

VU Learning HUB

BIO102 Quiz File

Chapter-wise Solved MCQs

vulearninghub.xyz

Lecture 1: Atomic Structure

- Q1. What does the Greek word atomos (from 'a' and 'tomos') literally mean? A) Continuous B) Indivisible C) Charged particle D) Spherical
- Q2. Who put forward the concept of the atom on scientific grounds in 1808? A) Democritus B) J.J. Thomson C) John Dalton D) Michael Faraday
- Q3. What is the magnitude of the electric charge carried by an electron? A) -1.6×10^{-19} coulombs B) -9.1×10^{-28} coulombs C) -1.008 coulombs D) -6.63×10^{-34} coulombs
- Q4. According to the (n+l) rule, which orbital is filled first between 3d and 4s? A) 3d because $n = 3$ B) 4s because its (n+l) value is 4, which is lower than 5 for 3d C) 3d because its (n+l) value is 3 D) Both fill simultaneously

Answer Key

- B — The word atom originates from Greek a ('not') and tomos ('divisible'), meaning indivisible
- C — John Dalton proposed the atomic concept on scientific grounds in 1808
- A — An electron carries a negative charge of -1.6×10^{-19} coulombs
- B — The 4s orbital has an (n+l) value of 4, making its energy lower than the 3d orbital whose (n+l) value is 5

Lecture 2: Matter and Energy

- Q1. Which isotope is selected as the international standard for defining one atomic mass unit (amu)? A) Hydrogen-1 B) Carbon-12 C) Oxygen-16 D) Nitrogen-14
- Q2. What is the numerical value of Avogadro's number? A) 1.66×10^{-24} B) 3.00×10^8 C) 6.02×10^{23} D) 1.98×10^{-19}
- Q3. How many neutrons are present in an atom of ordinary hydrogen (protium)? A) Zero B) One C) Two D) Three
- Q4. What type of mixture possesses a uniform composition throughout its body, such as salt in water? A) Heterogeneous mixture B) Suspension C) Homogeneous mixture D) Compound

Answer Key

- B — Carbon-12 is chosen as the standard reference, where 1 amu equals one-twelfth the mass of one C-12 atom
- C — One mole of any substance contains Avogadro's number of particles, which equals 6.02×10^{23}
- A — Ordinary hydrogen (protium) contains one proton and zero neutrons
- C — A homogeneous mixture (solution) has a uniform composition throughout

Lecture 3: Nature of Chemical Bonding

- Q1. What rule states that atoms tend to achieve eight electrons in their outermost shell to attain stability? A) Aufbau principle B) Octet rule C) Hund's rule D) Pauli exclusion principle
- Q2. What is defined as the amount of energy evolved when one mole of a crystalline ionic compound is formed from its gaseous ions? A) Ionization energy B) Lattice energy C) Bond dissociation energy D) Electron affinity

Q3. Which element possesses the highest electronegativity value of 4.0? A) Oxygen B) Chlorine C) Fluorine D) Nitrogen

Q4. What type of bond is formed when both of the shared bonding electrons are donated by a single atom? A) Single covalent bond B) Double covalent bond C) Ionic bond D) Coordinate covalent bond

Answer Key

B — The octet rule describes the tendency of atoms to acquire eight valence electrons similar to stable noble gases

B — Lattice energy is the energy released when one mole of an ionic crystal forms from gaseous ions

C — Fluorine has an electronegativity value of 4.0, making it the most electronegative element

D — In a coordinate covalent (dative) bond, both shared electrons are provided by one donor atom

Lecture 4: Chemical Reactions

Q1. What type of chemical reaction absorbs heat energy from its surroundings? A) Exothermic reaction B) Endothermic reaction C) Combustion reaction D) Neutralization reaction

Q2. In an oxidation-reduction reaction, what process is defined as the loss of electrons by an atom? A) Reduction B) Oxidation C) Neutralization D) Elimination

Q3. What products are produced when an acid reacts with a base in a neutralization process? A) Carbon dioxide and water B) Salt and water C) Hydrogen gas and salt D) Alcohol and ester

