

**Chapter 7 Review**

- \_\_\_\_\_ 1) In which set of elements would all members be expected to have very similar chemical properties?  
A) O, S, Se B) N, O, F C) Na, Mg, K D) S, Se, Si E) Ne, Na, Mg
- \_\_\_\_\_ 2) Electrons in the 1s subshell are much closer to the nucleus in Ar than in He due to the larger \_\_\_\_\_ in Ar.  
A) nuclear charge B) paramagnetism C) diamagnetism D) Hund's rule E) azimuthal quantum number
- \_\_\_\_\_ 3) The effective nuclear charge of an atom is primarily affected by \_\_\_\_\_.  
A) inner electrons B) outer electrons C) nuclear charge D) electron distribution E) orbital radial probability
- \_\_\_\_\_ 4) Atomic radius generally increases as we move \_\_\_\_\_.  
A) down 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 left to right across a period D) up a group and from right to left across a period E) down a group; the period position has no effect
- \_\_\_\_\_ 5) Of the following, which gives the correct order for atomic radius for Mg, Na, P, Si and Ar?  
A) Mg > Na > P > Si > Ar B) Ar > Si > P > Na > Mg C) Si > P > Ar > Na > Mg D) Na > Mg > Si > P > Ar E) Ar > P > Si > Mg > Na
- \_\_\_\_\_ 6) Which one of the following atoms has the largest radius?  
A) O B) F C) S D) Cl E) Ne
- \_\_\_\_\_ 7) \_\_\_\_\_ is isoelectronic with argon and \_\_\_\_\_ is isoelectronic with neon.  
A) Cl<sup>-</sup>, F<sup>-</sup> B) Cl<sup>-</sup>, Cl<sup>+</sup> C) F<sup>+</sup>, F<sup>-</sup> D) Ne<sup>-</sup>, Kr<sup>+</sup> E) Ne<sup>-</sup>, Ar<sup>+</sup>
- \_\_\_\_\_ 8) Which isoelectronic series is correctly arranged in order of increasing radius?  
A) K<sup>+</sup> < Ca<sup>2+</sup> < Ar < Cl<sup>-</sup> B) Cl<sup>-</sup> < Ar < K<sup>+</sup> < Ca<sup>2+</sup> C) Ca<sup>2+</sup> < Ar < K<sup>+</sup> < Cl<sup>-</sup> D) Ca<sup>2+</sup> < K<sup>+</sup> < Ar < Cl<sup>-</sup> E) Ca<sup>2+</sup> < K<sup>+</sup> < Cl<sup>-</sup> < Ar
- \_\_\_\_\_ 9) Of the choices below, which gives the order for first ionization energies?  
A) Kr > Se > Br > Ga > Ge B) Kr > Br > Se > Ge > Ga C) Ga > Br > Ge > Kr > Se D) Ga > Ge > Se > Br > Kr E) Br > Se > Ga > Kr > Ge
- \_\_\_\_\_ 10) Which equation correctly represents the first ionization of aluminum?  
A) Al<sup>-</sup>(g) → Al(g) + e<sup>-</sup> B) Al(g) → Al<sup>-</sup>(g) + e<sup>-</sup> C) Al(g) + e<sup>-</sup> → Al<sup>-</sup>(g) D) Al(g) → Al<sup>+</sup>(g) + e<sup>-</sup> E) Al<sup>+</sup>(g) + e<sup>-</sup> → Al(g)
- \_\_\_\_\_ 11) The ion with the smallest diameter is \_\_\_\_\_.  
A) Br<sup>-</sup> B) Cl<sup>-</sup> C) I<sup>-</sup> D) F<sup>-</sup> E) O<sup>2-</sup>

- \_\_\_\_\_ 12) Of the following species, \_\_\_\_\_ has the largest radius.  
A)  $\text{Rb}^+$  B)  $\text{Sr}^{2+}$  C)  $\text{Br}^-$  D) Kr E) Ar

Consider the following electron configurations to answer the questions that follow:

- (i)  $1s^2 2s^2 2p^6 3s^1$
- (ii)  $1s^2 2s^2 2p^6 3s^2$
- (iii)  $1s^2 2s^2 2p^6 3s^2 3p^1$
- (iv)  $1s^2 2s^2 2p^6 3s^2 3p^4$
- (v)  $1s^2 2s^2 2p^6 3s^2 3p^5$

- \_\_\_\_\_ 13) The electron configuration that belongs to the atom with the lowest second ionization energy is \_\_\_\_\_.  
A) (i) B) (ii) C) (iii) D) (iv) E) (v)
- \_\_\_\_\_ 14) The electron configuration of the atom that is expected to have a positive electron affinity is \_\_\_\_\_.  
A) (i) B) (ii) C) (iii) D) (iv) E) (v)
- \_\_\_\_\_ 15) Of the following elements, \_\_\_\_\_ has the most negative electron affinity.  
A) S B) Cl C) Se D) Br E) I
- \_\_\_\_\_ 16) Of the following elements, \_\_\_\_\_ has the most negative electron affinity.  
A) O B) K C) B D) Na E) S
- \_\_\_\_\_ 17) Sodium is much more apt to exist as a cation than is chlorine. This is because \_\_\_\_\_.  
A) chlorine is a gas and sodium is a solid B) chlorine has a greater electron affinity than sodium does  
C) chlorine is bigger than sodium D) chlorine has a greater ionization energy than sodium does  
E) chlorine is more metallic than sodium
- \_\_\_\_\_ 18) Which of the following correctly represents the electron affinity of bromine?  
A)  $\text{Br}(\text{g}) \rightarrow \text{Br}^+(\text{g}) + e^-$  B)  $\text{Br}(\text{g}) + e^- \rightarrow \text{Br}^-(\text{g})$  C)  $\text{Br}_2(\text{g}) + e^- \rightarrow \text{Br}^-(\text{g})$  D)  $\text{Br}_2(\text{g}) + 2 e^- \rightarrow 2 \text{Br}^-(\text{g})$   
E)  $\text{Br}^+(\text{g}) + e^- \rightarrow \text{Br}(\text{g})$
- \_\_\_\_\_ 19) Which one of the following is a metalloid?  
A) Ge B) S C) Br D) Pb E) C
- \_\_\_\_\_ 20) Of the elements below, \_\_\_\_\_ is the most metallic.  
A) Na B) Mg C) Al D) K E) Ar
- \_\_\_\_\_ 21) The list that correctly indicates the order of metallic character is \_\_\_\_\_.  
A)  $\text{B} > \text{N} > \text{C}$  B)  $\text{F} > \text{Cl} > \text{S}$  C)  $\text{Si} > \text{P} > \text{S}$  D)  $\text{P} > \text{S} > \text{Se}$  E)  $\text{Na} > \text{K} > \text{Rb}$

- \_\_\_\_\_ 31) Consider the following properties of an element:  
(i) It is solid at room temperature.  
(ii) It easily forms an oxide when exposed to air.  
(iii) When it reacts with water, hydrogen gas evolves.  
(iv) It must be stored submerged in oil.  
Which element fits the above description the best?  
A) sulfur B) copper C) mercury D) sodium E) magnesium
- \_\_\_\_\_ 32) The alkali metal that is naturally radioactive is \_\_\_\_\_.  
A) rubidium B) cesium C) lithium D) francium E) sodium
- \_\_\_\_\_ 33) The alkali metal that is used to treat manic-depressive illness is \_\_\_\_\_.  
A) Na B) K C) Li D) Rb E) Cs
- \_\_\_\_\_ 34) Which one of the following compounds produces a basic solution when dissolved in water?  
A)  $\text{SO}_2$  B)  $\text{Na}_2\text{O}$  C)  $\text{CO}_2$  D)  $\text{OF}_2$  E)  $\text{O}_2$
- \_\_\_\_\_ 35) Which alkaline earth metal will not react with liquid water or with steam?  
A) Be B) Mg C) Ca D) Ba E) They all react with liquid water and with steam.
- \_\_\_\_\_ 36) \_\_\_\_\_ is a unique element and does not truly belong to any family.  
A) Nitrogen B) Radium C) Hydrogen D) Uranium E) Helium
- \_\_\_\_\_ 37) Which one of the following elements has an allotrope that is produced in the upper atmosphere by lightning?  
A) N B) O C) S D) Cl E) He
- \_\_\_\_\_ 38) All of the halogens \_\_\_\_\_.  
A) exist under ambient conditions as diatomic gases B) tend to form positive ions of several different charges C) tend to form negative ions of several different charges D) exhibit metallic character E) form salts with alkali metals with the formula MX
- \_\_\_\_\_ 39) The noble gases were, until relatively recently, thought to be entirely unreactive. Experiments in the early 1960s showed that Xe could, in fact, form compounds with fluorine. The formation of compounds consisting of Xe is made possible by \_\_\_\_\_.  
A) the availability of xenon atoms B) xenon's noble gas electron configuration C) the stability of xenon atoms D) xenon's relatively low ionization energy E) xenon's relatively low electron affinity
- \_\_\_\_\_ 40) In nature, the noble gases exist as  
A) monatomic gaseous atoms B) the gaseous fluorides C) solids in rocks and in minerals D) alkali metal salts E) the sulfides

