

Topic: Basic Periodic Trends

123. First ionization energy is the energy required to remove one electron from a gaseous atom. How does first ionization energy generally change as you move from left to right across a period? (a) It generally decreases because atomic size increases. (b) It generally increases because atomic size decreases and effective nuclear charge increases. (c) It generally decreases because effective nuclear charge decreases. (d) It remains relatively constant across a period.

Answer: (b)

128. Among the elements Mg, Ca, Sr, and Ba, which one would be expected to be the most metallic? (a) Magnesium (Mg) (b) Calcium (Ca) (c) Strontium (Sr) (d) Barium (Ba)

Answer: (d)

Topic: Classification of Matter

44. Which of the following processes would result in the formation of a compound from elements? (a) Dissolving salt in water (b) Melting ice (c) Burning magnesium in air (d) Filtering sand from water

Answer: (c)

33. Which of the following is an example of a chemical compound? (a) Oxygen gas (O₂) (b) Nitrogen (N₂) (c) Carbon dioxide (CO₂) (d) Air

Answer: (c)

Topic: Atomic Structure

69. Which of the following particles is located outside the nucleus of an atom? (a) Proton (b) Neutron (c) Electron (d) Nucleon

Answer: (c)

Topic: Oxidation and Reduction (Basic)

308. Which statement correctly describes a reducing agent? a) It gains electrons. b) It causes reduction of another substance. c) It itself gets reduced. d) It accepts oxygen.

Answer: (b)

Topic: Physical and Chemical Properties

51. When a piece of paper burns, what type of property is demonstrated? (a) Solubility (b) Ductility (c) Flammability (d) Malleability

Answer: (c)

Topic: Balancing Chemical Equations

223. In a chemical equation, what does a coefficient placed in front of a chemical formula primarily indicate? (a) The number of atoms of a specific element within the compound (b) The molar mass of the compound (c) The number of molecules or moles of that substance (d) The type of chemical bond present in the compound

Answer: (c)

Topic: The Mole Concept

250. What volume would 0.75 moles of oxygen gas (O_2) occupy at Standard Temperature and Pressure (STP)?
a) 16.8 L b) 22.4 L c) 33.6 L d) 11.2 L

Answer: (a)

Topic: Oxidation and Reduction (Basic)

311. If a substance acts as an oxidizing agent, then it must be: a) Losing electrons b) Getting oxidized c) Getting reduced d) Causing reduction

Answer: (c)

Topic: Atomic Structure

73. The atomic mass unit (amu) is approximately equal to the mass of a: (a) Proton only (b) Electron only (c) Proton or a neutron (d) Proton, neutron, and electron combined

Answer: (c)

Topic: Ionic Bonding

153. Which noble gas configuration does a chloride ion (Cl^-) achieve? (a) Helium (b) Neon (c) Argon (d) Krypton

Answer: (c)

Topic: Balancing Chemical Equations

216. In the balanced chemical equation $2\text{Al} + 3\text{H}_2\text{SO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + \text{XH}_2$, what is the value of X? (a) 1 (b) 2 (c) 3 (d) 4

Answer: (c)

Topic: Subatomic Particles

82. The mass number of an atom represents the total count of which subatomic particles? a) Protons and electrons b) Neutrons and electrons c) Protons and neutrons d) Protons, neutrons, and electrons

Answer: (c)

Topic: Isotopes

103. The atomic number of an element is determined by the number of protons in its nucleus. If an element has isotopes, how does this affect its atomic number? a) The atomic number varies for each isotope of an element. b) The atomic number remains constant for all isotopes of an element. c) The atomic number is the average of the mass numbers of its isotopes. d) The atomic number is determined by the most abundant isotope.

Answer: (b)

Topic:

325. How many atoms of oxygen are present in one molecule of sulfuric acid, H_2SO_4 ? a) 1 b) 2 c) 4 d) 7

Answer: (c)

Topic: Energy in Chemical Reactions

298. When barium hydroxide octahydrate and ammonium thiocyanate are mixed, the temperature of the surroundings drops significantly. This observation suggests the reaction is: a) Exothermic, releasing energy to the surroundings. b) Endothermic, absorbing energy from the surroundings. c) A combustion reaction, producing heat. d) A neutralization reaction, releasing water.

Answer: (b)

Topic: Concentration (Qualitative)

275. A supersaturated solution is typically prepared by: (a) Heating a solvent, dissolving excess solute, and then slowly cooling it without disturbance. (b) Continuously stirring a solvent while adding solute at a low temperature. (c) Adding a very small amount of solute to a large volume of solvent. (d) Evaporating most of the solvent from a dilute solution.

Answer: (a)

Topic: Oxidation and Reduction (Basic)

302. In the context of hydrogen transfer, reduction is defined as the: a) Removal of hydrogen b) Addition of oxygen c) Addition of hydrogen d) Loss of electrons

Answer: (c)

Topic: Solutions and Solubility

264. A solution that contains more solute than a saturated solution at the same temperature and pressure is called a: (a) Unsaturated solution (b) Dilute solution (c) Concentrated solution (d) Supersaturated solution

Answer: (d)

Topic: Covalent Bonding

175. Which property of atoms is primarily responsible for determining the polarity of a covalent bond? (a) Atomic mass (b) Ionization energy (c) Electronegativity (d) Atomic radius

Answer: (c)

Topic: Atomic Structure

66. Which of the following statements about a neutral atom is correct? (a) The number of protons is equal to the number of neutrons. (b) The number of electrons is equal to the number of neutrons. (c) The number of protons is equal to the number of electrons. (d) The mass number is equal to the atomic number.

Answer: (c)

Topic: Physical and Chemical Properties

52. A student observes that a certain liquid has a distinct odor and a boiling point of 78 degrees Celsius. These observations describe the liquid's: (a) Chemical properties (b) Extensive properties (c) Physical properties (d) Intensive chemical properties

Answer: (c)

Topic:

330. A chemical reaction that releases heat into its surroundings is called: a) An endothermic reaction b) An exothermic reaction c) A decomposition reaction d) A synthesis reaction

Answer: (b)

Topic: Isotopes

96. Which property is most likely to be different for isotopes of the same element? a) Melting point. b) Density. c) Chemical reactivity. d) Number of valence electrons.

Answer: (b)

Topic: States of Matter

30. Evaporation causes cooling because: (a) The escaping particles absorb heat from the surroundings. (b) The remaining particles gain kinetic energy. (c) The density of the liquid increases. (d) The intermolecular forces become stronger.

Answer: (a)

Topic: Subatomic Particles

78. Which subatomic particle contributes to the atomic number of an element? a) Neutron b) Electron c) Proton d) Positron

Answer: (c)

Topic: Chemical Bonding Introduction

140. Which of the following statements correctly differentiates between ionic and covalent bonding? (a) Ionic bonds involve sharing of electrons, while covalent bonds involve transfer of electrons. (b) Ionic bonds occur between two nonmetals, while covalent bonds occur between a metal and a nonmetal. (c) Ionic bonds involve transfer of electrons, while covalent bonds involve sharing of electrons. (d) Both ionic and covalent bonds involve the complete transfer of electrons.

Answer: (c)

Topic: Atomic Structure

74. If an atom gains two electrons, what type of ion is formed? (a) A cation with a +2 charge (b) An anion with a -2 charge (c) A cation with a -2 charge (d) Anion with a +2 charge

Answer: (b)

Topic: The Mole Concept

251. A sample of hydrogen gas (H_2) occupies 5.6 litres at STP. How many moles of hydrogen gas are present? a) 0.25 mol b) 0.5 mol c) 1 mol d) 2 mol

Answer: (a)

Topic: Concentration (Qualitative)

284. A solution that is 'dilute' compared to another implies it has a: (a) Higher boiling point. (b) Lower concentration of solute. (c) Higher concentration of solute. (d) Greater density.

Answer: (b)

Topic: Chemical Bonding Introduction

149. The formation of a chemical bond between two atoms generally leads to a state of: (a) Higher potential energy for the system. (b) Lower potential energy for the system. (c) Unchanged potential energy for the system. (d) Higher kinetic energy for the system.

Answer: (b)

Topic:

326. What is the correct chemical name for the compound FeCl_3 ? a) Iron chloride b) Iron(I) chloride c) Iron(III) chloride d) Iron trichloride

Answer: (c)

Topic: Covalent Bonding

167. In a molecule of methane (CH_4), how many pairs of electrons are shared between the carbon atom and the four hydrogen atoms? (a) 1 pair (b) 2 pairs (c) 4 pairs (d) 8 pairs

Answer: (c)

Topic: Solutions and Solubility

270. A chemist prepared a solution by heating a substance in water until no more would dissolve. When the solution was allowed to cool slowly, crystals of the substance formed. What type of solution was likely formed when it was hot, and then when it cooled? (a) Unsaturated when hot, saturated when cooled. (b) Saturated when hot, unsaturated when cooled. (c) Supersaturated when hot, saturated when cooled. (d) Saturated when hot, supersaturated when cooled.

Answer: (c)

Topic: Chemical Bonding Introduction

148. Which pair of elements would most likely form an ionic compound? (a) Carbon and Oxygen (b) Nitrogen and Hydrogen (c) Lithium and Fluorine (d) Sulfur and Chlorine

Answer: (c)

Topic: The Periodic Table Organization

119. An element in Group 17, Period 4 would be expected to have properties most similar to which other element? (a) Bromine (Br) (b) Potassium (K) (c) Argon (Ar) (d) Sulfur (S)

Answer: (a)

Topic: Solutions and Solubility

265. How does increasing the surface area of a solid solute affect its rate of dissolution in a liquid solvent?

Answer: (Explanation)

Topic: Concentration (Qualitative)

274. Which statement accurately describes a saturated solution? (a) It can still dissolve a large amount of solute. (b) It contains less solute than it is capable of holding at that temperature. (c) It contains the maximum amount of solute that can be dissolved at a given temperature. (d) It contains more solute than it can theoretically hold, making it unstable.

Answer: (c)

Topic: Naming Simple Compounds

206. Which compound correctly represents the combination of a Group 2 element and a Group 17 element? (a) NaF: Sodium fluoride (b) MgBr₂: Magnesium bromide (c) AlCl₃: Aluminum chloride (d) SiO₂: Silicon dioxide

Answer: (b)

Topic: Types of Chemical Reactions

238. Which type of reaction results in two ionic compounds exchanging their ions to form two new compounds, often leading to the formation of a precipitate, gas, or water? (a) Combination (b) Single displacement (c) Double displacement (d) Decomposition

Answer: N/A

Topic: States of Matter

27. When pressure is applied to a gas, what typically happens to its volume? (a) It increases. (b) It decreases. (c) It remains unchanged. (d) It depends on the temperature.

