

- 5) Element M reacts with chlorine to form a compound with the formula MCl_2 . Element M is more reactive than magnesium and has a smaller radius than barium. This element is _____. 5) _____
A) Be B) Sr C) Ra D) K E) Na
- 6) The oxide of which element below can react with hydrochloric acid? 6) _____
A) carbon B) sulfur C) nitrogen D) selenium E) sodium
- 7) Metals can be _____ at room temperature. 7) _____
A) solid or liquid
B) liquid only
C) solid, liquid, or gas
D) liquid or gas
E) solid only
- 8) Most of the elements on the periodic table are _____. 8) _____
A) metals B) liquids C) nonmetals D) metalloids E) gases
- 9) Na reacts with element X to form an ionic compound with the formula Na_3X . Ca will react with X to form _____. 9) _____
A) Ca_3X_2 B) CaX_2 C) CaX D) Ca_2X_3 E) Ca_3X
- 10) What is the coefficient of M when the following equation is completed and balanced if M is an alkali metal? 10) _____
$$M(s) + H_2O(l) \rightarrow$$

A) 1 B) 2 C) 3 D) 4 E) 0
- 11) The substance, _____ is always produced when an active metal reacts with water. 11) _____
A) O_2 B) H_2O C) $NaOH$ D) H_2 E) CO_2
- 12) The reaction of potassium metal with elemental hydrogen produces _____. 12) _____
A) KH_2
B) K_2H
C) KH
D) None of the above; potassium will not react directly with hydrogen.
E) KOH

13) What is the coefficient of H₂O when the following equation is completed and balanced? 13) _____



- A) 1
- B) 2
- C) 3
- D) 5
- E) Ba(s) does not react with H₂O (l).

14) Oxides of most nonmetals combine with water to form _____. 14) _____

- A) an acid
- B) a base
- C) hydrogen gas
- D) water and a salt
- E) water

15) The reaction of a metal with a nonmetal produces a(n) _____. 15) _____

- A) acid
- B) base
- C) hydroxide
- D) oxide
- E) salt

16) The reaction of a metal with a nonmetal produces a(n) _____. 16) _____

- A) base
- B) hydroxide
- C) acid
- D) oxide
- E) salt

17) Which element would be expected to have chemical and physical properties closest to those of fluorine? 17) _____

- A) S
- B) Cl
- C) Fe
- D) Ne
- E) O

18) Electrons in the 1s subshell are much closer to the nucleus in Ar than in He due to the larger _____ in Ar. 18) _____

- A) diamagnetism
- B) azimuthal quantum number
- C) Hund's rule
- D) paramagnetism
- E) nuclear charge

- 19) Atomic radius generally increases as we move _____. 19) _____
- A) up a group and from right to left across a period
 - B) up a group and from left to right across a period
 - C) down a group and from right to left across a period
 - D) down a group; the period position has no effect
 - E) down a group and from left to right across a period
- 20) Of the following, which gives the correct order for atomic radius for Mg, Na, P, Si and Ar? 20) _____
- A) $\text{Ar} > \text{Si} > \text{P} > \text{Na} > \text{Mg}$
 - B) $\text{Na} > \text{Mg} > \text{Si} > \text{P} > \text{Ar}$
 - C) $\text{Si} > \text{P} > \text{Ar} > \text{Na} > \text{Mg}$
 - D) $\text{Mg} > \text{Na} > \text{P} > \text{Si} > \text{Ar}$
 - E) $\text{Ar} > \text{P} > \text{Si} > \text{Mg} > \text{Na}$
- 21) Screening by the valence electrons in atoms is _____. 21) _____
- A) essentially identical to that by core electrons
 - B) responsible for a general increase in atomic radius going across a period
 - C) more efficient than that by core electrons
 - D) less efficient than that by core electrons
 - E) both more efficient than that by core electrons and responsible for a general increase in atomic radius going across a period
- 22) The atomic radius of main-group elements generally increases down a group because _____. 22) _____
- A) the principal quantum number of the valence orbitals increases
 - B) effective nuclear charge increases down a group
 - C) effective nuclear charge zigzags down a group
 - D) effective nuclear charge decreases down a group
 - E) both effective nuclear charge increases down a group and the principal quantum number of the valence orbitals increases
- 23) Screening by core electrons in atoms is _____. 23) _____
- A) responsible for a general decrease in atomic radius going down a group
 - B) essentially identical to that by valence electrons
 - C) more efficient than that by valence electrons
 - D) less efficient than that by valence electrons
 - E) both essentially identical to that by valence electrons and responsible for a general decrease in atomic radius going down a group