Q4. What is the standard unit of measurement for the rate of a chemical reaction? A) Joules per mole B) Moles per second C) Grams per liter D) Torr

Answer Key

B — A reaction during which heat is absorbed is defined as an endothermic reaction

B — Oxidation is the loss of electrons from an atom, whereas reduction is the gain of electrons

B — Neutralization occurs when an acid and base react to form a salt and water

B — Rate of reaction represents product concentration formed per unit time, measured in moles/second

Lecture 5: Organic Chemistry

Q1. What unique property enables carbon atoms to bond with one another to form long chains? A) Isomerism B) Catenation C) Resonance D) Electronegativity

Q2. What term refers to different compounds that share the exact same molecular formula but possess different structural formulas? A) Allotropes B) Isotopes C) Isomers D) Polymers

Q3. Which functional group is present in alcohols such as methanol and ethanol? A) $-\text{CHO}$ B) $-\text{COOH}$ C) $-\text{OH}$ D) $-\text{CO}-$

Q4. Which class of organic compounds is produced by reacting a carboxylic acid with an alcohol? A) Ethers B) Esters C) Aldehydes D) Ketones

Answer Key

B — Catenation is carbon's unique ability to form open or closed chains of varying lengths

C — Isomers are distinct compounds sharing an identical molecular formula but differing in structural arrangement

C — Alcohols are characterized by the hydroxyl (-OH) functional group

B — Esters are synthesized through the condensation of carboxylic acids and alcohols

Lecture 12: Metals

Q1. What name is given to the vertical columns in the modern periodic table? A) Periods B) Groups C) Blocks D) Series

Q2. Which metal exists in a liquid state under room temperature conditions? A) Copper B) Sodium C) Mercury D) Zinc

Q3. What type of oxides are predominantly formed by nonmetallic elements? A) Basic oxides B) Acidic oxides C) Neutral oxides D) Metallic oxides

Q4. Which of the following elements is classified as a metalloid (semimetal)? A) Silicon B) Aluminum C) Bromine D) Sodium

Answer Key

B — Vertical columns in the periodic table are called groups or families

C — All metals are solids at room temperature with the exception of mercury

B — Nonmetals gain or share electrons and form oxides that are acidic in nature

A — Silicon is listed among the metalloids along with boron, germanium, arsenic, antimony, and tellurium

Lecture 13: Metallurgy of Copper & Aluminum

Q1. What is the primary commercial ore used for extracting aluminum metal? A) Hematite B) Bauxite C) Chalcopyrite D) Malachite

Q2. Which purification method uses concentrated caustic soda (NaOH) to treat bauxite ore? A) Hall's process B) Baeyer process C) Hoope's method D) Bosch process

Q3. What is the primary purpose of concentrating copper pyrite via froth-flotation? A) To dissolve copper in pine oil B) To float oil-wetted ore particles while water-wetted gangue settles C) To convert copper sulfide directly into copper oxide D) To reduce copper ions using carbon

Q4. Why is crude copper obtained from the Bessemer converter called "blistered copper"? A) It contains bubbles of trapped water vapor B) Escaping sulfur dioxide gas forms surface blisters upon cooling C) It is alloyed with zinc and tin D) It is produced by electrolytic deposition

Answer Key

B — Aluminum is commercially extracted from bauxite ore (hydrated aluminum oxide)

B — The Baeyer process purifies crude bauxite using concentrated NaOH solution

B — Froth-flotation separates crushed sulfide ore (wetted by oil) from gangue impurities (wetted by water)

B — Surface blisters are formed by SO_2 gas escaping as molten copper solidifies

Lecture 14: Metallurgy of Iron

- Q1. In which type of furnace is iron extracted from its oxide ores using pyrometallurgy? A) Reverberatory furnace B) Blast furnace C) Bessemer converter D) Downs cell
- Q2. What is the principal ore of iron? A) Hematite B) Bauxite C) Magnetite D) Pyrite
- Q3. What form of crude iron is directly tapped from the blast furnace containing 3–5% carbon? A) Wrought iron B) Steel C) Pig iron D) Stainless steel
- Q4. What is the purest commercial form of iron, containing only about 0.5% impurities? A) Cast iron B) Pig iron C) Wrought iron D) Steel

