PRACTICE EXAM 21: PHYSICAL SETTING/CHEMISTRY SIMULATION (85 QUESTIONS)

For each question, decide how many of the three statements are correct, then select:

A. None are correct · B. Exactly one is correct · C. Exactly two are correct · D. All three are correct

1. Consider the three statements below. I: Protons have a positive charge. II: Neutrons have no charge. III: Electrons have a negative charge.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

2. Consider the three statements below. I: The atomic number equals the number of protons. II: Isotopes differ in their number of neutrons. III: A neutral atom has equal numbers of protons and electrons.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

3. Consider the three statements below. I: Electrons are located in the nucleus. II: The atomic number equals the number of neutrons. III: Protons carry a negative charge.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

4. Consider the three statements below. I: An ionic bond forms between a metal and a nonmetal. II: A covalent bond involves the sharing of electrons. III: A metallic bond features mobile electrons.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

5. Consider the three statements below. I: A cation is positively charged. II: An anion is negatively charged. III: Metals tend to lose electrons.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

6. Consider the three statements below. I: Group 1 elements are the alkali metals. II: Group 17 elements are the noble gases. III: Group 18 elements have full outer shells.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

7. Consider the three statements below. I: Noble gases are highly reactive. II: Halogens are reactive nonmetals. III: Alkali metals are unreactive.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

8. Consider the three statements below. I: Atomic radius increases down a group. II: Ionization energy increases across a period. III: Electronegativity decreases across a period.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

9. Consider the three statements below. I: Atomic radius increases across a period. II: Metallic character increases across a period. III: Ionization energy decreases across a period.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

10. Consider the three statements below. I: Oxidation is the gain of electrons. II: Reduction is the gain of electrons. III: Oxidation and reduction occur separately and never together.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

11. Consider the three statements below. I: An acid produces hydrogen ions in solution. II: A base produces hydroxide ions in solution. III: Neutralization produces a salt and water.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

12. Consider the three statements below. I: A pH of 3 is basic. II: A pH of 7 is acidic. III: A pH of 10 is acidic.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

13. Consider the three statements below. I: Acids turn blue litmus paper red. II: Bases turn blue litmus paper red. III: Acids feel slippery.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

14. Consider the three statements below. I: A solid has no definite shape. II: A gas has no definite volume. III: A liquid has a definite shape.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

15. Consider the three statements below. I: Melting is the change of solid to liquid. II: Condensation is the change of gas to liquid. III: Sublimation is the change of liquid to gas.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

16. Consider the three statements below. I: Freezing absorbs energy. II: Boiling absorbs energy. III: Condensation absorbs energy.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

17. Consider the three statements below. I: Boyle's law relates volume and temperature. II: Charles's law relates pressure and volume. III: Increasing pressure increases gas volume at constant temperature.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

18. Consider the three statements below. I: One mole of gas occupies 11.2 L at STP. II: Avogadro's number is 3.01×10^{23}. III: Molarity is grams per liter.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

19. Consider the three statements below. I: One mole contains 6.02×10^{23} particles. II: One mole of gas occupies 22.4 L at STP. III: Molarity is moles of solute per liter of solution.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

20. Consider the three statements below. I: The gram-formula mass of water is 18. II: The gram-formula mass of CO_2 is 28. III: The gram-formula mass of O_2 is 16.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

21. Consider the three statements below. I: Synthesis breaks a compound into simpler parts. II: Decomposition combines substances into one product. III: Combustion produces only water.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

22. Consider the three statements below. I: A single-replacement reaction involves two compounds. II: A double-replacement reaction involves two compounds. III: Neutralization produces a gas and water.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

23. Consider the three statements below. I: An alpha particle is a high-speed electron. II: A beta particle is a high-speed electron. III: A gamma ray has a charge of +2.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

24. Consider the three statements below. I: Fission is the splitting of a heavy nucleus. II: Fusion is the joining of light nuclei. III: Half-life is constant regardless of temperature.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

25. Consider the three statements below. I: An alkane has only single bonds. II: An alkene has a double bond. III: An alkyne has a triple bond.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

