

PRACTICE EXAM 18: PHYSICAL SETTING/CHEMISTRY SIMULATION (85 QUESTIONS)

For each question, evaluate the two statements and select:

A. Only Statement I is correct · B. Only Statement II is correct · C. Both statements are correct · D. Neither statement is correct

1. Statement I: An atom's atomic number equals its number of protons. Statement II: An atom's atomic number equals its number of neutrons.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

2. Statement I: Electrons are located in the nucleus of an atom. Statement II: Protons are located in the nucleus of an atom.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

3. Statement I: Isotopes of an element have different numbers of protons. Statement II: Isotopes of an element have different numbers of neutrons.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

4. Statement I: A cation is a positively charged ion. Statement II: A cation forms when an atom gains electrons.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

5. Statement I: Metals tend to gain electrons to form negative ions. Statement II: Nonmetals tend to lose electrons to form positive ions.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

6. Statement I: An ionic bond forms between a metal and a nonmetal. Statement II: A covalent bond forms between two nonmetals.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

7. Statement I: Ionic compounds conduct electricity well in the solid state. Statement II: Covalent compounds always conduct electricity.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

8. Statement I: One mole of any substance contains 6.02×10^{23} particles. Statement II: One mole of any gas occupies 11.2 liters at STP.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

9. Statement I: Coefficients in an equation represent the number of atoms. Statement II: Subscripts may be changed to balance an equation.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

10. Statement I: An exothermic reaction absorbs heat from its surroundings. Statement II: An endothermic reaction absorbs heat from its surroundings.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

11. Statement I: A catalyst speeds up a reaction by lowering the activation energy. Statement II: A catalyst is permanently used up during the reaction.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

12. Statement I: Acids produce hydroxide ions in solution. Statement II: Bases produce hydrogen ions in solution.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

13. Statement I: A solution with a pH of 10 is acidic. Statement II: A solution with a pH of 3 is acidic.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

14. Statement I: Oxidation is the gain of electrons. Statement II: Reduction is the loss of electrons.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

15. Statement I: A solid has a definite shape and a definite volume. Statement II: A gas has neither a definite shape nor a definite volume.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

16. Statement I: Sublimation is the change of a solid directly into a gas. Statement II: Condensation is the change of a liquid into a solid.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

17. Statement I: Temperature is a measure of the average kinetic energy of particles. Statement II: Heat and temperature are the same physical quantity.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

18. Statement I: Molarity is measured in grams per liter. Statement II: Molarity is moles of solute per liter of solution.

- A. Only Statement I is correct

- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

19. Statement I: For most solids, solubility increases as temperature increases. Statement II: For most gases, solubility increases as temperature increases.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

20. Statement I: A saturated solution can always dissolve more solute. Statement II: Adding solvent to a solution increases its concentration.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

21. Statement I: Atomic radius increases from left to right across a period. Statement II: Ionization energy decreases from left to right across a period.

- A. Only Statement I is correct
- B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

22. Statement I: Atomic radius increases down a group. Statement II: Electronegativity increases up a group.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

23. Statement I: Noble gases have a full outer electron shell. Statement II: Noble gases are highly reactive elements.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

24. Statement I: A synthesis reaction combines substances into a single product. Statement II: A decomposition reaction breaks a compound into simpler substances.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

25. Statement I: Combustion of a hydrocarbon produces carbon dioxide and water. Statement II: Neutralization of an acid and a base produces a salt and water.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

26. Statement I: A double-replacement reaction involves only a single element. Statement II: A single-replacement reaction involves one element replacing another in a compound.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

27. Statement I: A beta particle is a helium nucleus. Statement II: An alpha particle is a high-speed electron.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

28. Statement I: Half-life is the time for half of a radioactive sample to decay. Statement II: The half-life of an isotope is constant regardless of temperature.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

29. Statement I: Nuclear fission is the joining of light nuclei. Statement II: Nuclear fusion is the joining of light nuclei.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

30. Statement I: A hydrocarbon contains carbon, hydrogen, and oxygen. Statement II: An alkane contains only single carbon-carbon bonds.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

31. Statement I: An alkene contains a carbon-carbon double bond. Statement II: An alkyne contains a carbon-carbon triple bond.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

32. Statement I: Isomers have the same molecular formula but different structures. Statement II: The empirical formula shows the simplest whole-number ratio of atoms.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