Answer: (b)

Topic: Naming Simple Compounds

199. What is the systematic name for FeCl_3 ? (a) Iron chloride (b) Iron (II) chloride (c) Iron (III) chloride (d) Ferric chloride

Answer: (c)

Topic: Isotopes

95. How do isotopes of an element differ in their chemical properties? a) They have significantly different chemical properties due to mass differences. b) They have identical chemical properties because they have the same number of protons and electrons. c) They react differently only at very high temperatures. d) They only differ in their ability to form ionic bonds.

Answer: (b)

Topic: Oxidation and Reduction (Basic)

309. A redox reaction is a chemical reaction in which: a) Only oxidation occurs b) Only reduction occurs c) Both oxidation and reduction occur simultaneously d) Neither oxidation nor reduction occurs

Answer: (c)

Topic: Energy in Chemical Reactions

290. Photosynthesis is a chemical process where plants convert carbon dioxide and water into glucose and oxygen using sunlight. This process is best classified as: a) An exothermic reaction b) An endothermic reaction c) A combustion reaction d) A decomposition reaction

Answer: (b)

Topic: Physical and Chemical Properties

56. When vinegar (acetic acid) reacts with baking soda (sodium bicarbonate) to produce carbon dioxide gas, this demonstrates: (a) A physical change only (b) A change in state only (c) A chemical property of both substances (d) An intensive physical property

Answer: (c)

Topic: Energy in Chemical Reactions

295. If the energy required to break bonds in reactants is greater than the energy released when new bonds are formed in products, the reaction will be: a) Exothermic b) Endothermic c) Neutral d) Spontaneous without activation energy

Answer: (b)

292. The minimum amount of energy required to initiate a chemical reaction is known as the: a) Heat of reaction b) Enthalpy change c) Activation energy d) Bond energy

Answer: (c)

Topic: Solutions and Solubility

257. In a sugar solution prepared by dissolving sugar in water, the solvent is: (a) Sugar (b) Water (c) The entire solution (d) Both sugar and water

Answer: (b)

Topic: Concentration (Qualitative)

271. Which term best describes a solution containing a small amount of solute relative to the maximum amount that can be dissolved? (a) Saturated (b) Dilute (c) Concentrated (d) Supersaturated

Answer: (b)

Topic: Naming Simple Compounds

202. The chemical formula for ammonium sulfate is: (a) NH_4SO_4 (b) $(\text{NH}_4)_2\text{SO}_4$ (c) $\text{NH}_4(\text{SO}_4)_2$ (d) $\text{N}_2\text{H}_8\text{SO}_4$

Answer: (b)

Topic: Covalent Bonding

166. Which statement best describes the formation of a covalent bond? (a) One atom gains electrons while another atom loses electrons. (b) Atoms share one or more pairs of electrons to achieve a stable electron configuration. (c) Electrostatic forces attract oppositely charged ions. (d) Metallic atoms form a lattice with a 'sea' of delocalized electrons.

Answer: (b)

Topic: Naming Simple Compounds

203. Which of the following compounds is correctly named? (a) CuCl_2 : Copper (I) chloride (b) MnO_2 : Manganese (IV) oxide (c) PbS : Lead (IV) sulfide (d) NiF_2 : Nickel (I) fluoride

Answer: (b)

Topic: Oxidation and Reduction (Basic)

305. Consider the reaction: $2\text{Mg(s)} + \text{O}_2\text{(g)} \rightarrow 2\text{MgO(s)}$. In this reaction, magnesium is: a) Oxidized b) Reduced c) Neither oxidized nor reduced d) Acting as an oxidizing agent

Answer: (a)

Topic: Basic Periodic Trends

130. Which of the following elements is generally considered to be the most reactive non-metal? (a) Iodine (I) (b) Chlorine (Cl) (c) Bromine (Br) (d) Fluorine (F)

Answer: (d)

Topic: Ionic Bonding

156. What is the chemical formula for the ionic compound formed between calcium (Ca) and oxygen (O)? (a) CaO_2 (b) CaO (c) Ca_2O (d) Ca_2O_3

Answer: (b)

Topic: Balancing Chemical Equations

215. For the complete combustion of propane (C_3H_8), the unbalanced equation is: $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$. When balanced, what are the coefficients for O_2 , CO_2 , and H_2O respectively? (a) 3, 5, 4 (b) 5, 3, 4 (c) 4, 3, 5 (d) 3, 4, 5

Answer: (b)

Topic: Chemical Bonding Introduction

136. Which of the following best describes a chemical bond? (a) The force that holds atoms together in a molecule or compound. (b) The energy released when two atoms combine. (c) The attraction between a nucleus and its electrons. (d) The process of forming new substances from reactants.

Answer: (a)

Topic: Isotopes

101. Why do stable isotopes not undergo radioactive decay? a) They have an unstable nucleus. b) They have an unfavorable neutron to proton ratio. c) They have a stable nucleus. d) They have too many electrons.

Answer: (c)

Topic: Types of Chemical Reactions

239. An acid-base reaction, where an acid reacts with a base to form a salt and water, is a specific type of: (a) Combination reaction (b) Decomposition reaction (c) Single displacement reaction (d) Double displacement reaction

Answer: N/A

Topic: Introduction to Chemistry

14. Define the term 'mole' in chemistry and state its approximate numerical value (Avogadro's number).

Answer: Unit for amount of substance; approx. 6.022×10^{23} particles.

Topic: Chemical Bonding Introduction

142. What is the stable electron configuration that most atoms attempt to achieve when forming chemical bonds? (a) Duet rule (2 valence electrons) (b) Triplet rule (3 valence electrons) (c) Octet rule (8 valence electrons) (d) Hexet rule (6 valence electrons)

Answer: (c)

Topic: Isotopes

93. What is the defining characteristic that all isotopes of a given element share? a) The same mass number. b) The same number of neutrons. c) The same number of protons. d) The same number of electrons in their

outermost shell.

Answer: (c)

Topic: Basic Periodic Trends

134. Which property is most directly responsible for the increase in atomic radius down a group? (a) Increase in nuclear charge. (b) Increase in effective nuclear charge. (c) Increase in the number of electron shells. (d) Increase in electronegativity.

Answer: (c)

Topic: Subatomic Particles

79. The atomic mass unit (amu) is approximately equal to the mass of which subatomic particle? a) Electron b) Proton c) Photon d) Neutrino

Answer: (b)

Topic: The Mole Concept

253. Which of the following is the empirical formula for glucose (C₆H₁₂O₆)? a) C₆H₁₂O₆ b) C₃H₆O₃ c) CH₂O d) CHO

Answer: (c)

Topic: Balancing Chemical Equations

213. When the equation $\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow \text{Fe} + \text{CO}_2$ is balanced with the smallest whole number coefficients, what is the coefficient for CO? (a) 1 (b) 2 (c) 3 (d) 4

Answer: (c)

Topic: Introduction to Chemistry

5. In the periodic table, elements in the same group (column) generally have: (a) The same atomic mass (b) Similar chemical properties (c) The same number of electron shells (d) Increasing reactivity down the group
Section: True or False Questions

Answer: (b)

Topic: Chemical Formulas

193. The chemical formula for table salt is: a) KCl b) CaCl_2 c) NaCl d) MgCl_2

Answer: (c)

Topic: Ionic Bonding

158. An ion with a positive charge is called a: (a) Anion (b) Cation (c) Isotope (d) Molecule

Answer: (b)

Topic: Types of Chemical Reactions

228. In the reaction $\text{Fe(s)} + \text{CuSO}_4\text{(aq)} \rightarrow \text{FeSO}_4\text{(aq)} + \text{Cu(s)}$, which type of chemical reaction is occurring? (a) Double displacement (b) Combination (c) Single displacement (d) Decomposition

Answer: N/A

Topic: Chemical Bonding Introduction

138. Which type of electrons are primarily involved in the formation of chemical bonds between atoms? (a) Core electrons (b) Inner shell electrons (c) Valence electrons (d) Proton electrons

Answer: (c)

Topic: States of Matter

22. How does boiling differ from evaporation? (a) Boiling occurs only at the surface, while evaporation occurs throughout the liquid. (b) Boiling occurs at a specific temperature, while evaporation can occur at any temperature below the boiling point. (c) Boiling is a slow process, while evaporation is a rapid process. (d) Boiling does not require heat, while evaporation requires heat.

Answer: (b)

Topic: Basic Periodic Trends

127. Metallic character refers to the tendency of an element to lose electrons and form positive ions. As you move across a period from left to right, how does metallic character generally change? (a) It increases. (b) It decreases. (c) It remains constant. (d) It first increases then decreases.

Answer: (b)

Topic: Types of Chemical Reactions

236. The burning of a candle, which releases light and heat, is an example of an: (a) Endothermic reaction (b) Decomposition reaction (c) Exothermic reaction (d) Double displacement reaction

Answer: N/A

Topic: Chemical Bonding Introduction

146. Which of the following statements is a characteristic property of compounds formed by ionic bonds? (a) They typically have low melting and boiling points. (b) They are generally poor conductors of electricity in their solid state. (c) They are usually liquids or gases at room temperature. (d) They dissolve poorly in water.

Answer: (b)

Topic: The Mole Concept

241. Which of the following statements correctly defines one mole of a substance? a) It is the amount of substance having a mass equal to its atomic number in grams. b) It is the amount of substance that contains Avogadro's number of particles. c) It is the volume occupied by 1 gram of any substance at STP. d) It is the concentration of a solution containing 1 gram of solute per litre.

Answer: (b)

Topic: Classification of Matter

38. Consider a clear, colorless liquid that boils at exactly 100 degrees Celsius at standard atmospheric pressure and freezes at 0 degrees Celsius. This liquid is most likely: (a) A heterogeneous mixture (b) A solution (c) A pure compound (d) An element

Answer: (c)

Topic: Solutions and Solubility

258. Which of the following factors increases the solubility of a gas in a liquid? (a) Increasing temperature (b) Decreasing pressure (c) Increasing pressure (d) Decreasing the surface area of the liquid

Answer: (c)

Topic: Atomic Structure

62. Which subatomic particle has a negligible mass compared to protons and neutrons? (a) Proton (b) Neutron (c) Electron (d) Nucleus

Answer: (c)

Topic: States of Matter

26. Which of the following is an example of a Bose-Einstein Condensate (BEC)? (a) Water vapor (b) Supercooled helium (c) Extremely hot gas (d) Interstellar clouds

Answer: (b)

Topic: Covalent Bonding

176. Which of these substances is an example of a network covalent solid? (a) Water (H_2O) (b) Sodium chloride (NaCl) (c) Diamond (C) (d) Carbon dioxide (CO_2)

Answer: (c)

Topic: Concentration (Qualitative)

280. A concentrated solution differs from a dilute solution primarily in the: (a) Type of solvent used. (b) Relative amount of solute present. (c) Temperature at which the solution was prepared. (d) Physical state of the solute.