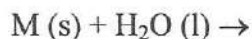
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- \_\_\_\_\_ 22) Of the elements below, \_\_\_\_\_ has the highest melting point.  
A) Ca B) K C) Fe D) Na E) Ba
- \_\_\_\_\_ 23) Of the following metals, \_\_\_\_\_ exhibits multiple oxidation states.  
A) Al B) Rb C) Mg D) Ni E) Cs
- \_\_\_\_\_ 24) The acidity of carbonated water is due to the \_\_\_\_\_.  
A) presence of sulfur B) reaction of  $\text{CO}_2$  and  $\text{H}_2\text{O}$  C) addition of acid D) nonmetal oxides  
E) none of the above
- \_\_\_\_\_ 25) Transition metals within a period differ mainly in the number of \_\_\_\_\_ electrons.  
A) s B) p C) d D) f E) all of the above
- \_\_\_\_\_ 26) Nonmetals can be \_\_\_\_\_ at room temperature.  
A) solid, liquid, or gas B) solid or liquid C) solid only D) liquid only E) liquid or gas
- \_\_\_\_\_ 27) When two elements combine to form a compound, the greater the difference in metallic character between the two elements, the greater the likelihood that the compound will be \_\_\_\_\_.  
A) a gas at room temperature B) a solid at room temperature C) metallic D) nonmetallic  
E) a liquid at room temperature
- \_\_\_\_\_ 28) Between which two elements is the difference in metallic character the greatest?  
A) Rb and O B) O and I C) Rb and I D) Li and O E) Li and Rb
- \_\_\_\_\_ 29) Consider the general valence electron configuration of  $ns^2np^5$  and the following statements:  
(i) Elements with this electron configuration are expected to form -1 anions.  
(ii) Elements with this electron configuration are expected to have large positive electron affinities.  
(iii) Elements with this electron configuration are nonmetals.  
(iv) Elements with this electron configuration form acidic oxides.  
Which statements are true?  
A) (i) and (ii) B) (i), (ii), and (iii) C) (ii) and (iii) D) (i), (iii), and (iv) E) All statements are true.
- \_\_\_\_\_ 30) This element is more reactive than lithium and magnesium but less reactive than potassium. This element is \_\_\_\_\_.  
A) Na B) Rb C) Ca D) Be E) Fr