33. Statement I: The gram-formula mass is found by subtracting the atomic masses. Statement II: The gram-formula mass is the sum of the atomic masses in a formula.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

34. Statement I: At constant temperature, increasing pressure increases a gas's volume. Statement II: At constant pressure, increasing temperature decreases a gas's volume.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

35. Statement I: Increasing temperature decreases the average kinetic energy of gas particles. Statement II: Increasing temperature increases the reaction rate.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

36. Statement I: Increasing the surface area of a solid decreases the reaction rate. Statement II: Increasing the concentration of a reactant increases the reaction rate.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

37. Statement I: At equilibrium, the forward and reverse reaction rates are equal. Statement II: Equilibrium can be reached only in a closed system.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

38. Statement I: Adding salt to water raises its freezing point. Statement II: Adding a nonvolatile solute to water lowers its boiling point.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

39. Statement I: An element is a substance made of two or more types of atoms. Statement II: A compound is a mixture of physically combined substances.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

40. Statement I: A homogeneous mixture has a uniform composition throughout. Statement II: A heterogeneous mixture has visibly different parts.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

41. Statement I: A physical change always produces a new substance. Statement II: A chemical change produces one or more new substances.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

42. Statement I: Distillation separates substances based on their colors. Statement II: Filtration separates a dissolved solid from a liquid.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

43. Statement I: Diamond is held together by ionic bonds. Statement II: Metals conduct electricity because of their mobile electrons.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

44. Statement I: Water is a polar molecule. Statement II: Oil and water mix easily because both are polar.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

45. Statement I: The law of conservation of mass states that mass is not created or destroyed. Statement II: A balanced equation has equal numbers of each atom on both sides.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

46. Statement I: The octet rule states that atoms seek to have two valence electrons. Statement II: Group 1 elements have seven valence electrons.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

47. Statement I: A group is a horizontal row of the periodic table. Statement II: A period is a vertical column of the periodic table.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

48. Statement I: The alkali metals are found in Group 1. Statement II: The halogens are found in Group 18.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

49. Statement I: A metalloid has properties between metals and nonmetals. Statement II: Silicon is classified as a noble gas.

- A. Only Statement I is correct

- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

50. Statement I: Adding a catalyst shifts the position of an equilibrium toward the products. Statement II: A catalyst speeds up both the forward and reverse reactions equally.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

51. Statement I: A strong acid ionizes only slightly in water. Statement II: A weak acid ionizes completely in water.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

52. Statement I: An electrolyte conducts electricity when dissolved in water. Statement II: Sugar is a strong electrolyte.

- A. Only Statement I is correct
- B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

53. Statement I: In NaCl, the bond is covalent. Statement II: In Cl₂, the bond is covalent.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

54. Statement I: Increasing the pressure on a liquid raises its boiling point. Statement II: Water boils at a lower temperature at high altitude.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

55. Statement I: A precipitate is an insoluble solid that forms in a solution. Statement II: The formation of a precipitate is evidence of a chemical change.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

56. Statement I: The number of neutrons in an atom equals its atomic number. Statement II: The mass number of an atom equals its number of electrons.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

57. Statement I: A polar covalent bond involves equal sharing of electrons. Statement II: A nonpolar covalent bond involves equal sharing of electrons.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

58. Statement I: Ice is less dense than liquid water. Statement II: Water contracts when it freezes.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

59. Statement I: Carbon dioxide is a greenhouse gas that traps heat. Statement II: Acid rain lowers the pH of lakes.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

60. Statement I: Helium is more dense than air. Statement II: Helium is highly flammable.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

61. Statement I: Evaporation is the change of a gas into a liquid. Statement II: Deposition is the change of a liquid into a solid.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

62. Statement I: The freezing of water is an endothermic process. Statement II: The melting of ice requires energy to be added.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

63. Statement I: A neutral atom has equal numbers of protons and electrons. Statement II: An anion has more protons than electrons.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

64. Statement I: Valence electrons are found in the outermost energy level. Statement II: Valence electrons are located in the nucleus.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

65. Statement I: Metals are generally good conductors of heat and electricity. Statement II: Nonmetals are generally poor conductors of electricity.