Answer: (b)

Topic: Basic Periodic Trends

131. The shielding effect (or screening effect) is most prominent for which of the following? (a) Inner shell electrons shielding outer shell electrons from the nucleus. (b) Outer shell electrons shielding inner shell electrons from the nucleus. (c) Protons shielding neutrons in the nucleus. (d) Neutrons shielding protons in the nucleus.

Answer: (a)

Topic: Naming Simple Compounds

205. What is the chemical name for PCl_5 ? (a) Phosphorus chloride (b) Phosphorus pentachloride (c) Pentaphosphorus chloride (d) Phosphorous (V) chloride

Answer: (b)

Topic: The Mole Concept

242. What is the molar mass of water (H_2O)? (Atomic masses: $\text{H}=1$, $\text{O}=16$) a) 17 g/mol b) 18 g/mol c) 19 g/mol d) 34 g/mol

Answer: (b)

Topic: Naming Simple Compounds

208. Which pair of compounds has a naming error? (a) N_2O : Dinitrogen monoxide; NO_2 : Nitrogen dioxide (b) SO_2 : Sulfur dioxide; SO_3 : Sulfur trioxide (c) Cu_2O : Copper (I) oxide; CuO : Copper (II) oxide (d) PbCl_2 : Lead (II) chloride; PbCl_4 : Lead (II) tetrachloride

Answer: (d)

Topic: Oxidation and Reduction (Basic)

315. Consider the reaction: $\text{Zn(s)} + \text{CuSO}_4\text{(aq)} \rightarrow \text{ZnSO}_4\text{(aq)} + \text{Cu(s)}$. In this reaction, copper (Cu^{2+} in CuSO_4) is: a) Oxidized by zinc b) Reduced by zinc c) Acting as a reducing agent d) Undergoing no change

Answer: (b)

Topic: Basic Periodic Trends

124. Consider the elements Lithium (Li), Sodium (Na), and Potassium (K). Which of these elements would have the lowest first ionization energy? (a) Lithium (b) Sodium (c) Potassium (d) All have similar first ionization

energies.

Answer: (c)

Topic:

328. The reaction $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$ is an example of a: a) Combination reaction b) Decomposition reaction c) Single displacement reaction d) Double displacement reaction

Answer: (b)

Topic: Oxidation and Reduction (Basic)

307. An oxidizing agent is a substance that: a) Itself gets oxidized b) Causes oxidation of another substance c) Gains hydrogen d) Loses electrons

Answer: (b)

Topic:

316. Which of the following is a physical property of matter? a) Reactivity with acid b) Ability to burn c) Melting point d) Tendency to rust

Answer: (c)

Topic: Balancing Chemical Equations

214. Balance the following chemical equation: $\text{NH}_3 + \text{O}_2 \rightarrow \text{NO} + \text{H}_2\text{O}$. What is the coefficient for O_2 ? (a) 3 (b) 5 (c) 2 (d) 4

Answer: (b)

Topic: Chemical Formulas

194. Which of the following chemical formulas is written incorrectly? a) H_2SO_4 b) KOH c) AlCl_3 d) $\text{Na}(\text{OH})_2$

Answer: (d)

Topic: Oxidation and Reduction (Basic)

303. According to the electronic concept, oxidation involves: a) Gain of electrons b) Loss of electrons c) Gain of oxygen d) Loss of hydrogen

Answer: (b)

Topic: Atomic Structure

61. What determines the identity of an element? (a) Number of neutrons (b) Number of protons (c) Number of electrons (d) Mass number

Answer: (b)

Topic: Covalent Bonding

171. The octet rule states that atoms tend to form bonds until they are surrounded by how many valence electrons? (a) 2 (b) 4 (c) 6 (d) 8

Answer: (d)

Topic:

323. Atoms bond with each other primarily to: a) Gain a positive charge b) Achieve a stable electron configuration c) Increase their atomic mass d) Become radioactive

Answer: (b)

Topic: Classification of Matter

34. A mixture differs from a compound in that a mixture: (a) Has components that are chemically bonded together. (b) Has a fixed composition by mass. (c) Can be separated into its components by physical methods. (d) Exhibits properties entirely different from its constituents.

Answer: (c)

Topic:

320. Which subatomic particle has a negative charge and is found outside the nucleus? a) Proton b) Neutron c) Electron d) Nucleus

Answer: (c)

Topic: Chemical Bonding Introduction

141. When an atom loses one or more electrons, it forms a: (a) Neutral atom. (b) Anion. (c) Cation. (d) Isotope.

Answer: (c)

Topic: Ionic Bonding

155. In which state will an ionic compound conduct electricity? (a) Solid state (b) Gaseous state (c) Molten state (d) Both solid and gaseous states

Answer: (c)

Topic: Basic Periodic Trends

135. Based on periodic trends, arrange the following elements in increasing order of their first ionization energy: Al, Si, P, Na. (a) $\text{Na} < \text{Al} < \text{Si} < \text{P}$ (b) $\text{P} < \text{Si} < \text{Al} < \text{Na}$ (c) $\text{Al} < \text{Na} < \text{Si} < \text{P}$ (d) $\text{Na} < \text{P} < \text{Si} < \text{Al}$

Answer: (a)

Topic: Introduction to Chemistry

10. The process where a solid changes directly into a gas without passing through a liquid state is called _____.

Answer: sublimation

Topic: The Mole Concept

248. How many oxygen atoms are present in 0.2 moles of calcium carbonate (CaCO_3)? a) 1.2044×10^{23} atoms b) 3.6132×10^{23} atoms c) 6.022×10^{23} atoms d) 1.8066×10^{24} atoms

Answer: (b)

Topic: Introduction to Chemistry

12. Distinguish between an ionic bond and a covalent bond based on how electrons are involved in their formation.

Answer: Ionic: electrons transferred; Covalent: electrons shared.

Topic: Chemical Formulas

190. Which of the following chemical formulas shows the simplest whole-number ratio of atoms in a compound? a) $C_6H_{12}O_6$ (glucose) b) H_2O_2 (hydrogen peroxide) c) N_2O_4 (dinitrogen tetroxide) d) CH_4 (methane)

Answer: (d)

Topic: Types of Chemical Reactions

230. Which of the following equations represents a combustion reaction? (a) $H_2O(l) + \text{energy} \rightarrow H_2(g) + O_2(g)$ (b) $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$ (c) $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ (d) $HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$

Answer: N/A

Topic: Introduction to Chemistry

7. The Law of Conservation of Mass states that mass is created or destroyed during a chemical reaction.

Answer: False

Topic: States of Matter

16. Which of the following statements best describes the particles in a liquid? (a) Particles are tightly packed and vibrate in fixed positions. (b) Particles are far apart and move randomly at high speeds. (c) Particles are closely packed but can slide past one another. (d) Particles are arranged in a regular, repeating pattern.

Answer: (c)

Topic: Naming Simple Compounds

196. What is the correct chemical name for the compound with the formula Li_2O ? (a) Lithium oxide (b) Dilithium monoxide (c) Lithium dioxide (d) Dilithium oxide

Answer: (a)

Topic: Balancing Chemical Equations

219. Consider the reaction between zinc and hydrochloric acid: $\text{Zn(s)} + \text{HCl(aq)} \rightarrow \text{ZnCl}_2\text{(aq)} + \text{H}_2\text{(g)}$. When balanced using the smallest whole number coefficients, what is the coefficient for HCl? (a) 1 (b) 2 (c) 3 (d) 4

Answer: (b)

Topic: Basic Periodic Trends

122. As you move down a group in the periodic table, what is the general trend observed for atomic radius? (a) It decreases due to increased nuclear charge. (b) It increases due to increased electron-electron repulsion. (c) It decreases due to increased shielding effect. (d) It increases due to the addition of new electron shells.

Answer: (d)

Topic: Physical and Chemical Properties

49. The ability of iron to combine with oxygen to form rust is an example of a: (a) Physical property (b) Chemical property (c) Intensive property (d) Extensive property

Answer: (b)

Topic: Concentration (Qualitative)

285. Which qualitative term describes a solution that could still dissolve additional solute at a given temperature? (a) Saturated (b) Concentrated (c) Unsaturated (d) Precipitate

Answer: (c)

Topic:

317. A homogeneous mixture is also known as a: a) Compound b) Element c) Solution d) Suspension

Answer: (c)

Topic: Covalent Bonding

179. Compared to ionic compounds, simple covalent compounds generally have: (a) Higher electrical conductivity in molten state. (b) Stronger forces between individual molecules. (c) Weaker forces between individual molecules. (d) Greater solubility in water.

Answer: (c)

Topic: Subatomic Particles

88. If an atom has an atomic number of 9 and a mass number of 19, how many neutrons does it have? a) 9 b) 10 c) 19 d) 28

Answer: (b)

Topic: Introduction to Chemistry

11. A chemical reaction that absorbs energy from its surroundings is known as a(n) _____ reaction. Section: Short Answer and Problem Solving Questions

Answer: endothermic

Topic: Classification of Matter

35. A homogeneous mixture is characterized by: (a) Having components that are visibly distinct. (b) Possessing a uniform composition throughout. (c) Allowing its components to settle out over time. (d) Being easily separated by filtration.

