

1. What is the nuclear charge of an iron atom (Fe)?
 - 1) +26
 - 2) +30
 - 3) +56
 - 4) +82
2. What is the mass number of an atom that has six protons, six electrons, and eight neutrons?
 - 1) 6
 - 2) 12
 - 3) 14
 - 4) 20
3. Which two nuclides are isotopes of the same element?
 - 1) $^{20}_{11}\text{Na}$ and $^{20}_{10}\text{Ne}$
 - 2) $^{39}_{19}\text{K}$ and $^{40}_{20}\text{Ca}$
 - 3) $^{39}_{19}\text{K}$ and $^{42}_{19}\text{K}$
 - 4) $^{14}_6\text{C}$ and $^{14}_7\text{N}$
4. What is the total number of valence electrons in an atom of germanium in the ground state?
 - 1) 8
 - 2) 2
 - 3) 14
 - 4) 4
5. Which electron configuration represents an atom in an excited state?
 - 1) 2-7
 - 2) 2-6-2
 - 3) 2-8-1
 - 4) 2-8-8-2
6. In the modern wave-mechanical model of the atom, the orbitals are regions of the most probable location of
 - 1) protons
 - 2) neutrons
 - 3) electrons
 - 4) positrons
7. Which Group 15 element exists as a diatomic molecule at STP?
 - 1) phosphorus
 - 2) nitrogen
 - 3) bismuth
 - 4) arsenic
8. Which of the following gases is monatomic at STP?
 - 1) hydrogen
 - 2) chlorine
 - 3) oxygen
 - 4) helium
9. The two forms of oxygen, $\text{O}_2(\text{g})$ and $\text{O}_3(\text{g})$, have
 - 1) different molecular structures and identical properties
 - 2) different molecular structures and different properties
 - 3) identical molecular structures and identical properties
 - 4) identical molecular structures and different properties
10. Which aqueous solution is colored?
 - 1) $\text{CuSO}_4(\text{aq})$
 - 2) $\text{BaCl}(\text{aq})$
 - 3) $\text{KCl}(\text{aq})$
 - 4) $\text{MgSO}_4(\text{aq})$
11. An atom of which element has the greatest attraction for the electrons in a bond with a hydrogen atom?
 - 1) chlorine
 - 2) phosphorus
 - 3) silicon
 - 4) sulfur
12. Which element requires the *least* amount of energy to remove the most loosely held electron from a gaseous atom in the ground state?
 - 1) bromine
 - 2) calcium
 - 3) sodium
 - 4) silver

Chemistry Vocabulary Review

13. Which substance can *not* be decomposed by a chemical change?
- 1) ammonia 2) copper
3) propanol 4) water
14. Which substance can be broken down by chemical means?
- 1) magnesium 2) manganese
3) mercury 4) methanol
15. What is the empirical formula for a compound with the molecular formula $C_6H_{12}Cl_2O_2$?
- 1) $CHClO$ 2) CH_2ClO
3) C_3H_6ClO 4) $C_6H_{12}Cl_2O_2$
16. The formula H_2O_2 is an example of
- 1) a molecular formula 2) an empirical formula
3) an ionic formula 4) an organic formula
17. The gram-formula mass of $(NH_4)_2CO_3$ is
- 1) 46.0 g 2) 64.0 g 3) 78.0 g 4) 96.0 g
18. The percent composition by mass of magnesium in $MgBr_2$ (gram-formula mass = 184 grams/mole) is equal to
- 1) $\frac{24}{184} \times 100$ 2) $\frac{160}{184} \times 100$ 3) $\frac{184}{24} \times 100$ 4) $\frac{184}{160} \times 100$
19. Which equation represents a decomposition reaction?
- 1) $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$
2) $Cu(s) + 2AgNO_3(aq) \rightarrow 2Ag(s) + Cu(NO_3)_2(aq)$
3) $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$
4) $KOH(aq) + HCl(aq) \rightarrow KCl(aq) + H_2O(l)$
20. Which balanced equation represents a redox reaction?
- 1) $CuCO_3(s) \rightarrow CuO(s) + CO_2(g)$
2) $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$
3) $AgNO_3(aq) + KCl(aq) \rightarrow AgCl(s) + KNO_3(aq)$
4) $H_2SO_4(aq) + 2KOH(aq) \rightarrow K_2SO_4(aq) + 2H_2O(l)$
21. Which equation shows conservation of atoms?
- 1) $H_2 + O_2 \rightarrow H_2O$ 2) $H_2 + O_2 \rightarrow 2H_2O$
3) $2H_2 + O_2 \rightarrow 2H_2O$ 4) $2H_2 + 2O_2 \rightarrow 2H_2O$
22. The bonds in BaO are best described as
- 1) covalent, because valence electrons are shared
2) covalent, because valence electrons are transferred
3) ionic, because valence electrons are shared
4) ionic, because valence electrons are transferred
23. As a bond between a hydrogen atom and a sulfur atom is formed, electrons are
- 1) shared to form an ionic bond
2) shared to form a covalent bond
3) transferred to form an ionic bond
4) transferred to form a covalent bond