- A. Only Statement I is correct

- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

66. Statement I: A chemical formula's subscript shows the number of whole molecules. Statement II: A chemical equation's coefficient shows the number of whole molecules.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

67. Statement I: Group 2 elements form ions with a +2 charge. Statement II: Group 17 elements form ions with a -1 charge.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

68. Statement I: A balanced equation obeys the law of conservation of mass. Statement II: In a chemical reaction, atoms are rearranged but not destroyed.

- A. Only Statement I is correct
- B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

69. Statement I: The kinetic molecular theory describes gas particles as being in constant motion. Statement II: The kinetic molecular theory assumes gas particles strongly attract one another.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

70. Statement I: Collision theory states that particles must collide with enough energy to react. Statement II: All collisions between particles result in a chemical reaction.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

71. Statement I: The most acidic solution has the highest pH. Statement II: A solution with a pH below 7 contains more hydrogen ions than hydroxide ions.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

72. Statement I: A triple bond is stronger than a single bond. Statement II: A single bond is the strongest type of covalent bond.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

73. Statement I: The boiling point of a liquid is the temperature at which it changes to a gas. Statement II: During boiling, the temperature of a pure liquid stays constant.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

74. Statement I: An exothermic reaction has products with more energy than the reactants. Statement II: An endothermic reaction releases energy to its surroundings.

A. Only Statement I is correct

B. Only Statement II is correct

C. Both statements are correct

D. Neither statement is correct

75. Statement I: Increasing the concentration of a reactant slows the reaction. Statement II: A catalyst lowers the activation energy of a reaction.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

76. Statement I: The atomic number increases from right to left across a period. Statement II: Atomic mass is always equal to the number of protons.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

77. Statement I: The reactivity of alkali metals increases down Group 1. Statement II: The reactivity of halogens increases down Group 17.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

78. Statement I: A heterogeneous mixture is the same as a pure substance. Statement II: The components of a mixture can be separated by physical means.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

79. Statement I: A solute is the substance that is dissolved in a solution. Statement II: A solvent is the substance that is dissolved in a solution.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

80. Statement I: Sodium chloride conducts electricity when melted or dissolved. Statement II: Solid sodium chloride does not conduct electricity.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

81. Statement I: Burning a candle is a chemical change. Statement II: Cutting a candle in half is a physical change.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

82. Statement I: A compound has the same properties as the elements that form it. Statement II: A compound can be broken down into elements by chemical means.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

83. Statement I: An alpha particle has a charge of -1 . Statement II: A beta particle has a charge of $+2$.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

84. Statement I: The percent composition of a compound is the same for any sample size. Statement II: The percentages of all elements in a compound add up to 100%.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

85. Statement I: At STP, one mole of any gas occupies 22.4 liters. Statement II: At STP, one mole of any gas occupies 1.0 liter.

- A. Only Statement I is correct
- B. Only Statement II is correct
- C. Both statements are correct
- D. Neither statement is correct

Practice Exam 18 – Explained Answer Key

1. A — Only Statement I is correct: the atomic number equals the number of protons. Statement II is false because the atomic number does not give the neutron count. The proton count alone defines the element.
2. B — Only Statement II is correct: protons are in the nucleus. Statement I is false because electrons occupy the region outside the nucleus. Only protons and neutrons reside in the nucleus.
3. B — Only Statement II is correct: isotopes differ in their number of neutrons. Statement I is false because isotopes share the same proton count. The differing neutrons give them different masses.
4. A — Only Statement I is correct: a cation is a positively charged ion. Statement II is false because a cation forms by losing, not gaining, electrons. Losing electrons leaves a net positive charge.
5. D — Neither statement is correct: metals lose electrons to form positive ions, and nonmetals gain electrons to form negative ions. Both statements reverse the actual behavior. Their roles are swapped.
6. C — Both statements are correct: ionic bonds form between metals and nonmetals, and covalent bonds form between two nonmetals. Ionic bonding transfers electrons, while covalent bonding shares them. Each statement correctly describes its bond.
7. D — Neither statement is correct: ionic solids do not conduct electricity, and covalent compounds do not always conduct. Ionic compounds conduct only when molten or dissolved, and most covalent compounds never conduct. Both claims are false.

