Ajman University of Science and Technology

General Chemistry for Engineering – Spring 2013-2014 - Dr. Zehra Edis

Assignment 3 - 25.03.2014-Solutions

1) The number of valence electrons in a main group element is given by _____.
A) the element's atomic number
B) the element's atomic weight
C) the element's group number
D) none of the above
Answer: C
Diff: 1
Section: 2.8

2) Valence electrons in the main group elements are contained in which type(s) of orbitals?
A) *s*
B) *p*
C) s and *p*
D) *d*
Answer: C
Diff: 1
Section: 2.8

3) How many electrons are there in the valence shell of a nitrogen atom?
A) 0
B) 2
C) 3
D) 5
E) 7
Answer: D
Diff: 2
Section: 2.8

4) An s-block element in the 5th Period is
A) Y.
B) As.
C) Sr.
D) Mo.
E) Ag.
Answer: C
Diff: 2
Section: 2.8

5) The element which has four valence electrons is _____.
A) H
B) Na
C) Mg

D) Si
E) S
Answer: D
Diff: 2
Section: 2.8

6) An element with 2 valence electrons is _____.
A) Se
B) Si
C) Ca
D) Rb
Answer: C
Diff: 2
Section: 2.8

7) In terms of atomic structure, the common characteristic of elements in the same group is
A) number of electrons.
B) number of electrons in the outermost shell.
C) number of neutrons.
D) number of protons.
E) none of the above
Answer: B
Diff: 3
Section: 2.8

8) Explain how the term "valence electrons" is related to electron configurations. Use the elements in group VI, Periods, 3, 4, and 5, as examples.
Answer: The electron configuration allows us to determine the number of valence electrons by identifying the orbitals in the outermost shell so their electrons can be counted. The orbitals in the outermost shell are all those with the largest coefficient. For example, the electron configuration of S is $1s^2 2s^2 2p^6 3s^2 3p^4$. The outermost orbitals, which have a coefficient of 3, contain six electrons. Therefore sulfur has six valence electrons. For Se, the electron configuration is [Ar]$4s^2 3d^{10} 4p^4$, and the orbitals with the largest coefficient (4) contain six electrons. Selenium has six valence electrons. Likewise, for Te, the electron configuration is [Kr] $5s^2 4d^{10} 5p^4$, and the orbitals with the largest coefficient (5) contain a total of six electrons, the valence electrons.
Diff: 3
Section: 2.8

9) Main group elements that are metals usually _____ one or more electrons to form _____, which have a _____ charge.
A) lose; anions; negative
B) lose; cations; negative
C) lose; cations; positive
D) gain; cations; positive
E) gain; anions; negative

Answer: C
Diff: 2
Section: 3.1

10) An element belonging to the halogen family would be expected to have a _____ ionization energy and a _____ electron affinity.
A) large; large
B) large; small
C) small; small
D) small; large
E) none of the above
Answer: A
Diff: 3
Section: 3.2

11) The statement that best describes the formation of an ionic compound is:
A) Electrons are transferred from a metal to a non-metal, and the resulting charged particles form a crystalline network.
B) Electrons are transferred from a non-metal to a metal, and the resulting charged particles form a crystalline network.
C) Electrons are shared between two atoms and discrete molecules are formed.
D) Electrons move freely among a network of nuclei in fixed positions.
E) Each atom achieves an octet using electrons provided from an external electrical supply.
Answer: A
Diff: 2
Section: 3.3

12) Which one of the compounds below is most likely to be *ionic*?
A) $SrBr_2$
B) NO_2
C) CBr_4
D) H_2O
Answer: A
Diff: 2
Section: 3.3

13)The property that describes the ease with which an atom gives up an electron to form a positive ion is
A) atomic number.
B) electron affinity.
C) electronegativity.
D) ionization energy.
E) none of the above
Answer: D
Diff: 1

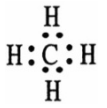
Section: 3.2

14) What fourth period element is represented by the dot structure shown?

