SOPHIA ACADEMY × BAIE

SOFIA KLIMENT 2024

Biology & Chemistry
Academic Solution Companion

50 source questions / 50 guided solutions

150 original reinforcement MCQs

English academic reasoning + Türkçe YKS yaklaşımı

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REVISED STUDY EDITION • NOVEMBER 2026

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SOURCE & EDITORIAL NOTE

How to use this companion

The principle is simple: learn the science behind every option, not merely the letter of the correct answer.

Each of the 50 items is presented as a clean excerpt of the supplied 2024 examination document. The original choices, diagrams, molecular structures, and mathematical notation remain visible; the original page headers, promotional artwork and the seven-page duplicate facsimile have been removed.

The Sophia MedPrep learning cycle

01	**CORRECT ANSWER** Understand why the correct option is scientifically valid.
02	**WHY INCORRECT?** Examine each distractor separately in academic English.
03	**WHAT YOU LEARNED** Identify the transferable fact or principle.
04	**YKS PERSPECTIVE** Reinforce the concept in Turkish with familiar exam reasoning.
05	**CHECK YOUR UNDERSTANDING** Solve three original four-option questions and review their keys.

Academic integrity and source status

This educational companion examines the seven-page source supplied under the title “Kliment 2024.” The original university issuance and an official answer key have not been independently authenticated. Sophia Academy and BAIE credit only this study edition’s layout, academic commentary and new practice questions—not authorship of the original examination.

Scientific accuracy is more important than forcing a letter key. Question 20 has no fully defensible answer under standard digestive physiology. Questions 3 and 49 include wording qualifications. Question 4 was checked against the membrane diagram and question 26 against the printed electron-configuration superscript.

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QUICK REFERENCE

Answer key | 50 source questions

Biology 01–25 / Chemistry 26–50

ITEM	KEY	ITEM	KEY	ITEM	KEY	ITEM	KEY	ITEM	KEY
01	A	02	C	03	D†	04	D	05	A
06	B	07	D	08	B	09	D	10	B
11	A	12	A	13	D	14	C	15	A
16	C	17	D	18	D	19	A	20	—*
21	C	22	D	23	B	24	A	25	D

ITEM	KEY	ITEM	KEY	ITEM	KEY	ITEM	KEY	ITEM	KEY
26	B	27	B	28	D	29	B	30	B
31	D	32	A	33	A	34	D	35	B
36	B	37	A	38	B	39	B	40	A
41	C	42	B	43	C	44	A	45	D
46	B	47	A	48	B	49	D†	50	A

—* Question 20: no fully valid choice; D appears intended but is scientifically defective.
† Questions 3 and 49: the likely intended answer requires a scientific wording qualification.

Study workflow

Attempt the question before reading the green answer panel. Then compare all other choices, read the Turkish YKS explanation, and solve three new questions. This layout is intentionally one question per learning unit.

Answer letters in this index are editorial determinations, not an official university key.

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SECTION I / BIOLOGY • EXAM ITEM 01/50

Question 01 | Transcription

1. During the process of transcription, the information in:

(A) DNA is converted into RNA information.
(B) RNA is converted into DNA information.
(C) protein is converted into RNA information.
(D) RNA is converted into protein information.

CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

Transcription transfers information from a DNA template into RNA through RNA polymerase; it does not synthesize a protein directly.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. reverses the normal transcription direction

C. describes no biological information-transfer pathway

D. describes translation, not transcription.

YKS PERSPECTIVE | TÜRKÇE

YKS: DNA'dan RNA sentezi transkripsiyondur. RNA'dan protein sentezi translasyondur; süreçleri ayır.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

RNA polymerase carries out DNA-directed RNA synthesis. Transcription is DNA-to-RNA information transfer.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

1.1 Which enzyme makes an RNA strand using DNA as the template?

(A) DNA ligase (B) RNA polymerase (C) Ribosome (D) DNA helicase

KEY B RNA polymerase carries out DNA-directed RNA synthesis.

1.2 An mRNA molecule is produced from a gene. This process is called:

(A) translation (B) replication (C) transcription (D) translocation

KEY C Transcription is DNA-to-RNA information transfer.

1.3 Which product is formed immediately by transcription of a protein-coding gene?

(A) RNA transcript (B) polypeptide chain (C) second DNA double helix (D) ATP synthase

KEY A The immediate product is RNA, not protein.

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SECTION I / BIOLOGY • EXAM ITEM 02/50

Question 02 | Anticodon

2. Which of the following is an anticodon?

(A) The part of a DNA molecule that codes for chain termination.
(B) A 3-nucleotide sequence of an mRNA molecule.
(C) A specific part of a tRNA molecule.
(D) A nucleotide triplet of an rRNA molecule.

CORRECT ANSWER / SCIENTIFIC STATUS

C

ACADEMIC EXPLANATION | ENGLISH

An anticodon is a three-nucleotide sequence on tRNA that base-pairs with the complementary codon on mRNA.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. is not an anticodon

B. describes an mRNA triplet

D. also refers to an mRNA triplet rather than tRNA.

YKS PERSPECTIVE | TÜRKÇE

YKS: Kodon mRNA'da, antikodon tRNA'dadır. Eşleşme tamamlayıcı bazlara dayanır.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

A tRNA anticodon base-pairs with the codon. Antiparallel RNA base pairing gives 3′-UAC-5′.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

2.1 Where is the triplet that recognizes an mRNA codon located?

(A) rRNA (B) DNA promoter (C) tRNA (D) ribosomal large subunit protein

KEY C A tRNA anticodon base-pairs with the codon.

2.2 An mRNA codon is 5′-AUG-3′. Which complementary anticodon written 3′ to 5′ can recognize it?

(A) 3′-UAC-5′ (B) 3′-AUG-5′ (C) 3′-TAC-5′ (D) 3′-GUA-5′

KEY A Antiparallel RNA base pairing gives 3′-UAC-5′.

2.3 Which statement distinguishes a codon from an anticodon?

(A) Both are normally DNA sequences (B) Codon is on mRNA; anticodon is on tRNA (C) Anticodon is on mRNA; codon is on tRNA (D) Both consist of two nucleotides

KEY B They are complementary RNA triplets on different RNA molecules.

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SECTION I / BIOLOGY • EXAM ITEM 03/50

Question 03 | Virus host range

3. Viruses can NOT infect:

(A) animals **(B)** plants **(C)** bacteria **(D)** other viruses

CORRECT ANSWER / SCIENTIFIC STATUS

D — textbook-intended; qualify the absolute wording

ACADEMIC EXPLANATION | ENGLISH

In an introductory cellular-host framework, animal, plant and bacterial cells may all be hosts of viruses, while a virus particle is not an autonomous cell capable of supporting a conventional replication cycle. The wording “cannot infect other viruses” is, however, too categorical: virophages can parasitize the replication factories of giant viruses inside cells. The intended multiple-choice response is D, subject to this scientific qualification.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. is wrong because animal viruses exist

B. because plant viruses exist

C. because bacteriophages infect bacteria.

ACADEMIC NOTE. SOURCE WORDING: The absolute statement is an oversimplification. Virophages provide an important qualification (see references).

YKS PERSPECTIVE | TÜRKÇE

YKS: Virüsler çoğalmak için hücresel konağa bağımlıdır; hayvan, bitki ve bakteri virüsleri bulunur. D şıkkı klasik okul düzeyindeki beklenen yanıttır. Ancak virofajların dev virüslerin hücre içi replikasyon fabrikalarını parazitleyebildiği bilimsel bir istisnadır.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Bacteriophages replicate in bacterial hosts. Viruses rely on host cells for essential replication functions.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

3.1 A virus that infects bacteria is called a:

(A) prion (B) bacteriophage (C) plasmid (D) protozoan

KEY B Bacteriophages replicate in bacterial hosts.

3.2 What is generally necessary for a virus to complete its replication cycle?

(A) Independent mitochondria (B) Host-cell machinery (C) A peptidoglycan cell wall (D) Photosynthesis

KEY B Viruses rely on host cells for essential replication functions.

3.3 Which statement best recognizes the virophage exception?

(A) Viruses are always free-living cells (B) Some virophages exploit giant-virus replication factories within cells (C) All animal viruses infect bacteria (D) Virophages eliminate the need for a cellular host

KEY B Virophages can parasitize viral factories but still depend on infected cells.

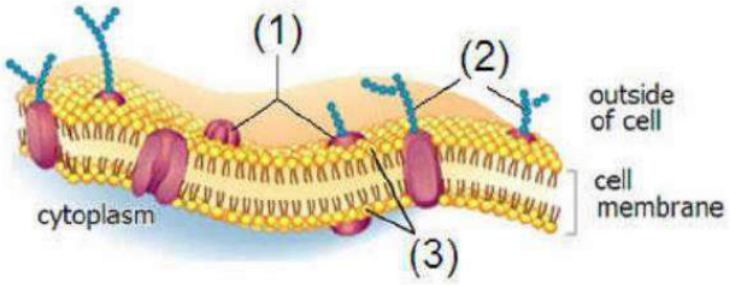
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SECTION I / BIOLOGY • EXAM ITEM 04/50

Question 04 | Plasma membrane diagram

4. Which of the statement is true to the following diagram of the plasma membrane?

(A) The plasma membrane is composed of lipids **(1)** and proteins **(2)**.
(B) Part **(2)** illustrates globular proteins.
(C) Part **(3)** plays a critical role in the cell recognition.
(D) Part **(3)** shows the bilayer of phospholipids.



CORRECT ANSWER / SCIENTIFIC STATUS

D — verified by the original membrane diagram

ACADEMIC EXPLANATION | ENGLISH

The arrows labelled (3) point to the phospholipid molecules arranged in two opposing leaflets: their hydrophilic heads face the aqueous environments and their hydrophobic tails face inward. This is the phospholipid bilayer. In the supplied illustration, (1) points to purple membrane-associated protein components, while (2) points to externally projecting carbohydrate groups rather than to the protein category asserted in option B.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. The labels are reversed: (1) does not designate the phospholipid component and (2) does not designate membrane proteins as the statement claims.

B. Label (2) points to carbohydrate projections, not globular membrane proteins.

C. Label (3) indicates phospholipids; cell recognition is commonly mediated by surface carbohydrate chains.

YKS PERSPECTIVE | TÜRKÇE

YKS: (3) numara fosfolipit çift tabakasını gösterir. Hidrofilik başlar sulu ortama, hidrofobik kuyruklar içe dönüktür. (2) numaralı çıkıntılar karbonhidrat zincirlerini; (1) ise protein yapılarını işaret eder. Doğru cevap D.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Amphipathic phospholipids arrange as a bilayer in water. Integral proteins are embedded in or span the bilayer.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

4.1 What is the structural foundation of a typical plasma membrane?

(A) Cellulose sheet (B) Phospholipid bilayer (C) Single layer of proteins (D) DNA helix

KEY B Amphipathic phospholipids arrange as a bilayer in water.

4.2 A membrane protein crosses the lipid bilayer. It is best described as:

(A) integral membrane protein (B) free cytosolic ribosome (C) chromatin protein (D) extracellular DNA

KEY A Integral proteins are embedded in or span the bilayer.

4.3 Carbohydrate chains projecting from the outer plasma membrane often contribute to:

(A) DNA replication (B) cell recognition (C) chromosome segregation (D) ribosome assembly

KEY B Glycoprotein and glycolipid sugars participate in recognition.