Answer: (b)

Topic: Types of Chemical Reactions

237. In the reaction $2\text{Na(s)} + \text{Cl}_2\text{(g)} \rightarrow 2\text{NaCl(s)}$, sodium changes from an oxidation state of 0 to +1, and chlorine changes from 0 to -1. This type of reaction is generally classified as: (a) Neutralization (b) Precipitation (c) Single displacement (d) Oxidation-reduction (Redox)

Answer: N/A

Topic: Naming Simple Compounds

200. Which of the following represents the formula for sulfur hexafluoride? (a) SF_6 (b) S_6F (c) SF_5 (d) S_5F

Answer: (a)

Topic: Ionic Bonding

157. Which of the following compounds is most likely to be ionic? (a) CH_4 (Methane) (b) CO_2 (Carbon dioxide) (c) KCl (Potassium chloride) (d) H_2O (Water)

Answer: (c)

Topic: Concentration (Qualitative)

277. You observe undissolved solid at the bottom of a beaker containing a sugar solution. This indicates the solution is most likely: (a) Dilute (b) Unsaturated (c) Supersaturated (d) Saturated

Answer: (d)

Topic: Atomic Structure

71. An ion has 17 protons, 18 neutrons, and 18 electrons. What is the charge of this ion? (a) +1 (b) -1 (c) 0 (d) +2

Answer: (b)

Topic: Energy in Chemical Reactions

294. Consider the combustion of methane ($\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$). This reaction typically releases a significant amount of heat and light. It is an example of a(n): (a) Endothermic process (b) Energy-neutral process (c) Exothermic process (d) Photosynthetic process

Answer: (c)

Topic: Chemical Bonding Introduction

145. In a Lewis electron dot structure, the dots represent the: (a) Total number of electrons in the atom. (b) Number of protons in the nucleus. (c) Number of valence electrons. (d) Number of neutrons in the atom.

Answer: (c)

137. Atoms tend to form chemical bonds primarily to: (a) Increase their mass and density. (b) Achieve a more stable electron configuration, similar to noble gases. (c) Become electrically neutral, regardless of stability. (d) Reduce their kinetic energy to absolute zero.

Answer: (b)

Topic: Classification of Matter

37. A substance X cannot be broken down into simpler substances by heating, electrolysis, or chemical reactions. It is most likely: (a) A compound (b) An element (c) A homogeneous mixture (d) A heterogeneous mixture

Answer: (b)

Topic: Types of Chemical Reactions

234. When an aqueous solution of sodium iodide is mixed with an aqueous solution of lead(II) nitrate, a precipitate of lead(II) iodide is formed. The other product in this double displacement reaction is: (a) Lead(II) hydroxide (b) Sodium nitrate (c) Iodine gas (d) Sodium sulfide

Answer: N/A

Topic: Subatomic Particles

87. Which of the following statements about subatomic particles is FALSE? a) Protons and neutrons are found in the nucleus. b) Electrons occupy shells or orbitals around the nucleus. c) Neutrons carry a positive charge. d) The nucleus accounts for most of an atom's mass.

Answer: (c)

Topic: Physical and Chemical Properties

46. Which of the following is an example of a physical property? (a) Reactivity with acid (b) Flammability (c) Boiling point (d) Ability to rust

Answer: (c)

Topic: Covalent Bonding

172. When two identical non-metal atoms bond together, what type of bond is formed? (a) Polar covalent bond (b) Non-polar covalent bond (c) Ionic bond (d) Metallic bond

Answer: (b)

174. Why do atoms form covalent bonds? (a) To transfer electrons to become charged ions. (b) To achieve a full outer electron shell, typically an octet. (c) To increase their individual energy levels. (d) To become more reactive with other elements.

Answer: (b)

Topic: Energy in Chemical Reactions

300. The law of conservation of energy states that energy cannot be created or destroyed, only transformed. How does this law apply to energy changes in chemical reactions? a) The total energy of reactants is always less than the total energy of products. b) The heat released or absorbed is a form of energy transformation, where the total energy of the system and surroundings remains constant. c) Energy is always lost as heat during a chemical reaction. d) Chemical energy is converted into mass during reactions.

Answer: (b)

Topic: Isotopes

102. Which statement about the atomic structure of isotopes of the same element is true? a) They have the same number of protons and electrons, but different numbers of neutrons. b) They have the same number of protons and neutrons, but different numbers of electrons. c) They have different numbers of protons, neutrons, and electrons. d) They have the same number of neutrons and electrons, but different numbers of protons.

Answer: (a)

Topic: Basic Periodic Trends

132. The effective nuclear charge experienced by the valence electrons generally increases across a period because: (a) The number of core electrons increases, leading to more repulsion. (b) The number of electron shells increases, increasing distance from the nucleus. (c) The number of protons increases while the number of inner shell electrons remains constant. (d) The total number of electrons increases, causing more electron-electron

repulsion.

Answer: (c)

Topic: Naming Simple Compounds

201. The formula for potassium iodide is: (a) K_2I (b) KI_2 (c) KI (d) $K(I)$

Answer: (c)

Topic:

318. Which statement accurately describes a chemical change? a) Water boiling into steam b) Ice melting into liquid water c) Wood burning to ash and smoke d) Sugar dissolving in water

Answer: (c)

Topic: Chemical Formulas

183. What is the correct chemical formula for sodium chloride? a) $NaCl_2$ b) Na_2Cl c) $NaCl$ d) $Na(Cl)_2$

Answer: (c)

Topic: Ionic Bonding

154. Ionic compounds typically have high melting and boiling points due to: (a) Weak intermolecular forces of attraction. (b) Strong electrostatic forces between oppositely charged ions. (c) The presence of delocalized electrons. (d) Their tendency to sublime at room temperature.

Answer: (b)

Topic: Chemical Formulas

182. How many hydrogen atoms are present in one molecule of ammonia, NH_3 ? a) 1 b) 2 c) 3 d) 4

Answer: (c)

Topic: Balancing Chemical Equations

225. A student balances the equation for the combustion of butane: $\text{C}_4\text{H}_{10} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$. What is the sum of the coefficients of the products (CO_2 and H_2O) in the correctly balanced equation using the smallest whole numbers? (a) 10 (b) 13 (c) 18 (d) 23

Answer: (c)

Topic: States of Matter

23. The spreading out and mixing of a substance with another substance due to the motion of its particles is known as: (a) Osmosis (b) Diffusion (c) Capillarity (d) Sedimentation

Answer: (b)

Topic: The Periodic Table Organization

111. Which block of the periodic table contains elements that are generally characterized by variable oxidation states and colorful compounds? (a) s-block (b) p-block (c) d-block (d) f-block

Answer: (c)

Topic: Physical and Chemical Properties

57. The property of conductivity, which allows electricity to pass through a substance, is primarily a: (a) Chemical property (b) Physical property (c) Reactive property (d) Extensive property

Answer: (b)

Topic: Classification of Matter

31. Which of the following best describes a pure substance? (a) It has variable composition and properties. (b) It can be separated into simpler substances by physical means. (c) It has a fixed chemical composition and distinct properties. (d) It is always a mixture of two or more elements.

Answer: (c)

Topic: Chemical Formulas

185. Which of the following is the correct chemical formula for carbon dioxide? a) CO b) CO₂ c) C₂O d) C₂O₂

Answer: (b)

189. In the chemical formula C₆H₁₂O₆, how many different elements are present? a) 3 b) 6 c) 12 d) 24

Answer: (a)

Topic: Solutions and Solubility

263. Differentiate between a true solution and a suspension based on their physical characteristics.

Answer: (Differentiation)

Topic: Chemical Bonding Introduction

144. Which of the following compounds is primarily held together by covalent bonds? (a) Sodium chloride (NaCl) (b) Magnesium oxide (MgO) (c) Carbon dioxide (CO₂) (d) Calcium fluoride (CaF₂)

Answer: (c)

Topic: Concentration (Qualitative)

276. How does increasing the temperature generally affect the solubility of most solid solutes in a liquid solvent? (a) It decreases solubility. (b) It has no effect on solubility. (c) It increases solubility. (d) It causes precipitation.

Answer: (c)

Topic: The Periodic Table Organization

116. An element belongs to Period 3 and Group 2 of the periodic table. How many valence electrons does it have? (a) 1 (b) 2 (c) 3 (d) 8

Answer: (b)

Topic: Ionic Bonding

163. What is the formula for the ionic compound formed between Magnesium (Mg²⁺) and Sulfate (SO₄²⁻)? (a) MgSO₄ (b) Mg₂SO₄ (c) Mg(SO₄)₂ (d) Mg₂(SO₄)₂

Answer: (a)

Topic: States of Matter

17. According to the kinetic theory of matter, which state has particles with the highest kinetic energy on average at a given temperature? (a) Solid (b) Liquid (c) Gas (d) Plasma

Answer: (c)

Topic: Energy in Chemical Reactions

293. Which statement correctly describes the overall energy change in a chemical reaction? a) Energy is always created or destroyed. b) The energy released from bond formation is always less than the energy absorbed for bond breaking. c) The net energy change is the difference between energy absorbed for breaking bonds and energy released from forming new bonds. d) All chemical reactions absorb energy.

Answer: (c)

Topic: Classification of Matter

32. An element is a substance that: (a) Can be broken down into simpler substances by chemical means. (b) Is composed of two or more different types of atoms chemically bonded together. (c) Consists of only one type of atom and cannot be decomposed by chemical methods. (d) Always exists as a gas at room temperature.

Answer: (c)

Topic: Solutions and Solubility

259. Define the term "saturated solution".

Answer: (Definition)

Topic: Concentration (Qualitative)

272. A solution is formed by dissolving 50g of sugar in 100mL of water at room temperature. Another solution is formed by dissolving 10g of sugar in 100mL of water at the same temperature. Compared to the second solution, the first solution is considered: (a) More dilute (b) Unsaturated (c) More concentrated (d) Less soluble

Answer: (c)

Topic: Balancing Chemical Equations

224. Which of the following represents the correctly balanced decomposition reaction of hydrogen peroxide? (a) $\text{H}_2\text{O}_2 \rightarrow \text{H}_2 + \text{O}_2$ (b) $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$ (c) $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}$ (d) $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2$

Answer: (b)

Topic: Types of Chemical Reactions

240. Rusting of iron, where iron reacts with oxygen and water to form iron oxides, is a slow process that falls under the general category of: (a) Neutralization (b) Oxidation (c) Photodecomposition (d) Saponification

Answer: N/A

226. Which of the following is an example of a combination reaction? (a) $2\text{HgO}(\text{s}) \rightarrow 2\text{Hg}(\text{l}) + \text{O}_2(\text{g})$ (b) $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$ (c) $\text{Zn}(\text{s}) + \text{CuSO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{Cu}(\text{s})$ (d) $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$

Answer: N/A

Topic: Oxidation and Reduction (Basic)

314. When hydrogen sulfide gas (H_2S) burns in air, it produces sulfur dioxide (SO_2) and water (H_2O). $2\text{H}_2\text{S}(\text{g}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{SO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$ In this reaction, which substance is oxidized? a) H_2S b) O_2 c) SO_2 d) H_2O

Answer: (a)

Topic: The Mole Concept

245. What is the mass of 2 moles of sodium chloride (NaCl)? (Atomic masses: $\text{Na}=23$, $\text{Cl}=35.5$) a) 29.25 g b) 58.5 g c) 117 g d) 234 g

