PRACTICE EXAM 14: PHYSICAL SETTING/CHEMISTRY SIMULATION (85 QUESTIONS)

1. What is the name for the number of protons in the nucleus of an atom?

A. mass number

B. neutron number

C. atomic number

D. oxidation number

2. What is the term for the total number of protons and neutrons in an atom's nucleus?

A. atomic number

B. atomic radius

C. ionization energy

D. mass number

3. What is the name for atoms of the same element that have different numbers of neutrons?

A. isotopes

B. ions

C. allotropes

D. isomers

4. What is the term for an atom that has gained or lost electrons and carries a charge?

A. molecule

B. ion

C. isotope

D. compound

5. What is the name for the electrons in the outermost energy level of an atom?

A. core electrons

B. bonding pairs

C. delocalized electrons

D. valence electrons

6. What is the term for a positively charged ion?

A. anion

B. cation

C. isotope

D. radical

7. What is the name for a negatively charged ion?

A. cation

B. proton

C. anion

D. nucleus

8. What is the term for a measure of an atom's attraction for shared electrons in a bond?

A. ionization energy

B. atomic radius

C. density

D. electronegativity

9. What is the name for the energy required to remove an electron from an atom?

A. activation energy

B. bond energy

C. ionization energy

D. heat of fusion

10. What is the term for one-half the distance between the nuclei of two bonded atoms of the same element?

A. atomic radius

B. mass number

C. bond length

D. ionic radius

11. What is the name for a bond formed by the transfer of electrons between a metal and a nonmetal?

A. covalent bond

B. ionic bond

C. metallic bond

D. hydrogen bond

12. What is the term for a bond formed by the sharing of electrons between two nonmetals?

A. covalent bond

B. ionic bond

C. metallic bond

D. polar bond

13. What is the name for the bonding in which metal atoms share a "sea" of mobile electrons?

A. ionic bond

B. covalent bond

C. metallic bond

D. hydrogen bond

14. What is the term for a covalent bond in which electrons are shared unequally?

A. nonpolar covalent bond

B. ionic bond

C. metallic bond

D. polar covalent bond

15. What is the name for the amount of a substance that contains 6.02×10^{23} particles?

A. mole

B. gram

C. liter

D. molarity

16. What is the term for the number 6.02×10^{23}, the number of particles in one mole?

A. Avogadro's number

B. atomic mass

C. molar volume

D. mass number

17. What is the name for the concentration unit equal to moles of solute per liter of solution?

A. density

B. molality

C. molarity

D. percent yield

18. What is the term for the sum of the atomic masses of all atoms in a chemical formula?

A. percent composition

B. empirical mass

C. molar volume

D. gram-formula mass

19. What is the name for the simplest whole-number ratio of atoms in a compound?

A. molecular formula

B. empirical formula

C. structural formula

D. condensed formula

20. What is the term for the formula that shows the actual number of atoms of each element in a molecule?

A. empirical formula

B. molecular formula

C. ionic formula

D. percent formula

21. What is the name for a reaction in which two or more substances combine to form a single product?

A. decomposition

B. single replacement

C. synthesis

D. combustion

22. What is the term for a reaction in which a single compound breaks down into simpler substances?

A. synthesis

B. decomposition

C. neutralization

D. combustion

23. What is the name for a reaction in which a hydrocarbon reacts with oxygen to produce carbon dioxide and water?

A. synthesis

B. combustion

C. decomposition

D. double replacement

24. What is the term for the reaction between an acid and a base that produces a salt and water?

A. combustion

B. synthesis

C. decomposition

D. neutralization

25. What is the name for a substance that speeds up a reaction by lowering its activation energy without being consumed?

A. reactant

B. product

C. inhibitor

D. catalyst

26. What is the term for the minimum energy required to start a chemical reaction?

A. activation energy

B. ionization energy

C. heat of reaction

D. bond energy

27. What is the name for a reaction that releases heat to its surroundings?

A. endothermic reaction

B. nuclear reaction

C. neutralization

D. exothermic reaction

28. What is the term for a reaction that absorbs heat from its surroundings?

A. exothermic reaction

B. combustion

C. synthesis

D. endothermic reaction

29. What is the name for the state in which the forward and reverse reaction rates are equal?

A. saturation

B. neutralization

C. equilibrium

D. completion

30. What is the term for the loss of electrons by a substance in a chemical reaction?

A. reduction

B. neutralization

C. oxidation

D. condensation

31. What is the name for the gain of electrons by a substance in a chemical reaction?

A. reduction

B. oxidation

C. sublimation

D. ionization

32. What is the term for the charge an atom would have if its bonding electrons were assigned to the more electronegative atom?

