SOPHIA MEDPREP SYSTEM / KLIMENT EDITION

MEDICINE ENTRANCE EXAM ACADEMIC SOLUTION COMPANION

SCENARIO 02 • BIOLOGY + CHEMISTRY

50 university-sourced, Sophia-adapted examination items • 50 English academic explanations • distractor-by-distractor analysis • 50 Turkish YKS approaches • 150 new four-option reinforcement questions

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EDITORIAL NOTE / HOW TO USE THIS BOOK

This companion accompanies Sophia MedPrep Medicine Entrance Exam Scenario 02. The student examination comprises 25 Biology and 25 Chemistry questions, adapted from the two Biology and two Chemistry university-published sample papers supplied for this project. The text was revised to repair ambiguous or defective answer choices. The adapted mock tests must not be represented as examinations actually administered by Sofia University or as an official university answer key.

For every question

1 Answer the adapted examination item before looking at the key.
2 Study the scientific reason for the correct answer in English.
3 Review the separate explanations for all three incorrect options.
4 Read the Turkish YKS Perspective to connect the concept with familiar examination reasoning.
5 Complete the three new reinforcement questions and check the concise rationale printed below each.

Symbols and editorial choices

GREEN = correct response and scientific reasoning. RED = why incorrect options fail. GOLD = Turkish YKS Perspective. BLUE = check your understanding. All four answer alternatives are given for each practice question, and the keyed response is explained.

Scientific quality and provenance

The source sample papers contain drafting weaknesses. These are addressed in the separate Sophia-adapted scenario booklets used as the basis for this publication. Corrections are editorial and do not imply official university approval. Scientific statements in this book are subject to final independent subject-specialist review before commercial publication.

Source materials

Biology example 1; Biology example 2; Chemistry example 1; Chemistry example 2. Supplied by the user as university-authored example examination materials. No official examination-year attribution is asserted for these sample test questions.

Design authorship

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SECTION I / BIOLOGY

Questions 01–25 • Cellular biology, human physiology, genetics and biology reasoning.

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QUESTION 01 | BIOLOGY

CELL ORGANELLES

Which organelle carries out intracellular digestion using hydrolytic enzymes?

A. Peroxisomes
B. Lysosomes
C. Ribosomes
D. Plastids

CORRECT ANSWER • B — Lysosomes

Lysosomes are acidic, membrane-bounded organelles containing hydrolytic enzymes that digest macromolecules acquired through endocytosis or autophagy.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Peroxisomes mainly perform oxidative metabolism and peroxide detoxification rather than lysosomal acid hydrolysis.

C. Ribosomes are protein-synthesis machines and have no digestive membrane lumen.

D. Plastids occur in plants and algae, not as the hydrolytic compartment of human cells.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Hücre içi sindirim lizozom enzimleriyle; peroksizom H_2O_2 metabolizması, ribozom protein sentezi yapar.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **Which organelle contains acid hydrolases?**

A. Lysosome
B. Ribosome
C. Peroxisome
D. Nucleolus

Answer: A. Lysosomes have digestive hydrolases.

R2. **Which intracellular pathway allows recycling of worn-out organelles?**

A. Ribosomal transcription
B. Autophagy followed by lysosomal degradation
C. Nuclear fusion
D. Fermentation only

Answer: B. Autophagic material is delivered to lysosomes.

R3. **Which internal condition favors many lysosomal enzymes?**

A. Strongly alkaline pH 14
B. Absence of water
C. Acidic pH
D. High atmospheric pressure

Answer: C. Acid hydrolases work best at low pH.

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QUESTION 02 | BIOLOGY

ENDOPLASMIC RETICULUM

Which statement about the endoplasmic reticulum is INCORRECT?

A. Protein-secreting plasma cells are particularly rich in rough ER

B. Mature human red blood cells contain abundant rough and smooth ER

C. Hepatocytes have both rough and smooth ER

D. Smooth ER participates in lipid metabolism and detoxification

CORRECT ANSWER • B — Mature human red blood cells contain abundant rough and smooth ER

Mature human erythrocytes lose their nucleus and membrane-bound organelles during development; they have neither abundant rough nor smooth ER.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Plasma cells are enriched in rough ER for immunoglobulin secretion.

C. Hepatocytes do contain both rough and smooth ER for protein synthesis and detoxification.

D. Smooth ER participates in lipid metabolism and detoxification, as stated.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Olgun eritrositte çekirdek ve ER bulunmaz; plazma hücresinde antikor için granüllü ER çoktur; karaciğer hücresinde iki ER de bulunur.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which organelle is especially abundant in antibody-secreting plasma cells?

A. Lysosome only
B. Rough ER
C. Centrioles only
D. Contractile vacuole
Answer: B. Antibodies are secretory proteins made on rough ER.

R2. Mature human erythrocytes characteristically lack:

A. Cell membrane
B. Hemoglobin
C. Nucleus and ER
D. Cytoplasm
Answer: C. They lose organelles during maturation.

R3. Which ER compartment is associated strongly with steroid synthesis and detoxification?

A. Nucleolus
B. Rough ER ribosome itself
C. Golgi cisterna only
D. Smooth ER
Answer: D. Smooth ER supports lipid metabolism.

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QUESTION 03 | BIOLOGY

BLOOD CELLS

Which of the following are the smallest circulating formed elements of human blood?

A. Small lymphocytes
B. Platelets
C. Erythrocytes
D. Neutrophils

CORRECT ANSWER • B — Platelets

Platelets are small anucleate cytoplasmic fragments approximately 2–3 µm in diameter, smaller than typical circulating erythrocytes and leukocytes.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Small lymphocytes are leukocytes and typically exceed platelet diameter.

C. Mature erythrocytes are around 7–8 µm across, larger than platelets.

D. Neutrophils are larger granulocytic leukocytes.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Kanın en küçük şekilli elemanı trombosittir (yaklaşık 2–3 µm); eritrosit ~7–8 µm; lökositler genellikle daha büyük.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **Which blood elements are formed by fragmentation of megakaryocytes?**

A. Erythrocytes
B. Neutrophils
C. Platelets
D. Eosinophils

Answer: C. Megakaryocytes release platelets.

R2. **What is the main physiological role of platelets?**

A. Oxygen transport
B. Antibody secretion
C. Thyroid hormone synthesis
D. Hemostasis

Answer: D. Platelets contribute to clot formation.

R3. **Which mature circulating formed element lacks a nucleus and is normally about 7–8 µm wide?**

A. Erythrocyte
B. Neutrophil
C. Small lymphocyte
D. Monocyte

Answer: A. Mature red cells are anucleate discs.

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QUESTION 04 | BIOLOGY

GOLGI APPARATUS

Which is a principal function of the Golgi apparatus?

A. Sorting, modifying and packaging proteins for delivery

B. Synthesizing chromosomal DNA

C. Producing ATP through oxidative phosphorylation

D. Assembling ribosomal RNA within the nucleolus

CORRECT ANSWER • A — Sorting, modifying and packaging proteins for delivery

The Golgi apparatus modifies, sorts and packages proteins and lipids arriving from the ER for transport to destinations including the plasma membrane, lysosomes and secretion.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. Chromosomal DNA synthesis occurs in the nucleus in S phase.

C. Oxidative phosphorylation is a mitochondrial process.

D. The nucleolus synthesizes/processes rRNA and assembles ribosomal subunits.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: ER'den gelen ürünler Golgi'de işlenir, paketlenir ve hedefe gönderilir; ATP üretimi mitokondriye, DNA sentezi çekirdeğe aittir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which organelle sorts newly synthesized secretory proteins?

A. Mitochondrion
B. Centriole
C. Peroxisome
D. Golgi apparatus
Answer: D. Golgi organizes secretory cargo.

R2. Which pathway correctly describes conventional secretion?

A. Rough ER → Golgi → vesicle
B. Nucleus → mitochondrion → lysosome
C. Peroxisome → centriole → chloroplast
D. Plasma membrane → DNA → ribosome
Answer: A. Secretory cargo moves through ER and Golgi.

R3. Glycoprotein processing is an important function of the:

A. Mitochondrial matrix only
B. Golgi apparatus
C. Nucleoplasm only
D. Centromere
Answer: B. Golgi enzymes modify carbohydrate chains.

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QUESTION 05 | BIOLOGY

DNA CHEMISTRY

In a standard DNA double helix, how many covalent bonds normally link a nitrogenous base directly to the sugar of its own nucleotide?

A. One N-glycosidic bond to deoxyribose
B. One N-glycosidic bond to ribose
C. Two covalent bonds to deoxyribose and the complementary base
D. Two covalent bonds to phosphate and the complementary base

CORRECT ANSWER • A — One N-glycosidic bond to deoxyribose

A DNA nitrogenous base is covalently linked to its own deoxyribose by one N-glycosidic bond; base pairing across strands uses noncovalent hydrogen bonds.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. DNA contains deoxyribose rather than the ribose characteristic of RNA.

C. The complementary base is connected by hydrogen bonds, not a second direct covalent bond.

D. A base does not covalently bond to a phosphate and its complementary base as proposed.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: DNA baz ile deoksiriboz arasında N-glikozit bağı; bazlar arasında hidrojen bağı; şeker-fosfat omurgasında fosfodiester bağı vardır.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. What bond joins a DNA base to its own pentose?

A. N-glycosidic bond
B. Hydrogen bond across strands
C. Peptide bond
D. Ionic salt bridge

Answer: A. The base links to deoxyribose via an N-glycosidic bond.

R2. Complementary DNA bases are primarily held together by:

A. Peptide bonds
B. Hydrogen bonds
C. Phosphodiester bonds across strands
D. Metallic bonds

Answer: B. Base pairs use hydrogen bonds.

R3. Which covalent bond links successive nucleotides within one DNA strand?