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SECTION I / BIOLOGY • EXAM ITEM 05/50

Question 05 | Cell cycle

5. A cell cycle consists of:

(A) interphase and mitosis
(B) G_1, the S phase, and G_2
(C) prophase, metaphase, anaphase, and telophase
(D) mitosis and meiosis

CORRECT ANSWER / SCIENTIFIC STATUS

A — best option; simplified terminology

ACADEMIC EXPLANATION | ENGLISH

At introductory level the cell cycle comprises interphase and the mitotic (M) phase. More precisely M phase also includes cytokinesis.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. omits mitosis and incorrectly treats G1/S/G2 alone as the full cycle

C. lists only mitotic stages

D. includes meiosis, which is not a standard phase of the mitotic cell cycle.

ACADEMIC NOTE. PRECISION: A conventional full cell-cycle description is interphase (G_1, S, G_2) plus M phase (mitosis and cytokinesis).

YKS PERSPECTIVE | TÜRKÇE

YKS: Hücre döngüsü interfaz (G1, S, G2) ve M evresi olarak incelenir. Mitoz, mayozla karıştırılmamalı.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

S phase is the DNA synthesis phase. Interphase G_1-S-G_2 precedes M phase.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

5.1 During which stage of interphase is DNA normally replicated?

(A) G_1 (B) S (C) G_2 (D) cytokinesis

KEY B S phase is the DNA synthesis phase.

5.2 Which sequence correctly describes a typical mitotic cell cycle?

(A) M, S, G_1, G_2 (B) G_1, S, G_2, M (C) S, M, G_2, G_1 (D) G_2, G_1, M, S

KEY B Interphase G_1-S-G_2 precedes M phase.

5.3 Which event is not part of the conventional mitotic cell cycle?

(A) G_2 checkpoint (B) DNA synthesis (C) Meiosis I (D) Mitotic chromosome segregation

KEY C Meiosis is a distinct reductional division program.

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SECTION I / BIOLOGY • EXAM ITEM 06/50

Question 06 | Mitochondria

6. The primary role of a mitochondrion is:

(A) intracellular digestion
(B) ATP synthesis
(C) lipid transport
(D) carbohydrate storage

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

Mitochondria carry out major stages of aerobic ATP production, especially oxidative phosphorylation at the inner mitochondrial membrane.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. refers primarily to lysosomal digestion

C. is not the primary mitochondrial role

D. is not a mitochondrial storage function.

YKS PERSPECTIVE | TÜRKÇE

YKS: Mitokondri ATP üretimiyle ilişkilidir; lizozom sindirim, Golgi paketleme işlevleriyle ayrılır.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Oxidative phosphorylation is associated with the inner mitochondrial membrane. Mitochondria are central to aerobic ATP synthesis.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

6.1 Where is the mitochondrial electron transport chain located?

(A) outer nuclear membrane (B) inner mitochondrial membrane (C) lysosomal membrane (D) Golgi lumen

KEY B Oxidative phosphorylation is associated with the inner mitochondrial membrane.

6.2 Which organelle is especially associated with aerobic ATP production?

(A) peroxisome (B) nucleolus (C) mitochondrion (D) smooth ER

KEY C Mitochondria are central to aerobic ATP synthesis.

6.3 Cristae increase the surface area of which structure?

(A) mitochondrial inner membrane (B) nuclear envelope (C) cell wall (D) chloroplast stroma

KEY A Cristae are inner-membrane folds.

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SECTION I / BIOLOGY • EXAM ITEM 07/50

Question 07 | Dihybrid genetics

7. In a cross *AaBb* × *AaBb*, what is the probability of producing the genotype *aabb*?

(A) 1/2 (B) 1/4 (C) 1/8 (D) 1/16

CORRECT ANSWER / SCIENTIFIC STATUS

D

ACADEMIC EXPLANATION | ENGLISH

For AaBb × AaBb, P(aa)=1/4 and P(bb)=1/4 under independent assortment; P(aabb)=1/16.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. 1/2 is the probability of a heterozygote at one locus, not the double-recessive genotype.

B. 1/4 is correct for aa or bb at one locus but ignores the other locus.

C. 1/8 does not follow the multiplication rule: (1/4) × (1/4) = 1/16.

YKS PERSPECTIVE | TÜRKÇE

YKS: Aa × Aa çaprazında aa olasılığı 1/4, Bb × Bb çaprazında bb olasılığı 1/4 olur. Genler bağımsızsa birlikte gerçekleşme olasılığı çarpılır: (1/4) × (1/4) = 1/16. Farklı genlerin ayrı ayrı olasılığını hesapla; toplama yapma.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Aa × Aa gives AA:Aa:aa as 1:2:1. Multiply the two independent probabilities.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

7.1 In Aa × Aa, the probability of an aa offspring is:

(A) 1/2 (B) 1/4 (C) 3/4 (D) 1

KEY B Aa × Aa gives AA:Aa:aa as 1:2:1.

7.2 For independent loci, P(aa)=1/4 and P(bb)=1/4. What is P(aabb)?

(A) 1/2 (B) 1/8 (C) 1/16 (D) 1/4

KEY C Multiply the two independent probabilities.

7.3 What fraction of AaBb × AaBb offspring is phenotypically dominant for both traits under complete dominance?

(A) 9/16 (B) 3/16 (C) 1/16 (D) 1/4

KEY A The dihybrid phenotype ratio is 9:3:3:1.

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SECTION I / BIOLOGY • EXAM ITEM 08/50

Question 08 | Vitamins

8. Vitamins:

(A) provide energy
(B) are necessary for growth and development
(C) are needed in large amounts
(D) are all synthesized in the body

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

Vitamins are micronutrients required for normal growth, metabolism and physiological function, generally in small amounts.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. is wrong because vitamins are not energy-yielding nutrients

C. because they are needed in small amounts

D. because not all vitamins are synthesized in sufficient quantities by the body.

YKS PERSPECTIVE | TÜRKÇE

YKS: Vitaminler enerji vermez; düzenleyici görevlidir ve az miktarda gereklidir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Vitamins act as micronutrients rather than metabolic fuels. Vitamins have distinct structures and support metabolism in small amounts.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

8.1 Which nutrient class generally does not contribute energy measured as food calories?

(A) lipids (B) carbohydrates (C) vitamins (D) proteins

KEY C Vitamins act as micronutrients rather than metabolic fuels.

8.2 Which statement about vitamins is correct?

(A) They are needed only in gram quantities (B) All are synthesized sufficiently by humans (C) They support normal metabolic functions (D) They are structurally identical

KEY C Vitamins have distinct structures and support metabolism in small amounts.

8.3 Which group contains only fat-soluble vitamins?

(A) A, D, E, K (B) B_1, B_2, C, K (C) B_6, B_{12}, C, D (D) C, K, folate, biotin

KEY A A, D, E and K are fat-soluble vitamins.

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SECTION I / BIOLOGY • EXAM ITEM 09/50

Question 09 | Nervous tissue

9. The tissue that senses stimuli and transmits electrical signals to the brain and other parts of the body is known as:

(A) epithelial tissue
(B) adipose tissue
(C) muscle tissue
(D) nervous tissue

CORRECT ANSWER / SCIENTIFIC STATUS

D

ACADEMIC EXPLANATION | ENGLISH

Nervous tissue contains excitable cells that receive and transmit electrical signals, including impulses toward the central nervous system.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. epithelial tissue lines surfaces

B. adipose tissue stores lipids

C. muscle tissue contracts and is not the principal signal-transmission tissue.

YKS PERSPECTIVE | TÜRKÇE

YKS: Uyaran alma ve impuls iletimi sinir dokusunun ayırt edici özelliğidir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Neurons transmit electrical signals. Epithelia line surfaces and cavities.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

9.1 Which cell is primarily specialized to conduct an action potential?

(A) adipocyte (B) neuron (C) fibroblast (D) erythrocyte

KEY B Neurons transmit electrical signals.

9.2 Which tissue mainly covers the surfaces of organs and cavities?

(A) epithelial tissue (B) nervous tissue (C) skeletal muscle (D) adipose tissue

KEY A Epithelia line surfaces and cavities.

9.3 Rapid signal transmission along an axon depends chiefly on:

(A) nerve impulses (B) fat storage (C) collagen deposition (D) bile secretion

KEY A Axons conduct electrical impulses.

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SECTION I / BIOLOGY • EXAM ITEM 10/50

Question 10 | Homeostasis

10. The ability of the human body to regulate the level of blood glucose is an example of:

(A) osmosis
(B) homeostasis
(C) blood circulation
(D) aerobic respiration

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

Blood-glucose regulation through insulin and glucagon is a classic negative-feedback example of homeostasis.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. osmosis is water movement

C. circulation transports blood but is not the regulatory principle

D. aerobic respiration produces ATP.

YKS PERSPECTIVE | TÜRKÇE

YKS: İç dengenin korunması homeostazidir. Kan şekeri ve vücut sıcaklığı tipik örneklerdir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Insulin helps oppose the original glucose increase. Glucagon stimulates processes that raise blood glucose.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

10.1 After eating, blood glucose rises and insulin promotes uptake. This is an example of:

(A) positive feedback (B) negative feedback (C) osmosis only (D) diffusion without regulation

KEY B Insulin helps oppose the original glucose increase.

10.2 Which hormone generally raises blood glucose when it becomes low?

(A) calcitonin (B) insulin (C) glucagon (D) melatonin

KEY C Glucagon stimulates processes that raise blood glucose.

10.3 Homeostasis is best defined as:

(A) complete absence of change (B) maintenance of internal conditions within functional limits (C) constant ATP production only (D) equal concentrations in all tissues

KEY B Homeostasis maintains variables within regulated ranges.

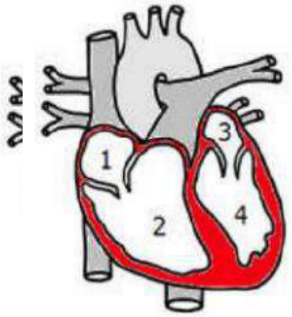
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SECTION I / BIOLOGY • EXAM ITEM 11/50

Question 11 | Heart diagram

11. The diagram below is of the human heart. The part labelled (3) is:

(A) left atrium
(B) left ventricle
(C) right atrium
(D) right ventricle



CORRECT ANSWER / SCIENTIFIC STATUS

A — diagram verified

ACADEMIC EXPLANATION | ENGLISH

In the supplied heart diagram, label (3) appears to mark the upper chamber on the viewer's right, corresponding to the anatomical left atrium. Label (4) is the thick-walled left ventricle.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. left ventricle corresponds to lower label (4), not (3)

C. right atrium is on the viewer's left

D. right ventricle is a lower chamber on the viewer's left.

ACADEMIC NOTE. VISUAL VERIFICATION: Label (3) is the left atrium (upper chamber on the viewer's right); label (4) is the left ventricle.

YKS PERSPECTIVE | TÜRKÇE

YKS: Kalp çizimlerinde görselin sağı anatomik soldur. (3) üst odacığı işaretliyorsa sol kulakçık (A); (4) sol karıncıktır. Bu sorunun cevabı görsel doğrulaması gerektirir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Pulmonary veins enter the left atrium. The left ventricle ejects oxygenated blood into the aorta.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

11.1 Which chamber receives oxygen-rich blood returning from the lungs?

(A) right ventricle (B) right atrium (C) left atrium (D) left ventricle

KEY C Pulmonary veins enter the left atrium.

11.2 Which chamber pumps blood directly into the aorta?

(A) right atrium (B) left ventricle (C) left atrium (D) right ventricle

KEY B The left ventricle ejects oxygenated blood into the aorta.

11.3 A heart diagram shows a thick-walled lower chamber on the viewer's right. This is usually the:

(A) left ventricle (B) right atrium (C) right ventricle (D) left atrium

KEY A Standard anterior diagrams reverse viewer and anatomical left-right.