- \_\_\_\_\_ 41) Hydrogen is unique among the elements because \_\_\_\_\_.  
1. It has only one valence electron.  
2. It is the only element that can emit an atomic spectrum.  
3. Its electron is not at all shielded from its nucleus.  
4. It is the lightest element.  
5. It is the only element to exist at room temperature as a diatomic gas.  
A) 1, 2, 3, 4, 5 B) 1, 3, 4 C) 1, 2, 3, 4 D) 2, 3, 4 E) 3, 4
- \_\_\_\_\_ 42) Astatine has a \_\_\_\_\_ density and a \_\_\_\_\_ atomic radius compared to iodine.  
A) greater; greater B) smaller; greater C) smaller; smaller D) greater; smaller E) equal; equal
- \_\_\_\_\_ 43) \_\_\_\_\_ is credited with developing the concept of atomic numbers.  
A) Dmitri Mendeleev B) Lothar Meyer C) Henry Moseley D) Ernest Rutherford  
E) Michael Faraday
- \_\_\_\_\_ 44) 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.  
A) increase, increase B) increase, decrease C) decrease, increase D) decrease, decrease  
E) are completely unpredictable
- \_\_\_\_\_ 45) The \_\_\_\_\_ have the most negative electron affinities.  
A) alkaline earth metals B) alkali metals C) halogens D) transition metals E) chalcogens
- \_\_\_\_\_ 46) Metals can be \_\_\_\_\_ at room temperature.  
A) liquid only B) solid only C) solid or liquid D) solid, liquid, or gas E) liquid or gas
- \_\_\_\_\_ 47) Na reacts with element X to form an ionic compound with the formula  $\text{Na}_3\text{X}$ . Ca will react with X to form \_\_\_\_\_.  
A)  $\text{CaX}_2$  B)  $\text{CaX}$  C)  $\text{Ca}_2\text{X}_3$  D)  $\text{Ca}_3\text{X}_2$  E)  $\text{Ca}_3\text{X}$
- \_\_\_\_\_ 48) Oxides of the active metals combine with water to form \_\_\_\_\_.  
A) metal hydroxides B) metal hydrides C) hydrogen gas D) oxygen gas E) water and a salt
- \_\_\_\_\_ 49) Oxides of most nonmetals combine with water to form \_\_\_\_\_.  
A) an acid B) a base C) water and a salt D) water E) hydrogen gas
- \_\_\_\_\_ 50) An alkaline earth metal forms a compound with oxygen with the formula \_\_\_\_\_.  
(The symbol M represents any one of the alkaline earth metals.)  
A)  $\text{MO}$  B)  $\text{M}_2\text{O}$  C)  $\text{MO}_2$  D)  $\text{M}_2\text{O}_2$  E)  $\text{MO}_3$

- \_\_\_\_\_ 51) What is the coefficient of M when the following equation is completed and balanced if M is an alkali metal?



- A) 1 B) 2 C) 3 D) 4 E) 0

- \_\_\_\_\_ 52) The reaction of potassium metal with elemental hydrogen produces \_\_\_\_\_.  
A) KH B)  $KH_2$  C)  $K_2H$  D) None of the above; potassium will not react directly with hydrogen. E) KOH

- \_\_\_\_\_ 53) The element(s) \_\_\_\_\_ could be used to produce a red or crimson color in fireworks.  
A) Mg or Ba B) Sr C) Ca, Sr, or Li D) Ba E) Na or K

- \_\_\_\_\_ 54) The reaction of a metal with a nonmetal produces a(n) \_\_\_\_\_.  
A) base B) salt C) acid D) oxide E) hydroxide

- \_\_\_\_\_ 55) The most common and stable allotrope of sulfur is \_\_\_\_\_.  
A) S B)  $S_2$  C)  $S_4$  D)  $S_8$  E) Sulfur does not form allotropes.

- \_\_\_\_\_ 56) The most common sulfur ion has a charge of \_\_\_\_\_.  
A) 2- B) 1- C) 4+ D) 6+ E) Sulfur does not form ions.

- \_\_\_\_\_ 57) Which periodic table group contains only nonmetals?  
A) 18 B) 2 C) 16 D) 17 E) 15

- \_\_\_\_\_ 58) Of the hydrogen halides, only \_\_\_\_\_ is a weak acid.  
A) HCl(aq) B) HBr(aq) C) HF(aq) D) HI(aq) E) They are all weak acids.

- \_\_\_\_\_ 59) The only noble gas that does not have the  $ns^2np^6$  valence electron configuration is \_\_\_\_\_.  
A) radon B) neon C) helium D) krypton E) All noble gases have the  $ns^2np^6$  valence electron configuration.