- 24) Which one of the following atoms has the largest radius? 24) _____
 A) F B) Cl C) S D) O E) Ne
- 25) Which one of the following atoms has the largest radius? 25) _____
 A) Ca B) Y C) Rb D) Sr E) K
- 26) Which one of the following has the smallest radius? 26) _____
 A) Br B) Na C) Cl D) P E) Fe
- 27) Which one of the following elements has the largest atomic radius? 27) _____
 A) Sb B) As C) Te D) Se E) S
- 28) In which of the following atoms is the 2s orbital closest to the nucleus? 28) _____
 A) Cl
 B) P
 C) Si
 D) S
 E) The 2s orbitals are the same distance from the nucleus in all of these atoms.
- 29) Which of the following correctly lists the five atoms in order of increasing size (smallest to largest)? 29) _____
 A) $F < O < S < Mg < Ba$
 B) $F < O < S < Ba < Mg$
 C) $O < F < S < Mg < Ba$
 D) $F < S < O < Mg < Ba$
 E) $O < F < S < Ba < Mg$
- 30) Which of the following correctly lists the five atoms in order of increasing size (smallest to largest)? 30) _____
 A) $F < Ge < Br < K < Rb$
 B) $F < Br < Ge < Rb < K$
 C) $F < K < Br < Ge < Rb$
 D) $F < K < Ge < Br < Rb$
 E) $F < Br < Ge < K < Rb$

- 31) Of the choices below, which gives the order for first ionization energies? 31) _____
- A) $\text{Cl} > \text{S} > \text{Al} > \text{Ar} > \text{Si}$
B) $\text{Ar} > \text{Cl} > \text{S} > \text{Si} > \text{Al}$
C) $\text{S} > \text{Si} > \text{Cl} > \text{Al} > \text{Ar}$
D) $\text{Cl} > \text{S} > \text{Al} > \text{Si} > \text{Ar}$
E) $\text{Al} > \text{Si} > \text{S} > \text{Cl} > \text{Ar}$
- 32) Of the following elements, which has the largest first ionization energy? 32) _____
- A) S B) Sb C) As D) Ge E) Se
- 33) Of the elements below, _____ has the largest first ionization energy. 33) _____
- A) Rb B) K C) Li D) Na E) H
- 34) _____ have the lowest first ionization energies of the groups listed. 34) _____
- A) Transition elements
B) Alkali metals
C) Halogens
D) Noble gases
E) Alkaline earth metals
- 35) Which equation correctly represents the first ionization of aluminum? 35) _____
- A) $\text{Al} (\text{g}) \rightarrow \text{Al}^- (\text{g}) + \text{e}^-$
B) $\text{Al}^- (\text{g}) \rightarrow \text{Al} (\text{g}) + \text{e}^-$
C) $\text{Al} (\text{g}) + \text{e}^- \rightarrow \text{Al}^- (\text{g})$
D) $\text{Al}^+ (\text{g}) + \text{e}^- \rightarrow \text{Al} (\text{g})$
E) $\text{Al} (\text{g}) \rightarrow \text{Al}^+ (\text{g}) + \text{e}^-$
- 36) Which equation correctly represents the first ionization of phosphorus? 36) _____
- A) $\text{P} (\text{g}) \rightarrow \text{P}^+ (\text{g}) + \text{e}^-$
B) $\text{P} (\text{g}) + \text{e}^- \rightarrow \text{P}^- (\text{g})$
C) $\text{P}^+ (\text{g}) + \text{e}^- \rightarrow \text{P} (\text{g})$
D) $\text{P} (\text{g}) \rightarrow \text{P}^- (\text{g}) + \text{e}^-$
E) $\text{P}^- (\text{g}) \rightarrow \text{P} (\text{g}) + \text{e}^-$
- 37) Of the following elements, _____ has the most negative electron affinity. 37) _____
- A) Al B) Si C) B D) P E) Cl