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SECTION I / BIOLOGY • EXAM ITEM 12/50

Question 12 | Fetal gas exchange

12. Which of the following structures is/are involved in gas exchange in a developing fetus?



(A) placenta **(B)** lungs **(C)** alveoli **(D)** tracheal system

CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

The placenta permits exchange of oxygen and carbon dioxide between maternal and fetal circulations across a placental barrier.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. fetal lungs are not the primary site of maternal–fetal gas exchange

C. alveoli do not provide placental exchange

D. a tracheal system is characteristic of insects.

YKS PERSPECTIVE | TÜRKÇE

YKS: Fetüs akciğerleriyle değil, plasenta aracılığıyla anneden oksijen alır.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

The placenta provides maternal-fetal gas exchange. Umbilical arteries carry fetal blood to the placenta.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

12.1 In a healthy pregnancy, most fetal oxygen enters fetal blood across the:

(A) fetal alveoli (B) placenta (C) fetal trachea (D) maternal bronchi

KEY B The placenta provides maternal-fetal gas exchange.

12.2 Which structure carries fetal blood toward the placenta?

(A) umbilical arteries (B) pulmonary veins (C) aorta only (D) superior vena cava

KEY A Umbilical arteries carry fetal blood to the placenta.

12.3 Which statement is normally correct about fetal and maternal blood?

(A) They routinely mix completely (B) Gas exchange can occur without free mixing (C) The fetus breathes room air (D) Placental exchange requires fetal alveoli

KEY B Substances pass across a placental barrier.

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SECTION I / BIOLOGY • EXAM ITEM 13/50

Question 13 | Digestion and absorption

13. Which of the following can be absorbed in the digestive tract without any hydrolysis?
(A) glycogen (B) sucrose (C) polypeptide (D) glucose

CORRECT ANSWER / SCIENTIFIC STATUS

D

ACADEMIC EXPLANATION | ENGLISH

Glucose is a monosaccharide and can be absorbed without hydrolysis; the other listed molecules must be broken down first.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. glycogen is a polysaccharide

B. sucrose is a disaccharide

C. polypeptides generally require digestion to smaller units.

YKS PERSPECTIVE | TÜRKÇE

YKS: Monosakkaritler doğrudan emilebilir. Disakkarit ve polisakkaritler önce hidroliz edilir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Glucose is a monosaccharide. Sucrase hydrolyses sucrose into monosaccharides.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

13.1 Which carbohydrate can be absorbed without hydrolysis?

(A) cellulose (B) sucrose (C) glucose (D) glycogen

KEY C Glucose is a monosaccharide.

13.2 Sucrose must be broken down before intestinal absorption by which enzyme?

(A) sucrase (B) pepsin (C) lipase (D) trypsin

KEY A Sucrase hydrolyses sucrose into monosaccharides.

13.3 Which is a polymer of many glucose residues?

(A) fructose (B) glycogen (C) ribose (D) galactose

KEY B Glycogen is a branched glucose polysaccharide.

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SECTION I / BIOLOGY • EXAM ITEM 14/50

Question 14 | Abdominal anatomy

14. Which of the following organs is located beneath the diaphragm in the right upper quadrant of the abdominal cavity?

(A) appendix **(B)** kidney **(C)** liver **(D)** stomach

CORRECT ANSWER / SCIENTIFIC STATUS

C

ACADEMIC EXPLANATION | ENGLISH

The liver occupies much of the right upper abdominal quadrant immediately below the diaphragm.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. appendix is usually in the right lower quadrant

B. kidney is retroperitoneal and more posterior

D. stomach is predominantly left upper quadrant.

YKS PERSPECTIVE | TÜRKÇE

YKS: Karaciğer sağ üst kadranda, mide çoğunlukla sol üst kadrandadır.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Most of the liver lies below the right diaphragm. Its typical location is the right lower quadrant.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

14.1 Which organ occupies most of the right upper abdominal quadrant?

(A) spleen (B) liver (C) appendix (D) urinary bladder

KEY B Most of the liver lies below the right diaphragm.

14.2 The appendix is usually located in the:

(A) left upper quadrant (B) right upper quadrant (C) right lower quadrant (D) left lower quadrant

KEY C Its typical location is the right lower quadrant.

14.3 Which organ stores and concentrates bile?

(A) pancreas (B) gallbladder (C) kidney (D) spleen

KEY B The gallbladder stores bile produced by the liver.

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SECTION I / BIOLOGY • EXAM ITEM 15/50

Question 15 | Pulmonary alveoli

15. In the lungs, gas exchange occurs in tiny one-celled air sacs called:

(A) alveoli **(B)** bronchi **(C)** bronchioles **(D)** trachea

CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

Alveoli are thin-walled microscopic air sacs where oxygen and carbon dioxide diffuse across the respiratory membrane.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. bronchi are conducting airways

C. bronchioles are smaller conducting airways

D. trachea is the major airway.

YKS PERSPECTIVE | TÜRKÇE

YKS: Gaz değişiminin esas yeri alveoldür; bronş ve trakea hava iletimini sağlar.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Diffusion occurs through alveolar-capillary membranes. A dense capillary network supports exchange.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

15.1 Where does most oxygen enter pulmonary capillaries?

(A) trachea (B) larynx (C) alveoli (D) main bronchi

KEY C Diffusion occurs through alveolar-capillary membranes.

15.2 Which structures closely surround lung alveoli?

(A) capillaries (B) nephrons (C) bile ducts (D) seminiferous tubules

KEY A A dense capillary network supports exchange.

15.3 Which airway is primarily a conducting tube rather than the main site of gas exchange?

(A) alveolar sac (B) alveolus (C) trachea (D) respiratory membrane

KEY C The trachea conducts air.

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SECTION I / BIOLOGY • EXAM ITEM 16/50

Question 16 | Female reproductive hormones

16. Female hormones are produced by which of the following?

(A) vagina **(B)** uterus **(C)** ovary **(D)** fallopian tube

CORRECT ANSWER / SCIENTIFIC STATUS

C

ACADEMIC EXPLANATION | ENGLISH

The ovaries produce estrogens and progesterone through developing follicles and the corpus luteum.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. vagina is not the main hormone-producing organ

B. uterus is chiefly a target organ

D. fallopian tube transports gametes and is not the principal endocrine source.

YKS PERSPECTIVE | TÜRKÇE

YKS: Östrojen ve progesteronun başlıca kaynağı yumurtalıktır.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

The corpus luteum is an endocrine structure in the ovary. The ovary produces oocytes and steroid hormones.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

16.1 Which structure forms after ovulation and secretes substantial progesterone?

(A) corpus luteum (B) cervix (C) fallopian tube (D) vagina

KEY A The corpus luteum is an endocrine structure in the ovary.

16.2 What is the main female gonad?

(A) uterus (B) ovary (C) vagina (D) cervix

KEY B The ovary produces oocytes and steroid hormones.

16.3 Fertilization most commonly occurs in the:

(A) uterine tube (B) uterine cavity (C) vagina (D) cervical canal

KEY A The ampulla of the uterine tube is the usual site.

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SECTION I / BIOLOGY • EXAM ITEM 17/50

Question 17 | Endocrine glands

17. Endocrine glands:

(A) secrete vitamins
(B) cease functioning after adolescence
(C) begin functioning in adolescence
(D) secrete their products into the blood

CORRECT ANSWER / SCIENTIFIC STATUS

D

ACADEMIC EXPLANATION | ENGLISH

Endocrine glands release hormones into interstitial fluid and ultimately the bloodstream rather than through ducts.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. vitamins are not endocrine secretions

B. endocrine glands do not universally cease after adolescence

C. many endocrine glands function before adolescence.

YKS PERSPECTIVE | TÜRKÇE

YKS: Endokrin bezler kanalsızdır, hormonları kana verir. Ekzokrin bezlerde kanal bulunur.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Hormones enter tissue fluid and the circulation. Salivary glands use ducts.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

17.1 An endocrine gland primarily releases its product into:

(A) excretory ducts (B) blood or interstitial fluid (C) intestinal lumen (D) skin surface

KEY B Hormones enter tissue fluid and the circulation.

17.2 Which gland is classically exocrine?

(A) thyroid (B) pituitary (C) salivary gland (D) adrenal cortex

KEY C Salivary glands use ducts.

17.3 Which substance is a hormone of the thyroid gland?

(A) thyroxine (B) amylase (C) pepsin (D) bile salt

KEY A Thyroxine is an endocrine secretion.

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SECTION I / BIOLOGY • EXAM ITEM 18/50

Question 18 | Medulla oblongata

18. Which of the following contains regulatory centers for the respiratory and circulatory systems?

(A) cerebellum
(B) thalamus
(C) hypothalamus
(D) medulla oblongata

CORRECT ANSWER / SCIENTIFIC STATUS

D

ACADEMIC EXPLANATION | ENGLISH

The medulla oblongata contains vital autonomic centers involved in respiratory and cardiovascular regulation.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. cerebellum primarily coordinates movement

B. thalamus relays sensory information

C. hypothalamus regulates endocrine/autonomic functions but is not the main medullary respiratory center.

YKS PERSPECTIVE | TÜRKÇE

YKS: Solunum ritmi ve dolaşım merkezleri omurilik soğanıyla ilişkilidir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Medullary centers participate in breathing control. The cerebellum coordinates movement.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

18.1 Which brainstem structure houses important autonomic breathing centers?

(A) cerebellum (B) medulla oblongata (C) hippocampus (D) occipital cortex

KEY B Medullary centers participate in breathing control.

18.2 Which structure is most closely involved in movement coordination and balance?

(A) cerebellum (B) thalamus (C) medulla (D) hypophysis

KEY A The cerebellum coordinates movement.

18.3 The thalamus is particularly important for:

(A) bile synthesis (B) relaying many sensory signals (C) making antibodies (D) producing digestive enzymes

KEY B It is a major sensory relay nucleus.

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SECTION I / BIOLOGY • EXAM ITEM 19/50

Question 19 | Proteins and amino acids

19. Which of the following molecules contain amino acids?

(1) pepsin
(2) vitamin D
(3) antibodies
(4) starch

(A) 1 and 2 **(B)** 1 and 3 **(C)** 2 and 4 **(D)** 3 and 4

CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

Pepsin is a protein enzyme and antibodies are immunoglobulin proteins; both contain amino-acid residues.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. includes starch, a polysaccharide

C. includes vitamin D, a secosteroid, and starch

D. includes starch and vitamin D, neither is an amino-acid polymer.

YKS PERSPECTIVE | TÜRKÇE

YKS: Enzimlerin çoğu ve antikorlar proteindir; nişasta karbonhidrat, D vitamini lipit türevidir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Antibodies are immunoglobulin proteins. Pepsin is a proteolytic protein enzyme.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

19.1 Which macromolecule class comprises most antibodies?

(A) polysaccharides (B) proteins (C) triglycerides (D) nucleic acids only

KEY B Antibodies are immunoglobulin proteins.

19.2 Pepsin contains amino acid residues because it is a(n):

(A) enzyme protein (B) starch polymer (C) vitamin D metabolite (D) fatty acid

KEY A Pepsin is a proteolytic protein enzyme.

19.3 What covalent linkage connects amino acids in a polypeptide?

(A) glycosidic bond (B) ester bond (C) peptide bond (D) phosphodiester bond

KEY C Peptide bonds connect amino-acid residues.

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SECTION I / BIOLOGY • EXAM ITEM 20/50

Question 20 | Oral digestive enzymes

20. Which of the following enzymes act oral cavity?

(1) pepsin	**(2)** trypsin	**(3)** amylase	**(4)** maltase
(A) 1 and 2	**(B)** 2 and 3	**(C)** 2 and 4	**(D)** 3 and 4

CORRECT ANSWER / SCIENTIFIC STATUS

No fully correct choice; D appears intended, but is scientifically defective

ACADEMIC EXPLANATION | ENGLISH

Among the listed enzymes, salivary alpha-amylase (statement 3) normally functions in the oral cavity. Pepsin functions in the stomach; trypsin functions in the small intestine; maltase is principally a small-intestinal brush-border activity. Option D pairs amylase with maltase, so it is apparently the setter's intended answer but is not a defensible statement of normal oral digestion. Since the paper offers no "3 only" alternative, it lacks an unambiguously correct choice under standard human physiology.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. Pepsin (1) acts primarily in the stomach, and trypsin (2) acts in the small intestine; neither is the normal oral enzyme required.