8. A — Only Statement I is correct: one mole contains 6.02×10^{23} particles. Statement II is false because one mole of gas occupies 22.4 liters at STP, not 11.2. The molar volume is 22.4 L.
9. D — Neither statement is correct: coefficients represent whole molecules or formula units, not atoms, and subscripts must never be changed to balance an equation. Both statements misstate the rules. Only coefficients are adjusted.
10. B — Only Statement II is correct: an endothermic reaction absorbs heat. Statement I is false because exothermic reactions release heat. The two energy behaviors are opposite.
11. A — Only Statement I is correct: a catalyst speeds a reaction by lowering the activation energy. Statement II is false because a catalyst is not consumed. It is recovered unchanged.
12. D — Neither statement is correct: acids produce hydrogen ions, and bases produce hydroxide ions. Both statements reverse the definitions. Their ion products are swapped.
13. B — Only Statement II is correct: a pH of 3 is acidic. Statement I is false because a pH of 10 is basic. Values below 7 are acidic, and above 7 are basic.
14. D — Neither statement is correct: oxidation is the loss of electrons, and reduction is the gain. Both statements reverse the definitions. Losing electrons is oxidation.
15. C — Both statements are correct: a solid has a definite shape and volume, and a gas has neither. The states differ in how their particles are arranged. Each statement correctly describes its state.
16. A — Only Statement I is correct: sublimation is solid directly to gas. Statement II is false because condensation is gas to liquid, not liquid to solid. Liquid to solid is freezing.
17. A — Only Statement I is correct: temperature measures average kinetic energy. Statement II is false because heat and temperature are different quantities. Heat is energy transferred due to a temperature difference.
18. B — Only Statement II is correct: molarity is moles of solute per liter of solution. Statement I is false because molarity is not measured in grams per liter. It is a mole-based concentration.
19. A — Only Statement I is correct: most solids become more soluble as temperature rises. Statement II is false because gas solubility decreases with rising temperature. Gases escape solution when heated.
20. D — Neither statement is correct: a saturated solution cannot dissolve more solute, and adding solvent decreases concentration. Both statements are false. Dilution lowers concentration.
21. D — Neither statement is correct: atomic radius decreases across a period, and ionization energy increases across a period. Both statements reverse the trends. The atoms shrink and hold electrons more tightly toward the right.
22. C — Both statements are correct: atomic radius increases down a group, and electronegativity increases up a group. Added shells enlarge atoms down a group, while smaller higher atoms attract electrons more. Each trend is correctly stated.
23. A — Only Statement I is correct: noble gases have a full outer shell. Statement II is false because noble gases are unreactive, not highly reactive. Their full shell makes them stable.
24. C — Both statements are correct: synthesis combines substances into one product, and decomposition breaks a compound into simpler substances. They are opposite processes. Each statement correctly defines its reaction.
25. C — Both statements are correct: hydrocarbon combustion gives carbon dioxide and water, and neutralization gives a salt and water. Both describe standard reaction products. Each statement is accurate.
26. B — Only Statement II is correct: single replacement involves one element replacing another in a compound. Statement I is false because double replacement involves two compounds, not a single element. The descriptions belong to different reaction types.

27. D — Neither statement is correct: a beta particle is a high-speed electron, and an alpha particle is a helium nucleus. Both statements swap the two particles. Their identities are reversed.
28. C — Both statements are correct: half-life is the time for half a sample to decay, and it is constant regardless of temperature. Half-life is an unchanging property of each isotope. Both statements are accurate.
29. B — Only Statement II is correct: fusion is the joining of light nuclei. Statement I is false because fission is the splitting of a heavy nucleus. The two processes are opposite.
30. B — Only Statement II is correct: an alkane has only single carbon-carbon bonds. Statement I is false because hydrocarbons contain only carbon and hydrogen, not oxygen. Oxygen would make it a different class.
31. C — Both statements are correct: an alkene has a double bond, and an alkyne has a triple bond. The bond type defines each class. Both statements are accurate.
32. C — Both statements are correct: isomers share a molecular formula but differ in structure, and the empirical formula gives the simplest ratio. Both describe standard concepts. Each statement is accurate.
33. B — Only Statement II is correct: the gram-formula mass is the sum of the atomic masses. Statement I is false because it is found by adding, not subtracting, the masses. The masses are totaled.
34. D — Neither statement is correct: increasing pressure decreases volume, and increasing temperature increases volume. Both statements reverse the gas laws. Pressure and volume are inverse, while temperature and volume are direct.
35. B — Only Statement II is correct: increasing temperature increases the reaction rate. Statement I is false because higher temperature increases, not decreases, kinetic energy. Hotter particles move faster.
36. B — Only Statement II is correct: increasing concentration increases the reaction rate. Statement I is false because increasing surface area increases, not decreases, the rate. More surface allows more collisions.
37. C — Both statements are correct: at equilibrium the forward and reverse rates are equal, and equilibrium requires a closed system. The closed system allows the reverse reaction to occur. Both statements are accurate.
38. D — Neither statement is correct: adding salt lowers the freezing point, and adding a solute raises the boiling point. Both statements reverse the colligative effects. The effects are opposite to what is stated.
39. D — Neither statement is correct: an element has only one type of atom, and a compound is chemically, not physically, combined. Both statements misstate the definitions. Mixtures, not compounds, are physically combined.
40. C — Both statements are correct: a homogeneous mixture is uniform, and a heterogeneous mixture has visibly separate parts. The two differ in their uniformity. Each statement is accurate.
41. B — Only Statement II is correct: a chemical change produces new substances. Statement I is false because a physical change does not produce a new substance. Only the form or state changes in a physical change.
42. D — Neither statement is correct: distillation separates by boiling point, not color, and filtration removes insoluble solids, not dissolved ones. Both statements are false. A dissolved solid is recovered by evaporation.