A. Amino acid peptide bond
B. Hydrogen bond between bases
C. Phosphodiester bond
D. Disulfide bond

Answer: C. The backbone is linked by 3′–5′ phosphodiester bonds.

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QUESTION 06 | BIOLOGY

DNA BASE PAIRING

A double-stranded DNA sample contains 120 purine bases and 120 pyrimidine bases in total. Which composition is possible?

A. 120 G and 120 A
B. 120 A and 120 T
C. 240 G and 240 T
D. 240 A and 240 C

CORRECT ANSWER • B — 120 A and 120 T

Double-stranded DNA has equal total purines and pyrimidines because A pairs with T and G pairs with C. A molecule containing 120 adenines and 120 thymines meets the stated 240-base total and pairing rule.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. 120 G plus 120 A contains only purines and no required pyrimidines.

C. 240 G plus 240 T would contain 480 bases, exceeding the stated total.

D. 240 A plus 240 C also totals 480 bases and violates the stated purine/pyrimidine count.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Çift sarmalda A=T, G=C. Toplam 120 pürin+120 pirimidin=240 baz; 120 A ve 120 T mümkündür.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. In a double-stranded DNA molecule, A always equals:

A. G
B. T
C. C
D. A+G

Answer: B. Watson–Crick pairing requires A=T.

R2. If a dsDNA sample contains 40 guanines, how many cytosines does it contain?

A. 20
B. 80
C. 40
D. 0

Answer: C. Each G pairs with C.

R3. Which nitrogenous bases are purines?

A. Cytosine and thymine
B. Thymine and uracil
C. Cytosine and uracil
D. Adenine and guanine

Answer: D. A and G are purines.

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QUESTION 07 | BIOLOGY

DNA ENZYMES

An enzyme cleaves the covalent bonds joining adjacent nucleotides along a DNA strand. Which bonds are hydrolyzed?

A. Phosphodiester bonds in the sugar–phosphate backbone

B. Hydrogen bonds between paired bases only

C. Covalent bonds between complementary bases

D. Bonds linking nitrogenous bases directly to each other across the helix

CORRECT ANSWER • A — Phosphodiester bonds in the sugar–phosphate backbone

The covalent 3′–5′ phosphodiester link connects the sugar-phosphate backbone of consecutive nucleotides. Nucleases that cut a DNA strand hydrolyze this bond.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. Breaking only hydrogen bonds separates strands without cleaving a strand backbone.

C. Bases across complementary strands are not directly joined by covalent bonds.

D. The proposal of direct covalent base-to-base interstrand links is wrong for ordinary DNA.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Nükleaz fosfodiester bağını keserse DNA zinciri parçalanır; hidrojen bağı koparsa çift zincir ayrılır.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which enzyme class cuts nucleic-acid backbone bonds?

A. Lipase
B. Amylase
C. Nuclease
D. Pepsin

Answer: C. Nucleases cleave phosphodiester bonds.

R2. Which process separates the two DNA strands without breaking their backbone?

A. Backbone hydrolysis
B. Proteolysis
C. Esterification
D. Denaturation

Answer: D. Hydrogen bonds and stacking are disrupted during melting.

R3. Which bond joins neighboring deoxyribose-phosphate units?

A. Phosphodiester bond
B. Peptide bond
C. Metallic bond
D. Disulfide bond

Answer: A. DNA uses a covalent phosphodiester backbone.

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QUESTION 08 | BIOLOGY

DNA REPLICATION

Which statement about eukaryotic DNA replication is correct?

A. It starts at origins bound by transcription initiation complexes only

B. Each chromosome generally contains multiple origins of replication

C. Both new DNA strands are synthesized continuously in the same direction as fork movement

D. Replication is conservative, producing one entirely old and one entirely new double helix

CORRECT ANSWER • B — Each chromosome generally contains multiple origins of replication

Eukaryotic chromosomes typically initiate DNA synthesis at many licensed origins, enabling replication of large genomes during S phase. Replication is semiconservative and new DNA is synthesized 5′→3′.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Replication origins recruit DNA replication factors, not exclusively transcription initiation complexes.

C. The leading strand is continuous but the lagging strand is synthesized discontinuously as Okazaki fragments.

D. Replication is semiconservative, not conservative.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Ökaryotik DNA'da çok sayıda başlangıç noktası vardır; yarı korunumlu çoğalma olur; geciken zincirde Okazaki parçaları oluşur.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. What model describes ordinary DNA replication?

A. Conservative only
B. Dispersive as the standard
C. Noncomplementary
D. Semiconservative
Answer: D. Each daughter duplex contains one parental strand.

R2. Which strand contains Okazaki fragments?

A. Lagging strand
B. Leading strand only
C. Both strands as one continuous piece
D. RNA strand of ribosome
Answer: A. Lagging DNA is made discontinuously.

R3. In which direction does DNA polymerase add nucleotides?

A. 3′ to 5′
B. 5′ to 3′
C. Both directions in the same chain
D. No directional preference
Answer: B. DNA synthesis extends the 3′ OH end.

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QUESTION 09 | BIOLOGY

ENZYME ACTIVITY

Which intervention can accelerate an enzyme-catalyzed biochemical reaction under otherwise appropriate conditions?

A. Decreasing reactant concentration to nearly zero
B. Removing the enzyme
C. Adding an appropriate enzyme when it is rate-limiting
D. Heating every enzyme to 100°C

CORRECT ANSWER • C — Adding an appropriate enzyme when it is rate-limiting

An enzyme increases reaction rate by lowering the activation barrier when enzyme amount is limiting and the substrate and environmental conditions are suitable.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Reducing substrate near zero usually lowers rate.

B. Removing the catalyst generally decreases reaction rate.

D. Heating every enzyme to 100°C typically denatures many enzymes rather than accelerating them.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Enzim aktivasyon enerjisini düşürür; uygun sıcaklık ve pH gerekir; çok yüksek sıcaklık denatürasyona yol açabilir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **Which kinetic barrier is lowered by an enzyme?**

A. Activation energy
B. Standard reaction enthalpy
C. Equilibrium constant
D. Nuclear binding energy

Answer: A. Enzymes reduce activation energy.

R2. **Why can boiling reduce enzyme activity?**

A. Automatic ATP synthesis
B. Protein denaturation
C. Creation of substrate
D. Formation of a new chromosome

Answer: B. Heat disrupts protein structure.

R3. **At low substrate concentration, adding more substrate to an unsaturated enzyme generally:**

A. Always stops the reaction
B. Reduces enzyme count
C. Increases rate
D. Changes atomic number

Answer: C. More substrate supports more enzyme turnovers.

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QUESTION 10 | BIOLOGY

CELL DIVISION

During which phase do homologous chromosomes separate toward opposite poles?

A. Mitosis

B. Meiosis I

C. Meiosis II

D. Fertilization

CORRECT ANSWER • B — Meiosis I

Homologous chromosomes separate during anaphase I of meiosis. Sister chromatids generally remain together until anaphase II.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Mitosis normally separates sister chromatids, not homologous pairs.

C. Meiosis II separates sister chromatids after the first reduction division.

D. Fertilization combines haploid nuclei and is not a chromosome-separation stage.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Mayoz I homolog kromozomlar, Mayoz II kardeş kromatitler ayrılır; anafaz I'e odaklan.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. What separates during anaphase I of meiosis?

A. Sister chromatids at their centromeres

B. Homologous chromosomes

C. Ribosomal RNA

D. Nuclear pores

Answer: B. Homologues disjoin in meiosis I.

R2. What separates during anaphase II?

A. Homologous chromosome pairs

B. Cell membranes only

C. Sister chromatids

D. Nucleoli

Answer: C. Meiosis II resembles a mitotic chromatid separation.

R3. Meiosis I primarily reduces chromosome number from:

A. Haploid to diploid

B. n to 4n

C. Triploid to tetraploid

D. Diploid to haploid

Answer: D. The first meiotic division is reductional.

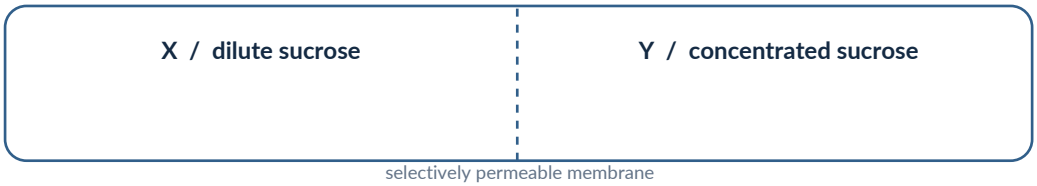
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QUESTION 11 | BIOLOGY

OSMOSIS

A semipermeable membrane separates solution X (dilute sucrose) from solution Y (concentrated sucrose). Which direction is the net movement of water by osmosis?

A. X → Y; the sucrose concentration difference tends to decrease
B. X → Y; the sucrose concentration difference must increase
C. Y → X; the sucrose concentration difference tends to decrease
D. Y → X; the sucrose concentration difference must increase



CORRECT ANSWER • A — X → Y; the sucrose concentration difference tends to decrease

Water moves by osmosis from lower effective solute concentration (higher water potential) in X toward higher effective solute concentration in Y, tending to reduce the concentration difference.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. Osmosis toward Y does not intrinsically increase the solute gradient in the normal two-compartment model.

C. The stated Y-to-X direction opposes the expected water-potential gradient.

D. The direction Y-to-X is incorrect under the supplied conditions.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Su az yoğun çözeltiden çok yoğun çözeltiye net geçer (X→Y); amaç derişim farkını azaltma yönündedir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Across a water-permeable membrane, net water movement is toward:

A. Higher water potential always
B. Lower solute concentration always
C. Lower water potential
D. Higher temperature only
Answer: C. Water follows its chemical potential gradient.

R2. If a cell is placed in a hypertonic medium, it usually:

A. Gains unlimited water
B. Replicates DNA instantly
C. Stops all solute diffusion
D. Loses water
Answer: D. Water exits toward the hypertonic exterior.