26. Consider the three statements below. I: Isomers have the same molecular formula. II: The empirical formula gives the simplest whole-number ratio. III: A hydrocarbon contains carbon, hydrogen, and oxygen.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

27. Consider the three statements below. I: Diamond is held together by ionic bonds. II: Sodium chloride is a covalent compound. III: Oxygen gas, O_2, is a compound.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

28. Consider the three statements below. I: Metals are poor conductors of electricity. II: Nonmetals are malleable and ductile. III: Metals tend to gain electrons.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

29. Consider the three statements below. I: A homogeneous mixture has visibly different parts. II: A heterogeneous mixture has visibly different parts. III: Saltwater is a heterogeneous mixture.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

30. Consider the three statements below. I: Burning is a chemical change. II: Melting is a chemical change. III: Rusting is a chemical change.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

31. Consider the three statements below. I: A physical change produces a new substance. II: A chemical change produces a new substance. III: Dissolving sugar in water is a chemical change.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

32. Consider the three statements below. I: Filtration separates a dissolved solid from a liquid. II: Distillation separates substances by color. III: A magnet separates two liquids.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

33. Consider the three statements below. I: Increasing temperature increases the reaction rate. II: Increasing concentration increases the reaction rate. III: Increasing surface area increases the reaction rate.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

34. Consider the three statements below. I: A catalyst lowers the activation energy. II: A catalyst is not consumed in the reaction. III: A catalyst speeds up the reaction.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

35. Consider the three statements below. I: Lowering temperature speeds up a reaction. II: A catalyst raises the activation energy. III: Decreasing concentration speeds up a reaction.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

36. Consider the three statements below. I: An exothermic reaction releases heat. II: An endothermic reaction absorbs heat. III: In an exothermic reaction, products have more energy than reactants.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

37. Consider the three statements below. I: Adding salt to water raises its freezing point. II: Adding a solute lowers the boiling point of water. III: Pure water freezes at a lower temperature than saltwater.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

38. Consider the three statements below. I: A group is a horizontal row of the periodic table. II: A period is a vertical column of the periodic table. III: Elements in the same period have similar chemical properties.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

39. Consider the three statements below. I: Sodium forms a +2 ion. II: Magnesium forms a +2 ion. III: Chlorine forms a +1 ion.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

40. Consider the three statements below. I: Group 2 elements form +2 ions. II: Group 17 elements form −1 ions. III: Group 1 elements form −1 ions.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

41. Consider the three statements below. I: Sodium's symbol is Na. II: Potassium's symbol is K. III: Iron's symbol is Ir.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

42. Consider the three statements below. I: Gold's symbol is Go. II: Silver's symbol is Si. III: Lead's symbol is Ld.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

43. Consider the three statements below. I: Water is a polar molecule. II: Oil is nonpolar. III: Oil dissolves easily in water.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

44. Consider the three statements below. I: Ice is less dense than liquid water. II: Water expands when it freezes. III: Ice floats on liquid water.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

45. Consider the three statements below. I: Temperature measures the average kinetic energy of particles. II: Heat is energy transferred due to a temperature difference. III: Kelvin is a unit of temperature.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

46. Consider the three statements below. I: Hydrochloric acid is HNO_3. II: Nitric acid is HNO_3. III: Sulfuric acid is HCl.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

47. Consider the three statements below. I: CO_2 is carbon dioxide. II: CO is carbon monoxide. III: NaCl is sodium oxide.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

48. Consider the three statements below. I: A saturated solution can dissolve more solute. II: An unsaturated solution can dissolve more solute. III: Adding solvent to a solution increases its concentration.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

49. Consider the three statements below. I: An electrolyte conducts electricity when dissolved in water. II: Sugar is a nonelectrolyte. III: Saltwater conducts electricity.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

50. Consider the three statements below. I: Solid sodium chloride conducts electricity well. II: Molten sodium chloride does not conduct electricity. III: Sodium chloride is a covalent compound.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