43. B — Only Statement II is correct: metals conduct because of their mobile electrons. Statement I is false because diamond is held together by covalent, not ionic, bonds. Diamond is a covalent network.
44. A — Only Statement I is correct: water is a polar molecule. Statement II is false because oil and water do not mix, since oil is nonpolar. Like dissolves like, so unlike substances do not mix.
45. C — Both statements are correct: conservation of mass means mass is not created or destroyed, and a balanced equation has equal atoms on both sides. The balancing reflects the conservation law. Both statements are accurate.
46. D — Neither statement is correct: the octet rule involves eight valence electrons, not two, and Group 1 elements have one valence electron, not seven. Both statements are false. The numbers are incorrect.
47. D — Neither statement is correct: a group is a vertical column, and a period is a horizontal row. Both statements swap the definitions. Their meanings are reversed.
48. A — Only Statement I is correct: the alkali metals are in Group 1. Statement II is false because the halogens are in Group 17, not Group 18. Group 18 holds the noble gases.
49. A — Only Statement I is correct: a metalloid has properties between metals and nonmetals. Statement II is false because silicon is a metalloid, not a noble gas. Silicon sits along the metal-nonmetal staircase.
50. B — Only Statement II is correct: a catalyst speeds the forward and reverse reactions equally. Statement I is false because a catalyst does not shift the equilibrium position. It only helps equilibrium be reached faster.
51. D — Neither statement is correct: a strong acid ionizes completely, and a weak acid ionizes only slightly. Both statements reverse the definitions. Their ionization extents are swapped.
52. A — Only Statement I is correct: an electrolyte conducts electricity when dissolved. Statement II is false because sugar is a nonelectrolyte. Sugar dissolves without forming ions.
53. B — Only Statement II is correct: in Cl_2 , the bond is covalent. Statement I is false because in NaCl , the bond is ionic. Sodium and chlorine transfer an electron.
54. C — Both statements are correct: increasing pressure raises the boiling point, and water boils at a lower temperature at high altitude. Lower altitude pressure lowers the boiling point. Both statements are accurate.
55. C — Both statements are correct: a precipitate is an insoluble solid that forms in solution, and its formation indicates a chemical change. The new solid is a new substance. Both statements are accurate.
56. D — Neither statement is correct: the neutron count is not the atomic number, and the mass number is not the electron count. Both statements misstate the relationships. The mass number is protons plus neutrons.
57. B — Only Statement II is correct: a nonpolar covalent bond shares electrons equally. Statement I is false because a polar covalent bond shares them unequally. The unequal sharing makes it polar.
58. A — Only Statement I is correct: ice is less dense than liquid water. Statement II is false because water expands, not contracts, when it freezes. This expansion is why ice floats.
59. C — Both statements are correct: carbon dioxide traps heat as a greenhouse gas, and acid rain lowers the pH of lakes. Both describe real environmental effects. Each statement is accurate.
60. D — Neither statement is correct: helium is less dense than air, and helium is nonflammable. Both statements are false. Helium's low density and inertness make it safe for balloons.
61. D — Neither statement is correct: evaporation is liquid to gas, and deposition is gas to solid. Both statements misstate the phase changes. Liquid to solid is freezing.