B. Trypsin (2) is pancreatic and becomes active in the small intestine; amylase (3) is oral, so the pair is not both correct.

C. Trypsin (2) is not a normal oral enzyme; maltase (4) is a small-intestinal brush-border enzyme.

D. Salivary amylase (3) is correct, but maltase (4) is not normally classified as an oral digestive enzyme; D is only the likely intended key.

ACADEMIC NOTE. ACADEMIC EXCEPTION / ITEM DEFECT: Do not grade this question as an undisputed D. Only statement (3) is correct in standard human digestive physiology.

YKS PERSPECTIVE | TÜRKÇE

YKS: Ağızda karbonhidrat sindirimini tükürük alfa-amilazı başlatır. Pepsin mide, tripsin ince bağırsak; maltaz ise ince bağırsak fırçamsı kenarında görev yapar. Bu nedenle bilimsel açıdan yalnız 3 doğrudur; seçeneklerde 3 tek başına yoktur. D muhtemel sınav niyetidir, geçerli bilimsel cevap olarak kabul edilmemelidir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Salivary alpha-amylase acts on starch in the oral cavity. Maltase activity is concentrated in intestinal brush-border enzymes.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

20.1 Which enzyme begins starch digestion in the human mouth?

(A) trypsin (B) salivary α-amylase (C) pepsin (D) maltase-glucoamylase

KEY B Salivary alpha-amylase acts on starch in the oral cavity.

20.2 Where is maltase primarily associated with carbohydrate digestion?

(A) small-intestinal brush border (B) gastric lumen (C) salivary duct (D) liver sinusoid

KEY A Maltase activity is concentrated in intestinal brush-border enzymes.

20.3 Which pairing correctly matches an enzyme with its main site of action?

(A) pepsin—mouth (B) trypsin—stomach (C) maltase—small intestine (D) salivary amylase—colon

KEY C Maltase functions mainly at the small-intestinal brush border.

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SECTION I / BIOLOGY • EXAM ITEM 21/50

Question 21 | Embryonic germ layers

21. Various regions of the three embryonic germ layers in human embryo develop into organs and tissues in the adult. Which of the following is CORRECT?

(1) mesoderm – brain and heart
(2) ectoderm – eyes and spinal cord
(3) endoderm – liver and ovary
(4) mesoderm – muscles and bones

(A) 1 and 2 **(B)** 2 and 3 **(C)** 2 and 4 **(D)** 3 and 4

CORRECT ANSWER / SCIENTIFIC STATUS

C

ACADEMIC EXPLANATION | ENGLISH

Ectoderm contributes to the nervous system and parts of the eye; mesoderm forms muscles and bones. Thus statements (2) and (4) are correct.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. includes false (1): the brain derives mainly from ectoderm

B. includes false (3): the ovary derives from mesoderm, not endoderm

D. also includes false (3).

YKS PERSPECTIVE | TÜRKÇE

YKS: Ektoderm sinir sistemi; mezoderm kas-kemik; endoderm sindirim-solunum epitelleri. Organların karma kökenleri olabileceğini unutma.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Skeletal muscle develops from mesoderm. Neural ectoderm forms the brain and spinal cord.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

21.1 Which germ layer gives rise to skeletal muscle?

(A) ectoderm (B) endoderm (C) mesoderm (D) trophoblast only

KEY C Skeletal muscle develops from mesoderm.

21.2 The central nervous system principally derives from:

(A) ectoderm (B) mesoderm (C) endoderm (D) yolk sac

KEY A Neural ectoderm forms the brain and spinal cord.

21.3 The epithelial lining of most of the gastrointestinal tract primarily derives from:

(A) mesoderm (B) endoderm (C) surface ectoderm (D) neural crest

KEY B Endoderm contributes much of the digestive epithelium.

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SECTION I / BIOLOGY • EXAM ITEM 22/50

Question 22 | Kidney functions

22. Which of the following is a function of the human kidney?

(1) Production of blood cells. **(2)** Excretion of glucose.
(3) Excretion of toxins **(4)** Regulation of sodium in the blood.

(A) 1 and 2 **(B)** 2 and 3 **(C)** 2 and 4 **(D)** 3 and 4

CORRECT ANSWER / SCIENTIFIC STATUS

D

ACADEMIC EXPLANATION | ENGLISH

Kidneys eliminate metabolic wastes and regulate electrolytes, including sodium. Statements (3) and (4) are correct.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. includes false (1) as written: kidneys regulate erythropoiesis via erythropoietin but do not directly produce blood cells

B. includes false (2), since normal kidneys reabsorb filtered glucose

C. includes false (2).

YKS PERSPECTIVE | TÜRKÇE

YKS: Böbrek atık maddeleri atar ve su-elektrolit dengesini düzenler (3,4). Sağlıklı böbrek glikozu geri emer. Kan hücresi böbrekte üretilmez; böbreğin ürettiği eritropoietin kemik iliğini uyarır.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Erythropoietin stimulates erythropoiesis in marrow. Glucose is ordinarily reclaimed by proximal tubules.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

22.1 Which kidney-produced hormone promotes red blood cell formation elsewhere?

(A) erythropoietin (B) insulin (C) oxytocin (D) thyroxine

KEY A Erythropoietin stimulates erythropoiesis in marrow.

22.2 Under normal conditions, filtered glucose is mainly:

(A) excreted completely (B) reabsorbed by renal tubules (C) converted to bile (D) stored in bladder walls

KEY B Glucose is ordinarily reclaimed by proximal tubules.

22.3 Which kidney activity helps regulate extracellular-fluid composition?

(A) sodium balance (B) light perception (C) sperm maturation (D) peptide synthesis only

KEY A Renal handling of sodium regulates fluid and electrolyte balance.

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SECTION I / BIOLOGY • EXAM ITEM 23/50

Question 23 | Reproductive organs and hormones

23. Which of the following organs is correctly paired with its function?

(1) Testes – produces testosterone, a male sex hormone
(2) Prostate gland – produces progesterone, a male sex hormone
(3) Seminal vesicles maturation and storage of sperm
(4) Ovary – produces progesterone, a female sex hormone

(A) 1 and 2 **(B)** 1 and 4 **(C)** 2 and 4 **(D)** 3 and 4



CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

Testes produce testosterone, and ovaries produce progesterone; statements (1) and (4) are correct.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. includes false (2): prostate does not produce progesterone as the male sex hormone
C. includes false (2)
D. includes false (3): seminal vesicles do not mature/store sperm (epididymis does).

YKS PERSPECTIVE | TÜRKÇE

YKS: Testis testosteron; ovaryum progesteron üretir. Spermler epididimiste olgunlaşır ve depolanır.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

The epididymis supports sperm maturation and storage. Leydig cells in the testis secrete testosterone.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

23.1 Where do sperm mature and acquire motility?
(A) seminal vesicles (B) epididymis (C) prostate (D) ureter
KEY B The epididymis supports sperm maturation and storage.
23.2 Which male organ produces testosterone?
(A) testis (B) seminal vesicle (C) prostate (D) bladder
KEY A Leydig cells in the testis secrete testosterone.
23.3 A major ovarian steroid hormone is:
(A) progesterone (B) gastrin (C) aldosterone (D) calcitonin
KEY A Ovarian follicles and corpus luteum make reproductive steroids.

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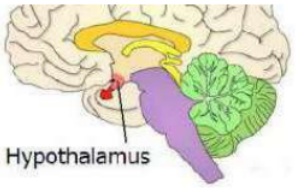
SECTION I / BIOLOGY • EXAM ITEM 24/50

Question 24 | Hypothalamus

24. Hypothalamus controls:

(1) body temperature
(2) sleep
(3) heart rate
(4) muscle actions

(A) 1 and 2 **(B)** 1 and 4 **(C)** 2 and 4 **(D)** 3 and 4



CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

The hypothalamus participates in thermoregulation and sleep/circadian control, corresponding to (1) and (2).

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. includes false (4): direct voluntary muscle action is controlled through motor systems
C. includes false (4)
D. includes false (4) and incorrectly excludes thermoregulation.

YKS PERSPECTIVE | TÜRKÇE

YKS: Hipotalamus sıcaklık, açlık, susuzluk ve biyolojik ritimle ilişkilidir; istemli kas hareketi temel görevi değildir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

The hypothalamus contains thermoregulatory circuitry. Hypothalamic networks influence circadian rhythms and sleep.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

24.1 Which brain region is a major regulator of body temperature?
(A) hypothalamus (B) cerebellum (C) occipital lobe (D) spinal dorsal root
KEY A The hypothalamus contains thermoregulatory circuitry.

24.2 Which function is strongly associated with the hypothalamus?
(A) circadian and sleep regulation (B) direct voluntary muscle contraction (C) retinal focusing (D) hematopoiesis
KEY A Hypothalamic networks influence circadian rhythms and sleep.

24.3 Which endocrine structure is controlled by hypothalamic releasing hormones?
(A) anterior pituitary (B) salivary gland (C) sweat gland (D) pancreatic duct
KEY A Hypothalamic hormones regulate anterior pituitary function.

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SECTION I / BIOLOGY • EXAM ITEM 25/50

Question 25 | Human gamete chromosomes

25. A human cell that contains 22 autosomes and a X chromosome must be:

(1) a somatic cell of a female
(2) a somatic cell of a male
(3) a sperm cell
(4) an egg cell

(A) 1 and 2 **(B)** 1 and 4 **(C)** 2 and 4 **(D)** 3 and 4

CORRECT ANSWER / SCIENTIFIC STATUS

D

ACADEMIC EXPLANATION | ENGLISH

A haploid gamete with 22 autosomes and one X chromosome can be an X-bearing sperm or an egg; statements (3) and (4) are correct.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. The expression includes (1), a female somatic cell with 44 autosomes and XX, not a haploid cell.

B. The expression includes (1), a female somatic cell, which is diploid.

C. The expression includes (2), a male somatic cell with 44 autosomes and XY, not a gamete.

YKS PERSPECTIVE | TÜRKÇE

YKS: İnsanda gamet 22 otozom + X/Y, somatik hücre 44 otozom + XX/XY taşır.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Human eggs are haploid and X-bearing. A typical sperm has 22 autosomes plus X or Y.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

25.1 A typical human ovum contains:

(A) 44 autosomes and XX (B) 22 autosomes and X (C) 22 autosomes and Y (D) 44 autosomes and XY

KEY B Human eggs are haploid and X-bearing.

25.2 Which statement about sperm chromosomes is correct?

(A) Every sperm carries X (B) Each sperm contains 44 autosomes (C) A sperm can carry X or Y (D) Sperm contain no autosomes

KEY C A typical sperm has 22 autosomes plus X or Y.

25.3 How many autosomes are present in a typical human somatic cell?

(A) 22 (B) 23 (C) 44 (D) 46

KEY C Diploid somatic cells have 22 autosomal pairs, or 44 autosomes.