Answer: (c)

Topic: States of Matter

24. In which state of matter are the intermolecular forces of attraction strongest? (a) Solid (b) Liquid (c) Gas (d) Plasma

Answer: (a)

Topic: Concentration (Qualitative)

281. When sugar is stirred into water, it dissolves. If you keep adding sugar and stirring, eventually no more sugar dissolves and some solid sugar remains at the bottom. At this point, the solution is best described as: (a) Dilute (b) Unsaturated (c) Supersaturated (d) Saturated

Answer: (d)

Topic: Types of Chemical Reactions

233. According to the activity series, which of the following reactions will occur? (a) $\text{Cu(s)} + \text{ZnSO}_4\text{(aq)} \rightarrow$ (b) $\text{Ag(s)} + \text{KNO}_3\text{(aq)} \rightarrow$ (c) $\text{Mg(s)} + \text{FeSO}_4\text{(aq)} \rightarrow$ (d) $\text{Au(s)} + \text{HCl(aq)} \rightarrow$

Answer: N/A

Topic: The Mole Concept

247. Calculate the molar mass of hydrated copper(II) sulfate, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. (Atomic masses: Cu=63.5, S=32, O=16, H=1) a) 159.5 g/mol b) 185.5 g/mol c) 249.5 g/mol d) 273.5 g/mol

Answer: (c)

Topic: Physical and Chemical Properties

60. A substance is observed to be brittle, has a high melting point, and conducts electricity when molten but not when solid. These characteristics primarily describe: (a) An ionic compound (b) A metallic element (c) A covalent network solid (d) A molecular compound

Answer: (a)

48. Which of these changes represents a physical change? (a) Burning of wood (b) Rusting of iron (c) Melting of ice (d) Digestion of food

Answer: (c)

Topic: Ionic Bonding

151. Which of the following best describes ionic bonding? (a) Sharing of electrons between two non-metal atoms. (b) Transfer of electrons from a metal atom to a non-metal atom. (c) Attraction between positive nuclei and a 'sea' of delocalized electrons. (d) Formation of hydrogen bonds between polar molecules.

Answer: (b)

Topic:

324. Which type of bond involves the transfer of electrons between atoms? a) Covalent bond b) Metallic bond c) Hydrogen bond d) Ionic bond

Answer: (d)

Topic: Covalent Bonding

173. Which of the following molecules contains a triple covalent bond? (a) O₂ (Oxygen gas) (b) H₂O (Water) (c) N₂ (Nitrogen gas) (d) CO₂ (Carbon dioxide)

Answer: (c)

Topic: Chemical Bonding Introduction

143. Consider the elements Potassium (K) and Chlorine (Cl). What type of chemical bond is expected to form between them? (a) Covalent bond, due to sharing of electrons. (b) Ionic bond, due to transfer of electrons. (c) Metallic bond, due to delocalized electrons. (d) Hydrogen bond, due to electrostatic attraction.

Answer: (b)

Topic: The Mole Concept

255. Given the reaction: $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$. If 2 moles of N₂ react, what mass of NH₃ will be produced? (Atomic masses: N=14, H=1) a) 17 g b) 34 g c) 51 g d) 68 g

Answer: (d)

Topic: Energy in Chemical Reactions

289. When chemical bonds are broken during a reaction, which of the following typically occurs? a) Energy is released. b) Energy is absorbed. c) No energy change occurs. d) Energy is converted into matter.

Answer: (b)

Topic:

329. What is the approximate molar mass of water (H₂O)? (Atomic masses: H=1 amu, O=16 amu) a) 17 g/mol b) 18 g/mol c) 32 g/mol d) 34 g/mol

Answer: (b)

Topic: Solutions and Solubility

266. Which of the following is a characteristic of a true solution? (a) Its particles scatter a beam of light. (b) Its particles settle down on standing. (c) It is transparent and does not scatter light. (d) Its components can be separated by simple filtration.

Answer: (c)

Topic:

327. When the equation $\text{Al} + \text{O}_2 \rightarrow \text{Al}_2\text{O}_3$ is balanced, what is the coefficient for Al? a) 1 b) 2 c) 3 d) 4

Answer: (d)

Topic: The Periodic Table Organization

107. Elements in the same period of the periodic table share which of the following characteristics? (a) The same number of valence electrons (b) Similar chemical properties (c) The same number of electron shells (d) The same physical state at room temperature

Answer: (c)

Topic: Physical and Chemical Properties

54. Which statement is true regarding chemical properties? (a) They can be observed without changing the substance's composition. (b) They describe how a substance interacts with energy. (c) They are measured only at high temperatures. (d) They describe a substance's potential to undergo chemical reactions.

Answer: (d)

Topic: States of Matter

25. A state of matter that consists of super-energetic and super-excited particles, often found in stars and lightning, is called: (a) Liquid (b) Gas (c) Bose-Einstein Condensate (d) Plasma

Answer: (d)

Topic: Atomic Structure

65. What is the maximum number of electrons that can occupy the first electron shell ($n=1$)? (a) 2 (b) 8 (c) 18 (d) 32

Answer: (a)

Topic: Solutions and Solubility

262. For most solid solutes, what happens to their solubility in a liquid solvent as the temperature of the solvent increases? (a) It decreases (b) It increases (c) It remains unchanged (d) It first decreases then increases

Answer: (b)

Topic: Chemical Formulas

186. What is the chemical formula for calcium carbonate? (Calcium ion is Ca^{2+} , Carbonate ion is CO_3^{2-}) a) CaCO_3 b) $\text{Ca}(\text{CO}_3)_2$ c) Ca_2CO_3 d) CaCO_2

Answer: (a)

Topic: Introduction to Chemistry

2. An atom of an element has 6 protons, 6 neutrons, and 6 electrons. What is its atomic mass number? (a) 6 (b) 12 (c) 18 (d) It cannot be determined from the given information.

Answer: (b)

Topic: The Periodic Table Organization

109. An element is found to be a good conductor of heat and electricity, ductile, and malleable. It reacts vigorously with water to produce hydrogen gas. To which class of elements does it most likely belong? (a) Non-metals (b) Metalloids (c) Alkali metals (d) Noble gases

Answer: (c)

Topic: Chemical Formulas

192. What is the correct name for the compound N_2O_5 ? a) Dinitrogen pentoxide b) Nitrogen oxide c) Dinitrogen oxide d) Pentanitrogen dioxide

Answer: (a)

Topic: Atomic Structure

64. Isotopes are atoms of the same element that differ in their: (a) Number of protons (b) Number of electrons (c) Number of neutrons (d) Atomic number

Answer: (c)

Topic: Covalent Bonding

180. Which of the following statements about valence electrons in covalent bonding is correct? (a) Valence electrons are transferred from one atom to another. (b) Valence electrons are shared equally between all atoms in a molecule. (c) Valence electrons are involved in the formation of shared pairs between atoms. (d) Valence electrons become delocalized and form a 'sea' around positive ions.

Answer: (c)

Topic: States of Matter

20. Which state of matter is highly compressible due to large intermolecular spaces? (a) Solid (b) Liquid (c) Gas (d) Both liquid and gas

Answer: (c)

Topic: Oxidation and Reduction (Basic)

306. In the reaction: $\text{CuO(s)} + \text{H}_2\text{(g)} \rightarrow \text{Cu(s)} + \text{H}_2\text{O(l)}$, which substance undergoes reduction? a) CuO b) H_2 c) Cu d) H_2O

Answer: (a)

Topic: Energy in Chemical Reactions

296. A reaction profile diagram shows the energy of reactants and products. For an exothermic reaction, how would the energy level of the products compare to the reactants on such a diagram? a) Products would be at a higher energy level. b) Products would be at a lower energy level. c) Products and reactants would be at the same energy level. d) The diagram would only show activation energy.

Answer: (b)

Topic: Solutions and Solubility

268. What effect does decreasing the partial pressure of a gas above a liquid have on the solubility of that gas in the liquid?

Answer: (Explanation)

Topic: Subatomic Particles

89. The discovery of the electron is famously attributed to: a) Ernest Rutherford b) Niels Bohr c) J.J. Thomson d) James Chadwick

Answer: (c)

Topic: Physical and Chemical Properties

47. What type of property describes a substance's ability to undergo a chemical reaction to form new substances? (a) Physical property (b) Chemical property (c) Intensive property (d) Extensive property

Answer: (b)

Topic: Isotopes

99. Deuterium ($2/1\text{ H}$) and Protium ($1/1\text{ H}$) are isotopes of hydrogen. How many neutrons does Deuterium have?
a) 0 b) 1 c) 2 d) 3

Answer: (b)

Topic: Types of Chemical Reactions

231. When magnesium metal reacts with oxygen gas, the product formed is magnesium oxide. This reaction type is: (a) Decomposition (b) Combination (c) Single displacement (d) Double displacement

Answer: N/A

Topic: Chemical Formulas

191. An element X from Group 13 forms a compound with an element Y from Group 17. What is the most likely chemical formula for this compound? a) XY b) X_2Y c) XY_3 d) X_3Y

Answer: (c)

Topic: The Mole Concept

254. In the balanced chemical equation: $2H_2 + O_2 \rightarrow 2H_2O$, how many moles of oxygen are needed to react completely with 4 moles of hydrogen? a) 1 mole b) 2 moles c) 3 moles d) 4 moles

Answer: (b)

Topic: Types of Chemical Reactions

227. The decomposition of potassium chlorate ($KClO_3$) into potassium chloride (KCl) and oxygen gas (O_2) is represented by which of the following equations? (a) $KClO_3(s) + O_2(g) \rightarrow KCl(s) + 2O_2(g)$ (b) $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$ (c) $KCl(s) + 3O_2(g) \rightarrow KClO_3(s)$ (d) $2KClO_3(s) \rightarrow 2KCl(s) + O_2(g)$

Answer: N/A

Topic: States of Matter

29. If the kinetic energy of particles in a substance decreases significantly, what is the most likely phase change to occur? (a) Melting (b) Evaporation (c) Freezing (d) Sublimation

Answer: (c)

Topic: Concentration (Qualitative)

282. Which of the following statements is true regarding the solubility of gases in liquids? (a) Solubility of gases generally increases with increasing temperature. (b) Solubility of gases generally decreases with increasing temperature. (c) Temperature has no significant effect on gas solubility. (d) Solubility of gases is independent of pressure.

Answer: (b)

278. Which of the following is an example of increasing the dilution of a solution? (a) Adding more solute to the solution. (b) Evaporating some solvent from the solution. (c) Adding more solvent to the solution. (d) Cooling the solution to decrease solubility.