62. B — Only Statement II is correct: melting ice requires added energy. Statement I is false because freezing releases energy and is exothermic, not endothermic. Freezing gives off heat.
63. A — Only Statement I is correct: a neutral atom has equal protons and electrons. Statement II is false because an anion has more electrons than protons. The extra electrons give the anion its negative charge.
64. A — Only Statement I is correct: valence electrons are in the outermost energy level. Statement II is false because they are not in the nucleus. The nucleus holds only protons and neutrons.
65. C — Both statements are correct: metals are good conductors, and nonmetals are poor conductors. This difference reflects metallic bonding. Both statements are accurate.
66. B — Only Statement II is correct: a coefficient shows the number of whole molecules. Statement I is false because a subscript shows the number of atoms of an element, not whole molecules. Subscripts count atoms.
67. C — Both statements are correct: Group 2 elements form +2 ions, and Group 17 elements form -1 ions. The group number predicts the ion charge. Both statements are accurate.
68. C — Both statements are correct: a balanced equation obeys conservation of mass, and atoms are rearranged but not destroyed in a reaction. The two ideas are linked. Each statement is accurate.
69. A — Only Statement I is correct: the kinetic molecular theory describes gas particles in constant motion. Statement II is false because the theory assumes negligible attraction between particles. Particles are treated as moving independently.
70. A — Only Statement I is correct: collision theory requires collisions with enough energy. Statement II is false because not all collisions lead to a reaction. Proper orientation and sufficient energy are both needed.
71. B — Only Statement II is correct: a pH below 7 means more hydrogen than hydroxide ions. Statement I is false because the most acidic solution has the lowest, not highest, pH. Lower pH means greater acidity.
72. A — Only Statement I is correct: a triple bond is stronger than a single bond. Statement II is false because a single bond is the weakest, not the strongest, covalent bond. More shared pairs make a stronger bond.
73. C — Both statements are correct: the boiling point is where a liquid changes to gas, and the temperature stays constant during boiling. The energy goes into the phase change. Both statements are accurate.
74. D — Neither statement is correct: exothermic products have less energy than reactants, and endothermic reactions absorb, not release, energy. Both statements reverse the energy behavior. The descriptions are swapped.
75. B — Only Statement II is correct: a catalyst lowers the activation energy. Statement I is false because increasing concentration speeds, not slows, the reaction. More reactant particles collide more often.
76. D — Neither statement is correct: atomic number increases left to right, not right to left, and atomic mass includes neutrons, not just protons. Both statements are false. The mass number is protons plus neutrons.
77. A — Only Statement I is correct: alkali metal reactivity increases down Group 1. Statement II is false because halogen reactivity increases up, not down, Group 17. Fluorine, at the top, is the most reactive halogen.
78. B — Only Statement II is correct: a mixture's components can be separated physically. Statement I is false because a heterogeneous mixture is not a pure substance. Mixtures have variable composition.

79. A — Only Statement I is correct: a solute is the substance that is dissolved. Statement II is false because a solvent does the dissolving, not the dissolving-into. The solvent is the dissolving medium.
80. C — Both statements are correct: sodium chloride conducts when melted or dissolved, and solid sodium chloride does not conduct. The ions must be free to move to conduct. Both statements are accurate.
81. C — Both statements are correct: burning a candle is a chemical change, and cutting one is a physical change. Burning forms new substances, while cutting only changes shape. Both statements are accurate.
82. B — Only Statement II is correct: a compound can be broken into elements by chemical means. Statement I is false because a compound does not share the properties of its elements. The chemical combination produces new properties.
83. D — Neither statement is correct: an alpha particle has a +2 charge, and a beta particle has a -1 charge. Both statements give the wrong charges. The values are incorrect.
84. C — Both statements are correct: percent composition is independent of sample size, and the element percentages add up to 100%. Composition is a fixed property of the compound. Both statements are accurate.
85. A — Only Statement I is correct: one mole of gas occupies 22.4 liters at STP. Statement II is false because the molar volume is 22.4 L, not 1.0 L. The 22.4-liter value applies to any gas at STP.