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SECTION II / CHEMISTRY • EXAM ITEM 26/50

Question 26 | Transition-metal ions

26. Which one of the following ions has the electron configuration [Ar]3d^4?

(A) Mn^{2+} **(B)** Cr^{2+} **(C)** Fe^{3+} **(D)** Co^{3+}

CORRECT ANSWER / SCIENTIFIC STATUS

B — Cr^{2+}; exponent confirmed as 3d^4 in the source scan

ACADEMIC EXPLANATION | ENGLISH

The scanned question explicitly asks for [Ar]3d^4, not [Ar]3d^5. Neutral chromium has the exceptional ground-state configuration [Ar]3d^{5}4s^1. On formation of Cr^{2+}, the 4s electron is removed first and one 3d electron second, giving [Ar]3d^4. Therefore B is uniquely correct. Mn^{2+} and Fe^{3+} are both [Ar]3d^5; Co^{3+} is [Ar]3d^6.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. Mn^{2+} has [Ar]3d^5 rather than the requested [Ar]3d^4.

C. Fe^{3+} also has [Ar]3d^5, not [Ar]3d^4.

D. Co^{3+} has [Ar]3d^6, not [Ar]3d^4.

ACADEMIC NOTE. CORRECTION: The previous working PDF misread the superscript as d^5, producing an incorrect double-answer warning. The source clearly reads d^4.

YKS PERSPECTIVE | TÜRKÇE

YKS: Basılı soruda istenen dizilim [Ar]3d^4 olarak doğrulandı. Nötr Cr: [Ar]3d^{5}4s^1. Önce 4s, sonra 3d elektronu çıkarılır: Cr^{2+} = [Ar]3d^4. Mn^{2+} ve Fe^{3+} d^5, Co^{3+} d^6 olduğundan doğru B.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Remove the 4s electron first and then one 3d electron. Mn^{2+} is d^5; Cr^{2+} is d^4 and Co^{3+}/Fe^{2+} are d^6.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

26.1 Neutral chromium is [Ar]3d^{5}4s^1. After formation of Cr^{2+}, what is its configuration?

(A) [Ar]3d^5 (B) [Ar]3d^4 (C) [Ar]3d^6 (D) [Ar]4s^2

KEY B Remove the 4s electron first and then one 3d electron.

26.2 Which ion has the electron configuration [Ar]3d^5?

(A) Cr^{2+} (B) Co^{3+} (C) Mn^{2+} (D) Fe^{2+}

KEY C Mn^{2+} is d^5; Cr^{2+} is d^4 and Co^{3+}/Fe^{2+} are d^6.

26.3 When first-row transition metals form cations, electrons are generally lost first from:

(A) 3p orbitals (B) 4s orbital (C) 2p orbital (D) nuclear shells

KEY B The 4s electrons are generally removed before 3d during cation formation.

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SECTION II / CHEMISTRY • EXAM ITEM 27/50

Question 27 | Triple bonds

27. A triple bond consists of

(A) three σ bonds
(B) one σ and two π bonds
(C) three π bonds
(D) two σ and one π bond

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

A triple covalent bond contains one sigma bond and two pi bonds.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. three sigma bonds cannot form the conventional triple bond

C. three pi bonds omit the necessary sigma bond

D. two sigma and one pi is incorrect.

YKS PERSPECTIVE | TÜRKÇE

YKS: Tek bağ 1 sigma; çift bağ 1 sigma + 1 pi; üçlü bağ 1 sigma + 2 pi.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

A triple bond consists of one sigma and two pi bonds. One sigma plus one pi bond makes a double bond.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

27.1 A carbon-carbon triple bond contains:

(A) three σ bonds (B) one σ and two π bonds (C) two σ and one π bond (D) three π bonds

KEY B A triple bond consists of one sigma and two pi bonds.

27.2 A carbon-carbon double bond comprises:

(A) two σ bonds (B) one σ and one π bond (C) two π bonds (D) one π bond only

KEY B One sigma plus one pi bond makes a double bond.

27.3 How many π bonds are present between the carbon atoms of ethyne?

(A) zero (B) one (C) two (D) three

KEY C Ethyne has a carbon-carbon triple bond and therefore two pi bonds.

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SECTION II / CHEMISTRY • EXAM ITEM 28/50

Question 28 | First ionization energy

28. Which one of the following elements has the largest first ionization energy?

(A) Na **(B)** Rb **(C)** Al **(D)** Cl

CORRECT ANSWER / SCIENTIFIC STATUS

D

ACADEMIC EXPLANATION | ENGLISH

Chlorine has the highest first ionization energy among Na, Rb, Al and Cl due to effective nuclear attraction and periodic trends.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. Na is an alkali metal with low ionization energy

B. Rb is even lower

C. Al has lower first ionization energy than Cl.

YKS PERSPECTIVE | TÜRKÇE

YKS: İyonlaşma enerjisi genel olarak periyotta sağa, grupta yukarı artar; istisnalar ayrıca değerlendirilir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Chlorine lies farther right and higher in the periodic table. Ionization energy generally decreases down a group.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

28.1 Which element has the greater first ionization energy?

(A) rubidium (B) sodium (C) chlorine (D) potassium

KEY C Chlorine lies farther right and higher in the periodic table.

28.2 Which alkali metal has the lower first ionization energy?

(A) lithium (B) rubidium (C) both are equal (D) neither has electrons

KEY B Ionization energy generally decreases down a group.

28.3 Across a period, first ionization energy generally:

(A) decreases toward the right (B) increases toward the right (C) remains always constant (D) depends only on mass number

KEY B Effective nuclear attraction generally increases across the period.

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SECTION II / CHEMISTRY • EXAM ITEM 29/50

Question 29 | Phosphorus oxide and acid

29. Which of the following oxides corresponds to the oxoacid H_3PO_4?

(A) P_2O_3 **(B)** P_2O_5 **(C)** P_2O_7 **(D)** PO_2

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

Phosphoric acid H3PO4 is conventionally associated with phosphorus(V) oxide P2O5 (empirical formula; molecular form P4O10).

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. P2O3 is phosphorus(III) oxide

C. P2O7 is not the standard oxide formula

D. PO2 is not the usual acid anhydride of H3PO4.

YKS PERSPECTIVE | TÜRKÇE

YKS: H3PO4 için asit anhidridi P2O5 (gerçekte P4O10) kabul edilir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Phosphorus(V) oxide has empirical formula P2O5. P4O10 reacts with water to form H3PO4.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

29.1 What is the empirical formula of phosphorus(V) oxide?

(A) P_2O_3 (B) P_2O_5 (C) PO (D) P_3O_2

KEY B Phosphorus(V) oxide has empirical formula P2O5.

29.2 Hydrating phosphorus(V) oxide under appropriate conditions yields:

(A) phosphoric acid (B) hydrochloric acid (C) sulfurous acid (D) nitrous acid

KEY A P4O10 reacts with water to form H3PO4.

29.3 What is phosphorus oxidation state in H_3PO_4?

(A) +3 (B) +4 (C) +5 (D) −3

KEY C 3(+1)+P+4(−2)=0 gives P=+5.

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SECTION II / CHEMISTRY • EXAM ITEM 30/50

Question 30 | Potassium sulfite

30. What is the correct formula for potassium sulfite?

(A) KSO_4 **(B)** K_2SO_3 **(C)** K_2SO_4 **(D)** P_2SO_4

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

Sulfite is SO3^2− and potassium is K+, so charge neutrality requires K2SO3.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. KSO4 has incorrect charges

C. K2SO4 is sulfate, not sulfite

D. P2SO4 is not potassium sulfite.

YKS PERSPECTIVE | TÜRKÇE

YKS: Sülfit SO3(2−), sülfat SO4(2−); K+ ile sülfitin formülü K2SO3.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Sulfate is SO_4^{2-} and requires two potassium ions. Sulfite is SO_3^{2-}; sulfate is SO_4^{2-}.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

30.1 What is the formula of potassium sulfate?

(A) KSO_4 (B) K_2SO_4 (C) K_2SO_3 (D) KSO_3

KEY B Sulfate is SO_4^{2-} and requires two potassium ions.

30.2 Which formula denotes the sulfite ion?

(A) SO_4^{2-} (B) HSO_4^- (C) SO_3^{2-} (D) SO_2

KEY C Sulfite is SO_3^{2-}; sulfate is SO_4^{2-}.

30.3 What is the formula of sodium sulfite?

(A) $NaSO_3$ (B) Na_2SO_4 (C) Na_2SO_3 (D) $NaSO_4$

KEY C Two Na^+ ions balance the SO_3^{2-} ion.

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SECTION II / CHEMISTRY • EXAM ITEM 31/50

Question 31 | Metal displacement

31. The metal used to recover copper from a solution of copper sulphate is

(A) Na **(B)** Ag **(C)** Hg **(D)** Fe

CORRECT ANSWER / SCIENTIFIC STATUS

D

ACADEMIC EXPLANATION | ENGLISH

Iron is more reactive than copper and can reduce Cu2+ to copper metal in CuSO4 solution: Fe + CuSO4 → FeSO4 + Cu.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. Na reacts vigorously with water, so is unsuitable for an aqueous copper sulfate recovery procedure

B. Ag is less reactive than Cu

C. Hg is less reactive than Cu.

YKS PERSPECTIVE | TÜRKÇE

YKS: Aktif metal, daha az aktif metalin iyonunu çözeltiden indirger. Sulu ortamda Na kullanılmaz.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Iron is more active than copper and reduces Cu^{2+}. Copper(II) gains electrons to become copper metal.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

31.1 Which metal can displace copper from aqueous $CuSO_4$ under ordinary conditions?

(A) silver (B) mercury (C) iron (D) gold

KEY C Iron is more active than copper and reduces Cu^{2+}.

31.2 In $Fe(s)+Cu^{2+}(aq)\rightarrow Fe^{2+}(aq)+Cu(s)$, which species is reduced?

(A) Fe (B) Cu^{2+} (C) Fe^{2+} (D) SO_4^{2-}

KEY B Copper(II) gains electrons to become copper metal.

31.3 Why is metallic sodium an unsuitable choice for recovering copper from aqueous $CuSO_4$?

(A) It cannot lose electrons (B) It reacts vigorously with water (C) It is less reactive than copper (D) It is a noble gas

KEY B Sodium reacts with the solvent itself.

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SECTION II / CHEMISTRY • EXAM ITEM 32/50

Question 32 | Reaction classification

32. The following reactions:

$Pb^{2+}(aq) + 2\ I^-(aq) \rightarrow PbI_2(s)$
$2\ Ce^{+4}(aq) + 2\ I^-(aq) \rightarrow I_2(aq) + 2\ Ce^{+3}(aq)$
$NaOH(aq) + HNO_2(aq) \rightarrow NaNO_2(aq) + H_2O(l)$

are examples of

(A) precipitation, redox, and acid-base reactions, respectively
(B) precipitation, acid-base, and redox reactions, respectively
(C) redox, acid-base, and precipitation reactions, respectively
(D) acid-base reactions

CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

Pb2+ + I− gives a precipitate; Ce4+ + I− is electron-transfer redox; NaOH + HNO2 gives acid–base neutralization.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. mislabels the second reaction as acid–base

C. wrongly calls the first redox

D. ignores precipitation and redox.

YKS PERSPECTIVE | TÜRKÇE

YKS: İlk tepkimede PbI_2 katısı oluşur = çökelme; ikinci tepkimede Ce^{4+} indirgenir ve I^- yükseltgenir = redoks; üçüncü tepkimede asit ve baz nötrleşir. Sıra: çökelme, redoks, asit-baz.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

A solid precipitate is formed from ions in solution. Iodide loses electrons when converted to iodine.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

32.1 Formation of insoluble PbI_2 from aqueous ions is a:

(A) precipitation reaction (B) combustion reaction (C) polymerization (D) substitution of an alkane

KEY A A solid precipitate is formed from ions in solution.

32.2 Which change demonstrates a redox reaction?

(A) I^- oxidized to I_2 (B) H^+ neutralized by OH^- (C) NaCl dissolves (D) ice melts

KEY A Iodide loses electrons when converted to iodine.