- 38) Sodium is much more apt to exist as a cation than is chlorine. This is because _____.
- 38) _____
- A) chlorine has a greater electron affinity than sodium does
 B) chlorine is bigger than sodium
 C) chlorine has a greater ionization energy than sodium does
 D) chlorine is a gas and sodium is a solid
 E) chlorine is more metallic than sodium
- 39) Which equation correctly represents the electron affinity of calcium?
- 39) _____
- A) $\text{Ca (g)} \rightarrow \text{Ca}^- \text{ (g)} + e^-$
 B) $\text{Ca}^+ \text{ (g)} + e^- \rightarrow \text{Ca (g)}$
 C) $\text{Ca}^- \text{ (g)} \rightarrow \text{Ca (g)} + e^-$
 D) $\text{Ca (g)} \rightarrow \text{Ca}^+ \text{ (g)} + e^-$
 E) $\text{Ca (g)} + e^- \rightarrow \text{Ca}^- \text{ (g)}$
- 40) Which of the following correctly represents the electron affinity of bromine?
- 40) _____
- A) $\text{Br (g)} + e^- \rightarrow \text{Br}^- \text{ (g)}$
 B) $\text{Br}_2 \text{ (g)} + e^- \rightarrow \text{Br}^- \text{ (g)}$
 C) $\text{Br}^+ \text{ (g)} + e^- \rightarrow \text{Br (g)}$
 D) $\text{Br}_2 \text{ (g)} + 2 e^- \rightarrow 2 \text{Br}^- \text{ (g)}$
 E) $\text{Br (g)} \rightarrow \text{Br}^+ \text{ (g)} + e^-$
- 41) Which isoelectronic series is correctly arranged in order of increasing radius?
- 41) _____
- A) $\text{Ca}^{2+} < \text{K}^+ < \text{Cl}^- < \text{Ar}$
 B) $\text{K}^+ < \text{Ca}^{2+} < \text{Ar} < \text{Cl}^-$
 C) $\text{Ca}^{2+} < \text{Ar} < \text{K}^+ < \text{Cl}^-$
 D) $\text{Ca}^{2+} < \text{K}^+ < \text{Ar} < \text{Cl}^-$
 E) $\text{Cl}^- < \text{Ar} < \text{K}^+ < \text{Ca}^{2+}$
- 42) Hydrogen is unique among the elements because _____.
- 42) _____
1. It is not really a member of any particular group.
 2. Its electron is not at all shielded from its nucleus.
 3. It is the lightest element.
 4. It is the only element to exist at room temperature as a diatomic gas.
 5. It exhibits some chemical properties similar to those of groups 1A and 7A.
- A) 2, 3, 4, 5 B) 1, 4, 5 C) 3, 4 D) 1, 2, 3, 4, 5 E) 1, 2, 3, 5

43) All of the halogens _____.

- A) exist under ambient conditions as diatomic gases
- B) exhibit metallic character
- C) tend to form positive ions of several different charges
- D) form salts with alkali metals with the formula MX
- E) tend to form negative ions of several different charges

43) _____

44) Of the following statements, _____ is not true for oxygen.

- A) Oxygen is a colorless gas at room temperature.
- B) The most stable allotrope of oxygen is O₂.
- C) The chemical formula of ozone is O₃.
- D) Dry air is about 79% oxygen.
- E) Oxygen forms peroxide and superoxide anions.

44) _____

45) The list that correctly indicates the order of metallic character is _____.

- A) P > S > Se
- B) Si > P > S
- C) F > Cl > S
- D) Na > K > Rb
- E) B > N > C

45) _____