Answer: (c)

Topic: Energy in Chemical Reactions

299. In many industrial processes, catalysts are used to speed up chemical reactions. Catalysts achieve this by: a) Increasing the overall energy change of the reaction. b) Decreasing the activation energy of the reaction. c) Making the reaction more endothermic. d) Providing more energy to the reactants.

Answer: (b)

Topic: States of Matter

18. The process by which a solid directly changes into a gas without passing through the liquid state is called: (a) Condensation (b) Evaporation (c) Sublimation (d) Freezing

Answer: (c)

Topic: Oxidation and Reduction (Basic)

310. Rusting of iron is an example of a redox reaction. In this process, iron is: a) Reduced by oxygen b) Oxidized by oxygen c) Reduced by water d) Oxidized by hydrogen

Answer: (b)

Topic: Naming Simple Compounds

207. Which of the following names clearly indicates a covalent compound? (a) Calcium chloride (b) Iron (III) oxide (c) Dihydrogen monoxide (d) Potassium nitrate

Answer: (c)

Topic: Chemical Formulas

184. Magnesium belongs to Group 2 and Oxygen belongs to Group 16 of the periodic table. What is the chemical formula for magnesium oxide? a) MgO_2 b) Mg_2O c) MgO d) $\text{Mg}(\text{OH})_2$

Answer: (c)

Topic:

321. Isotopes of an element have the same number of: a) Neutrons but different numbers of protons b) Protons but different numbers of neutrons c) Electrons but different numbers of protons d) Protons and neutrons

Answer: (b)

Topic: Types of Chemical Reactions

229. When aqueous solutions of silver nitrate and sodium chloride are mixed, a white precipitate of silver chloride is formed. This is an example of a: (a) Single displacement reaction (b) Neutralization reaction (c) Combustion reaction (d) Double displacement reaction

Answer: N/A

Topic:

319. The nucleus of an atom contains: a) Protons and electrons b) Neutrons and electrons c) Protons and neutrons d) Protons, neutrons, and electrons

Answer: (c)

Topic: Subatomic Particles

76. Which of the following is considered a fundamental subatomic particle found in all atoms (excluding hydrogen-1's nucleus)? a) Alpha particle b) Photon c) Neutron d) Deuteron

Answer: (c)

Topic: Isotopes

98. The notation $(A/Z)X$ is used to represent an atom, where X is the element symbol, A is the mass number, and Z is the atomic number. For isotopes, which values would typically change? a) Only Z. b) Only A. c) Both A and Z. d) Neither A nor Z.

Answer: (b)

Topic: Solutions and Solubility

261. Explain the principle "like dissolves like" in the context of solutions.

Answer: (Explanation)

Topic: The Periodic Table Organization

112. An element has an atomic number of 18. Based on its position in the periodic table, what can be predicted about its reactivity? (a) It is highly reactive and forms ionic compounds. (b) It is moderately reactive and forms covalent compounds. (c) It is unreactive and does not readily form compounds. (d) It is highly reactive and forms acidic oxides.

Answer: (c)

Topic: States of Matter

21. Naphthalene balls disappear over time without leaving any residue. This phenomenon is an example of: (a) Melting (b) Condensation (c) Evaporation (d) Sublimation

Answer: (d)

Topic: Naming Simple Compounds

204. The systematic name for H_2SO_4 is: (a) Hydrosulfuric acid (b) Sulfurous acid (c) Sulfuric acid (d) Hydrogen sulfate

Answer: (c)

Topic: Chemical Bonding Introduction

147. A molecule of oxygen (O_2) is formed when two oxygen atoms share two pairs of electrons. This type of bond is known as a: (a) Single covalent bond. (b) Double covalent bond. (c) Triple covalent bond. (d) Ionic bond.

Answer: (b)

Topic: Chemical Formulas

188. What is the correct chemical formula for iron(III) oxide? a) FeO b) Fe_2O_3 c) Fe_3O_2 d) FeO_3

Answer: (b)

Topic: States of Matter

19. What effect does increasing the temperature typically have on the rate of evaporation of a liquid? (a) It decreases the rate of evaporation. (b) It increases the rate of evaporation. (c) It has no effect on the rate of evaporation. (d) It first decreases, then increases the rate of evaporation.

Answer: (b)

Topic: Covalent Bonding

169. Carbon dioxide (CO_2) is an example of a molecule containing which type of covalent bond(s)? (a) Only single bonds (b) Only double bonds (c) Both single and double bonds (d) One triple bond

Answer: (b)

Topic: Isotopes

94. Carbon-12 and Carbon-14 are isotopes of carbon. What is the difference between these two atoms? a) Carbon-14 has two more protons than Carbon-12. b) Carbon-14 has two more electrons than Carbon-12. c) Carbon-14 has two more neutrons than Carbon-12. d) Carbon-12 has two more neutrons than Carbon-14.

Answer: (c)

Topic: Introduction to Chemistry

1. Which of the following is a physical property of matter? (a) Flammability (b) Reactivity with acid (c) Density (d) Ability to rust

Answer: (c)

Topic: The Periodic Table Organization

114. Which statement accurately describes the metallic character of elements across a period from left to right? (a) Metallic character increases. (b) Metallic character decreases. (c) Metallic character remains constant. (d) Metallic character increases, then decreases.

Answer: (b)

Topic: Ionic Bonding

164. The overall process of forming an ionic bond involves the release of energy, mainly due to the formation of the crystal lattice. This energy is known as: (a) Ionization energy (b) Electron affinity (c) Lattice energy (d) Bond dissociation energy

Answer: (c)

Topic: Introduction to Chemistry

13. Balance the following chemical equation: $\text{N}_2 (\text{g}) + \text{H}_2 (\text{g}) \longrightarrow \text{NH}_3 (\text{g})$

Answer: $\text{N}_2 (\text{g}) + 3\text{H}_2 (\text{g}) \longrightarrow 2\text{NH}_3 (\text{g})$

Topic: The Periodic Table Organization

120. How many electron shells does an element in Period 5 of the periodic table possess? (a) 1 (b) 3 (c) 5 (d) 7

Answer: (c)

Topic: Ionic Bonding

159. The repeating arrangement of positive and negative ions in an ionic compound is known as a: (a) Molecular lattice (b) Metallic lattice (c) Covalent network (d) Crystal lattice

Answer: (d)

Topic: Classification of Matter

43. A student mixes sand and water in a beaker. This combination represents a: (a) Homogeneous mixture (b) Solution (c) Compound (d) Heterogeneous mixture

Answer: (d)

Topic: The Periodic Table Organization

118. Which of the following elements is a metalloid, exhibiting properties of both metals and non-metals? (a) Sodium (Na) (b) Silicon (Si) (c) Oxygen (O) (d) Neon (Ne)

Answer: (b)

Topic: Subatomic Particles

80. In a neutral atom, the number of electrons is always equal to the number of which subatomic particle? a) Neutrons b) Protons c) Quarks d) Isotopes

Answer: (b)

Topic: Oxidation and Reduction (Basic)

304. A substance is said to be reduced if it: a) Gains oxygen b) Loses hydrogen c) Loses electrons d) Gains electrons

Answer: (d)

Topic: Ionic Bonding

161. The strength of an ionic bond is primarily dependent on: (a) The size of the atoms involved only. (b) The number of valence electrons only. (c) The charge of the ions and the distance between their nuclei. (d) The electronegativity difference between identical atoms.

Answer: (c)

Topic: Concentration (Qualitative)

279. The term "concentration" in chemistry qualitatively refers to the: (a) Mass of the solvent. (b) Volume of the solution. (c) Amount of solute dissolved in a given amount of solvent or solution. (d) Purity of the solvent.

Answer: (c)

Topic: The Periodic Table Organization

113. As you move down a group in the periodic table, what generally happens to the atomic radius? (a) It decreases due to increased nuclear charge. (b) It increases due to the addition of new electron shells. (c) It remains constant as the number of valence electrons is the same. (d) It varies unpredictably due to differing isotopes.

Answer: (b)

Topic: Physical and Chemical Properties

53. The process of evaporating water from a salt solution to obtain pure salt relies on which type of property difference? (a) Chemical properties (b) Intensive chemical properties (c) Physical properties (d) Reactivity properties

Answer: (c)

Topic: Basic Periodic Trends

126. Which of the following elements is expected to have the highest electronegativity? (a) Cesium (Cs) (b) Fluorine (F) (c) Oxygen (O) (d) Nitrogen (N)

Answer: (b)

Topic: Classification of Matter

36. Which of the following is a heterogeneous mixture? (a) Sugar dissolved in water (b) Salt dissolved in water (c) Milk (d) Brass (an alloy of copper and zinc)

Answer: (c)

Topic: Energy in Chemical Reactions

288. Which of the following is an example of an endothermic process? a) Burning of wood b) Neutralization of an acid by a base c) Melting of ice d) Respiration in living organisms

Answer: (c)

Topic: Solutions and Solubility

269. Explain why oil and water do not mix to form a homogeneous solution.

Answer: (Explanation)

Topic: Balancing Chemical Equations

217. Which of the following chemical equations is already balanced? (a) $\text{C}_2\text{H}_6 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ (b) $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ (c) $\text{KClO}_3 \rightarrow \text{KCl} + \text{O}_2$ (d) $\text{H}_2\text{SO}_4 + \text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$

Answer: (b)

Topic: Chemical Bonding Introduction

150. Which noble gas configuration is achieved by the fluoride ion (F^-) in an ionic compound? (a) Helium configuration (b) Neon configuration (c) Argon configuration (d) Krypton configuration

Answer: (b)

Topic: Atomic Structure

75. The nucleus of an atom contains: (a) Protons and electrons (b) Neutrons and electrons (c) Protons and neutrons (d) Protons, neutrons, and electrons

Answer: (c)

Topic: Isotopes

97. How are isotopes of an element represented on the periodic table? a) Each isotope has its own unique box on the periodic table. b) Only the most abundant isotope is represented. c) All isotopes are grouped together in one box, represented by the average atomic mass. d) Isotopes are listed as sub-entries under the main element.

Answer: (c)

Topic: The Periodic Table Organization

110. The elements Fluorine (F), Chlorine (Cl), Bromine (Br), and Iodine (I) are all found in the same group on the periodic table. Which property do they most likely share? (a) They are all gases at room temperature. (b) They tend to form positive ions in reactions. (c) They have seven valence electrons. (d) They are unreactive.