51. Consider the three statements below. I: Most solids become more soluble as temperature rises. II: Most gases become less soluble as temperature rises. III: Solubility describes how much solute dissolves in a solvent.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

52. Consider the three statements below. I: A precipitate is an insoluble solid that forms in a solution. II: A color change can signal a chemical reaction. III: Gas bubbles can signal a chemical reaction.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

53. Consider the three statements below. I: Helium is diatomic. II: Oxygen is diatomic. III: Neon is diatomic.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

54. Consider the three statements below. I: A nonpolar covalent bond involves unequal sharing of electrons. II: A polar covalent bond involves unequal sharing of electrons. III: An ionic bond involves equal sharing of electrons.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

55. Consider the three statements below. I: Carbon is a metal. II: Silicon is a noble gas. III: Sodium is a nonmetal.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

56. Consider the three statements below. I: A balanced equation has equal numbers of each atom on both sides. II: The law of conservation of mass applies to chemical reactions. III: Subscripts may be changed to balance an equation.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

57. Consider the three statements below. I: Coefficients show the number of atoms of one element. II: Subscripts show the number of whole molecules. III: A coefficient indicates the color of a compound.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

58. Consider the three statements below. I: Alpha decay decreases the atomic number by 2. II: Beta decay increases the atomic number by 1. III: Gamma rays carry no charge.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

59. Consider the three statements below. I: Valence electrons are located in the nucleus. II: Valence electrons are in the outermost energy level. III: The nucleus contains electrons.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

60. Consider the three statements below. I: Group 18 elements have one valence electron. II: Group 1 elements have one valence electron. III: Group 17 elements have one valence electron.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

61. Consider the three statements below. I: Combustion of a hydrocarbon produces carbon dioxide and water. II: Neutralization produces a salt and water. III: Synthesis produces two or more products.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

62. Consider the three statements below. I: A hand warmer is exothermic. II: An instant cold pack is endothermic. III: Condensation is endothermic.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

63. Consider the three statements below. I: The most acidic solution has the highest pH. II: A pH of 14 is strongly acidic. III: Pure water has a pH of 1.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

64. Consider the three statements below. I: A compound is a mixture of physically combined substances. II: An element contains two or more types of atoms. III: A mixture is chemically combined.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

65. Consider the three statements below. I: Increasing pressure on a gas increases its volume at constant temperature. II: Increasing temperature increases gas volume at constant pressure. III: Gas particles are tightly packed and barely move.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

66. Consider the three statements below. I: Diamond is a metal. II: Mercury is a solid at room temperature. III: Oxygen is a liquid at room temperature.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

67. Consider the three statements below. I: Metals are generally good conductors of electricity. II: Nonmetals are generally poor conductors. III: Metalloids are always better conductors than metals.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

68. Consider the three statements below. I: A saturated hydrocarbon contains only single bonds. II: An unsaturated hydrocarbon contains a double or triple bond. III: Methane is a hydrocarbon.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

69. Consider the three statements below. I: Reduction is the loss of electrons. II: Oxidation is the gain of electrons. III: In a redox reaction, only oxidation occurs.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

70. Consider the three statements below. I: Stomach acid has a high pH. II: Household ammonia is acidic. III: Adding more water to an acid increases its acidity.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

71. Consider the three statements below. I: A strong acid ionizes only slightly in water. II: A weak acid ionizes only slightly in water. III: A strong acid does not conduct electricity.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

72. Consider the three statements below. I: The forward and reverse rates are equal at equilibrium. II: Equilibrium requires a closed system. III: At equilibrium, the reaction has completely stopped.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

73. Consider the three statements below. I: $CaCO_3$ is calcium carbonate. II: NaOH is sodium hydroxide. III: H_2SO_4 is hydrochloric acid.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

74. Consider the three statements below. I: Filtration separates an insoluble solid from a liquid. II: Distillation separates liquids by their boiling points. III: Evaporation can recover a dissolved solid from a solution.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

75. Consider the three statements below. I: Sodium is a Group 1 metal. II: Chlorine is a Group 17 nonmetal. III: Argon is a halogen.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