R3. Which process describes solvent movement across a selectively permeable membrane?

A. Osmosis
B. Active pumping of DNA
C. Translation
D. Phagocytosis only
Answer: A. Osmosis is water movement across the membrane.

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QUESTION 12 | BIOLOGY

ANATOMY

Which endocrine gland is located at the base of the throat, just inferior to the laryngeal prominence?

A. Pituitary gland

B. Pineal gland

C. Hypothalamus

D. Thyroid gland

CORRECT ANSWER • D — Thyroid gland

The thyroid lies anterior to the trachea below the larynx, with lobes connected by an isthmus, and releases thyroid hormones T3 and T4.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. The pituitary lies within the sella turcica at the skull base.

B. The pineal gland is located in the brain near the roof of the third ventricle.

C. The hypothalamus is a brain region in the diencephalon.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Adem elmasının altında soluk borusu önündeki bez tiroiddir; hipofiz, epifiz ve hipotalamus beyindedir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **Which hormones are produced by thyroid follicular cells?**

A. FSH and LH

B. Insulin and glucagon

C. ACTH and GH

D. T3 and T4

Answer: D. Thyroid follicles synthesize thyroid hormones.

R2. **Which hormone regulates thyroid hormone production from anterior pituitary?**

A. TSH

B. PTH

C. ADH

D. Glucagon

Answer: A. TSH stimulates the thyroid gland.

R3. **Which gland lies in the neck near the trachea?**

A. Pituitary

B. Thyroid

C. Pineal

D. Hypothalamus

Answer: B. Thyroid is a cervical endocrine gland.

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QUESTION 13 | BIOLOGY

ENDOCRINE CONTROL

Which pair of hormones has the most direct opposing effects in maintaining blood glucose homeostasis?

A. Epinephrine and norepinephrine

B. Insulin and glucagon

C. Estrogen and progesterone

D. Thyroxine and melatonin

CORRECT ANSWER • B — Insulin and glucagon

Insulin lowers blood glucose through tissue uptake and anabolic storage, whereas glucagon raises glucose by promoting hepatic glycogenolysis and gluconeogenesis.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Epinephrine and norepinephrine are stress catecholamines and not the principal opposing endocrine pair.

C. Estrogen and progesterone chiefly regulate reproduction.

D. Thyroxine and melatonin are not the principal mutually opposing blood-glucose hormones.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: İnsülin kan şekerini düşürür, glukagon yükseltir; pankreas beta/alpha hücrelerini eşleştir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **Which pancreatic hormone raises blood glucose during fasting?**

A. Glucagon
B. Insulin
C. Calcitonin
D. Prolactin

Answer: A. Glucagon increases hepatic glucose output.

R2. **Which pancreatic cells produce glucagon?**

A. Beta cells
B. Alpha cells
C. Delta cells exclusively
D. Chief cells of stomach

Answer: B. Alpha cells secrete glucagon.

R3. **What is a major effect of insulin on skeletal muscle?**

A. Stimulating hepatic glucose release exclusively
B. Suppressing protein synthesis
C. Increasing glucose uptake
D. Stopping GLUT4 movement

Answer: C. Insulin drives GLUT4 translocation.

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QUESTION 14 | BIOLOGY

CELLULAR METABOLISM

During strenuous exercise, increased anaerobic glycolysis in muscle produces more:

A. Sodium chloride

B. Fructose

C. Carbon dioxide exclusively

D. Lactate

CORRECT ANSWER • D — Lactate

Lactate increases when glycolytic pyruvate is reduced by lactate dehydrogenase to regenerate NAD+ under high glycolytic demand. Lactate accumulation should not, however, be taught as the sole established cause of exercise-associated muscle cramps.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. NaCl does not arise as a product of anaerobic glycolysis.

B. Fructose is not the main reduced pyruvate product in muscle.

C. Carbon dioxide is not the sole defining product of this pyruvate-to-lactate reaction.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Yoğun egzersizde pirüvat laktata dönüşerek NAD+ yenilenir. Kaynak sınavdaki laktat-kramp ilişkisi aşırı basitleştirilmiştir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which enzyme reduces pyruvate to lactate?

A. Pepsin
B. Lactate dehydrogenase
C. ATP synthase
D. DNA polymerase

Answer: B. LDH interconverts pyruvate and lactate.

R2. Why is pyruvate-to-lactate conversion useful during high glycolytic flux?

A. Directly makes O2
B. Creates chromosomes
C. Regenerates NAD+
D. Stops glucose use

Answer: C. NAD+ supports continued glycolysis.

R3. Is lactate established as the sole direct cause of muscle cramps?

A. Yes, in every case
B. Only in mitochondria
C. Only in resting infants
D. No

Answer: D. Exercise cramps have multifactorial mechanisms.

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QUESTION 15 | BIOLOGY

VITAMINS

Deficiency of which vitamin can cause night blindness and xerophthalmia?

A. Vitamin A
B. Vitamin B12
C. Vitamin K
D. Vitamin D

CORRECT ANSWER • A — Vitamin A

Vitamin A is required for normal phototransduction and epithelial maintenance; deficiency can cause night blindness and xerophthalmia, progressing to corneal damage in severe cases.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. Vitamin B12 deficiency mainly affects hematopoiesis and neurologic function.

C. Vitamin K deficiency chiefly impairs gamma-carboxylation of clotting proteins.

D. Vitamin D deficiency affects calcium-phosphate homeostasis and bone mineralization.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: A vitamini rodopsin ve görme için gerekli; eksikliği gece körlüğü, ileri dönemde kseroftalmi yapar.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which photoreceptor type is most important for vision in dim light?

A. Cones only
B. Ganglion cells only
C. Rods
D. Bipolar cells only

Answer: C. Rods support scotopic vision.

R2. Which vitamin deficiency is associated with xerophthalmia?

A. Vitamin K
B. Vitamin B12
C. Vitamin D
D. Vitamin A

Answer: D. Vitamin A supports ocular epithelial integrity.

R3. Which molecule incorporates vitamin-A-derived retinal?

A. Rhodopsin
B. Hemoglobin
C. Insulin
D. Collagen

Answer: A. Rhodopsin is a retinal-containing photopigment.

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QUESTION 16 | BIOLOGY

HUMAN TISSUES

Smooth muscle occurs in which of the following?

A. Uterus

B. Arterial walls

C. Stomach

D. All of the above

CORRECT ANSWER • D — All of the above

Smooth muscle occurs in the uterine wall, vascular walls and gastrointestinal tract, including the stomach. Its contractile filaments are not arranged into visible sarcomeres.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Uterine myometrium does contain smooth muscle; A alone is incomplete because B and C also do.

B. Arterial walls contain vascular smooth muscle, but this is not the only site listed.

C. The stomach wall contains smooth muscle, but A and B are also correct.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Düz kas uterus, damar ve sindirim kanalı duvarında yer alır; istemsiz çalışır ve çizgisiz görünür.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **Which tissue type forms the stomach muscular layer?**

A. Cardiac muscle
B. Skeletal muscle only
C. Nervous tissue only
D. Smooth muscle
Answer: D. The GI muscularis contains smooth muscle.

R2. **Which feature distinguishes smooth from skeletal muscle?**

A. No visible sarcomeric striations
B. Voluntary control in all organs
C. Multiple nuclei in every cell
D. T-tubules identical to skeletal fibers
Answer: A. Smooth muscle lacks striated sarcomere organization.

R3. **Which part of a blood vessel commonly contains smooth muscle?**

A. Erythrocyte membrane
B. Tunica media
C. Blood plasma
D. Lumen fluid
Answer: B. The tunica media regulates vascular tone.

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QUESTION 17 | BIOLOGY

SKELETAL SYSTEM

A tendon is a connective tissue structure that normally joins:

A. Bone to bone
B. Muscle to bone
C. Nerve to muscle
D. Muscle to muscle only

CORRECT ANSWER • B — Muscle to bone

Tendons are dense regular connective tissues connecting muscle to bone, transferring force from muscle contraction to the skeleton.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Ligaments most commonly connect one bone to another.

C. A nerve-to-muscle communication site is a neuromuscular junction, not a tendon.

D. Tendons primarily connect muscle to bone rather than only muscle to muscle.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Tendon kası kemiğe, ligament kemiği kemiğe bağlar; ikisi farklı yapılardır.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **Which structure generally connects bone to bone?**

A. Ligament
B. Tendon
C. Neuron
D. Motor end plate

Answer: A. Ligaments link bones across joints.

R2. **Which tissue is rich in aligned type I collagen bundles?**

A. Blood plasma
B. Tendon
C. Alveolar air
D. Retinal pigment

Answer: B. Tendons contain dense regular connective tissue.

R3. **What is a principal tendon function?**

A. Hormone synthesis
B. Blood filtering
C. Transmission of muscle force to bone
D. Myelin production

Answer: C. Tendons couple contraction to movement.

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QUESTION 18 | BIOLOGY

GAMETOGENESIS

What is the chromosome complement of a normal human secondary oocyte?

A. 23, Y
B. 23, X
C. 46, XY
D. 46, XX

CORRECT ANSWER • B — 23, X

After meiosis I a normal human secondary oocyte is haploid, containing 22 autosomes plus X; it arrests at metaphase II until fertilization or degeneration.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Human eggs do not carry Y chromosomes.

C. 46,XY is a male diploid complement.

D. 46,XX is a diploid female complement, not secondary-oocyte chromosome count.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: İkincil oosit 23,X kromozom taşır; metafaz II'de 23 çift kromatitli kromozom nedeniyle 46 DNA molekülü vardır.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. How many autosomes occur in a normal human secondary oocyte?

A. 44
B. 22
C. 46
D. 23 pairs

Answer: B. A gamete has 22 autosomes and one sex chromosome.

R2. At which stage does the ovulated secondary oocyte normally arrest?