32.3 $HNO_3(aq)+NaOH(aq)\rightarrow NaNO_3(aq)+H_2O(l)$ is mainly:

(A) acid-base neutralization (B) nuclear decay (C) polymerization (D) sublimation

KEY A Acid and base produce water and a salt.

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SECTION II / CHEMISTRY • EXAM ITEM 33/50

Question 33 | Spontaneous reactions

33. Which of the following combinations will NOT react spontaneously under standard conditions?

(A) $Cu(s) + NaCl(aq) \rightarrow$
(B) $Cu^{2+}(aq) + Zn(s) \rightarrow$
(C) $Zn(s) + HCl(aq) \rightarrow$
(D) $CuO(s) + H_2SO_4(aq) \rightarrow$

CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

Copper metal does not spontaneously displace sodium from aqueous NaCl under standard conditions; the other listed processes are feasible in their usual chemical contexts.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. Cu2+ + Zn is spontaneous redox

C. Zn + HCl produces H2

D. CuO + H2SO4 undergoes acid–base reaction.

YKS PERSPECTIVE | TÜRKÇE

YKS: Etkinlik serisi: Cu, Na+ iyonunu indirgemez; Zn, Cu2+ iyonunu indirger.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Zinc is above copper in the activity series. Copper cannot reduce the highly electropositive sodium ion.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

33.1 Which metal can reduce Cu^{2+} in aqueous solution?

(A) copper itself (B) zinc (C) silver (D) gold

KEY B Zinc is above copper in the activity series.

33.2 Which displacement is not expected spontaneously in water?

(A) $Zn + Cu^{2+}$ (B) $Fe + Cu^{2+}$ (C) $Cu + Na^{+}$ (D) $Zn + H^{+}$

KEY C Copper cannot reduce the highly electropositive sodium ion.

33.3 Which reaction can release H_2 with dilute hydrochloric acid?

(A) Zn + HCl (B) Ag + HCl (C) Au + HCl (D) Pt + HCl

KEY A Zinc is sufficiently reactive to reduce H^{+} to H_2.

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SECTION II / CHEMISTRY • EXAM ITEM 34/50

Question 34 | Reaction kinetics

34. Which combination of factors will affect the rate of the following reaction?

$$Zn(s) + 2\,HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$$

(A) Temperature and surfaces only
(B) Temperature and concentration only
(C) Concentration and surface area only
(D) Temperature, concentration, and surface area

CORRECT ANSWER / SCIENTIFIC STATUS

D

ACADEMIC EXPLANATION | ENGLISH

For solid Zn reacting with aqueous HCl, temperature, acid concentration and zinc surface area can all influence reaction rate.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. omits concentration

B. omits surface area

C. omits temperature.

YKS PERSPECTIVE | TÜRKÇE

YKS: Katı-sıvı tepkimelerde yüzey alanı; sıcaklık ve derişim hızı etkiler.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

More surface contact increases productive collision opportunities. Higher temperature generally raises reaction rate.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

34.1 Powdered zinc usually reacts faster with aqueous acid than a zinc block because it has:

(A) smaller mass of each atom (B) greater exposed surface area (C) lower temperature (D) fewer collisions

KEY B More surface contact increases productive collision opportunities.

34.2 Which change typically increases the rate of Zn + 2HCl reaction?

(A) decrease acid concentration (B) cool the solution (C) increase temperature (D) reduce exposed zinc area

KEY C Higher temperature generally raises reaction rate.

34.3 For a solid metal and acid reaction, which trio of factors can all matter?

(A) temperature, acid concentration, metal surface area (B) light intensity, colour, sound (C) pressure only, density only, mass number (D) atomic number only, isotopic abundance, pH label

KEY A These three influence collision frequency or activation.

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SECTION II / CHEMISTRY • EXAM ITEM 35/50

Question 35 | Chemical equilibrium

35. Consider the following

I	Constant Temperature
II	Equal concentrations of reactants and products
III	Equal rates of forward and reverse reactions

A system at equilibrium must have

(A) I and II only **(B)** I and III only **(C)** II and III only **(D)** D. I, II , and III

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

A dynamic equilibrium at constant temperature has equal forward and reverse reaction rates. Reactant and product concentrations need not be equal.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. includes false II

C. includes false II

D. includes false II. Statement I is a standard condition for a stable equilibrium measurement, not a universal independent definition.

ACADEMIC NOTE. CONCEPTUAL PRECISION: I (constant temperature) concerns the fixed conditions assumed for a stable equilibrium. The defining kinetic condition is III (equal forward and reverse rates); equal concentrations (II) are not required.

YKS PERSPECTIVE | TÜRKÇE

YKS: Denge anında ileri ve geri hız eşittir; madde derişimleri birbirine eşit olmak zorunda değildir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Dynamic equilibrium involves equal opposing rates. Equal rates yield stationary concentrations, not equal values.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

35.1 At dynamic chemical equilibrium, the rates of the forward and reverse reactions are:

(A) both zero (B) equal and nonzero (C) always different (D) independent of one another

KEY B Dynamic equilibrium involves equal opposing rates.

35.2 At equilibrium, reactant and product concentrations must be:

(A) exactly equal (B) both zero (C) constant but not necessarily equal (D) always increasing

KEY C Equal rates yield stationary concentrations, not equal values.

35.3 Which system best supports stable equilibrium?

(A) open vessel losing gas continuously (B) closed system at fixed conditions (C) reaction with products removed continuously (D) system with temperature rising continuously

KEY B Stable conditions and containment are typically needed.

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SECTION II / CHEMISTRY • EXAM ITEM 36/50

Question 36 | Sulfide hydrolysis

36. The net ionic equation for the hydrolysis of the salt Na_2S is

(A) $Na_2S \rightleftarrows 2\,Na^+ + S^{2-}$

(B) $S^{2-} + H_2O \rightleftarrows OH^- + HS^+$

(C) $Na_2S + 2\,H_2O \rightleftarrows 2NaOH + H_2S$

(D) $2\,Na^+ + S^{2-} + 2\,H_2O \rightleftarrows 2\,Na^+ + 2\,OH^- + H_2S$

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

The first net ionic hydrolysis step is S2− + H2O ⇌ HS− + OH−; sulfide acts as a base.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. is salt dissociation, not hydrolysis

C. is a molecular overall expression rather than net ionic first-step hydrolysis

D. is not the correct minimal net ionic equation.

YKS PERSPECTIVE | TÜRKÇE

YKS: Na_2S suda Na^+ ve S^{2-} iyonlarına ayrışır; hidroliz yapan S^{2-} iyonudur: $S^{2-} + H_2O \rightleftharpoons HS^- + OH^-$. Ortam bazikleşir. Na^+ seyirci iyondur; net iyon denklemine yazılmaz.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

S^{2-} accepts a proton from water, creating OH^-. The sulfide base accepts H^+ from water.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

36.1 When sulfide ion reacts with water, which ion makes the solution basic?

(A) H_3O^+ (B) OH^- (C) Cl^- (D) NO_3^-

KEY B S^{2-} accepts a proton from water, creating OH^-.

36.2 Which is the correct first hydrolysis step of sulfide?

(A) $S^{2-} + H_2O \rightleftharpoons HS^- + OH^-$ (B) $S^{2-} + H_2O \rightleftharpoons SO_4^{2-} + H_2$ (C) $S^{2-} \rightarrow 2S^+$ (D) $Na^+ + H_2O \rightarrow NaOH + H^+$

KEY A The sulfide base accepts H^+ from water.

36.3 An aqueous Na_2S solution is generally:

(A) strongly acidic (B) neutral by definition (C) basic (D) always a saturated gas

KEY C Hydrolysis of sulfide produces hydroxide.

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SECTION II / CHEMISTRY • EXAM ITEM 37/50

Question 37 | Acid properties

37. Which of the following best describes a solution of acid?

	Litmus Colour	Reaction with Zn
(A)	red	reaction
(B)	red	no reaction
(C)	blue	no reaction
(D)	blue	reaction

CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

Acidic solutions turn blue litmus red and typical nonoxidizing acids react with zinc to release hydrogen.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. incorrectly says no Zn reaction

C. incorrectly predicts blue litmus

D. incorrectly predicts blue litmus.

ACADEMIC NOTE. SCOPE: The H_2-release rule applies to common non-oxidizing acids and suitably reactive metals such as Zn; it is not universal for every acidic solution and every metal.

YKS PERSPECTIVE | TÜRKÇE

YKS: Asit mavi turnusolü kırmızı yapar; Zn gibi aktif metallerle çoğunlukla H2 verir. Her asit için aynı metal tepkimesi genellenmez.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Acidic conditions turn blue litmus red. $Zn + 2HCl$ gives $ZnCl_2$ and H_2.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

37.1 What happens when blue litmus is placed in an acidic solution?

(A) turns red (B) turns green (C) remains always blue (D) produces H_2 directly

KEY A Acidic conditions turn blue litmus red.

37.2 Dilute HCl reacts with zinc metal to release:

(A) oxygen (B) nitrogen (C) hydrogen (D) chlorine gas

KEY C $Zn + 2HCl$ gives $ZnCl_2$ and H_2.

37.3 Which is a suitable example of a typically acidic solution?

(A) aqueous NaOH (B) aqueous HCl (C) aqueous NH_3 (D) pure hydrocarbon

KEY B HCl in water forms hydronium and chloride.

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SECTION II / CHEMISTRY • EXAM ITEM 38/50

Question 38 | Alkyne bromination

38. Which of the following is the product of the reaction of 1-hexyne with 1 mol of Br_2?

(A) $CH_3(CH_2)_3CH{=}CBr_2$

(B) $CH_3(CH_2)_3C(Br){=}CHBr$

(C) $CH_3(CH_2)_3C(Br){=}CH_2$

(D) $CH_3(CH_2)_3CH_2CH_2Br$

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

Addition of one equivalent of Br2 to a terminal alkyne gives a vicinal dibromoalkene, retaining a C=C bond; option B depicts this structure.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. is inconsistent with the displayed addition pattern

C. has only one Br

D. is a bromoalkane rather than the dibromoalkene product.

YKS PERSPECTIVE | TÜRKÇE

YKS: Alkinin üçlü bağına yalnız 1 mol Br_2 katılırsa iki Br atomu komşu karbonlara eklenir, C≡C bağı C=C hâline gelir. Son ürün dibromoalkendir; 2 mol Br_2 olsaydı tetrabromoalkan oluşabilirdi.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

One Br2 across a triple bond leaves a double bond with two Br atoms. One halogen equivalent reduces the triple bond to double.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

38.1 One equivalent of Br_2 added to ethyne primarily yields:

(A) ethane (B) 1,2-dibromoethene (C) 1,1,2,2-tetrabromoethane (D) bromoethane

KEY B One Br2 across a triple bond leaves a double bond with two Br atoms.

38.2 After addition of one mol Br_2 per mol alkyne, which bond generally remains between the two original alkyne carbons?

(A) C≡C (B) C=C (C) C−C only (D) no carbon-carbon bond

KEY B One halogen equivalent reduces the triple bond to double.

38.3 How many bromine atoms enter the product when one Br_2 molecule adds across an alkyne?

(A) one (B) two (C) three (D) four

KEY B One Br_2 molecule supplies two bromine atoms.