76. Consider the three statements below. I: Density is mass divided by volume. II: The mole is a unit for amount of substance. III: Temperature is measured with a balance.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

77. Consider the three statements below. I: Burning wood is a chemical change. II: Tearing paper is a physical change. III: Boiling water is a physical change.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

78. Consider the three statements below. I: Fluorine is the most reactive halogen. II: The reactivity of alkali metals increases down the group. III: The reactivity of halogens increases down the group.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

79. Consider the three statements below. I: A solute is the substance that is dissolved. II: A solvent is the dissolving substance. III: In saltwater, salt is the solvent.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

80. Consider the three statements below. I: CH_4 contains five atoms in total. II: CO_2 contains two atoms in total. III: H_2O contains two atoms in total.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

81. Consider the three statements below. I: An ionic compound conducts electricity when molten. II: A metallic substance conducts electricity as a solid. III: A covalent molecular substance usually does not conduct electricity.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

82. Consider the three statements below. I: Atomic mass includes both protons and neutrons. II: Isotopes of an element have the same number of protons. III: The number of protons identifies the element.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

83. Consider the three statements below. I: A beta particle has a charge of +2. II: An alpha particle has a charge of +2. III: A gamma ray has a charge of −1.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

84. Consider the three statements below. I: Increasing surface area slows a reaction. II: A higher concentration slows a reaction. III: Raising the temperature slows a reaction.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

85. Consider the three statements below. I: The percent composition of a compound is fixed for any sample size. II: The element percentages in a compound add up to 100%. III: A compound has the same properties as its component elements.

A. None are correct

B. Exactly one is correct

C. Exactly two are correct

D. All three are correct

Practice Exam 21 — Explained Answer Key

1. D — All three are correct: protons are positive, neutrons are neutral, and electrons are negative. These three charges define the atom's particles. The balance of protons and electrons keeps an atom neutral.
2. D — All three are correct: the atomic number equals the protons, isotopes differ in neutrons, and a neutral atom has equal protons and electrons. Each describes a core fact of atomic structure. Together they define how atoms are counted and identified.
3. A — None are correct: electrons are outside the nucleus, the atomic number equals protons not neutrons, and protons are positive not negative. Every statement misstates a basic fact. All three are false.
4. D — All three are correct: ionic bonds form between a metal and nonmetal, covalent bonds share electrons, and metallic bonds have mobile electrons. Each describes a recognized bonding type. The three together cover the main bond categories.

5. D — All three are correct: a cation is positive, an anion is negative, and metals lose electrons. Losing electrons makes metals form cations. The statements are mutually consistent.
6. C — Two are correct: Group 1 is the alkali metals and Group 18 has full outer shells, but Group 17 is the halogens, not the noble gases. The false statement misnames Group 17. The other two are accurate.
7. B — One is correct: halogens are reactive nonmetals, but noble gases are unreactive and alkali metals are reactive. Only the halogen statement holds. The other two reverse the actual reactivity.
8. C — Two are correct: atomic radius increases down a group and ionization energy increases across a period, but electronegativity increases, not decreases, across a period. The third statement reverses the trend. The first two are correct.
9. A — None are correct: atomic radius decreases across a period, metallic character decreases across a period, and ionization energy increases across a period. Each statement reverses the real trend. All three are false.
10. B — One is correct: reduction is the gain of electrons, but oxidation is the loss, not gain, and oxidation and reduction always occur together. Only the second statement is true. The others misstate redox.
11. D — All three are correct: acids release hydrogen ions, bases release hydroxide ions, and neutralization yields a salt and water. Each describes standard acid-base chemistry. The three are consistent.
12. A — None are correct: a pH of 3 is acidic not basic, a pH of 7 is neutral not acidic, and a pH of 10 is basic not acidic. Each statement misclassifies the pH. All three are false.
13. B — One is correct: acids turn blue litmus red, but bases do not turn blue litmus red and acids do not feel slippery. Only the first statement holds. Slippery feel and that litmus change belong to bases.
14. B — One is correct: a gas has no definite volume, but a solid has a definite shape and a liquid does not. Only the second statement is true. The other two misstate the states of matter.
15. C — Two are correct: melting is solid to liquid and condensation is gas to liquid, but sublimation is solid to gas, not liquid to gas. The third statement is false. The first two are accurate.
16. B — One is correct: boiling absorbs energy, but freezing and condensation release energy. Only the second statement is true. The other two name exothermic changes.
17. A — None are correct: Boyle's law relates pressure and volume, Charles's law relates volume and temperature, and increasing pressure decreases volume. Each statement is wrong. All three are false.
18. A — None are correct: one mole of gas occupies 22.4 L, Avogadro's number is 6.02×10^{23}, and molarity is moles per liter. Each statement gives an incorrect value or definition. All three are false.
19. D — All three are correct: a mole is 6.02×10^{23} particles, occupies 22.4 L of gas at STP, and molarity is moles per liter. Each is a standard quantitative fact. The three are consistent.
20. B — One is correct: the gram-formula mass of water is 18, but CO_2 is 44 not 28, and O_2 is 32 not 16. Only the first value is right. The other two are incorrect.
21. A — None are correct: synthesis combines substances, decomposition breaks them apart, and combustion yields carbon dioxide and water. Each statement reverses or misstates the reaction. All three are false.
22. B — One is correct: a double-replacement reaction involves two compounds, but single replacement involves an element and a compound, and neutralization yields salt and water, not a gas. Only the second statement holds. The others are wrong.