Answer: (c)

Topic: Basic Periodic Trends

133. When comparing the reactivity of metals in Group 1 of the periodic table, what trend is observed as you move down the group? (a) Reactivity decreases because atomic size increases, making it harder to lose electrons. (b) Reactivity increases because atomic size increases, making it easier to lose electrons. (c) Reactivity decreases because ionization energy increases. (d) Reactivity remains constant as they all have one valence electron.

Answer: (b)

Topic: Balancing Chemical Equations

222. When aluminum (Al) reacts with copper(II) chloride (CuCl_2) to produce aluminum chloride (AlCl_3) and copper (Cu), the balanced equation shows that for every 2 moles of aluminum, how many moles of copper are produced? (a) 1 (b) 2 (c) 3 (d) 4

Answer: (c)

Topic: Physical and Chemical Properties

58. Which of the following physical properties would be most useful for separating a mixture of sand and iron filings? (a) Density (b) Color (c) Magnetism (d) Solubility

Answer: (c)

Topic: Chemical Bonding Introduction

139. An atom of sodium (Na) with 1 valence electron is most likely to form a chemical bond by: (a) Gaining seven electrons to achieve a stable octet. (b) Sharing its one electron with another atom. (c) Losing its one valence electron to achieve a stable octet. (d) Accepting a proton to balance its charge.

Answer: (c)

Topic: The Periodic Table Organization

117. Elements that are considered "transition metals" are found in which part of the periodic table? (a) The far left (Groups 1 and 2) (b) The far right (Groups 17 and 18) (c) The middle section (Groups 3-12) (d) The bottom two rows (Lanthanides and Actinides)

Answer: (c)

Topic: Oxidation and Reduction (Basic)

301. Which of the following best describes the process of oxidation in terms of oxygen transfer? a) Removal of oxygen b) Addition of oxygen c) Addition of hydrogen d) Removal of electrons

Answer: (b)

Topic: Classification of Matter

40. In an element, all atoms present: (a) Must have the same number of neutrons. (b) Have the same atomic number (number of protons). (c) Are always chemically bonded to each other. (d) Can be separated by simple physical means.

Answer: (b)

Topic: Concentration (Qualitative)

273. If you add a tiny crystal of solute to an unknown solution and it dissolves immediately, the original solution was most likely: (a) Saturated (b) Supersaturated (c) Unsaturated (d) Precipitated

Answer: (c)

Topic: Covalent Bonding

168. Which of the following is a general property of most simple covalent compounds? (a) High melting and boiling points (b) Good electrical conductivity in solid state (c) Low melting and boiling points (d) Soluble in all polar and non-polar solvents

Answer: (c)

Topic: Chemical Formulas

181. Which of the following represents a chemical formula? a) 2H b) H₂O c) O + O d) Air

Answer: (b)

Topic: Oxidation and Reduction (Basic)

312. In the reaction $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$, which substance is the reducing agent? a) Fe₂O₃ b) CO c) Fe d) CO₂

Answer: (b)

Topic: Isotopes

105. Considering the definition of isotopes, what can be concluded about their position on the Periodic Table? a) Each isotope occupies a separate position on the Periodic Table. b) Isotopes of an element are represented together in the same position on the Periodic Table. c) Only the most abundant isotope of an element is shown on the Periodic Table. d) Isotopes are not represented on the Periodic Table at all.

Answer: (b)

Topic: Introduction to Chemistry

8. Isotopes of the same element have the same number of protons but different numbers of neutrons. Section: Fill-in-the-Blank Questions

Answer: True

Topic: Subatomic Particles

77. What is the approximate relative mass of an electron compared to a proton? a) About 1 times the mass of a proton b) About 1836 times the mass of a proton c) About 1/1836 times the mass of a proton d) Negligible,

effectively zero

Answer: (c)

Topic: Atomic Structure

70. The atomic number of Carbon is 6. How many valence electrons does a neutral Carbon atom have? (a) 2 (b) 4 (c) 6 (d) 8

Answer: (b)

Topic: Isotopes

100. A common application of radioactive isotopes is in: a) Enhancing the strength of materials. b) Sterilizing medical equipment and tracing biological pathways. c) Changing the color of plastics. d) Increasing the boiling point of water.

Answer: (b)

Topic: Subatomic Particles

83. An atom has 17 protons, 18 neutrons, and 17 electrons. What is its mass number? a) 17 b) 18 c) 34 d) 35

Answer: (d)

Topic: Energy in Chemical Reactions

287. In an endothermic reaction, which of the following is true regarding the energy of the products and reactants? a) The products have lower energy than the reactants. b) The products have higher energy than the reactants. c) The products and reactants have equal energy. d) The energy change depends solely on the activation energy.

Answer: (b)

Topic: Ionic Bonding

165. How many electrons are transferred when one atom of potassium (K) reacts with one atom of bromine (Br) to form potassium bromide (KBr)? (a) 1 electron is transferred from Br to K. (b) 2 electrons are transferred from K to Br. (c) 1 electron is transferred from K to Br. (d) No electrons are transferred, they are shared.

Answer: (c)

Topic: Classification of Matter

45. A sample of matter is found to have varying density throughout and different parts can be seen with the naked eye. This sample is most likely a: (a) Pure element (b) Pure compound (c) Homogeneous mixture (d) Heterogeneous mixture

Answer: (d)

Topic: Ionic Bonding

162. Ionic compounds are generally soluble in: (a) Non-polar solvents like hexane. (b) Polar solvents like water. (c) Metallic solvents like mercury. (d) All types of solvents.

Answer: (b)

Topic: Atomic Structure

67. An atom of an element has an atomic number of 9 and a mass number of 19. How many neutrons does this atom contain? (a) 9 (b) 10 (c) 19 (d) 28

Answer: (b)

Topic: Types of Chemical Reactions

235. A chemical reaction that absorbs heat from its surroundings is classified as: (a) Exothermic (b) Combustion (c) Endothermic (d) Redox

Answer: N/A

232. Barium carbonate (BaCO_3) decomposes upon heating to form barium oxide (BaO) and carbon dioxide (CO_2). This is a: (a) Synthesis reaction (b) Displacement reaction (c) Decomposition reaction (d) Neutralization reaction

Answer: N/A

Topic: Ionic Bonding

160. Which pair of elements would most readily form an ionic bond? (a) Carbon and Oxygen (b) Nitrogen and Hydrogen (c) Sodium and Chlorine (d) Silicon and Fluorine

Answer: (c)

Topic: Atomic Structure

72. Which element is represented by an atom with 20 protons? (a) Neon (Ne) (b) Calcium (Ca) (c) Argon (Ar) (d) Potassium (K)

Answer: (b)

Topic: Classification of Matter

42. Which statement accurately differentiates between a mixture and a compound? (a) Mixtures are always heterogeneous, while compounds are always homogeneous. (b) The components of a mixture retain their individual properties, while a compound has new properties. (c) Compounds can be separated by physical means, but mixtures require chemical means. (d) Mixtures have a fixed boiling point, while compounds have a range of boiling points.

Answer: (b)

Topic: Introduction to Chemistry

9. An atom that gains electrons becomes a negatively charged ion called a(n) _____.

Answer: anion

Topic: Naming Simple Compounds

198. The chemical name for $\text{Ca}(\text{NO}_3)_2$ is: (a) Calcium dinitrate (b) Calcium nitrate (c) Calcium nitrogen trioxide (d) Calcium nitrite

Answer: (b)

Topic: Energy in Chemical Reactions

297. Which of the following physical changes involves the absorption of energy? a) Condensation of water vapor b) Freezing of water c) Sublimation of dry ice d) Burning of a candle

Answer: (c)

Topic: Balancing Chemical Equations

212. Consider the unbalanced equation: $\text{H}_2 + \text{Cl}_2 \rightarrow \text{HCl}$. What is the sum of the smallest whole number coefficients after balancing this equation? (a) 3 (b) 4 (c) 2 (d) 5

Answer: (b)

Topic: Subatomic Particles

84. Two atoms are isotopes of the same element if they have the same number of: a) Protons and neutrons b) Protons but different numbers of neutrons c) Neutrons but different numbers of protons d) Electrons and protons

Answer: (b)

Topic: Classification of Matter

41. When atoms combine to form a compound, they do so: (a) In variable ratios, retaining their individual properties. (b) In fixed ratios by mass, forming new substances with new properties. (c) Through simple mixing, without any chemical change. (d) By losing their electrons completely to become ions.

Answer: (b)

Topic: The Periodic Table Organization

108. Which of the following groups of elements primarily contains metals? (a) Group 17 (Halogens) (b) Group 18 (Noble Gases) (c) Group 1 (Alkali Metals) (d) Group 14 (Carbon Group)

Answer: (c)

Topic: Basic Periodic Trends

125. Electronegativity is a measure of an atom's ability to attract shared electrons in a chemical bond. Which of the following statements is true regarding electronegativity trends? (a) It generally decreases across a period and increases down a group. (b) It generally increases across a period and increases down a group. (c) It generally increases across a period and decreases down a group. (d) It generally decreases across a period and decreases down a group.

Answer: (c)

Topic: Physical and Chemical Properties

59. Gold is known to be unreactive with most common acids. This describes gold's: (a) Malleability (b) Ductility (c) Chemical inertness (d) High density

Answer: (c)

Topic: Covalent Bonding

178. What is the maximum number of covalent bonds a single carbon atom can typically form according to the octet rule? (a) 1 (b) 2 (c) 3 (d) 4

Answer: (d)

Topic: Atomic Structure

68. When an atom loses an electron, it forms a: (a) Cation (b) Anion (c) Isotope (d) Neutral atom

Answer: (a)

Topic: Introduction to Chemistry

4. The chemical formula for sodium carbonate is Na_2CO_3 . What is the total number of atoms in one formula unit of sodium carbonate? (a) 3 (b) 4 (c) 5 (d) 6

Answer: (d)

Topic: Subatomic Particles

86. An atom becomes a positive ion (cation) when it: a) Gains protons b) Loses electrons c) Gains neutrons d) Loses protons

Answer: (b)

Topic: Balancing Chemical Equations

211. Which law forms the fundamental basis for balancing chemical equations? (a) Law of Multiple Proportions (b) Law of Conservation of Energy (c) Law of Conservation of Mass (d) Law of Definite Proportions

Answer: (c)

Topic: Introduction to Chemistry

6. A liquid has a definite volume but an indefinite shape.

Answer: True

Topic: Naming Simple Compounds

211. What is the name of the compound $\text{Al}(\text{OH})_3$? (a) Aluminum hydroxide (b) Aluminum (III) hydroxide (c) Trialuminum hydroxide (d) Aluminum trihydroxide

Answer: (a)

Topic: Ionic Bonding

152. When a sodium atom (Na) forms an ionic bond, it typically: (a) Gains one electron to become Na^- . (b) Loses one electron to become Na^+ . (c) Gains two electrons to become Na^{2-} . (d) Shares electrons with another atom.