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SECTION II / CHEMISTRY • EXAM ITEM 39/50

Question 39 | Nucleophilic substitution

39. Which compound undergoes the substitution reaction with NaCN?

(A) $CH_3(CH_2)_3C(Cl)=CH_2$

(B) $CH_3(CH_2)_3CH_2CH_2Br$

(C) $CH_3(CH_2)_3CH=CBr_2$

(D) $CH_3(CH_2)_3CH=CHCl$

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

The primary alkyl bromide in B can undergo nucleophilic substitution with CN−, replacing Br with CN.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. is a vinylic chloride, which resists ordinary SN2

C. is a vinylic dibromide

D. is a vinylic chloride, also unsuitable for ordinary SN2.

YKS PERSPECTIVE | TÜRKÇE

YKS: SN2 için birincil alkil halojenür uygundur; vinilik halojenürler olağan SN2'ye girmez.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

An accessible primary sp^3 carbon favors backside attack by CN^-. Bromide serves as the leaving group.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

39.1 Which substrate normally undergoes SN2 with NaCN most readily?

(A) primary alkyl bromide (B) tertiary alkyl bromide (C) vinyl chloride (D) chlorobenzene

KEY A An accessible primary sp^3 carbon favors backside attack by CN^-.

39.2 During substitution of bromoethane with cyanide, the group displaced is:

(A) CN^- (B) H^+ (C) Br^- (D) CH_3^-

KEY C Bromide serves as the leaving group.

39.3 Why do ordinary vinylic halides resist SN2?

(A) their halogen is absent (B) the leaving group is on an sp^2 carbon (C) CN^- is never a nucleophile (D) they contain too many hydrogens

KEY B Backside attack at vinyl sp^2 carbon is disfavored.

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SECTION II / CHEMISTRY • EXAM ITEM 40/50

Question 40 | Ether formation

40. Which of the following alcohols gives the best yield of dialkyl ether by heating with a trace of sulfuric acid?

(A) Pentan-1-ol
(B) Pentan-2-ol
(C) 2-Methylbutan-2-ol
(D) 1-Methylcyclohexan-1-ol

CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

Primary pentan-1-ol can undergo intermolecular dehydration to form a dialkyl ether under suitably controlled acid-catalyzed conditions.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. secondary alcohol more readily undergoes competing elimination

C. is secondary and branched

D. is tertiary and favors alkene formation.

YKS PERSPECTIVE | TÜRKÇE

YKS: Uygun koşullarda birincil alkoller eterleşebilir; ikincil/üçüncül alkollerde eliminasyon rekabeti artar.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Two alcohol molecules combine to form R−O−R with loss of water. Primary alcohols generally have less competing elimination.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

40.1 Acid-catalyzed intermolecular dehydration of two ethanol molecules under suitable conditions gives:

(A) ethene only (B) diethyl ether and water (C) ethanal and water (D) acetic acid

KEY B Two alcohol molecules combine to form R−O−R with loss of water.

40.2 Which alcohol class is normally more suitable for acid-catalyzed symmetric ether synthesis?

(A) primary alcohols (B) tertiary alcohols (C) phenols only (D) all are equally suitable

KEY A Primary alcohols generally have less competing elimination.

40.3 At stronger dehydrating conditions, a tertiary alcohol commonly forms an:

(A) alkene (B) alkyne only (C) aldehyde (D) amide

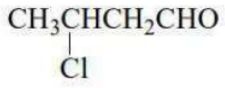
KEY A Tertiary alcohols favor elimination rather than clean intermolecular ether formation.

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SECTION II / CHEMISTRY • EXAM ITEM 41/50

Question 41 | IUPAC aldehyde naming

41. The correct IUPAC name for the following compound is:



(A) 2-Chloro-4-butanal
(B) 2-Chlorobutan-4-al
(C) 3-Chloro-4-butanal
(D) 3-Chlorobutanal

CORRECT ANSWER / SCIENTIFIC STATUS

C

ACADEMIC EXPLANATION | ENGLISH

The aldehyde carbon is C1 in CH3–CH(Cl)–CH2–CHO, making chlorine C3: 3-chlorobutanal.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. numbers from the wrong end

B. incorrectly uses the suffix/locant

D. gives chlorine position 2 rather than 3.

YKS PERSPECTIVE | TÜRKÇE

YKS: Aldehitte –CHO karbonu 1 numaradır. CHO–CH2–CH(Cl)–CH3 = 3-klorobütanal.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

The terminal aldehyde carbon is carbon 1. Three carbons and terminal −CHO give propanal.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

41.1 The carbonyl carbon in an aldehyde is assigned which parent-chain locant?

(A) last carbon only (B) 1 (C) 2 (D) zero

KEY B The terminal aldehyde carbon is carbon 1.

41.2 What is the name of CH_3CH_2CHO?

(A) propanal (B) propanone (C) ethanal (D) butanal

KEY A Three carbons and terminal −CHO give propanal.

41.3 What is the IUPAC name of $CH_3CH(Br)CHO$?

(A) 3-bromopropanal (B) 2-bromopropanal (C) 2-bromopropanone (D) bromopropane

KEY B The aldehyde carbon is 1 and Br is on carbon 2.

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SECTION II / CHEMISTRY • EXAM ITEM 42/50

Question 42 | Acetic acid reactions

42. Which reaction is NOT possible with acetic acid?

(A) $CH_3COOH + NaOH \longrightarrow$

(B) $CH_3COOH + NaCl \longrightarrow$

(C) $CH_3COOH + Na_2CO_3 \longrightarrow$

(D) $CH_3COOH + NH_3 \longrightarrow$

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

Acetic acid does not undergo a meaningful net acid–base reaction with neutral sodium chloride under ordinary aqueous conditions.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. reacts with NaOH by neutralization

C. reacts with carbonate producing CO2

D. reacts with NH3 to give ammonium acetate.

YKS PERSPECTIVE | TÜRKÇE

YKS: Zayıf asit + NaCl için net tepkime beklenmez; baz ve karbonatla tepkime olur.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Hydroxide accepts the acid proton to form acetate and water. Acid-carbonate reactions generate carbon dioxide.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

42.1 Which reagent neutralizes aqueous acetic acid to sodium acetate and water?

(A) NaOH (B) NaCl (C) $NaNO_3$ (D) solid NaBr

KEY A Hydroxide accepts the acid proton to form acetate and water.

42.2 When acetic acid reacts with sodium carbonate, which gas is released?

(A) O_2 (B) N_2 (C) CO_2 (D) Cl_2

KEY C Acid-carbonate reactions generate carbon dioxide.

42.3 Why is mixing aqueous CH_3COOH and NaCl not normally treated as a net chemical reaction?

(A) NaCl oxidizes acetate (B) no strong acid-base driving force produces new species (C) chloride becomes chlorine immediately (D) sodium precipitates

KEY B The ions coexist without appreciable net reaction.

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SECTION II / CHEMISTRY • EXAM ITEM 43/50

Question 43 | Peptide bonds

43. Peptide bonds can be classified as:

(A) Amines
(B) Carboxylic acids
(C) Amides
(D) Esters

CORRECT ANSWER / SCIENTIFIC STATUS

C

ACADEMIC EXPLANATION | ENGLISH

A peptide bond is a carboxamide linkage, –C(=O)–NH–, formed between amino-acid residues.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. amines lack the defining adjacent carbonyl

B. carboxylic acids contain –COOH

D. esters contain –COO– rather than –CONH–.

YKS PERSPECTIVE | TÜRKÇE

YKS: Peptit bağı amid bağıdır. Karboksil ile amino grubu arasında su çıkışıyla kurulur.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Peptide linkages have the −C(=O)−NH− amide structure. Condensation removes water between amino and carboxyl groups.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

43.1 Which functional group best describes a peptide linkage?

(A) ester (B) ether (C) amide (D) ketone

KEY C Peptide linkages have the −C(=O)−NH− amide structure.

43.2 Forming a peptide bond between two amino acids usually releases:

(A) H_2O (B) CO_2 (C) O_2 (D) NH_3 always

KEY A Condensation removes water between amino and carboxyl groups.

43.3 Which linkage is characteristic of a simple ester rather than an amide?

(A) −COO− (B) −CONH− (C) −NHCO− (D) −CONR−

KEY A Esters contain a carbonyl connected to oxygen rather than nitrogen.

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SECTION II / CHEMISTRY • EXAM ITEM 44/50

Question 44 | Monosaccharides

44. Which of the following compound is NOT a monosaccharide?

(A) D-Sucrose
(B) D-Glucose
(C) D-Mannose
(D) D-Ribose

CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

Sucrose is a disaccharide composed of glucose and fructose, unlike glucose, mannose and ribose, which are monosaccharides.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. glucose is a monosaccharide

C. mannose is a monosaccharide

D. ribose is a monosaccharide.

YKS PERSPECTIVE | TÜRKÇE

YKS: Sükroz disakkarittir; glikoz, mannoz, riboz monosakkarittir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Sucrose contains glucose and fructose residues. Sucrose is built from glucose and fructose.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

44.1 Which is a disaccharide?

(A) ribose (B) mannose (C) glucose (D) sucrose

KEY D Sucrose contains glucose and fructose residues.

44.2 What products result from complete hydrolysis of sucrose?

(A) glucose and fructose (B) two galactose molecules (C) two ribose molecules (D) glucose and amino acid

KEY A Sucrose is built from glucose and fructose.

44.3 Which listed compound is a monosaccharide?

(A) starch (B) glycogen (C) ribose (D) cellulose

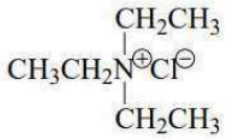
KEY C Ribose is a five-carbon monosaccharide.

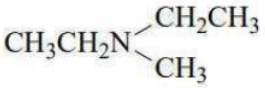
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SECTION II / CHEMISTRY • EXAM ITEM 45/50

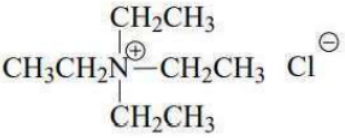
Question 45 | Quaternary ammonium

45. Which one correctly depicts a quaternary ammonium ion?

(A) 

(B) 

(C) $CH_3CH_2NHCH_3$

(D) 

CORRECT ANSWER / SCIENTIFIC STATUS

D

ACADEMIC EXPLANATION | ENGLISH

A quaternary ammonium ion has nitrogen bonded to four carbon substituents and a positive charge; D shows such a cation with chloride counterion.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. is not a correctly represented quaternary ammonium species in the supplied drawing

B. is a neutral tertiary amine

C. is a secondary amine.

YKS PERSPECTIVE | TÜRKÇE

YKS: Kuaterner amonyumda N dört organik gruba bağlıdır ve + yüklüdür. Karşı iyon ayrıca bulunabilir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Four organic substituents give R_4N^+. Tetravalent ammonium nitrogen carries a +1 formal charge.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

45.1 A typical quaternary ammonium cation has nitrogen attached to:

(A) one carbon substituent (B) two carbon substituents (C) three carbon substituents (D) four carbon substituents

KEY D Four organic substituents give R_4N^+.

45.2 What is the net charge of the tetraethylammonium ion, $(C_2H_5)_4N$?

(A) −1 (B) 0 (C) +1 (D) +2

KEY C Tetravalent ammonium nitrogen carries a +1 formal charge.

45.3 Which formula represents a neutral tertiary amine rather than a quaternary ammonium ion?

(A) R_4N^+ (B) R_3N (C) RNH_3^+ (D) $R_2NH_2^+$

KEY B A neutral tertiary amine has three organic substituents and a lone pair.

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SECTION II / CHEMISTRY • EXAM ITEM 46/50

Question 46 | Aromatic directing effects

46. Consider the following statements concerning the effect of a methyl group, $-CH_3$, on an electrophilic aromatic substitution:

I. The methyl group will activate the aromatic ring.
II. The methyl group will deactivate the aromatic ring.
III. The methyl group will be a *meta*-director.
IV. The methyl group will be an *ortho*- and a *para*-director.