A. oxidation number

B. atomic number

C. mass number

D. formal mass

33. What is the name for a substance that conducts electricity when dissolved in water?

A. insulator

B. nonelectrolyte

C. solvent

D. electrolyte

34. What is the term for a substance that produces hydrogen ions (H^+) in solution?

A. base

B. salt

C. acid

D. buffer

35. What is the name for a substance that produces hydroxide ions (OH^-) in solution?

A. acid

B. base

C. salt

D. electrolyte

36. What is the term for the scale that measures the acidity or basicity of a solution?

A. molarity

B. pH

C. density

D. titration

37. What is the name for the ionic compound produced, along with water, in a neutralization reaction?

A. acid

B. base

C. salt

D. buffer

38. What is the term for the change of a substance directly from a solid to a gas?

A. melting

B. condensation

C. sublimation

D. deposition

39. What is the name for the change of a substance directly from a gas to a solid?

A. sublimation

B. evaporation

C. condensation

D. deposition

40. What is the term for the change of a substance from a gas to a liquid?

A. evaporation

B. condensation

C. sublimation

D. freezing

41. What is the name for the change of a substance from a liquid to a gas?

A. condensation

B. vaporization

C. freezing

D. deposition

42. What is the term for the change of a substance from a solid to a liquid?

A. melting

B. freezing

C. boiling

D. sublimation

43. What is the name for the change of a substance from a liquid to a solid?

A. melting

B. freezing

C. condensation

D. evaporation

44. What is the term for the substance that is dissolved in a solution?

A. solvent

B. solute

C. precipitate

D. catalyst

45. What is the name for the substance that does the dissolving in a solution?

A. solute

B. precipitate

C. solvent

D. electrolyte

46. What is the term for a solution that holds the maximum amount of dissolved solute at a given temperature?

A. saturated solution

B. unsaturated solution

C. dilute solution

D. concentrated solution

47. What is the name for an insoluble solid that forms when two solutions are mixed?

A. solvent

B. solute

C. electrolyte

D. precipitate

48. What is the term for the time required for half of a radioactive sample to decay?

A. decay rate

B. half-life

C. activation time

D. reaction time

49. What is the name for a particle of nuclear radiation that is a helium nucleus with a +2 charge?

A. beta particle

B. gamma ray

C. positron

D. alpha particle

50. What is the term for a particle of nuclear radiation that is a high-speed electron?

A. beta particle

B. alpha particle

C. neutron

D. proton

51. What is the name for the process in which one element is changed into another through a nuclear reaction?

A. ionization

B. sublimation

C. transmutation

D. neutralization

52. What is the term for the splitting of a heavy nucleus into smaller nuclei, releasing energy?

A. fusion

B. decay

C. transmutation

D. fission

53. What is the name for the combining of light nuclei into a heavier nucleus, releasing energy?

A. fission

B. decay

C. fusion

D. ionization

54. What is the term for an organic compound containing only carbon and hydrogen?

A. hydrocarbon

B. carbohydrate

C. alcohol

D. ester

55. What is the name for a saturated hydrocarbon containing only single carbon-carbon bonds?

A. alkene

B. alkyne

C. aromatic

D. alkane

56. What is the term for compounds that have the same molecular formula but different structures?

A. isotopes

B. allotropes

C. polymers

D. isomers

57. What is the name for the energy that an object has due to its motion?

A. potential energy

B. activation energy

C. kinetic energy

D. bond energy

58. What is the term for the measure of the average kinetic energy of the particles in a sample?

A. heat

B. pressure

C. density

D. temperature

59. What is the name for the energy transferred between objects due to a temperature difference?

A. heat

B. temperature

C. work

D. mass

60. What is the term for the amount of mass per unit volume of a substance?

A. density

B. pressure

C. molarity

D. concentration

61. What is the name for the force exerted per unit area, such as by a gas on its container walls?

A. density

B. temperature

C. pressure

D. volume

62. What is the term for a pure substance made of only one type of atom?