- \_\_\_\_\_ 60) Of the halogens, which are gases at room temperature and atmospheric pressure?  
A) fluorine, bromine, and iodine B) fluorine, chlorine, and bromine C) fluorine, chlorine, bromine, and iodine D) fluorine, chlorine, and iodine E) fluorine and chlorine

- \_\_\_\_\_ 61)  $Cl_2(g) + H_2O(l) \rightarrow$  \_\_\_\_\_  
A) HCl(aq) + HOCl(aq) B)  $2 Cl^-(aq) + H_2O(l)$  C)  $2 HCl(aq) + O_2(g)$  D)  $2 HCl(aq) + O_2^-(g)$  E)  $Cl_2(aq) + H_2O(l)$

- \_\_\_\_\_ 62) In which of the following atoms is the 3s orbital closest to the nucleus?  
A) Se B) Br C) As D) Ga E) Ge

Name: \_\_\_\_\_

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- \_\_\_\_\_ 63) Which one of the following has the smallest radius?  
A) K B) Br C) Fe D) Sr
- \_\_\_\_\_ 64) Of the following atoms, which has the largest first ionization energy?  
A) Sb B) Se C) As D) S E) Ge
- 65) The degree of interaction between two electrical charges depends on the \_\_\_\_\_ and the \_\_\_\_\_ of the charges and the distance between them.
- 66) Which noble gas has the highest first ionization energy?
- 67) An added electron to the element bromine goes into which orbital?
- 68) What are the elements called that are located between the metals and non-metals?
- 69) Which metal is a liquid at room temperature?
- 70)  $[\text{Kr}]5s^2$  is the electron configuration for \_\_\_\_\_.
- 71) Of the alkaline earth metals, which two elements are the least reactive?
- 72) All of the group 16 elements are solids except \_\_\_\_\_.
- \_\_\_\_\_ 73) The effective nuclear charge acting on an electron is larger than the actual nuclear charge.
- \_\_\_\_\_ 74) The atomic radius of iodine is one-half the distance separating the iodine nuclei.
- \_\_\_\_\_ 75) Elements that readily conduct electricity are elements with low ionization energies.
- \_\_\_\_\_ 76) Xenon can form compounds with fluorine.
- 77) Write net ionic equations for the following reactions:  
(a) barium oxide and water  
(b) carbon dioxide and aqueous sodium hydroxide  
(c) potassium metal burns in an atmosphere of chlorine gas  
(d) a fresh surface of lithium metal is exposed to oxygen gas  
(e) barium metal is heated in an atmosphere of hydrogen  
(f) sulfur dioxide reacts with water  
(g) magnesium oxide reacts with nitric acid

**Chapter 7 Review**  
**Answer Section**

- 1) A
- 2) A
- 3) A
- 4) A
- 5) D
- 6) C
- 7) A
- 8) D
- 9) B
- 10) D
- 11) D
- 12) C
- 13) B
- 14) B
- 15) B
- 16) E
- 17) D
- 18) B
- 19) A
- 20) D
- 21) C
- 22) C
- 23) D
- 24) B
- 25) C
- 26) A
- 27) B
- 28) A
- 29) D
- 30) A
- 31) D
- 32) D
- 33) C
- 34) B
- 35) A
- 36) C
- 37) B
- 38) E

- 39) D
- 40) A
- 41) E
- 42) A
- 43) C
- 44) A
- 45) C
- 46) C
- 47) D
- 48) A
- 49) A
- 50) A
- 51) B
- 52) A
- 53) B
- 54) B
- 55) D
- 56) A
- 57) A
- 58) C
- 59) C
- 60) E
- 61) A
- 62) B
- 63) B
- 64) D
- 65) signs, magnitude
- 66) helium
- 67) 4p
- 68) Metalloids
- 69) Mercury (Hg)
- 70) strontium
- 71) Be and Mg
- 72) oxygen
- 73) F
- 74) T
- 75) T
- 76) T
- 77) ?