(A) I and III; **(B)** I and IV; **(C)** II and III; **(D)** II and IV

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

A methyl substituent donates electron density and activates the aromatic ring, directing electrophilic substitution mainly to ortho and para positions. I and IV are correct.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. includes III, the false meta-directing statement

C. includes false II and III

D. includes false II.

YKS PERSPECTIVE | TÜRKÇE

YKS: –CH3 aktive edici orto/para yönlendiricidir; elektron çeken birçok grup meta yönlendirir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Methyl is an activating ortho/para director. The methyl substituent donates electron density to the ring.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

46.1 A methyl group on benzene generally directs electrophilic substitution to:

(A) ortho and para (B) meta only (C) ipso only (D) all positions equally

KEY A Methyl is an activating ortho/para director.

46.2 Compared with benzene, toluene is commonly:

(A) deactivated to electrophilic substitution (B) activated to electrophilic substitution (C) incapable of nitration (D) an aliphatic alkene

KEY B The methyl substituent donates electron density to the ring.

46.3 Which statement about the $-CH_3$ substituent in aromatic electrophilic substitution is correct?

(A) it is meta-directing (B) it withdraws electron density strongly (C) it usually activates the ring (D) it prevents substitution

KEY C Methyl stabilizes ortho/para substitution intermediates.

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SECTION II / CHEMISTRY • EXAM ITEM 47/50

Question 47 | Aldehyde carbonyl reactivity

47. Which statement about the carbonyl group of aldehydes is true?

I. The carbon atom in the carbonyl group can attract nucleophiles.
II. The carbon atom in the carbonyl group can attract electrophiles.
III The carbonyl group undergoes addition reaction.
IV. The carbon atom in the carbonyl group can attract Lewis acids.

(A) I and III **(B)** II and IV **(C)** I, II and III **(D)** I, III and IV

CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

The polarized carbonyl carbon is electrophilic and attracts nucleophiles; aldehyde carbonyls undergo nucleophilic addition. Statements I and III are correct.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. includes IV, which incorrectly assigns Lewis-acid attraction to the electrophilic carbon

C. includes II, incorrectly suggesting electrophiles attack carbonyl carbon

D. includes II and IV.

YKS PERSPECTIVE | TÜRKÇE

YKS: C=O bağında karbon kısmi pozitif, oksijen kısmi negatiftir. Nükleofil karbona saldırır.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Oxygen draws electron density from carbonyl carbon. Nucleophiles are attracted to electrophilic carbonyl carbon.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

47.1 In an aldehyde carbonyl, the carbon atom is mainly:

(A) electrophilic (B) nucleophilic (C) a permanent negative ion (D) nonpolar

KEY A Oxygen draws electron density from carbonyl carbon.

47.2 Which reactant type usually attacks an aldehyde carbonyl carbon?

(A) nucleophile (B) electrophile only (C) neutral noble gas (D) free chloride radical only

KEY A Nucleophiles are attracted to electrophilic carbonyl carbon.

47.3 What is a common reaction class of aldehydes?

(A) nucleophilic addition (B) electrophilic aromatic substitution (C) alkane free-radical halogenation (D) peptide hydrolysis only

KEY A The C=O π bond can open during nucleophilic addition.

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SECTION II / CHEMISTRY • EXAM ITEM 48/50

Question 48 | Aldehyde reduction

48. Which of the following is the product of the reaction of butanal with H_2/Pt:

(A) Butanoic acid
(B) Butan-1-ol;
(C) Butan-2-one
(D) Butan-2-ol

CORRECT ANSWER / SCIENTIFIC STATUS

B

ACADEMIC EXPLANATION | ENGLISH

Hydrogenation of butanal with H2/Pt reduces the aldehyde carbonyl to the primary alcohol butan-1-ol.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. butanoic acid is an oxidation product

C. butan-2-one is a ketone with different connectivity

D. butan-2-ol is a secondary alcohol from a ketone.

YKS PERSPECTIVE | TÜRKÇE

YKS: Aldehit indirgenirse birincil alkol oluşur; yükseltgenirse karboksilik asit oluşabilir.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

An aldehyde is reduced to a primary alcohol. Reduction adds hydrogen to carbonyl and produces an alcohol.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

48.1 Catalytic hydrogenation of propanal gives:

(A) propanoic acid (B) propan-1-ol (C) propan-2-ol (D) propanone

KEY B An aldehyde is reduced to a primary alcohol.

48.2 Which transformation represents reduction of an aldehyde?

(A) R−CHO → R−CH_2OH (B) R−CHO → R−COOH (C) R−CHO → R−COCl (D) R−CHO → R−COOR

KEY A Reduction adds hydrogen to carbonyl and produces an alcohol.

48.3 Hydrogenation of butan-2-one gives:

(A) butanal (B) butan-1-ol (C) butan-2-ol (D) butanoic acid

KEY C A ketone is reduced to a secondary alcohol.

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SECTION II / CHEMISTRY • EXAM ITEM 49/50

Question 49 | Soap chemistry

49. Soaps are:

I. Long-chain esters
II. Long-chain fatty acids
III. Sodium salts of long-chain carboxylic acids
IV. Both polar and nonpolar molecules

(A) I and IV **(B)** II and IV **(C)** I, II and III **(D)** III and IV

CORRECT ANSWER / SCIENTIFIC STATUS

D — intended answer with an imprecise description

ACADEMIC EXPLANATION | ENGLISH

Common soaps are sodium or potassium salts of long-chain fatty acids (statement III). Each soap ion is amphiphilic: it contains a polar, hydrophilic carboxylate head and a nonpolar, hydrophobic hydrocarbon tail. Statement IV describes soaps as “both polar and nonpolar molecules,” which is imprecise: the scientifically preferable wording is “molecules/ions possessing both polar and nonpolar regions.” Thus III and IV are the evident intended combination, yielding D, but the original wording should be annotated.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

A. includes false I (soaps are not generally long-chain esters)

B. includes false II (free fatty acids are not the soap salts)

C. includes false I and II. IV calls soaps 'both polar and nonpolar molecules', which is imprecise: they are amphiphilic molecules with polar and nonpolar regions.

ACADEMIC NOTE. TERMINOLOGY: Amphiphilic is more precise than describing the entire soap species as both “polar and nonpolar molecules.”

YKS PERSPECTIVE | TÜRKÇE

YKS: Sabunlar uzun zincirli yağ asitlerinin Na^+ veya K^+ tuzlarıdır. Tek bir sabun türünde hidrofilik/polar baş ve hidrofobik/apolar kuyruk bulunur. III doğru; IV bilimsel anlatım bakımından “polar ve apolar bölgeleri vardır” biçiminde düzeltilmelidir. Sınavın beklenen şıkkı D.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

Soaps are long-chain carboxylate salts. Nonpolar tails interact with oils and grease.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

49.1 Which description best defines a common soap?

(A) sodium or potassium salt of a long-chain fatty acid (B) pure triglyceride (C) free glucose polymer (D) aromatic hydrocarbon

KEY A Soaps are long-chain carboxylate salts.

49.2 The hydrocarbon tail of a soap molecule is mainly:

(A) hydrophilic (B) hydrophobic (C) ionic (D) strongly acidic

KEY B Nonpolar tails interact with oils and grease.

49.3 Why can soap assist in dispersing grease in water?

(A) It contains both hydrophilic and hydrophobic regions (B) It consists entirely of nonpolar atoms (C) It destroys water molecules (D) It converts fat to protein

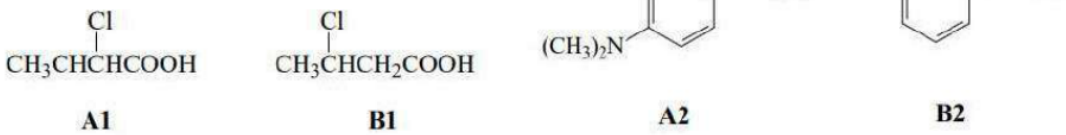
KEY A Amphiphilic structure enables micelle formation and emulsification.

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SECTION II / CHEMISTRY • EXAM ITEM 50/50

Question 50 | Substituent effects on acidity

50. Of the two pairs of acids, which one is stronger in each pair?



A1 B1 A2 B2

Pair 1 Pair 2

(A) A1, B2 **(B)** A1, A2 **(C)** B1, B2 **(D)** B1, A2

CORRECT ANSWER / SCIENTIFIC STATUS

A

ACADEMIC EXPLANATION | ENGLISH

In pair 1, chlorine closer to COOH withdraws electrons more strongly by induction, making A1 more acidic. In pair 2, the para-dimethylamino donor reduces acidity relative to unsubstituted benzoic acid B2.

WHY INCORRECT? | OPTION-BY-OPTION ANALYSIS

B. chooses electron-donating A2 instead of B2

C. choose B1, where chlorine is farther from COOH and exerts a weaker inductive effect.

D. choose B1, where chlorine is farther from COOH and exerts a weaker inductive effect.

YKS PERSPECTIVE | TÜRKÇE

YKS: Karboksil grubuna yakın Cl elektron çeker, karboksilat anyonunu indüktif etkiyle kararlı kılar; A1, B1'den daha asidiktir. Aromatik halkada para $-N(CH_3)_2$ elektron verir; benzoik aside göre asitliği düşürür. İkinci çiftte B2 daha güçlüdür. Birlikte A1+B2 → A.

WHAT YOU LEARNED | TRANSFERABLE PRINCIPLE

The inductive electron-withdrawing effect is stronger when Cl is closer to COOH. Electron donation destabilizes the carboxylate relative to the acid.

CHECK YOUR UNDERSTANDING | 3 ORIGINAL MCQs

50.1 Which chlorine-substituted butanoic acid is generally more acidic?

(A) 2-chlorobutanoic acid (B) 4-chlorobutanoic acid (C) both always equal (D) chlorine has no effect

KEY A The inductive electron-withdrawing effect is stronger when Cl is closer to COOH.

50.2 What is the general effect of a strong para electron-donating substituent on benzoic acid acidity?

(A) it always makes acidity infinite (B) it often decreases acidity (C) it removes the carboxyl group (D) it always doubles pKa numerically

KEY B Electron donation destabilizes the carboxylate relative to the acid.

50.3 Which effect explains increased acidity from an electron-withdrawing substituent near COOH?

(A) inductive stabilization of the conjugate base (B) increase in atomic mass alone (C) spontaneous polymerization (D) loss of carbon atoms

KEY A Electron withdrawal stabilizes the carboxylate conjugate base.

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EDITORIAL APPENDIX

Scientific qualifications & source notes

This short appendix records source-item limitations that must remain visible in academic use. It is not a substitute for a university-authenticated answer key.

Q03 — virus-host wording

The intended textbook answer is D. The absolute assertion that viruses cannot infect other viruses is not universally precise in light of virophages and giant-virus replication systems.

Q04 — membrane illustration

Verified against the source image: D. Arrow (3) identifies the phospholipid bilayer.

Q20 — defective multiple-choice item

Only salivary alpha-amylase in statement (3) is normally active in the mouth. Maltase is primarily an intestinal brush-border enzyme. Thus none of the four complete pair options is scientifically correct. D seems intended; do not treat it as an undisputed key.

Q26 — $3d^4$ not $3d^5$

The scan asks for $[Ar]3d^4$. Cr^{2+} is $[Ar]3d^4$, so the answer is B; Mn^{2+} and Fe^{3+} have $[Ar]3d^5$.

Q49 — soaps as amphiphiles

The intended combination is III and IV (D), but the appropriate statement is that soap ions possess polar and nonpolar regions rather than being literally two sorts of molecules.

Selected science references

OpenStax, Chemical Digestion and Absorption · openstax.org/books/anatomy-and-physiology/pages/23-7-chemical-digestion-and-absorption-a-closer-look

NCBI Bookshelf, Physiology: Small Bowel · ncbi.nlm.nih.gov/books/NBK532263/

Sobhy, Virophages and Their Interactions with Giant Viruses, 2018 · pmc.ncbi.nlm.nih.gov/articles/PMC6027436/

Designed for students who learn the principle, not merely the pattern.

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