A. G1 of mitosis
B. Anaphase I
C. Metaphase II
D. Prophase of mitosis

Answer: C. The secondary oocyte pauses at metaphase II.

R3. Which chromosome count characterizes a haploid human gamete?

A. 46
B. 47
C. 92
D. 23

Answer: D. Human gametes have 23 chromosomes.

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QUESTION 19 | BIOLOGY

HUMAN GENETICS

Which chromosomal condition is represented by the illustrated human karyotype?

A. Turner syndrome (45,X)
B. Klinefelter syndrome (47,XXY)
C. Down syndrome (trisomy 21)
D. Hemophilia A



CORRECT ANSWER • B — Klinefelter syndrome (47,XXY)

The displayed karyotype has an additional X chromosome together with a Y chromosome, giving a 47,XXY complement typical of Klinefelter syndrome.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Turner syndrome is usually 45,X and lacks the extra X in 47,XXY.

C. Down syndrome typically involves trisomy 21, not 47,XXY.

D. Hemophilia A is commonly a factor VIII gene disorder and cannot be diagnosed from this XXY karyotype.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Karyotipte XXY varsa Klinefelter; 45,X Turner; üç adet 21 Down. Sayım ve cinsiyet kromozomuna dikkat.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which karyotype commonly indicates Klinefelter syndrome?

A. 45,X
B. 46,XX
C. 47,XXY
D. 47,+21 with XX
Answer: C. Klinefelter most often has XXY chromosomes.

R2. Turner syndrome typically involves:

A. 47,XXY
B. 47,XXX in all cases
C. 46,XY in all cases
D. 45,X
Answer: D. Monosomy X is characteristic.

R3. Trisomy 21 is most directly associated with:

A. Down syndrome
B. Hemophilia A
C. Klinefelter syndrome
D. Sickle-cell trait
Answer: A. Down syndrome commonly results from an extra chromosome 21.

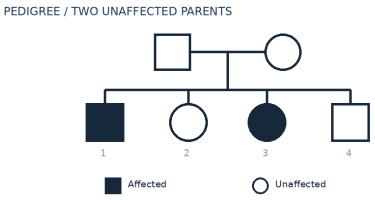
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QUESTION 20 | BIOLOGY

PEDIGREE ANALYSIS

Examine the pedigree shown. Two unaffected parents have an affected child; both sexes are affected in the extended family. Which inheritance pattern best fits the pedigree?

A. Autosomal dominant with complete penetrance
B. Autosomal recessive
C. X-linked dominant
D. X-linked recessive



CORRECT ANSWER • B — Autosomal recessive

An affected child of two unaffected parents is compatible with autosomal recessive inheritance if both parents are carriers. The family pattern involving both sexes supports an autosomal rather than a strictly sex-linked mechanism.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. A fully penetrant autosomal dominant trait typically needs an affected parent; unaffected parents producing an affected child is atypical.

C. X-linked dominant inheritance would normally require an affected parent for an affected child.

D. X-linked recessive inheritance is less consistent with the provided broad distribution and the affected female pattern under unaffected-father conditions.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Sağlıklı iki taşıyıcı ebeveynden hasta çocuk gelebilir: Aa×Aa → aa %25. Erkek-kız birlikte etkileniyorsa otozomal olasılığı düşün.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **If two unaffected carriers (Aa × Aa) have a child, the chance of aa is:**

A. 1/2
B. 3/4
C. 1
D. 1/4

Answer: D. Punnett square yields 1:2:1.

R2. **Which inheritance pattern often affects both sexes equally?**

A. Autosomal recessive
B. Y-linked
C. Mitochondrial exclusively in males
D. Sex-limited only

Answer: A. Autosomal genes are not on sex chromosomes.

R3. **What is the genotype of an unaffected carrier for an autosomal recessive disease?**

A. aa
B. Aa
C. AA only
D. XY always

Answer: B. Heterozygotes carry one pathogenic recessive allele.

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QUESTION 21 | BIOLOGY

DIGESTIVE ENZYMES

Human saliva contains amylase, which can hydrolyze which carbohydrates?
1. Starch; 2. Albumin; 3. Cholesterol; 4. Glycogen; 5. Casein; 6. Cellulose.

A. 1 and 4
B. 1, 4 and 6
C. 2, 3 and 5
D. 3, 5 and 6

CORRECT ANSWER • A — 1 and 4

Salivary alpha-amylase hydrolyzes α-1,4 linkages in starch and glycogen, but not proteins, lipids or beta-linked cellulose. Therefore statements 1 and 4 are correct.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. Cellulose is beta-1,4-linked and is not digested by human salivary amylase.

C. Albumin and casein are proteins, while cholesterol is a sterol; none matches the amylase substrate set.

D. Cholesterol and casein are not amylase substrates, and cellulose is not cleaved by human salivary amylase.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Tükürük amilazı nişasta ve glikojendeki alfa-1,4 bağlarını keser; selüloz beta-1,4 olduğundan insan amilazı parçalayamaz.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which polysaccharide is a substrate for salivary amylase?

A. Starch
B. Cellulose
C. Chitin
D. Collagen

Answer: A. Amylase cleaves alpha-1,4 glucosidic bonds.

R2. Why is cellulose not digested by salivary amylase?

A. It is made of amino acids
B. It contains beta-1,4 glycosidic linkages
C. It has no covalent bonds
D. It is a steroid

Answer: B. Human amylase targets alpha linkages.

R3. Salivary amylase begins carbohydrate digestion mainly in the:

A. Stomach acid exclusively
B. Colon only
C. Mouth
D. Bloodstream

Answer: C. Saliva contains amylase in the oral cavity.

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QUESTION 22 | BIOLOGY

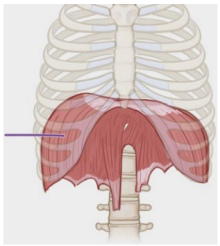
RESPIRATORY ANATOMY

The organ illustrated is the diaphragm. Which statements are correct?

1. It is mainly smooth muscle.
2. It contains skeletal muscle and connective tissue.
3. It is active during inspiration.
4. It is the major active muscle of quiet expiration.
5. It derives from mesoderm.
6. It derives from endoderm.

A. 1, 3 and 5
B. 1, 4 and 6
C. 2, 3 and 5
D. 2, 4 and 6

?



CORRECT ANSWER • C — 2, 3 and 5

The diaphragm is striated skeletal muscle with connective tissue; it contracts during inspiration, increases thoracic volume and originates embryologically from mesodermal structures.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. The diaphragm is not primarily smooth muscle, invalidating statement 1.

B. Quiet expiration is mostly passive relaxation, and the diaphragm is not mesoderm-independent.

D. Statements 4 and 6 are false: quiet expiration is passive and the diaphragm does not originate from endoderm.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Diyafram çizgili iskelet kasıdır, istemsiz ritmik de çalışır; soluk alma sırasında kasılıp düzleşir; mezoderm kökenli.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. What happens to the diaphragm during quiet inspiration?

A. It relaxes upward
B. It contracts and descends
C. It ceases movement
D. It becomes cartilage

Answer: B. Diaphragm contraction expands the thorax.

R2. The diaphragm muscle is classified structurally as:

A. Smooth muscle
B. Cardiac muscle
C. Skeletal muscle
D. Epithelial tissue

Answer: C. It contains striated skeletal muscle fibers.

R3. What is the embryonic germ-layer origin of diaphragm muscle?

A. Endoderm
B. Ectoderm only
C. Trophoblast only
D. Mesoderm

Answer: D. Skeletal muscle arises from mesoderm.

QUESTION 23 | BIOLOGY

NERVOUS SYSTEM

Which combination lists the four main anatomical subdivisions of the brain?
1. Cerebrum; 2. Thalamus; 3. Brainstem; 4. Meninges; 5. Diencephalon; 6. Cerebellum; 7. Spinal cord.

A. 1, 2, 3 and 4
B. 1, 3, 5 and 6
C. 2, 5, 6 and 7
D. 3, 4, 6 and 7

CORRECT ANSWER • B — 1, 3, 5 and 6

Four major brain subdivisions are the cerebrum, diencephalon, brainstem and cerebellum. Thalamus is part of diencephalon; meninges are coverings and spinal cord lies outside the brain.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. The thalamus is part of diencephalon and meninges are protective membranes rather than a subdivision.

C. This duplicates diencephalon/thalamus and incorrectly includes spinal cord.

D. Meninges and spinal cord should not replace cerebrum/diencephalon as major brain subdivisions.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Beyin bölümleri serebrum, diensefalon, beyin sapı ve serebellumdur; talamus diensefalonun parçasıdır.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which structure belongs to the diencephalon?

A. Spinal cord
B. Dura mater
C. Thalamus
D. Brachial plexus

Answer: C. The thalamus is within diencephalon.

R2. Which structure is a protective covering, not a principal brain division?

A. Cerebellum
B. Brainstem
C. Cerebrum
D. Meninges

Answer: D. Meninges cover the CNS.

R3. Which structure coordinates motor balance and precision?

A. Cerebellum
B. Liver
C. Hypothalamus only
D. Pituitary

Answer: A. Cerebellum modulates coordination and balance.

QUESTION 24 | BIOLOGY

PROBABILITY

Assume that the sex of each newborn is independent with P(boy) = P(girl) = 1/2. Four babies are born. Which row correctly gives:
(a) P(exactly 2 boys and 2 girls); (b) P(all 4 girls); (c) most probable boy–girl split; (d) P(at least 1 girl)?