A. compound

B. element

C. mixture

D. solution

63. What is the name for a pure substance made of two or more elements chemically combined?

A. element

B. mixture

C. alloy

D. compound

64. What is the term for a combination of two or more substances that are physically combined?

A. mixture

B. compound

C. element

D. molecule

65. What is the name for a mixture with a uniform composition throughout?

A. homogeneous mixture

B. heterogeneous mixture

C. compound

D. suspension

66. What is the term for a mixture with visibly different parts that are not uniform?

A. homogeneous mixture

B. solution

C. compound

D. heterogeneous mixture

67. What is the name for a change in which no new substance is formed?

A. physical change

B. chemical change

C. nuclear change

D. combustion

68. What is the term for a change that produces one or more new substances?

A. physical change

B. phase change

C. chemical change

D. state change

69. What is the name for a mixture of a metal with one or more other elements?

A. compound

B. salt

C. alloy

D. isotope

70. What is the term for the principle that the properties of elements are a periodic function of their atomic numbers?

A. law of conservation of mass

B. octet rule

C. Avogadro's law

D. periodic law

71. What is the name for a vertical column of elements in the periodic table?

A. period

B. series

C. group

D. block

72. What is the term for a horizontal row of elements in the periodic table?

A. group

B. period

C. family

D. series

73. What is the name for the unreactive elements in Group 18 with full outer electron shells?

A. halogens

B. noble gases

C. alkali metals

D. transition metals

74. What is the term for the reactive nonmetals in Group 17?

A. noble gases

B. alkali metals

C. halogens

D. metalloids

75. What is the name for the highly reactive metals in Group 1?

A. alkaline earth metals

B. halogens

C. alkali metals

D. noble gases

76. What is the term for an element with properties between those of metals and nonmetals?

A. metalloid

B. noble gas

C. halogen

D. transition metal

77. What is the name for the law stating that mass is neither created nor destroyed in a chemical reaction?

A. law of conservation of mass

B. periodic law

C. octet rule

D. Boyle's law

78. What is the term for the tendency of atoms to gain, lose, or share electrons to achieve eight valence electrons?

A. periodic law

B. octet rule

C. conservation law

D. Avogadro's rule

79. What is the name for the number placed in front of a formula in an equation to balance it?

A. coefficient

B. subscript

C. exponent

D. superscript

80. What is the term for the small number written below an element's symbol to show how many atoms are present?

A. coefficient

B. exponent

C. subscript

D. superscript

81. What is the name for the set of standard conditions defined as 0 °C and 1 atmosphere of pressure?

A. room temperature

B. STP

C. NTP

D. boiling point

82. What is the term for the model describing gas particles as being in constant, random motion with negligible attraction?

A. collision theory

B. atomic theory

C. periodic theory

D. kinetic molecular theory

83. What is the name for the idea that reactions occur when particles collide with sufficient energy and proper orientation?

A. collision theory

B. kinetic theory

C. quantum theory

D. bonding theory

84. What is the term for the instrument used to measure the heat released or absorbed in a reaction?

A. barometer

B. calorimeter

C. thermometer

D. manometer

85. What is the name for the dense, positively charged center of an atom containing protons and neutrons?

A. electron cloud

B. nucleus

C. valence shell

D. orbital

Practice Exam 14 – Explained Answer Key

1. C — The atomic number is the number of protons in an atom's nucleus. It uniquely identifies the element. In a neutral atom, it also equals the number of electrons.
2. D — The mass number is the total of protons and neutrons in the nucleus. It gives the approximate mass of the atom. Different mass numbers for the same element indicate different isotopes.
3. A — Isotopes are atoms of the same element with different numbers of neutrons. They share the atomic number but differ in mass number. This gives them different masses while keeping the same chemical identity.