Chemistry Vocabulary Review

24. Conductivity in a metal results from the metal atoms having
- 1) high electronegativity
 - 2) high ionization energy
 - 3) highly mobile protons in the nucleus
 - 4) highly mobile electrons in the valence shell
25. Silicon dioxide (SiO_2) and diamonds are best described as
- 1) molecular substances with coordinate covalent bonding
 - 2) molecular substances with ionic bonding
 - 3) network solids with covalent bonding
 - 4) network solids with ionic bonding
26. Which of these formulas contains the most polar bond?
- 1) H–Br
 - 2) H–Cl
 - 3) H–F
 - 4) H–I
27. Which compound has molecules that form the strongest hydrogen bonds?
- 1) HI
 - 2) HBr
 - 3) HF
 - 4) HCl
28. Which formula represents a polar molecule?
- 1) H_2
 - 2) H_2O
 - 3) CO_2
 - 4) CCl_4
29. At STP, fluorine is a gas and iodine is a solid. This observation can be explained by the fact that fluorine has
- 1) weaker intermolecular forces of attraction than iodine
 - 2) stronger intermolecular forces of attraction than iodine
 - 3) lower average kinetic energy than iodine
 - 4) higher average kinetic energy than iodine
30. Which statement describes a chemical property of aluminum?
- 1) Aluminum is malleable.
 - 2) Aluminum reacts with sulfuric acid.
 - 3) Aluminum conducts an electric current.
 - 4) Aluminum has a density of 2.698 g/cm^3 at STP.
31. Which kind of energy is stored within a chemical substance?
- 1) free energy
 - 2) activation energy
 - 3) kinetic energy
 - 4) potential energy
32. Which sample of ethanol has particles with the highest average kinetic energy?
- 1) 10.0 mL of ethanol at 25°C
 - 2) 10.0 mL of ethanol at 55°C
 - 3) 100.0 mL of ethanol at 35°C
 - 4) 100.0 mL of ethanol at 45°C
33. At STP, a sample of which element has the highest entropy?
- 1) Na(s)
 - 2) $\text{Hg}(\ell)$
 - 3) $\text{Br}_2(\ell)$
 - 4) $\text{F}_2(\text{g})$
34. Under which conditions of temperature and pressure would helium behave most like an ideal gas?
- 1) 50 K and 20 kPa
 - 2) 50 K and 600 kPa
 - 3) 750 K and 20 kPa
 - 4) 750 K and 600 kPa
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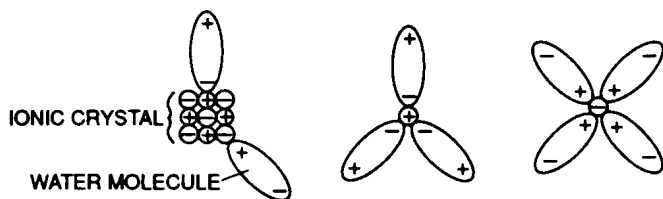
35. The table below shows mass and volume data for four samples of substances at 298 K and 1 atmosphere.