23. B — One is correct: a beta particle is a high-speed electron, but an alpha particle is a helium nucleus and a gamma ray has no charge. Only the second statement is true. The others misidentify the emissions.
24. D — All three are correct: fission splits a heavy nucleus, fusion joins light nuclei, and half-life is temperature-independent. Each describes a nuclear fact. The three are consistent.
25. D — All three are correct: alkanes have single bonds, alkenes have a double bond, and alkynes have a triple bond. The bond order defines each hydrocarbon class. All three statements are accurate.
26. C — Two are correct: isomers share a molecular formula and the empirical formula gives the simplest ratio, but hydrocarbons contain only carbon and hydrogen, not oxygen. The third statement is false. The first two are accurate.
27. A — None are correct: diamond is covalent, sodium chloride is ionic, and O_2 is an element. Each statement misstates the bonding or classification. All three are false.
28. A — None are correct: metals are good conductors, nonmetals are brittle rather than malleable, and metals lose electrons. Each statement reverses a property. All three are false.
29. B — One is correct: a heterogeneous mixture has visibly different parts, but a homogeneous mixture is uniform and saltwater is homogeneous. Only the second statement holds. The other two misclassify the mixtures.
30. C — Two are correct: burning and rusting are chemical changes, but melting is a physical change. The melting statement is false. The other two involve new substances forming.
31. B — One is correct: a chemical change produces a new substance, but a physical change does not, and dissolving sugar is physical. Only the second statement holds. The others misclassify the changes.
32. A — None are correct: filtration removes insoluble solids, distillation separates by boiling point, and a magnet works on magnetic solids, not liquids. Each statement is wrong. All three are false.
33. D — All three are correct: increasing temperature, concentration, and surface area all speed up a reaction. Each raises collision frequency or energy. The three factors consistently increase the rate.
34. D — All three are correct: a catalyst lowers activation energy, is not consumed, and speeds up the reaction. These describe how a catalyst works. The three statements are consistent.
35. A — None are correct: lowering temperature slows a reaction, a catalyst lowers activation energy, and decreasing concentration slows a reaction. Each statement reverses the effect. All three are false.
36. C — Two are correct: exothermic reactions release heat and endothermic reactions absorb heat, but in an exothermic reaction the products have less, not more, energy. The third statement is false. The first two are accurate.
37. A — None are correct: adding salt lowers the freezing point, adding a solute raises the boiling point, and saltwater freezes lower than pure water. Each statement reverses the colligative effect. All three are false.
38. A — None are correct: a group is a column, a period is a row, and elements in a group, not a period, share properties. Each statement is wrong. All three are false.
39. B — One is correct: magnesium forms a +2 ion, but sodium forms +1 not +2, and chlorine forms −1 not +1. Only the second statement holds. The others give wrong charges.
40. C — Two are correct: Group 2 forms +2 ions and Group 17 forms −1 ions, but Group 1 forms +1 ions, not −1. The third statement is false. The first two are accurate.
41. C — Two are correct: sodium is Na and potassium is K, but iron is Fe, not Ir. The iron symbol is wrong. The first two symbols are correct.