A. (a) 1/2; (b) 1/8; (c) 2:2; (d) 1/10

B. (a) 3/8; (b) 1/16; (c) 2:2; (d) 15/16

C. (a) 1/8; (b) 1/32; (c) 1:3; (d) 1/3

D. (a) 1/16; (b) 1/64; (c) 1:3; (d) 1/4

CORRECT ANSWER • B — (a) 3/8; (b) 1/16; (c) 2:2; (d) 15/16

With four independent births of equal boy/girl probability, exactly two boys has binomial probability C(4,2)(1/2)^4 = 6/16 = 3/8. All girls is 1/16; 2:2 is the most likely split; at least one girl is 1 − (1/2)^4 = 15/16.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. The exactly-two probability is not 1/2, all-girl probability not 1/8, and at-least-one not 1/10.

C. The proposed probabilities 1/8, 1/32 and 1/3 are not binomial results for four independent births.

D. The probabilities 1/16, 1/64 and 1/4 likewise conflict with the four-birth binomial model.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Dört doğumda toplam 2^4=16 eş olasılıklı sıra; 2 erkek 2 kız için 4'ün 2'li kombinasyonu=6, 6/16=3/8. En az bir kız=1−1/16=15/16.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. For 3 independent births with equal sex probability, P(all girls) is:

A. 1/4
B. 1/2
C. 3/8
D. 1/8

Answer: D. There is one all-girl outcome among 2^3 possibilities.

R2. For 4 births, how many ordered sequences contain exactly two girls?

A. 6
B. 2
C. 4
D. 8

Answer: A. Choose two positions among four: C(4,2)=6.

R3. For 3 independent births, P(at least one girl) is:

A. 1/8
B. 7/8
C. 3/8
D. 1/2

Answer: B. Use complement: 1−P(all boys)=1−1/8.

QUESTION 25 | BIOLOGY

ORGAN FUNCTIONS

Which organs are correctly paired with their functions?
1. Thymus – primary site of erythrocyte formation.
2. Spleen – principal regulator of blood glucose.
3. Gallbladder – stores and releases bile.
4. Liver – metabolizes drugs and toxins.
5. Kidneys – regulate blood pressure and water–electrolyte balance.

A. 1, 2 and 3
B. 1, 4 and 5
C. 2, 3 and 5
D. 3, 4 and 5

CORRECT ANSWER • D — 3, 4 and 5

The gallbladder stores and releases bile, the liver performs drug and toxin metabolism, and kidneys regulate fluid, electrolytes and blood pressure; statements 3, 4, 5 are correct.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Statement 1 is false because erythropoiesis occurs mainly in marrow; statement 2 falsely assigns glucose regulation to spleen.

B. Statement 1 remains false even though liver and kidneys have valid functions.

C. Statement 2 wrongly names the spleen as the principal blood-glucose regulator.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Safra kesesi safrayı depolar, karaciğer detoksifikasyon yapar, böbrek su-tuz ve basıncı düzenler; eritrosit kemik iliğinde üretilir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. What is the main storage function of the gallbladder?

A. Bile
B. Insulin
C. Hemoglobin
D. Oxygen

Answer: A. The gallbladder concentrates and stores bile.

R2. Which organ is a major site of drug metabolism?

A. Spleen
B. Liver
C. Gallbladder lumen
D. Thymus

Answer: B. Hepatic enzymes metabolize drugs.

R3. Which organ regulates blood pressure through renin release and fluid balance?

A. Spleen
B. Appendix
C. Kidney
D. Lens

Answer: C. Renin-angiotensin and sodium handling influence blood pressure.

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SECTION II / CHEMISTRY

Questions 26–50 • General, inorganic and organic chemistry.

QUESTION 26 | CHEMISTRY

ELECTRON CONFIGURATION

How many atomic orbitals in the outermost occupied shell of a ground-state Ca atom actually contain electrons?

A. One
B. Two
C. Three
D. Four

CORRECT ANSWER • A — One

Ground-state calcium is [Ar]4s2; its outermost occupied principal shell (n=4) has electrons only in the 4s orbital. The question explicitly asks occupied orbitals, not the total number of available n=4 orbitals.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. Two is the number of outer-shell electrons, not occupied orbitals.

C. Three counts neither n=4 occupied orbitals nor actual electron configuration.

D. Four does not describe the single occupied 4s orbital.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Ca(Z=20) [Ar]$4s^2$. Son katmanda elektron içeren orbital sayısı 1 (4s); elektron sayısı ise 2'dir. İkisini ayır.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. What is the ground-state electron configuration of calcium?

A. [Ar]3d2
B. [Ar]4s2
C. [Ne]3s2
D. [Ar]4p2

Answer: B. Calcium has two electrons in 4s.

R2. How many electrons occupy the 4s orbital of ground-state Ca?

A. One
B. Three
C. Two
D. Zero

Answer: C. 4s has two paired electrons.

R3. How many 4s atomic orbitals exist within the 4s subshell?

A. Two
B. Three
C. Five
D. One

Answer: D. An s subshell contains one orbital.

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QUESTION 27 | CHEMISTRY

BOND POLARITY

In which sequence does the polarity of the H–halogen bond increase from left to right?

A. HF, HBr, HCl, HI

B. HI, HBr, HCl, HF

C. HI, HCl, HBr, HF

D. HF, HCl, HBr, HI

CORRECT ANSWER • B — HI, HBr, HCl, HF

Bond polarity generally increases with electronegativity difference. Among hydrogen halides the order is HI < HBr < HCl < HF, because halogen electronegativity increases I < Br < Cl < F.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. This sequence starts with the most polar HF and is not monotonically increasing.

C. The ordering HCl before HBr reverses the expected relative electronegativity differences.

D. This sequence is decreasing rather than increasing.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Halojenlerin elektronegatifliği F>Cl>Br>I; H–X bağ polarlığı HI<HBr<HCl<HF şeklinde artar.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which H–X bond is most polar?

A. H–I

B. H–Br

C. H–F

D. H–Cl

Answer: C. Fluorine has the highest electronegativity.

R2. Which hydrogen halide has the smallest H–halogen bond electronegativity difference?

A. HF

B. HCl

C. HBr

D. HI

Answer: D. Iodine is least electronegative among these halogens.

R3. What trend typically increases bond polarity?

A. Greater electronegativity difference

B. Equal electronegativity only

C. Greater atomic number alone

D. Identical bonded atoms

Answer: A. Unequal attraction polarizes a bond.

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QUESTION 28 | CHEMISTRY

DNA HYDROGEN BONDS

How many hydrogen bonds form in a standard Watson–Crick adenine–thymine base pair?

A. One
B. Two
C. Four
D. Six

CORRECT ANSWER • B — Two

A canonical Watson–Crick A–T base pair contains two hydrogen bonds; in contrast G–C contains three.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. One bond undercounts the canonical A–T interaction.

C. Four overcounts A–T hydrogen bonds.

D. Six overcounts well beyond either canonical pair.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: DNA'da A–T arasında 2, G–C arasında 3 hidrojen bağı vardır. Bağ sayısını baz çiftine göre ezberle.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. How many canonical hydrogen bonds join G and C?

A. Two
B. One
C. Four
D. Three

Answer: D. G–C has three hydrogen bonds.

R2. Which DNA pair has two hydrogen bonds?

A. A–T
B. G–C
C. G–T as canonical
D. A–C as canonical

Answer: A. A–T pairs through two hydrogen bonds.

R3. Which DNA fragment generally has higher Tm at the same length and conditions?

A. AT-rich
B. GC-rich
C. Single-stranded RNA only
D. No bases

Answer: B. GC enrichment usually stabilizes DNA duplexes.

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QUESTION 29 | CHEMISTRY

THERMOCHEMISTRY

The standard enthalpy of neutralization is approximately −57 kJ per mole of water formed for which acid–base reaction?

A. $CH_3COOH + NaOH$
B. $HCl + NaOH$
C. $H_2SO_4 + Zn(OH)_2$ (solid)
D. $NH_3(aq) + HCl$

CORRECT ANSWER • B — HCl + NaOH

For dilute aqueous strong monoprotic acid and strong base, the dominant net ionic reaction is H+ + OH− → H2O, releasing approximately 57 kJ per mole of water under standard-type conditions; HCl + NaOH is the standard model.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Weak acetic acid requires ionization enthalpy, so the measured heat differs.

C. Solid Zn(OH)2 adds dissolution processes and is not the simple strong-base model.

D. NH3(aq) is a weak base and its protonation changes the observed enthalpy.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Güçlü asit + güçlü bazın nötrleşmesinde H+ + OH− → H2O, yaklaşık −57 kJ/mol H2O. Zayıf asit/bazın iyonlaşma ısısı sonucu etkiler.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. What is the net ionic equation for HCl + NaOH(aq)?

A. H+ + OH− → H2O
B. Na+ + Cl− → NaCl(s)
C. H2 + O2 → H2O
D. Cl2 + H2 → HCl

Answer: A. Strong acid-base neutralization forms water.

R2. The standard neutralization enthalpy of strong acid/base is approximately:

A. +57 kJ per mol H2O
B. −57 kJ per mol H2O
C. 0
D. −5700 kJ per mol H2O

Answer: B. Neutralization is exothermic.

R3. Which reagent is a weak base in water?

A. NaOH
B. KOH
C. NH3
D. Ba(OH)2

Answer: C. Ammonia only partially protonates in water.

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QUESTION 30 | CHEMISTRY

REACTION STOICHIOMETRY

Consider two elementary stages:

$2A + B \rightarrow 2C, \Delta H_1 < 0$

$C + D \rightarrow A + 2E, \Delta H_2 < 0$

After multiplying the second stage by two and adding, which is the correct overall reaction?

A. A + B + D → 4E

B. B + 2D → 4E

C. 2A + B + 2D → 2C + 4E

D. B + D → 2E

CORRECT ANSWER • B — B + 2D → 4E

Doubling the second stage gives 2C + 2D → 2A + 4E. Adding 2A + B → 2C cancels 2A and 2C, leaving B + 2D → 4E.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. A includes uncancelled A and the incorrect coefficient for D.