Answer: (b)

Topic: Covalent Bonding

177. A molecule like HCl (hydrogen chloride) has a bond where electrons are shared unequally. This type of bond is called a: (a) Pure covalent bond (b) Non-polar covalent bond (c) Polar covalent bond (d) Ionic bond

Answer: (c)

Topic: Basic Periodic Trends

129. Non-metallic character is associated with the tendency to gain electrons. What is the general trend for non-metallic character down a group in the periodic table? (a) It increases. (b) It decreases. (c) It remains

constant. (d) It first decreases then increases.

Answer: (b)

Topic: Introduction to Chemistry

3. Which of the following is an example of a homogeneous mixture? (a) Sand and water (b) Oil and vinegar (c) Salt dissolved in water (d) Blood

Answer: (c)

Topic: Solutions and Solubility

267. Give one common example of a solid-solid solution.

Answer: (Example)

Topic: The Mole Concept

249. What is the number of molecules in 28 grams of nitrogen gas (N_2)? (Atomic mass: $N=14$) a) 6.022×10^{23} molecules b) 3.011×10^{23} molecules c) 1.2044×10^{24} molecules d) 14 molecules

Answer: (a)

Topic: Oxidation and Reduction (Basic)

313. Which of the following statements is INCORRECT? a) Oxidation involves loss of electrons. b) Reduction involves gain of electrons. c) An oxidizing agent is itself reduced. d) A reducing agent is itself reduced.

Answer: (d)

Topic: Balancing Chemical Equations

220. What is the total number of oxygen atoms present on the product side of the unbalanced equation: $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O$? (a) 2 (b) 3 (c) 4 (d) 5

Answer: (b)

Topic: The Periodic Table Organization

106. Which of the following statements best describes the primary basis for the arrangement of elements in the modern periodic table? (a) Increasing atomic mass (b) Increasing number of neutrons (c) Increasing atomic number (d) Increasing number of isotopes

Answer: (c)

Topic: Chemical Formulas

187. The formula for aluminum sulfate is: (Aluminum ion is Al^{3+} , Sulfate ion is SO_4^{2-}) a) AlSO_4 b) $\text{Al}_2(\text{SO}_4)_3$ c) Al_3SO_4 d) $\text{Al}(\text{SO}_4)_2$

Answer: (b)

Topic: The Mole Concept

243. How many molecules are present in 0.5 moles of carbon dioxide (CO_2)? a) 3.011×10^{23} molecules b) 6.022×10^{23} molecules c) 1.204×10^{24} molecules d) 0.5 molecules

Answer: (a)

Topic: Basic Periodic Trends

121. Which of the following statements correctly describes the trend in atomic radius across a period from left to right in the periodic table? (a) It generally increases due to increasing effective nuclear charge. (b) It generally decreases due to increasing effective nuclear charge. (c) It generally increases due to increasing number of electron shells. (d) It generally decreases due to increasing number of electron shells.

Answer: (b)

Topic: Balancing Chemical Equations

221. If the coefficient of potassium nitrate (KNO_3) in the balanced decomposition reaction of potassium nitrate ($\text{KNO}_3 \rightarrow \text{KNO}_2 + \text{O}_2$) is 2, what is the coefficient for oxygen (O_2)? (a) 1 (b) 2 (c) 3 (d) 4

Answer: (a)

Topic: Solutions and Solubility

256. A solution is best described as: (a) A pure substance (b) A heterogeneous mixture (c) A homogeneous mixture (d) A compound

Answer: (c)

Topic: Classification of Matter

39. Air is best classified as a/an: (a) Element (b) Compound (c) Homogeneous mixture (d) Heterogeneous mixture

Answer: (c)

Topic: Atomic Structure

63. An atom has 15 protons, 16 neutrons, and 15 electrons. What is its mass number? (a) 15 (b) 16 (c) 30 (d) 31

Answer: (d)

Topic: Energy in Chemical Reactions

291. A chemical reaction feels warm to the touch. This indicates that the reaction: a) Absorbs heat from your hand, making it feel cool. b) Releases heat to your hand, making it feel warm. c) Converts chemical energy into light energy. d) Has a very high activation energy.

Answer: (b)

286. Which statement best describes an exothermic reaction? a) A reaction that absorbs heat from its surroundings. b) A reaction that releases heat to its surroundings. c) A reaction that requires light energy to proceed. d) A reaction that only occurs at high temperatures.

Answer: (b)

Topic: Solutions and Solubility

260. Which of the following is an example of a gas dissolved in a liquid solution? (a) Air (b) Brass (c) Carbonated soft drink (d) Fog

Answer: (c)

Topic: Subatomic Particles

90. An atom of oxygen-18 (^{18}O) differs from an atom of oxygen-16 (^{16}O) primarily in its number of: a) Protons b) Electrons c) Neutrons d) Positrons

Answer: (c)

Topic: Introduction to Chemistry

15. Identify whether the following reaction involves oxidation and reduction: $\text{Zn (s)} + \text{CuSO}_4 \text{ (aq)} \longrightarrow \text{ZnSO}_4 \text{ (aq)} + \text{Cu (s)}$ Justify your answer by explaining what happens to the oxidation state of Zn and Cu.

Answer: Yes. Zn is oxidized (0 to +2); Cu is reduced (+2 to 0).

Topic: The Mole Concept

252. What is the percentage by mass of oxygen in potassium permanganate (KMnO_4)? (Atomic masses: K=39, Mn=55, O=16) a) 25.3% b) 31.6% c) 40.5% d) 63.2%

Answer: (c)

Topic: Physical and Chemical Properties

55. Density is a physical property defined as mass per unit volume. How does density help distinguish between different substances? (a) It changes a substance's chemical composition. (b) It indicates a substance's reactivity. (c) It is a unique characteristic for pure substances at constant conditions. (d) It depends on the amount of substance present.

Answer: (c)

Topic:

322. Elements in the same group (vertical column) of the periodic table typically have: a) The same number of protons b) Similar chemical properties c) The same atomic mass d) Similar physical states at room temperature

Answer: (b)

Topic: Concentration (Qualitative)

283. If you have 50 mL of a concentrated sulfuric acid solution and you want to make it less hazardous to handle, you should: (a) Add more sulfuric acid to it. (b) Evaporate some water from it. (c) Slowly and carefully add water to it while stirring. (d) Cool the solution to a very low temperature.

Answer: (c)

Topic: Subatomic Particles

85. Which subatomic particle is negatively charged and orbits the nucleus? a) Proton b) Neutron c) Electron d) Positron

Answer: (c)

Topic: The Periodic Table Organization

115. Which scientist is credited with organizing the first widely accepted periodic table, leaving gaps for undiscovered elements and predicting their properties? (a) John Dalton (b) J.J. Thomson (c) Dmitri Mendeleev (d) Ernest Rutherford

Answer: (c)

Topic: Chemical Formulas

195. What is the chemical formula for ammonium phosphate? (Ammonium ion is NH_4^+ , Phosphate ion is PO_4^{3-})
a) NH_4PO_4 b) $(\text{NH}_4)_3\text{PO}_4$ c) $\text{NH}_4(\text{PO}_4)_3$ d) $(\text{NH}_4)_2\text{PO}_4$

Answer: (b)

Topic: States of Matter

28. The energy required to change a unit mass of a substance from liquid to gas at its boiling point without any change in temperature is called: (a) Specific heat capacity (b) Latent heat of fusion (c) Latent heat of vaporization (d) Heat of combustion

Answer: (c)

Topic: Naming Simple Compounds

197. Choose the correct name for the compound N_2O_4 . (a) Nitrogen oxide (b) Dinitrogen tetroxide (c) Dinitrogen tetraoxide (d) Nitrogen tetroxide

Answer: (b)

Topic: Isotopes

91. What are isotopes? a) Atoms of the same element with different numbers of protons. b) Atoms of different elements with the same number of neutrons. c) Atoms of the same element with different numbers of neutrons. d) Atoms of different elements with the same mass number.

Answer: (c)

Topic: Subatomic Particles

81. An element's identity is uniquely determined by the number of its: a) Neutrons b) Electrons c) Protons d) Valence electrons

Answer: (c)

Topic: Balancing Chemical Equations

218. When magnesium metal reacts with oxygen gas to form solid magnesium oxide, the correctly balanced chemical equation is: (a) $\text{Mg} + \text{O} \rightarrow \text{MgO}$ (b) $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ (c) $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}_2$ (d) $\text{Mg} + 2\text{O} \rightarrow \text{MgO}$

Answer: (b)

Topic: Isotopes

104. Which of the following is true regarding the physical properties of isotopes? a) Physical properties such as density and boiling point are identical for all isotopes. b) Physical properties can vary slightly due to differences in mass. c) Physical properties are only affected by the number of electrons. d) Physical properties are solely determined by the atomic number.

Answer: (b)

Topic: Naming Simple Compounds

210. The correct formula for Chromium (III) carbonate is: (a) CrCO_3 (b) $\text{Cr}_3(\text{CO}_3)_2$ (c) $\text{Cr}_2(\text{CO}_3)_3$ (d) $\text{Cr}(\text{CO}_3)_3$

Answer: (c)

Topic: Physical and Chemical Properties

50. Which of the following is NOT considered a physical property of matter? (a) Color (b) Density (c) Hardness (d) Corrosiveness

Answer: (d)

Topic: Isotopes

92. Which statement correctly describes isotopes of the same element? a) They have the same mass number but different atomic numbers. b) They have the same number of protons but different numbers of neutrons. c) They have different numbers of protons and different numbers of electrons. d) They have different atomic numbers but the same number of neutrons.

Answer: (b)

Topic: The Mole Concept

246. How many moles are present in 49 grams of sulfuric acid (H_2SO_4)? (Atomic masses: H=1, S=32, O=16) a) 0.25 mol b) 0.5 mol c) 1 mol d) 2 mol

Answer: (b)

244. A sample contains 1.8066×10^{24} atoms of helium. How many moles of helium are in the sample? a) 0.3 moles b) 1 mole c) 2 moles d) 3 moles

Answer: (d)

Topic: Covalent Bonding

170. Which pair of elements is most likely to form a covalent bond? (a) Sodium and Chlorine (b) Magnesium and Oxygen (c) Carbon and Oxygen (d) Potassium and Bromine

Answer: (c)