4. B — An ion is an atom that has gained or lost electrons and carries a charge. Losing electrons gives a positive charge, and gaining them gives a negative charge. The imbalance of protons and electrons produces the charge.
5. D — Valence electrons are those in the outermost energy level of an atom. They determine how an atom bonds and reacts. The group number often indicates how many there are.
6. B — A cation is a positively charged ion. It forms when an atom loses one or more electrons. Metals commonly form cations.
7. C — An anion is a negatively charged ion. It forms when an atom gains one or more electrons. Nonmetals commonly form anions.
8. D — Electronegativity measures an atom's attraction for shared electrons in a bond. It increases across a period and up a group. Fluorine has the highest value.
9. C — Ionization energy is the energy required to remove an electron from an atom. It increases across a period and decreases down a group. Higher values mean electrons are held more tightly.
10. A — Atomic radius is one-half the distance between the nuclei of two bonded atoms of the same element. It reflects the size of the atom. It increases down a group and decreases across a period.
11. B — An ionic bond forms by the transfer of electrons between a metal and a nonmetal. This creates oppositely charged ions held together by attraction. Ionic compounds have high melting points.
12. A — A covalent bond forms by the sharing of electrons between two nonmetals. The shared pairs hold the atoms together. No ions are formed in this bonding.
13. C — A metallic bond is the bonding in which metal atoms share a "sea" of mobile electrons. These free electrons explain conductivity and malleability. The bonding holds metal atoms together.
14. D — A polar covalent bond is one in which electrons are shared unequally. The more electronegative atom pulls the shared electrons closer, creating partial charges. The unequal sharing makes the bond polar.
15. A — A mole is the amount of a substance containing 6.02×10^{23} particles. It links the microscopic particle count to a measurable amount. This is the central unit of the mole concept.
16. A — Avogadro's number is 6.02×10^{23}, the number of particles in one mole. It defines the size of a mole. This constant connects moles to particle counts.
17. C — Molarity is the concentration unit equal to moles of solute per liter of solution. It expresses how concentrated a solution is. Dividing moles by liters gives molarity.
18. D — Gram-formula mass is the sum of the atomic masses of all atoms in a chemical formula. Each element's mass is multiplied by its subscript and totaled. This value converts between mass and moles.
19. B — The empirical formula is the simplest whole-number ratio of atoms in a compound. It may differ from the molecular formula. It is found by reducing the subscripts to lowest terms.
20. B — The molecular formula shows the actual number of atoms of each element in a molecule. It may be a multiple of the empirical formula. It gives the true composition of the molecule.
21. C — A synthesis reaction is one in which two or more substances combine to form a single product. Simpler substances join into a more complex one. The single product is its signature.
22. B — A decomposition reaction is one in which a single compound breaks down into simpler substances. One reactant yields multiple products. It is the reverse of synthesis.
23. B — A combustion reaction is one in which a hydrocarbon reacts with oxygen to produce carbon dioxide and water. It releases energy as heat and light. Burning fuels are common examples.
24. D — Neutralization is the reaction between an acid and a base that produces a salt and water. The hydrogen and hydroxide ions combine to form water. This moves the solution toward neutral.