Masses and Volumes of Four Samples

Sample	Mass (g)	Volume (mL)
A	30.	60.
B	40.	50.
C	45	90.
D	90.	120.

Which two samples could consist of the same substance?

- 1) A and B 2) A and C
 3) B and C 4) C and D
36. What amount of heat is required to completely melt a 29.95-gram sample of $\text{H}_2\text{O}(\text{s})$ at 0°C ?
- 1) 334 J 2) 2260 J
 3) 1.00×10^3 J 4) 1.00×10^4 J
37. Which phase change at STP represents sublimation?
- 1) $\text{CO}_2(\text{s}) \rightarrow \text{CO}_2(\text{g})$ 2) $\text{H}_2\text{O}(\text{s}) \rightarrow \text{H}_2\text{O}(\ell)$
 3) $\text{CO}_2(\ell) \rightarrow \text{CO}_2(\text{g})$ 4) $\text{H}_2\text{O}(\ell) \rightarrow \text{H}_2\text{O}(\text{s})$
38. The diagrams below represent an ionic crystal being dissolved in water.

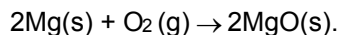


According to the diagrams, the dissolving process takes place by

- 1) hydrogen bond formation
 2) network bond formation
 3) van der Waals attractions
 4) molecule-ion attractions
39. A dilute, aqueous potassium nitrate solution is best classified as a
- 1) homogeneous compound
 2) homogeneous mixture
 3) heterogeneous compound
 4) heterogeneous mixture
40. A beaker contains both alcohol and water. These liquids can be separated by distillation because the liquids have different
- 1) boiling points 2) densities
 3) particle sizes 4) solubilities
41. A solution containing 55 grams of NH_4Cl in 100. grams of water is saturated at a temperature of
- 1) 47°C 2) 57°C 3) 67°C 4) 77°C

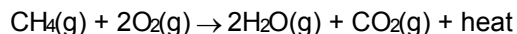
Chemistry Vocabulary Review

42. Which phrase describes the molarity of a solution?
- 1) liters of solute per mole of solution
 - 2) liters of solution per mole of solution
 - 3) moles of solute per liter of solution
 - 4) moles of solution per liter of solution
43. A piece of Mg(s) ribbon is held in a Bunsen burner flame and begins to burn according to the equation:



The reaction begins because the reactants

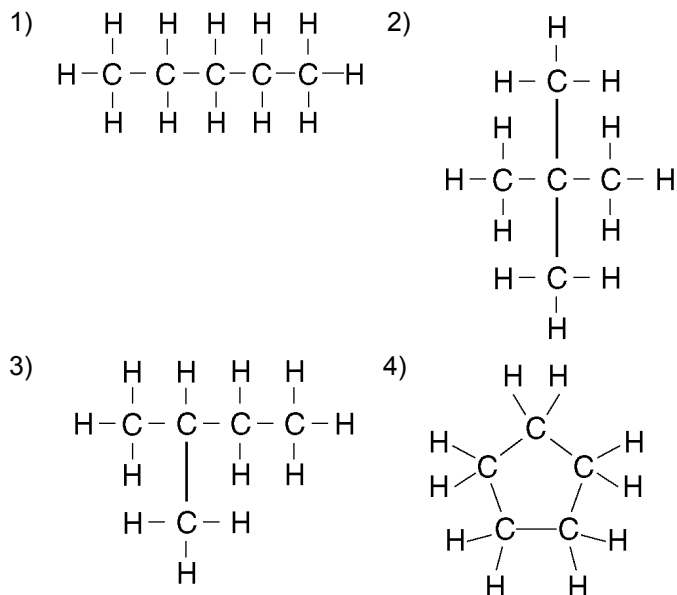
- 1) are activated by heat from the Bunsen burner flame
 - 2) are activated by heat from the burning magnesium
 - 3) underwent an increase in entropy
 - 4) underwent a decrease in entropy
44. Given the balanced equation representing a reaction:



Which statement is true about energy in this reaction?