Answer Key

- B — Iron extraction via pyrometallurgical reduction takes place in a Blast Furnace
- A — Hematite (Fe_2O_3) is the principal ore of iron
- C — Pig iron (cast iron) is the immediate product of the blast furnace containing 3–5% carbon
- C — Wrought iron is the purest form of iron produced when impurities are removed to ~0.5%

Lecture 15: Corrosion and its Prevention

- Q1. What is the chemical formula of rust formed when iron reacts with oxygen and water? A) FeO B) Fe_3O_4 C) $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ D) FeSO_4
- Q2. What name is given to the process of applying a protective zinc coating onto iron? A) Galvanizing B) Tin plating C) Electroplating D) Calcination
- Q3. In cathodic protection of underground iron pipes, which sacrificial metal rod is connected? A) Lead B) Copper C) Zinc D) Silver
- Q4. What protective oxide film forms on stainless steel to make it resistant to rusting? A) Iron oxide B) Chromium oxide C) Nickel oxide D) Zinc oxide

Answer Key

- C — Rust is chemically defined as hydrated ferric oxide, $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$
- A — Galvanizing is the process of coating iron with zinc to prevent corrosion
- C — Zinc acts as a sacrificial anode, undergoing oxidation while protecting the connected iron cathode
- B — Reaction of chromium with atmospheric oxygen forms a tough, non-corrosive chromium oxide film

Lecture 16: Periodic Table (Hydrogen & Oxygen)

- Q1. What gas mixture produced from coke and steam is known as "water gas"? A) CO_2 and H_2 B) CO and H_2 C) CH_4 and H_2O D) N_2 and H_2
- Q2. What type of hydrides are formed when hydrogen reacts with p-block elements? A) Ionic hydrides B) Metallic hydrides C) Covalent hydrides D) Interstitial hydrides
- Q3. What are the two allotropic forms of oxygen gas? A) Water and hydrogen peroxide B) Dioxygen (O_2) and Ozone (O_3) C) Monatomic oxygen and superoxide D) Oxide and peroxide
- Q4. What compound is used in emergency rescue masks to generate oxygen gas by reacting with moisture and CO_2 ? A) Na_2O B) CaO C) KO_2 D) H_2O_2

Answer Key

B — Heating coke with steam produces water gas, an equimolar mixture of carbon monoxide (CO) and hydrogen (H₂)

C — P-block elements combine with hydrogen to form molecular covalent hydrides

B — Oxygen exists in two allotropic modifications: dioxygen (O₂) and ozone (O₃)

C — Potassium superoxide (KO₂) reacts with exhaled moisture and CO₂ to yield oxygen gas in breathing masks

Lecture 17: Properties and Trends in Periodic Table (Nitrogen, Ammonia, Nitric Acid)

Q1. Which industrial method is used for synthesizing ammonia from nitrogen and hydrogen gases? A) Ostwald's method B) Contact process C) Haber process D) Bosch process

Q2. Which process produces nitric acid (HNO₃) on an industrial scale by oxidizing ammonia? A) Ostwald's method B) Castner-Kellner process C) Baeyer process D) Haber process

Q3. Why is ammonia (NH₃) chemically classified as a base? A) It donates protons in aqueous solutions B) It possesses a lone pair of electrons on nitrogen that can be donated C) It lacks hydrogen atoms D) It reacts with water to release hydrogen gas

Q4. What type of bonding holds the two nitrogen atoms together in an N₂ molecule? A) Single covalent bond B) Double covalent bond C) Triple covalent bond (1 sigma and 2 pi bonds) D) Ionic bond

Answer Key

C — The Haber process synthesizes NH₃ from N₂ and H₂ at 500 °C using an Fe₂O₃/Al₂O₃ catalyst

A — Ostwald's method manufactures HNO₃ via the catalytic oxidation of ammonia

B — Ammonia acts as a Lewis base (electron pair donor) because nitrogen has an unshared lone pair