42. A — None are correct: gold is Au, silver is Ag, and lead is Pb. Each statement gives a wrong symbol. All three are false.
43. C — Two are correct: water is polar and oil is nonpolar, but oil does not dissolve in water. The third statement is false. Like dissolves like, so the polar and nonpolar do not mix.
44. D — All three are correct: ice is less dense than water, water expands on freezing, and ice floats. The expansion lowers the density. The three facts are linked and accurate.
45. D — All three are correct: temperature is average kinetic energy, heat is transferred energy, and kelvin is a temperature unit. Each describes a thermal concept. The three statements are consistent.
46. B — One is correct: nitric acid is HNO_3, but hydrochloric acid is HCl not HNO_3, and sulfuric acid is H_2SO_4 not HCl. Only the second statement holds. The others mismatch the formulas.
47. C — Two are correct: CO_2 is carbon dioxide and CO is carbon monoxide, but NaCl is sodium chloride, not sodium oxide. The third statement is false. The first two are accurate.
48. B — One is correct: an unsaturated solution can dissolve more solute, but a saturated solution cannot, and adding solvent decreases concentration. Only the second statement holds. The others are wrong.
49. D — All three are correct: an electrolyte conducts when dissolved, sugar is a nonelectrolyte, and saltwater conducts. Each describes solution conductivity. The three statements are consistent.
50. A — None are correct: solid sodium chloride does not conduct, molten sodium chloride does conduct, and sodium chloride is ionic, not covalent. Each statement is wrong. All three are false.
51. D — All three are correct: most solids grow more soluble with heat, most gases grow less soluble with heat, and solubility measures how much dissolves. Each describes solubility behavior. The three are consistent.
52. D — All three are correct: a precipitate is an insoluble solid forming in solution, and color change and gas bubbles both signal a chemical reaction. Each is recognized evidence of a reaction. The three statements are accurate.
53. B — One is correct: oxygen is diatomic, but helium and neon are monatomic noble gases. Only the second statement holds. Noble gases exist as single atoms.
54. B — One is correct: a polar covalent bond involves unequal sharing, but a nonpolar covalent bond shares equally and an ionic bond transfers electrons. Only the second statement holds. The others misstate the bonds.
55. A — None are correct: carbon is a nonmetal, silicon is a metalloid, and sodium is a metal. Each statement misclassifies the element. All three are false.
56. C — Two are correct: a balanced equation has equal atoms on both sides and obeys conservation of mass, but subscripts must never be changed to balance. The third statement is false. The first two are accurate.
57. A — None are correct: coefficients show whole molecules, subscripts show atoms of an element, and a coefficient does not indicate color. Each statement is wrong. All three are false.
58. D — All three are correct: alpha decay lowers the atomic number by 2, beta decay raises it by 1, and gamma rays are uncharged. Each describes a decay effect. The three statements are accurate.
59. B — One is correct: valence electrons are in the outermost level, but they are not in the nucleus and the nucleus holds no electrons. Only the second statement holds. The others misplace the electrons.
60. B — One is correct: Group 1 elements have one valence electron, but Group 18 has eight and Group 17 has seven. Only the second statement holds. The others give wrong counts.