- 1) The reaction is exothermic because it releases heat.
 - 2) The reaction is exothermic because it absorbs heat.
 - 3) The reaction is endothermic because it releases heat.
 - 4) The reaction is endothermic because it absorbs heat.
45. In a chemical reaction, the difference between the potential energy of the products and the potential energy of the reactants is defined as the
- 1) activation energy
 - 2) ionization energy
 - 3) heat of reaction
 - 4) heat of vaporization
46. Which two factors must be equal when a chemical reaction reaches equilibrium?
- 1) the concentration of the reactants and the concentration of the products
 - 2) the number of reactant particles and the number of product particles
 - 3) the rate of the forward reaction and the rate of the reverse reaction
 - 4) the mass of the reactants and the mass of the products
47. A reaction will be spontaneous if it results in products that have
- 1) lower potential energy and less randomness
 - 2) lower potential energy and more randomness
 - 3) greater potential energy and less randomness
 - 4) greater potential energy and more randomness
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48. Which structural formula represents a molecule that is *not* an isomer of pentane?



49. Petroleum is a complex mixture of

- 1) hydroxides 2) hydrocarbons
3) esters 4) ethers

50. Which equation represents fermentation?

- 1) $\text{C}_2\text{H}_6 + \text{Cl}_2 \rightarrow \text{C}_2\text{H}_6\text{Cl} + \text{HCl}$
2) $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2 \text{C}_2\text{H}_5\text{OH} + 2 \text{CO}_2$
3) $\text{CH}_3\text{COOH} + \text{CH}_3\text{OH} \rightarrow \text{CH}_3\text{COOCH}_3 + \text{H}_2\text{O}$
4) $n\text{C}_2\text{H}_4 \rightarrow (\text{C}_2\text{H}_4)_n$

51. Which reaction best represents the complete combustion of ethene?

- 1) $\text{C}_2\text{H}_4 + \text{HCl} \rightarrow \text{C}_2\text{H}_5\text{Cl}$
2) $\text{C}_2\text{H}_4 + \text{Cl}_2 \rightarrow \text{C}_2\text{H}_4\text{Cl}_2$
3) $\text{C}_2\text{H}_4 + 3 \text{O}_2 \rightarrow 2 \text{CO}_2 + 2 \text{H}_2\text{O}$
4) $\text{C}_2\text{H}_4 + \text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_5\text{OH}$

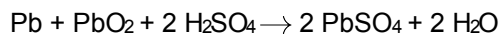
52. In which kind of reaction is soap one of the products?

- 1) oxidation 2) saponification
3) neutralization 4) fermentation

53. What is the oxidation number of chromium in the chromate ion, CrO_4^{2-} ?

- 1) +6 2) +2 3) +3 4) +8

54. Given the lead-acid battery reaction:



Which electronic equation represents the half-reaction for the oxidation that occurs?

- 1) $\text{Pb} \rightarrow \text{Pb}^{2+} + 2 \text{e}^-$ 2) $\text{Pb}^{4+} + 4 \text{e}^- \rightarrow \text{Pb}$
3) $\text{Pb}^{2+} + 2 \text{e}^- \rightarrow \text{Pb}$ 4) $\text{Pb} \rightarrow \text{Pb}^{4+} + 4 \text{e}^-$