C. C leaves both starting and intermediate species after cancellation.

D. D fails to double the second step and has incorrect stoichiometry for E.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: İkinci basamağı 2 ile çarp: 2C+2D→2A+4E; ilk basamakla topla, 2A/2C sadeleşir: B+2D→4E.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. For A→B and B→C, what is the net reaction?

A. B→A

B. A→C

C. A+B→C

D. A→B+C

Answer: B. The intermediate B cancels.

R2. When a balanced reaction equation is multiplied by 2, its ΔH is:

A. Unchanged

B. Divided by 2

C. Multiplied by 2

D. Always zero

Answer: C. Enthalpy is extensive.

R3. What must be eliminated when adding elementary steps to obtain an overall equation?

A. Every reactant

B. Every product

C. All coefficients

D. Species appearing on both sides as intermediates

Answer: D. Intermediates cancel algebraically.

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QUESTION 31 | CHEMISTRY

CHEMICAL EQUILIBRIUM

At dynamic chemical equilibrium, the rate of the reverse reaction is:

A. Higher than the forward rate

B. Lower than the forward rate

C. Equal to the forward rate

D. Always zero

CORRECT ANSWER • C — Equal to the forward rate

At dynamic equilibrium, microscopic forward and reverse reaction rates are equal, preventing a net concentration change even though each process continues.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. A higher reverse rate would cause net shift toward reactants.

B. A lower reverse rate would cause net shift toward products.

D. An equilibrium reaction continues at nonzero rates rather than having reverse rate zero.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Dengede vileri=vgeri. Tepkime durmaz; karşıt yönlü süreçler eşit hızda sürer.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **At dynamic equilibrium, forward and reverse reaction rates are:**

A. Both zero
B. Always unequal
C. Equal
D. Directly proportional to atomic number
Answer: C. Equal rates prevent net change.

R2. **Which description of dynamic equilibrium is correct?**

A. All reactions stop
B. Only product remains
C. Reactants and products must match in concentration
D. Molecules still react
Answer: D. Both directions continue.

R3. **At equilibrium, a catalyst primarily changes:**

A. How fast equilibrium is reached
B. The fixed-temperature value of K
C. The sign of every charge
D. The atom count
Answer: A. Catalysts speed both directions.

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QUESTION 32 | CHEMISTRY

SOLUTION CONCENTRATION

Assuming the usual mass/volume convention, how many grams of NaCl are needed to prepare 1.00 L of a 0.9% (m/v) solution?

A. 9 g
B. 0.9 g
C. 0.09 g
D. 90 g

CORRECT ANSWER • A — 9 g

A 0.9% (m/v) solution contains 0.9 g solute per 100 mL solution. For 1000 mL, multiply by ten: 9 g NaCl.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. 0.9 g is the amount specified for only 100 mL, not 1 L.

C. 0.09 g is smaller by a factor of 100.

D. 90 g would correspond to a 9% (m/v) solution.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: %0,9 m/v = 100 mL'de 0,9 g; 1000 mL'de 9 g. Birim ve yüzde tanımını başta yaz.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. How many grams are in 200 mL of 1% (m/v) NaCl?

A. 0.2 g
B. 20 g
C. 1 g
D. 2 g

Answer: D. 1 g per 100 mL gives 2 g per 200 mL.

R2. A 5% (m/v) solution contains how many g per 100 mL?

A. 5 g
B. 0.5 g
C. 50 g
D. 100 g

Answer: A. Percent m/v is g per 100 mL.

R3. How many grams solute prepare 500 mL of 0.2% (m/v)?

A. 0.1 g
B. 1 g
C. 10 g
D. 2 g

Answer: B. 0.2g/100mL × 5=1g.

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QUESTION 33 | CHEMISTRY

PRECIPITATION

Which pair of aqueous solutions produces a precipitate when mixed in suitable concentrations?

A. $NaNO_3$ and KCl
B. $CaCl_2$ and Na_2CO_3
C. NaCl and KNO_3
D. K_2SO_4 and $NaNO_3$

CORRECT ANSWER • B — $CaCl_2$ and Na_2CO_3

Ca2+ reacts with CO3^2− to produce poorly soluble CaCO3(s); the other listed mixtures contain ions that remain soluble under the usual aqueous conditions.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. NaNO3 and KCl lead to soluble nitrate/chloride combinations without net precipitation.

C. NaCl and KNO3 similarly remain as dissolved spectator ions.

D. K2SO4 and NaNO3 give only soluble alkali-metal and nitrate salts.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: CaCl2 + Na2CO3 → CaCO3(k) + 2NaCl. Çökelme için çözünmeyen tuz oluşması gerekir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which precipitate forms from Ca2+ and CO3^2−?

A. CaCO3
B. NaCl
C. KNO3
D. Glucose

Answer: A. Calcium carbonate is poorly soluble.

R2. Which ion is usually a spectator when CaCl2 mixes with Na2CO3?

A. Ca2+
B. Na+
C. CO3^2−
D. No spectator ions

Answer: B. Na+ remains dissolved.

R3. Which salts are nearly always soluble in water?

A. All carbonates
B. All sulfides
C. Nitrates
D. All hydroxides

Answer: C. Nitrate salts are generally soluble.

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QUESTION 34 | CHEMISTRY

REDOX CHEMISTRY

In the redox transformation $I^- \rightarrow I_2$ and $MnO_4^- \rightarrow MnO_2$, which species is oxidized?

A. Oxygen atoms in permanganate

B. Manganese in permanganate

C. Iodide ions

D. No species is oxidized

CORRECT ANSWER • C — Iodide ions

Iodide (I−) loses electrons and is converted to elemental iodine (I2), so iodine is oxidized. Manganese in permanganate gains electrons as its oxidation number decreases from +7 to +4 in MnO2.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Oxygen is not the atom undergoing oxidation in this indicated redox change.

B. Manganese is reduced from +7 to +4 rather than oxidized.

D. Iodide oxidation does occur, so the claim that no species is oxidized is false.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: I−(−1)→I2(0) yükseltgenme; Mn(+7)→MnO2(+4) indirgenme. Elektron veren yükseltgenir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. When an ion loses electrons, it undergoes:

A. Reduction
B. Oxidation
C. Hydration only
D. Precipitation necessarily
Answer: B. Oxidation is electron loss.

R2. What is Mn oxidation number in MnO4−?

A. +4
B. −1
C. +7
D. +2
Answer: C. x+4(−2)=−1 gives +7.

R3. Which species is the reducing agent in I− → I2?

A. MnO4−
B. MnO2
C. Water exclusively
D. I−
Answer: D. Iodide donates electrons.

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QUESTION 35 | CHEMISTRY

AROMATIC SUBSTITUTION

Which substituent acts predominantly as a meta director in electrophilic aromatic substitution?

A. $-CH_3$
B. $-NO_2$
C. −NHCOR
D. −OH

CORRECT ANSWER • B — $-NO_2$

A nitro group strongly withdraws electron density by induction and resonance, deactivating the ring and favoring meta substitution in electrophilic aromatic reactions.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. A methyl group is generally ortho/para-directing.

C. An amide-substituted amino group −NHCOR can donate by resonance and generally directs ortho/para.

D. A hydroxyl group is a strong resonance donor and ortho/para director.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: −NO2 elektron çeker ve meta yönlendirir; −CH3, −OH ve −NHCOR çoğunlukla orto/para yönlendirir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which substituent typically directs electrophilic substitution to meta?

A. −OH
B. −NH2
C. −NO2
D. −CH3

Answer: C. Nitro groups are meta-directing.

R2. Which group usually activates an aromatic ring?

A. −NO2
B. −CN
C. −COOH
D. −OH

Answer: D. Hydroxyl donates electron density by resonance.

R3. In benzene nomenclature, meta corresponds to positions:

A. 1,3
B. 1,2
C. 1,4
D. 1,6 as distinct from 1,2

Answer: A. Meta is a 1,3 relationship.

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QUESTION 36 | CHEMISTRY

ORGANIC ISOMERISM

1-Propanol and 2-propanol are:

A. Chain isomers

B. Positional isomers

C. Functional group isomers

D. Not isomers

CORRECT ANSWER • B — Positional isomers

1-Propanol and 2-propanol share the same molecular formula C3H8O and functional group (alcohol), but the −OH group is on a different carbon. They are positional isomers.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Their three-carbon skeleton is identical, so they are not chain isomers.

C. Both have the same alcohol functional group, so they are not functional group isomers.

D. They are distinct compounds with different connectivities.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: 1-propanol ve 2-propanol aynı karbon iskeletinde −OH konumu farklı: konum izomerliği.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **1-Butanol and 2-butanol are examples of:**

A. Isotopes
B. Chain isomers exclusively
C. Identical molecules
D. Positional isomers
Answer: D. The −OH location differs.

R2. **Which pair can be functional group isomers?**

A. Ethanol and dimethyl ether
B. 1-Propanol and 2-propanol
C. Two drawings of propane
D. Ethane and propane
Answer: A. C2H6O can occur as alcohol or ether.

R3. **Constitutional isomers must share their:**

A. Bond connectivity
B. Molecular formula
C. Boiling point
D. Functional group in all cases
Answer: B. They have same formula but differing connectivity.

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QUESTION 37 | CHEMISTRY

SOLUTION REACTIONS

Which pair of aqueous solutions normally produces no net ionic reaction upon mixing?

A. $CaCl_2$ and $NaNO_3$
B. $AgNO_3$ and HI
C. $CuSO_4$ and Na_2S
D. HCl and KOH

CORRECT ANSWER • A — $CaCl_2$ and $NaNO_3$

CaCl2 and NaNO3 yield only soluble ions in ordinary aqueous solution; neither an insoluble salt, gas nor weakly ionized product is formed, so there is no net ionic reaction.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. AgNO3 with HI forms insoluble AgI(s).

C. CuSO4 and Na2S yield insoluble CuS(s).

D. HCl and KOH undergo acid-base neutralization to form water.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Çözeltide yeni çökelti/gaz/zayıf elektrolit oluşmazsa net iyon denklemi yoktur; AgI, CuS çöker, HCl+KOH nötrleşir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. What insoluble product forms when Ag+ meets I−?