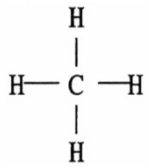
A) K
B) Ca
C) Mn
D) Br
E) Co
Answer: D
Diff: 2

15) A chemical bond formed between two identical atoms is a(an) _____ bond.
A) atomic
B) pure covalent
C) polar covalent
D) ionic
E) molecular
Answer: B
Diff: 1

16) Which representation of a methane molecule is **not** correct? (A methane molecule is composed of one carbon atom and four hydrogen atoms.)
A) CH_4
B)



C)



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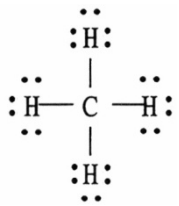
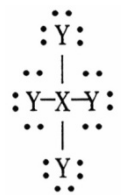


E) none of the above
Answer: D
Diff: 1

17) For the dot structure shown the most likely elements are X =_____ and Y = _____.



A) carbon; hydrogen
B) carbon; fluorine
C) carbon; oxygen
D) hydrogen; carbon
E) fluorine; carbon
Answer: B
Diff: 3
Section: 4.2

18) Which element is most likely to be "X" in the diatomic molecule shown?

A) nitrogen
B) oxygen
C) fluorine
D) hydrogen
E) helium
Answer: B
Diff: 2

19) A chemical bond formed when two atoms share six electrons is a _____ bond; it is best described as _____.
A) double; covalent
B) double; ionic
C) single; covalent
D) single; ionic
E) triple; covalent
Answer: E
Diff: 2
Section: 4.3

20) In forming covalent bonds where the octet rule is obeyed, sulfur usually forms _____ bonds and chlorine usually forms _____ bonds.
A) one; one
B) two; two
C) one; two
D) two; one
E) six; seven
Answer: D
Diff: 1
Section: 4.7

21) What is the formula for an ionic compound made of magnesium and sulfur?
A) MgS
B) MgS_2
C) Mg_2S
D) Mg_2S_3
E) none of the above
Answer: A

22) Which of the following statements about Lewis structures is FALSE?
A) An octet is when an atom has 8 valence electrons.
B) A duet is a stable electron configuration for helium.
C) An ionic bond occurs when electrons are transferred.
D) A covalent bond occurs when electrons are shared.
E) All of the above statements are true.
Answer: E
Diff: 2 Page Ref: 10.2

23) Which Lewis structure below correctly represents KCl?

A) $K^+ [\ddot{\underset{\ddot{}}{Cl}}]^-$

B) $K^+ [: \ddot{\underset{\ddot{}}{Cl}} :]^-$

C) $K : \ddot{\underset{\ddot{}}{Cl}} :$

D) $: \ddot{\underset{\ddot{}}{K}} : : \ddot{\underset{\ddot{}}{Cl}} :$

E) none of the above
Answer: B
Diff: 2 Page Ref: 10.3

24) What is the correct Lewis structure for water?

A) $H\text{-}: \ddot{\underset{\ddot{}}{O}} :\text{-}H$

B) $: \ddot{\underset{\ddot{}}{H}} - \ddot{\underset{\ddot{}}{O}} - \ddot{\underset{\ddot{}}{H}} :$

C) $H= \ddot{\underset{\ddot{}}{O}} =H$

D) $H- \ddot{\underset{\ddot{}}{O}} -H$

E) none of the above
Answer: D

Diff: 2 Page Ref: 10.4

25) The Lewis structure for carbon monoxide is $:C \equiv O:$ This structures shows
A) 4 lone pairs and 1 bonding pair.
B) 4 lone pairs and 3 bonding pairs.
C) 2 lone pairs and 3 bonding pairs.
D) 2 lone pairs and 1 bonding pair.
E) none of the above
Answer: C
Diff: 1 Page Ref: 10.4

26) What is the correct Lewis structure for CN^-?
A) $[C\text{-}N]^-$

B) $[:\underset{\cdot\cdot}{\overset{\cdot\cdot}{C}}\text{-}\underset{\cdot\cdot}{\overset{\cdot\cdot}{N}}:]^-$

C) $[\underset{\cdot\cdot}{\overset{\cdot\cdot}{C}}=\underset{\cdot\cdot}{\overset{\cdot\cdot}{N}}:]^-$

D) $[:C\equiv N:]^-$

E) none of the above
Answer: D
Diff: 2 Page Ref: 10.5