25. D — A catalyst is a substance that speeds up a reaction by lowering its activation energy without being consumed. It provides an easier reaction pathway. The catalyst is recovered unchanged.
26. A — Activation energy is the minimum energy required to start a chemical reaction. It is the barrier that colliding particles must overcome. Catalysts lower this barrier.
27. D — An exothermic reaction is one that releases heat to its surroundings. The products hold less energy than the reactants. The released energy warms the surroundings.
28. D — An endothermic reaction is one that absorbs heat from its surroundings. The products hold more energy than the reactants. The absorbed energy cools the surroundings.
29. C — Equilibrium is the state in which the forward and reverse reaction rates are equal. Concentrations remain constant even though both reactions continue. It is reached in a closed system.
30. C — Oxidation is the loss of electrons by a substance. Losing electrons raises the oxidation number. It always occurs alongside reduction.
31. A — Reduction is the gain of electrons by a substance. Gaining electrons lowers the oxidation number. It always accompanies oxidation.
32. A — The oxidation number is the charge an atom would have if its bonding electrons were assigned to the more electronegative atom. It helps track electron transfer in reactions. This value is used to balance redox equations.
33. D — An electrolyte is a substance that conducts electricity when dissolved in water. It produces mobile ions in solution. Salts and strong acids are common electrolytes.
34. C — An acid is a substance that produces hydrogen ions (H^+) in solution. This gives it a pH below 7. Acids react with many metals and bases.
35. B — A base is a substance that produces hydroxide ions (OH^-) in solution. This gives it a pH above 7. Bases feel slippery and neutralize acids.
36. B — pH is the scale that measures the acidity or basicity of a solution. Values below 7 are acidic, and above 7 are basic. It reflects the hydrogen-ion concentration.
37. C — A salt is the ionic compound produced, along with water, in a neutralization reaction. It forms from the cation of the base and the anion of the acid. Table salt is a familiar example.
38. C — Sublimation is the change of a substance directly from solid to gas. It bypasses the liquid state. Dry ice subliming is a common example.
39. D — Deposition is the change of a substance directly from gas to solid. It is the reverse of sublimation. Frost forming from water vapor is an example.
40. B — Condensation is the change of a substance from gas to liquid. Energy is released as the gas cools. Dew forming on grass is an example.
41. B — Vaporization is the change of a substance from liquid to gas. It requires energy to overcome the attractions between particles. Boiling and evaporation are forms of vaporization.
42. A — Melting is the change of a substance from solid to liquid. Added energy frees the particles to move. It occurs at the melting point.
43. B — Freezing is the change of a substance from liquid to solid. Removing energy locks the particles into a fixed arrangement. It occurs at the freezing point.
44. B — The solute is the substance that is dissolved in a solution. It is usually present in the smaller amount. In saltwater, the salt is the solute.
45. C — The solvent is the substance that does the dissolving in a solution. It is usually present in the larger amount. In saltwater, the water is the solvent.
46. A — A saturated solution holds the maximum amount of dissolved solute at a given temperature. No more solute will dissolve. It represents the solubility limit.

47. D — A precipitate is an insoluble solid that forms when two solutions are mixed. It separates out because it cannot stay dissolved. Its formation indicates a reaction.
48. B — Half-life is the time required for half of a radioactive sample to decay. It is constant for a given isotope. Each half-life reduces the sample by half.
49. D — An alpha particle is a particle of nuclear radiation that is a helium nucleus with a +2 charge. It has two protons and two neutrons. Its emission lowers the atomic number by two.
50. A — A beta particle is a particle of nuclear radiation that is a high-speed electron. It carries a −1 charge. Its emission raises the atomic number by one.
51. C — Transmutation is the process in which one element is changed into another through a nuclear reaction. Changing the number of protons changes the element. It does not occur in ordinary chemical reactions.
52. D — Fission is the splitting of a heavy nucleus into smaller nuclei, releasing energy. It powers nuclear reactors. The process releases enormous amounts of energy.
53. C — Fusion is the combining of light nuclei into a heavier nucleus, releasing energy. It powers the Sun and stars. It releases even more energy than fission.
54. A — A hydrocarbon is an organic compound containing only carbon and hydrogen. Methane and propane are examples. The presence of other elements would make it a different class.
55. D — An alkane is a saturated hydrocarbon containing only single carbon-carbon bonds. It holds the maximum number of hydrogen atoms. The "-ane" ending identifies it.
56. D — Isomers are compounds that have the same molecular formula but different structures. The different arrangements give them different properties. This is why one formula can represent more than one substance.
57. C — Kinetic energy is the energy an object has due to its motion. Faster-moving particles have more kinetic energy. Temperature measures the average kinetic energy of particles.
58. D — Temperature is the measure of the average kinetic energy of the particles in a sample. It reflects how fast the particles move. It governs reaction rates and phase changes.
59. A — Heat is the energy transferred between objects due to a temperature difference. It flows from hotter to colder objects. Heat is a form of energy transfer.
60. A — Density is the amount of mass per unit volume of a substance. It is found by dividing mass by volume. This intensive property helps identify substances.
61. C — Pressure is the force exerted per unit area, such as by a gas on its container walls. Gas particles striking the walls create pressure. It increases with temperature and decreasing volume.
62. B — An element is a pure substance made of only one type of atom. It cannot be broken into simpler substances chemically. Each element has a unique atomic number.
63. D — A compound is a pure substance made of two or more elements chemically combined. It has a fixed ratio of elements. Its properties differ from those of its elements.
64. A — A mixture is a combination of two or more substances that are physically combined. The components keep their own properties. Mixtures can be separated by physical means.
65. A — A homogeneous mixture has a uniform composition throughout. Its components are evenly distributed. Saltwater is an example.
66. D — A heterogeneous mixture has visibly different parts that are not uniform. Its composition varies from place to place. Sand in water is an example.
67. A — A physical change is one in which no new substance is formed. Only the form or state changes. Melting and dissolving are examples.
68. C — A chemical change is one that produces one or more new substances. The original substances are transformed. Burning and rusting are examples.