C — An N₂ molecule contains a strong triple bond consisting of one sigma and two pi bonds

Lecture 18: Halogens (VII)

Q1. Which halogen exists in a liquid state under standard room temperature conditions? A) Fluorine B) Chlorine C) Bromine D) Iodine

Q2. Which cell process produces chlorine gas at the anode during the electrolysis of molten NaCl? A) Castner-Kellner cell process B) Downs cell process C) Hall's process D) Hoopes process

Q3. What active species is directly responsible for the bleaching action of moist chlorine gas? A) Hydrogen gas B) Atomic (nascent) oxygen C) Calcium chloride D) Hydrochloric acid

Q4. How is hydrogen chloride (HCl) gas prepared in the laboratory? A) Reaction of sodium chloride with sulfuric acid B) Decomposition of ammonium chloride C) Electrolysis of brine D) Oxidation of manganese dioxide

Answer Key

C — Among halogens, fluorine and chlorine are gases, bromine is liquid, and iodine is solid

B — The Downs cell process electrolyzes molten NaCl (mixed with CaCl₂) to obtain chlorine at the anode

B — HOCl produced from Cl₂ and water decomposes to release nascent oxygen, which oxidizes colored stains

A — Heating NaCl with concentrated H₂SO₄ generates hydrogen chloride gas in the laboratory

Lecture 20: Properties of Solutions

Q1. What unit of concentration represents the number of moles of solute dissolved per dm³ (liter) of solution? A) Molality B) Molarity C) Mass percentage D) Volume percentage

Q2. Why is molality independent of temperature changes, unlike molarity? A) Molality is based on solution volume B) Molality is a mass-to-mass ratio (moles of solute per kg of solvent) C) Molality applies exclusively to liquids D) Molality measures gas pressure

Q3. What is a solution called when it can dissolve no further solute at a specific temperature? A) Unsaturated solution B) Saturated solution C) Concentrated solution D) Colloidal solution

Q4. What optical phenomenon involving light scattering is exhibited by colloids but not true solutions? A) Electrolysis B) Tyndall effect C) Hydration D) Calcination

Answer Key

B — Molarity (M) is defined as moles of solute per dm³ (liter) of solution

B — Molality (m) measures mass per mass (moles/kg), which does not alter with thermal expansion

B — A saturated solution contains maximum dissolved solute in equilibrium with undissolved solute

B — Colloids contain larger dispersed particles that scatter light, known as the Tyndall effect

Lecture 21: Acids, Bases

Q1. According to the Lowry-Bronsted theory, how are acids and bases defined? A) Acid produces OH⁻, base produces H⁺ B) Acid is a proton donor, base is a proton acceptor C) Acid is an electron pair acceptor, base is an electron pair donor D) Acid is a reducing agent, base is an oxidizing agent

Q2. What is the mathematical definition of pH proposed by Soren Sorenson? A) Positive logarithm of [OH⁻] B) Negative logarithm to the base 10 of hydrogen ion concentration (-log₁₀[H⁺]) C) Natural logarithm of [H⁺] D) Ratio of dissociation constants

Q3. What is the pH value of a neutral aqueous solution at 25 °C? A) 0 B) 14 C) 7 D) 1

Q4. What is a buffer solution? A) A solution that ionizes completely in water B) A solution that resists changes in pH upon addition of small amounts of acid or base C) A mixture of strong acid and strong base D) A solution with a constant pH of 14

Answer Key

B — Under Lowry-Bronsted concepts, an acid donates a proton (H⁺) while a base accepts a proton

B — pH is defined mathematically as $\text{pH} = -\log_{10}[\text{H}^+]$

C — At 25 °C, pure water has $[\text{H}^+] = 10^{-7}$ M, yielding a neutral pH of 7

B — Buffer solutions contain a weak acid/base and its conjugate salt to resist drastic pH changes

End of Quiz

BIO102 — 56 solved MCQs
Prepared by VU Learning HUB
vulearninghub.xyz