A. AgI(s)
B. NaNO3(s)
C. KCl(s)
D. Glucose
Answer: A. Silver iodide is insoluble.

R2. What is the net ionic reaction of HCl(aq) + KOH(aq)?

A. K+ + Cl− → KCl(s)
B. H+ + OH− → H2O
C. H2O → H2 + O2
D. Cl− + H+ → HCl(g) always
Answer: B. Strong acid and base form water.

R3. Which indicates a possible net ionic reaction?

A. Two fully soluble nitrate salts with no other driving force
B. Simple mixing of NaCl and KNO3
C. Precipitate formation
D. Stirring pure water
Answer: C. A precipitate removes ions from solution.

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QUESTION 38 | CHEMISTRY

ORGANIC REACTIONS

Which statement is FALSE?

A. Alkanes can burn in oxygen

B. Alkenes can undergo addition of hydrogen halides

C. Alkynes cannot undergo ozonolysis

D. Aromatic rings can undergo bromination under suitable conditions

CORRECT ANSWER • C — Alkynes cannot undergo ozonolysis

Alkynes can undergo ozonolysis, typically yielding oxidative cleavage products under suitable conditions. Thus the categorical assertion that alkynes cannot react with ozone is false.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Alkanes can undergo combustion in oxygen; A is true.

B. Alkenes add hydrogen halides across their double bonds; B is true.

D. Arenes undergo electrophilic bromination under suitable catalytic conditions; D is true.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Alkinlerin ozonolizi mümkündür; “asla tepkime vermez” gibi mutlak ifadeleri kontrol et.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **Which unsaturated hydrocarbon commonly undergoes electrophilic HX addition?**

A. Alkane only

B. Alkene

C. Fully saturated cycloalkane exclusively

D. Noble gas

Answer: B. The C=C bond reacts with HX.

R2. **Benzene reacts with Br2 in the presence of FeBr3 mainly by:**

A. Simple radical addition under every condition

B. Neutralization

C. Electrophilic substitution

D. Fermentation

Answer: C. Aromaticity is retained by substitution.

R3. **Ozonolysis can cleave which carbon-carbon unsaturation?**

A. Only C–C sigma bonds in methane

B. No unsaturated bond ever

C. Only peptide bonds

D. C≡C

Answer: D. Alkynes can undergo oxidative cleavage.

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QUESTION 39 | CHEMISTRY

REDOX REACTIONS

Consider $Zn + Cu(NO_3)_2 \rightarrow Zn(NO_3)_2 + Cu$. Which statement is TRUE?

A. Cu^{2+} is the oxidizing agent

B. Cu^{2+} is the reducing agent

C. Zinc loses electrons and is therefore reduced

D. The reaction is impossible

CORRECT ANSWER • A — Cu^{2+} is the oxidizing agent

Zn is oxidized to Zn2+ while Cu2+ is reduced to Cu metal. The species accepting electrons, Cu2+, is the oxidizing agent; nitrate is a spectator ion in this displacement.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. Cu2+ accepts rather than supplies electrons, so it is not the reducing agent.

C. Zinc loses electrons and is therefore oxidized, not reduced.

D. The reaction is spontaneous under conventional aqueous standard conditions.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Zn→Zn2+ +2e− yükseltgenme; Cu2+ +2e−→Cu indirgenme. Cu2+ yükseltgendir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which metal is oxidized in Zn + Cu2+ → Zn2+ + Cu?

A. Copper metal

B. Both exactly equally

C. Zinc

D. Neither

Answer: C. Zinc loses electrons.

R2. Which ion is reduced in this reaction?

A. Zn2+

B. NO3−

C. H+ necessarily

D. Cu2+

Answer: D. Copper(II) gains electrons.

R3. What is the function of an oxidizing agent?

A. Accepting electrons

B. Donating electrons only

C. Increasing all pH values

D. Removing all ions

Answer: A. Oxidizing agents undergo reduction.

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QUESTION 40 | CHEMISTRY

ORGANIC FUNCTIONAL GROUPS

Which formula represents an ether?

A. CH_3CHO
B. CH_3OCH_3
C. CH_3COCH_3
D. CH_3COOH

CORRECT ANSWER • B — CH_3OCH_3

Dimethyl ether CH3OCH3 contains an oxygen atom singly bonded to two carbon substituents (R–O–R′), which defines the ether functional group.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. CH3CHO is an aldehyde containing –CHO.

C. CH3COCH3 is a ketone with an internal C=O group.

D. CH3COOH is a carboxylic acid.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Eter R–O–R′; aldehit –CHO; keton >C=O; asit –COOH. Fonksiyonel grubu tanı.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. **Which formula is an ether?**

A. CH3CH2OH
B. CH3CHO
C. CH3COOH
D. CH3CH2OCH3

Answer: D. An ether has oxygen between two carbon groups.

R2. **What is the functional-group pattern for an aldehyde?**

A. R–CHO
B. R–O–R′
C. R–COOR′
D. R–NH2

Answer: A. Aldehydes contain terminal carbonyl –CHO.

R3. **Which class contains CH3COCH3?**

A. Ether
B. Ketone
C. Primary amine
D. Alkene

Answer: B. Acetone is a ketone.

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QUESTION 41 | CHEMISTRY

ESTERIFICATION

Esters are commonly formed by reacting:

A. A strong acid with a strong base

B. An amine with an alcohol

C. A carboxylic acid with an alcohol

D. An amine with an alkene

CORRECT ANSWER • C — A carboxylic acid with an alcohol

Fischer esterification combines a carboxylic acid and alcohol under acid catalysis to form an ester and water in equilibrium.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Acid-base neutralization typically forms salts and water rather than an ester.

B. Amines and alcohols are not the usual pair for ordinary Fischer esterification.

D. Amines and alkenes are not the standard ester-forming reactant combination.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Karboksilik asit + alkol ester + su (asit katalizi). Esterleşme ile nötrleşmeyi ayır.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Ethanoic acid plus ethanol can form:

A. Ethyl ethanoate
B. Ethanal only
C. Methane
D. Ethene exclusively
Answer: A. Acid plus alcohol gives an ester.

R2. What small molecule is usually eliminated in Fischer esterification?

A. Oxygen gas
B. Water
C. Chlorine
D. Ammonia always
Answer: B. Ester formation eliminates water.

R3. What is the characteristic ester linkage?

A. −O− only
B. −NH2
C. −COO−
D. −CHO only
Answer: C. Esters contain −C(=O)−O−.

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QUESTION 42 | CHEMISTRY

HALOGENATED COMPOUNDS

CH_3–CH(Cl)–CH_3 is classified as a:

A. Primary alkyl halide

B. Secondary alkyl halide

C. Tertiary alkyl halide

D. Quaternary alkyl halide

CORRECT ANSWER • B — Secondary alkyl halide

In CH3–CH(Cl)–CH3, chlorine is attached to the central carbon, which is bonded to two other carbons. Hence the carbon bearing the halogen is secondary.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. A primary haloalkane has a halogen-bearing carbon attached to only one other carbon.

C. A tertiary haloalkane requires three carbon substituents on the halogen-bearing carbon.

D. A neutral carbon cannot be ordinarily quaternary and still carry the specified chlorine bond.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Halojenin bağlı olduğu C atomuna kaç C bağlı? CH3–CHCl–CH3: iki C → sekonder.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. 2-Bromopropane is a:

A. Primary alkyl halide
B. Secondary alkyl halide
C. Tertiary alkyl halide
D. Quaternary halide
Answer: B. The C–Br carbon bonds to two carbons.

R2. Which structure contains a primary carbon-bound chlorine?

A. (CH3)3CCl
B. CH3CHClCH3
C. CH3CH2Cl
D. (CH3)2CHCl
Answer: C. The CH2Cl carbon bonds to one other carbon.

R3. Which condition defines a tertiary alkyl halide?

A. Halogen bonded to three atoms
B. Carbon chain with three total atoms only
C. Halogen bound to nitrogen
D. Halogen-bearing carbon bonded to three carbons
Answer: D. Tertiary classification is based on carbon substitution.

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QUESTION 43 | CHEMISTRY

POLYMER CHEMISTRY

A typical condensation polymerization reaction joins monomers while releasing a small molecule such as:

A. Hydrogen gas
B. Oxygen gas
C. Carbon dioxide only
D. Water

CORRECT ANSWER • D — Water

Condensation polymerization often joins monomers through reactions that eliminate a small molecule, commonly water, while forming bonds such as ester or amide linkages.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Hydrogen gas is not the standard condensation byproduct in typical ester/amide polymerizations.

B. Oxygen gas is not released by ordinary condensation polymerization.

C. Carbon dioxide can occur in some specialized systems but is not the only or typical small molecule implied.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Kondenzasyon polimerleşmesinde monomerler bağlanırken su gibi küçük molekül ayrılabilir; poliester/poliamit örneklerini bil.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which polymer linkage can arise from condensation of acid and alcohol groups?

A. Pure ionic bond only
B. Metallic bond
C. Ester linkage
D. Hydrogen gas linkage

Answer: C. Polyesters contain ester bonds.

R2. A typical byproduct of forming a peptide bond from amino and carboxyl groups is:

A. Oxygen gas
B. Elemental sulfur
C. Methane
D. Water

Answer: D. Condensation eliminates water.

R3. What is a monomer?

A. A unit that can join in polymer formation
B. An atom with no nucleus
C. A nonreactive noble gas always
D. A macroscopic crystal only

Answer: A. Monomers are building units of polymers.