69. C — An alloy is a mixture of a metal with one or more other elements. Combining metals can improve their properties. Steel and brass are examples.
70. D — The periodic law states that the properties of elements are a periodic function of their atomic numbers. Arranging elements by atomic number causes properties to repeat. This is the basis of the periodic table.
71. C — A group is a vertical column of elements in the periodic table. Elements in a group share similar chemical properties. They have the same number of valence electrons.
72. B — A period is a horizontal row of elements in the periodic table. The period number equals the number of occupied energy levels. Properties change gradually across a period.
73. B — Noble gases are the unreactive elements in Group 18 with full outer electron shells. Their complete octets make them stable. This explains their general inertness.
74. C — Halogens are the reactive nonmetals in Group 17. They have seven valence electrons and form −1 ions. They readily gain an electron to complete their octet.
75. C — Alkali metals are the highly reactive metals in Group 1. They have one valence electron and form +1 ions. Their single outer electron is easily lost.
76. A — A metalloid is an element with properties between those of metals and nonmetals. Silicon is a common example. Metalloids border the metal-nonmetal staircase.
77. A — The law of conservation of mass states that mass is neither created nor destroyed in a chemical reaction. The mass of products equals the mass of reactants. This is why equations must be balanced.
78. B — The octet rule is the tendency of atoms to gain, lose, or share electrons to achieve eight valence electrons. This stable configuration drives bonding. A full outer shell lowers an atom's energy.
79. A — A coefficient is the number placed in front of a formula in an equation to balance it. It counts whole molecules or formula units. Coefficients are adjusted to conserve mass.
80. C — A subscript is the small number written below an element's symbol to show how many atoms are present. It applies only to the element it follows. Changing a subscript changes the substance.
81. B — STP is the set of standard conditions defined as 0 °C and 1 atmosphere of pressure. Gas volumes are often compared at STP. One mole of any gas occupies 22.4 L at STP.
82. D — The kinetic molecular theory is the model describing gas particles as being in constant, random motion with negligible attraction. It explains gas behavior. Collisions between particles are treated as elastic.
83. A — Collision theory is the idea that reactions occur when particles collide with sufficient energy and proper orientation. Not every collision leads to a reaction. This explains how rate is affected by various factors.
84. B — A calorimeter is the instrument used to measure the heat released or absorbed in a reaction. It captures the energy change. This makes it the key tool in calorimetry.
85. B — The nucleus is the dense, positively charged center of an atom containing protons and neutrons. It holds nearly all of the atom's mass. The electrons occupy the space around it.