61. C — Two are correct: hydrocarbon combustion gives carbon dioxide and water, and neutralization gives salt and water, but synthesis yields one product, not two or more. The third statement is false. The first two are accurate.
62. C — Two are correct: a hand warmer is exothermic and a cold pack is endothermic, but condensation is exothermic, not endothermic. The third statement is false. The first two are accurate.
63. A — None are correct: the most acidic solution has the lowest pH, a pH of 14 is strongly basic, and pure water has a pH of 7. Each statement is wrong. All three are false.
64. A — None are correct: a compound is chemically combined, an element has one type of atom, and a mixture is physically combined. Each statement reverses a definition. All three are false.
65. B — One is correct: increasing temperature increases gas volume at constant pressure, but increasing pressure decreases volume and gas particles move freely, not tightly packed. Only the second statement holds. The others are wrong.
66. A — None are correct: diamond is a nonmetal form of carbon, mercury is a liquid at room temperature, and oxygen is a gas. Each statement misstates a fact. All three are false.
67. C — Two are correct: metals are good conductors and nonmetals are poor conductors, but metalloids are not always better conductors than metals. The third statement is false. The first two are accurate.
68. D — All three are correct: a saturated hydrocarbon has only single bonds, an unsaturated one has a double or triple bond, and methane is a hydrocarbon. Each describes hydrocarbon chemistry. The three statements are consistent.
69. A — None are correct: reduction is the gain of electrons, oxidation is the loss, and redox always pairs oxidation with reduction. Each statement is wrong. All three are false.
70. A — None are correct: stomach acid has a low pH, ammonia is basic, and adding water dilutes an acid rather than increasing acidity. Each statement is wrong. All three are false.
71. B — One is correct: a weak acid ionizes only slightly, but a strong acid ionizes completely and does conduct electricity. Only the second statement holds. The others misstate acid strength.
72. C — Two are correct: forward and reverse rates are equal at equilibrium and equilibrium needs a closed system, but the reaction has not stopped at equilibrium. The third statement is false. The first two are accurate.
73. C — Two are correct: $CaCO_3$ is calcium carbonate and NaOH is sodium hydroxide, but H_2SO_4 is sulfuric acid, not hydrochloric. The third statement is false. The first two are accurate.
74. D — All three are correct: filtration removes an insoluble solid, distillation separates liquids by boiling point, and evaporation recovers a dissolved solid. Each is a valid separation method. The three statements are accurate.
75. C — Two are correct: sodium is a Group 1 metal and chlorine is a Group 17 nonmetal, but argon is a noble gas, not a halogen. The third statement is false. The first two are accurate.
76. C — Two are correct: density is mass divided by volume and the mole measures amount of substance, but temperature is measured with a thermometer, not a balance. The third statement is false. The first two are accurate.
77. D — All three are correct: burning wood is a chemical change, while tearing paper and boiling water are physical changes. Each is classified correctly. The three statements are accurate.
78. C — Two are correct: fluorine is the most reactive halogen and alkali metal reactivity increases down the group, but halogen reactivity increases up, not down, the group. The third statement is false. The first two are accurate.

79. C — Two are correct: a solute is the dissolved substance and a solvent is the dissolving substance, but in saltwater salt is the solute, not the solvent. The third statement is false. The first two are accurate.
80. B — One is correct: CH_4 has five atoms total, but CO_2 has three not two, and H_2O has three not two. Only the first statement holds. The other two undercount the atoms.
81. D — All three are correct: an ionic compound conducts when molten, a metal conducts as a solid, and a covalent molecular substance usually does not conduct. Each describes a conductivity rule. The three statements are accurate.
82. D — All three are correct: atomic mass includes protons and neutrons, isotopes share the same proton count, and the proton number identifies the element. Each describes atomic structure. The three statements are consistent.
83. B — One is correct: an alpha particle has a +2 charge, but a beta particle has a −1 charge and a gamma ray has no charge. Only the second statement holds. The others give wrong charges.
84. A — None are correct: increasing surface area, raising concentration, and raising temperature all speed up a reaction, not slow it. Each statement reverses the effect. All three are false.
85. C — Two are correct: percent composition is fixed for any sample and the element percentages total 100%, but a compound does not share the properties of its elements. The third statement is false. The first two are accurate.