QUESTION 44 | CHEMISTRY

STRUCTURAL ISOMERISM

Butanal ($CH_3CH_2CH_2CHO$) and butan-2-one ($CH_3COCH_2CH_3$) are:

A. Constitutional isomers

B. Isotopes

C. Identical molecules

D. Carboxylic acids

CORRECT ANSWER • A — Constitutional isomers

Butanal and butan-2-one have the same molecular formula C4H8O but different connectivity and functional groups (aldehyde versus ketone), making them constitutional functional-group isomers.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. Isotopes differ in neutron number within elements, not in organic bond connectivity.

C. The two compounds have different carbonyl positions and identities, so they are not identical.

D. Both compounds are carbonyl compounds but neither is a carboxylic acid.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Butanal ve bütan-2-on C4H8O izomeri; biri aldehit, diğeri keton → fonksiyonel grup izomerliği.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which pair can be functional-group isomers?

A. Ethane and propane

B. Butane and butene

C. Methane and methanol

D. Propanal and propanone

Answer: D. C3H6O can be aldehyde or ketone.

R2. Which functional group is present in butanal?

A. Aldehyde

B. Ketone internal carbonyl

C. Carboxylic acid

D. Ether

Answer: A. Butanal terminates in −CHO.

R3. Which functional group is present in butan-2-one?

A. Aldehyde

B. Ketone

C. Primary amine

D. Ester

Answer: B. Its carbonyl carbon bonds to two carbons.

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QUESTION 45 | CHEMISTRY

ETHERS

Compounds with the general structure R–O–R′ are called:

A. Carboxylic acids
B. Alcohols
C. Ethers
D. Aldehydes

CORRECT ANSWER • C — Ethers

Ethers have the general connectivity R–O–R′, with an oxygen atom single-bonded to two carbon-containing groups.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Carboxylic acids contain the –COOH group.

B. Alcohols contain an –OH group bonded to carbon, not R–O–R′.

D. Aldehydes contain terminal carbonyl –CHO.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: R–O–R eter; R–OH alkol. Aynı C2H6O formülünde etanol ve dimetil eter fonksiyonel izomer olabilir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which functional group belongs to ethers?

A. R–O–R′
B. R–OH
C. R–CHO
D. R–COOH

Answer: A. Ethers have two C–O single bonds.

R2. Which common ether has formula CH3OCH3?

A. Ethanol
B. Dimethyl ether
C. Acetaldehyde
D. Acetic acid

Answer: B. CH3–O–CH3 is dimethyl ether.

R3. Which pair are functional isomers with formula C2H6O?

A. Methane and ethane
B. Ethene and ethyne
C. Ethanol and dimethyl ether
D. Propane and butane

Answer: C. They share formula but differ functional group.

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QUESTION 46 | CHEMISTRY

CARBONYL COMPOUNDS

Which class of organic compounds does NOT contain a carbonyl (C=O) group as its defining functional group?

A. Alcohols

B. Esters

C. Ketones

D. Aldehydes

CORRECT ANSWER • A — Alcohols

Alcohols are characterized by C−OH and do not contain a carbonyl group as their defining functionality; esters, ketones and aldehydes each include C=O.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. Esters include the −C(=O)−O− unit, so they do contain carbonyl.

C. Ketones have an internal C=O group.

D. Aldehydes have a terminal carbonyl −CHO.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Karbonil C=O içeren aldehit, keton, ester; alkolün ayırt edici grubu −OH, karbonil değildir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which functional group contains C=O?

A. Ether

B. Ketone

C. Simple alkane

D. Alcohol as its only group

Answer: B. Ketones are carbonyl compounds.

R2. What defines a simple alcohol?

A. Terminal −CHO only

B. −COO− linkage

C. Hydroxyl group attached to carbon

D. −COOH

Answer: C. Alcohols contain a carbon-bound OH.

R3. Which carbonyl-containing compound has R−CO−R′?

A. Ether

B. Amine

C. Alkene

D. Ketone

Answer: D. Ketones have carbonyl flanked by carbon groups.

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QUESTION 47 | CHEMISTRY

ALCOHOL OXIDATION

Under controlled conditions, oxidation of a primary alcohol can yield:

A. An aldehyde
B. A ketone exclusively
C. An alkane
D. A tertiary alcohol

CORRECT ANSWER • A — An aldehyde

Mild, controlled oxidation of a primary alcohol can produce an aldehyde. Further oxidation under stronger aqueous conditions can convert the aldehyde to a carboxylic acid.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

B. A ketone is more commonly produced by oxidation of a secondary alcohol.

C. An alkane is more reduced than the starting alcohol and is not an oxidation product.

D. A tertiary alcohol cannot normally arise simply through oxidation of a primary alcohol.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Primer alkol → aldehit → karboksilik asit; sekonder alkol → keton. Kontrollü oksitlemede aldehit elde edilir.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Controlled oxidation of ethanol may give:

A. Propanone
B. Ethane
C. Ethanal
D. Ethene only

Answer: C. Ethanol is a primary alcohol yielding ethanal.

R2. Controlled oxidation of propan-2-ol gives:

A. Propanal
B. Propane
C. Propan-1-ol
D. Propanone

Answer: D. Secondary alcohols yield ketones.

R3. Further oxidation of an aldehyde generally produces:

A. Carboxylic acid
B. Ether
C. Alkane
D. Tertiary amine

Answer: A. Aldehydes can oxidize to acids.

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QUESTION 48 | CHEMISTRY

POLYMERIZATION

A condensation polymerization can be described as:

A. Monomers join only through removal of elemental oxygen

B. Monomers link together, often eliminating a small molecule such as water

C. A hydrocarbon is oxidized by molecular oxygen

D. A hydrocarbon is oxidized by water

CORRECT ANSWER • B — Monomers link together, often eliminating a small molecule such as water

Condensation polymerization links suitable bifunctional monomers and often eliminates small molecules such as water; this is distinct from addition-chain polymerization, which generally incorporates unsaturated monomers without a small-molecule byproduct.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Removing elemental oxygen as such is not the standard definition.

C. Hydrocarbon combustion is oxidation, not polymer formation.

D. Oxidation by water is not a definition of condensation polymerization.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Kondenzasyonda çok fonksiyonlu monomerler bağlanır, küçük molekül (çoğunlukla H_2O) ayrılabilir; katılma polimerizasyonunda böyle zorunluluk yok.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which polymer class commonly contains amide bonds formed by condensation?

A. Polyethylene
B. Polypropylene
C. Polyisobutylene
D. Polyamide
Answer: D. Polyamides often arise from condensation reactions.

R2. Which monomer type readily undergoes addition polymerization?

A. Alkene
B. Noble gas
C. NaCl crystal
D. Pure water only
Answer: A. C=C monomers undergo chain addition.

R3. Which byproduct is common in polyester condensation?

A. Hydrogen gas
B. Water
C. Helium
D. Elemental carbon
Answer: B. Carboxylic acids and diols release water.

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QUESTION 49 | CHEMISTRY

AMINES

Which statement about amines is correct?

A. They are acids that produce ammonia when mixed with water

B. They are inorganic acids

C. They can act as organic bases and form ammonium salts with acids

D. They are always neutral and never protonate

CORRECT ANSWER • C — They can act as organic bases and form ammonium salts with acids

Amines possess nitrogen lone pairs and often behave as weak organic bases, accepting protons from acids to form substituted ammonium salts.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. Amines are not generally organic acids that generate ammonia on addition of water.

B. Amines are carbon-containing organic nitrogen bases rather than inorganic acids.

D. Most amines can be protonated; the statement that they never protonate is false.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: Amin RNH2/R2NH/R3N baz davranış gösterir; H+ alıp amonyum tuzu oluşturur.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. What is formed when methylamine reacts with HCl?

A. Methylammonium chloride

B. Methanol

C. Methane

D. Ethanoic acid

Answer: A. Amine protonation gives an ammonium salt.

R2. Why can an amine accept H+?

A. It has no electrons

B. Nitrogen has a lone electron pair

C. It contains a carboxyl group

D. It is always ionic already

Answer: B. The N lone pair binds a proton.

R3. Which formula is a tertiary amine?

A. CH3NH2

B. (CH3)2NH

C. (CH3)3N

D. CH3CONH2

Answer: C. Three methyl groups attach to the amine nitrogen.

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QUESTION 50 | CHEMISTRY

ALCOHOL CLASSIFICATION

An alcohol is secondary when the carbon bearing the hydroxyl group is bonded to:

A. Four other carbon atoms
B. Three other carbon atoms
C. One other carbon atom
D. Two other carbon atoms

CORRECT ANSWER • D — Two other carbon atoms

A secondary alcohol has a hydroxyl-bearing carbon attached to two other carbon atoms (and usually one hydrogen). Propan-2-ol is a typical example.

WHY INCORRECT? / OPTION-BY-OPTION ANALYSIS

A. A carbon with four C−C single bonds cannot also bind an OH in an ordinary neutral alcohol.

B. A carbon bearing OH and three carbon substituents defines a tertiary alcohol.

C. A carbon bearing OH and one other carbon substituent defines a primary alcohol.

YKS PERSPECTIVE / TÜRKÇE AÇIKLAMA

YKS: OH'nin bağlı olduğu karbona bağlı karbon sayısı 1=primer, 2=sekonder, 3=tersiyer.

CHECK YOUR UNDERSTANDING / THREE NEW QUESTIONS

R1. Which alcohol is secondary?

A. Propan-1-ol
B. Propan-2-ol
C. 2-Methylpropan-2-ol
D. Methanol

Answer: B. Propan-2-ol has two carbon neighbors at its OH-bearing carbon.

R2. An OH-bearing carbon attached to three carbons defines a:

A. Primary alcohol
B. Secondary alcohol
C. Tertiary alcohol
D. Ether

Answer: C. Three carbon substituents imply tertiary.

R3. Which oxidation product is typical of a secondary alcohol?

A. Aldehyde only
B. Alkane only
C. Carboxylic acid directly with no cleavage
D. Ketone

Answer: D. Secondary alcohol oxidation forms ketones.

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