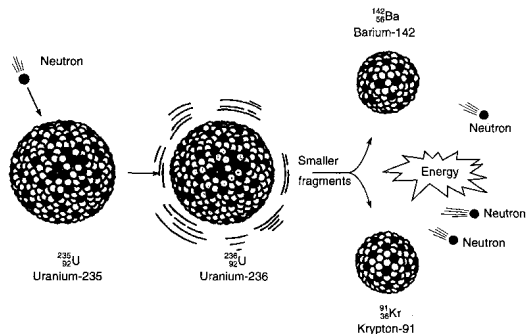
Chemistry Vocabulary Review

55. Which energy conversion occurs in a voltaic cell?
- 1) chemical energy to electrical energy
 - 2) chemical energy to nuclear energy
 - 3) electrical energy to chemical energy
 - 4) nuclear energy to electrical energy
56. What is the purpose of the salt bridge in a voltaic cell?
- 1) It blocks the flow of electrons.
 - 2) It blocks the flow of positive and negative ions.
 - 3) It is a path for the flow of electrons.
 - 4) It is a path for the flow of positive and negative ions.
57. Which occurs at the cathode during the electrolysis of fused KCl?
- 1) the oxidation of K^+ ion
 - 2) the reduction of K^+ ion
 - 3) the oxidation of Cl^- ion
 - 4) the reduction of Cl^- ion
58. Which substance is an electrolyte?
- 1) CCl_4
 - 2) C_2H_6
 - 3) HCl
 - 4) H_2O
59. An aqueous solution of lithium hydroxide contains hydroxide ions as the only negative ion in the solution. Lithium hydroxide is classified as an
- 1) aldehyde
 - 2) alcohol
 - 3) Arrhenius acid
 - 4) Arrhenius base
60. Which substance can be classified as an Arrhenius acid?
- 1) KF
 - 2) HF
 - 3) KOH
 - 4) LiH
61. Which change in pH represents a hundredfold increase in the concentration of hydronium ions in a solution?
- 1) pH 1 to pH 2
 - 2) pH 1 to pH 3
 - 3) pH 2 to pH 1
 - 4) pH 3 to pH 1
62. Which statement describes an alternate theory of acids and bases?
- 1) Acids and bases are both H^+ acceptors.
 - 2) Acids and bases are both H^+ donors.
 - 3) Acids are H^+ acceptors, and bases are H^+ donors.
 - 4) Acids are H^+ donors, and bases are H^+ acceptors.
63. Which word equation represents a neutralization reaction?
- 1) base + acid \rightarrow salt + water
 - 2) base + salt \rightarrow water + acid
 - 3) salt + acid \rightarrow base + water
 - 4) salt + water \rightarrow acid + base
64. The nucleus of a radium-226 atom is unstable, which causes the nucleus to spontaneously
- 1) absorb electrons
 - 2) absorb protons
 - 3) decay
 - 4) oxidize
65. What is the half-life of a radioisotope if 25.0 grams of an original 200.-gram sample of the isotope remains unchanged after 11.46 days?
- 1) 2.87 d
 - 2) 3.82 d
 - 3) 11.46 d
 - 4) 34.38 d
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66. Which equation is an example of artificial transmutation?

- 1) ${}^9_4\text{Be} + {}^4_2\text{He} \rightarrow {}^{12}_6\text{C} + {}^1_0\text{n}$
- 2) $\text{U} + 3 \text{F}_2 \rightarrow \text{UF}_6$
- 3) $\text{Mg}(\text{OH})_2 + 2 \text{HCl} \rightarrow 2 \text{H}_2\text{O} + \text{MgCl}_2$
- 4) $\text{Ca} + 2 \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$

67. The diagram below represents a nuclear reaction in which a neutron bombards a heavy nucleus.



Which type of reaction does the diagram illustrate?

- 1) fission
- 2) fusion
- 3) alpha decay
- 4) beta decay

68. Which equation represents nuclear fusion?

- 1) ${}^{14}_6\text{C} \rightarrow {}^{14}_7\text{N} + {}^0_{-1}\text{e}$
- 2) ${}^{27}_{13}\text{Al} + {}^4_2\text{He} \rightarrow {}^{30}_{15}\text{P} + {}^1_0\text{n}$
- 3) ${}^{235}_{92}\text{U} + {}^1_0\text{n} \rightarrow {}^{139}_{56}\text{Ba} + {}^{94}_{36}\text{Kr} + 3 {}^1_0\text{n}$
- 4) ${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{He} + {}^1_0\text{n}$