

Question Paper Preview

Notations :

- Options shown in green color and with ✓ icon are correct.
- Options shown in red color and with ✗ icon are incorrect.

Question Paper Name :	Paper II Chemistry
Subject Name :	Paper II Chemistry
Creation Date :	2025-03-26 06:57:27
Duration :	150
Total Marks :	300
Display Marks:	Yes
Change Font Color :	No
Change Background Color :	No
Change Theme :	No
Help Button :	No
Show Reports :	No
Show Progress Bar :	No

Paper II Chemistry

Group Number :	1
Group Id :	63068028488
Group Maximum Duration :	0
Group Minimum Duration :	150
Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	300

Paper II Chemistry

Section Id :	63068058633
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	150
Number of Questions to be attempted :	150
Section Marks :	300
Section Negative Marks :	0.66
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	63068076022
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 6306801225245 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

A statement is given, followed by two conclusions numbered I and II. You have to consider the statement to be true, even if it seems to be at variance from commonly known facts. You are to decide which of the given conclusions can definitely be drawn from the given statement.

Statement:

Group 1 elements have lower ionization energies than Group 2 elements.

Conclusions:

I: Group 1 elements form +1 cations by losing one electron.

II: Group 1 elements are more reactive than Group 2 elements.

Options :

- ✘ Only conclusion I is correct
- ✘ Only conclusion II is correct
- ✔ Both conclusion I and conclusion II are correct
- ✘ Neither conclusion I nor conclusion II is correct

Question Number : 2 Question Id : 6306801237154 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

When aluminium carbide (Al_4C_3) reacts with water, the products formed are:

Options :

- ✘ carbon dioxide and aluminium hydroxide
- ✘ methane and aluminium oxide
- ✘ ethane and aluminium hydroxide
- ✔ methane and aluminium hydroxide

Question Number : 3 Question Id : 6306801237558 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements is FALSE about non-transition elements?

Options :

- ✘ They have a full outermost electron shell.
- ✔ Non-transition elements typically show multiple oxidation states.
- ✘ Their compounds are usually colourless.
- ✘ They include elements from Groups 1, 2, and 13-18.

Question Number : 4 Question Id : 6306801243654 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Borazine is often referred to as 'inorganic benzene'. Which of the following structural similarities does borazine share with benzene?

Options :

- ✘ Borazine is a non-polar molecule.
- ✔ Borazine has a six-membered ring structure with alternating bonds.
- ✘ Borazine has identical bond lengths.
- ✘ Borazine undergoes electrophilic substitution reactions similar to benzene.

Question Number : 5 Question Id : 6306801243702 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In the given question two statements are provided: Assertion (A) and Reason (R). Read both statements carefully, determine their relationship and choose the most appropriate option.

Assertion (A): Silicon dioxide (SiO_2) is considered an acidic oxide.

Reason (R): Silicon dioxide reacts readily with water to form silicic acid.

Options :

- ✘ Both A and R are true, and R is the correct explanation of A.
- ✘ Both A and R are true, but R is not the correct explanation of A.
- ✔ A is true, but R is false.
- ✘ A is false, but R is true.

Question Number : 6 Question Id : 6306801252539 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Select the correct option based on the Assertion (A) and Reason (R) given below.

Assertion (A): P_2O_3 has a structure that includes P–O single bonds and P=P double bonds.

Reason (R): The bonding in P_2O_3 allows phosphorus to attain the octet configuration.

Options :

- ✘ Both A and R are true, and R is the correct explanation of A.
- ✘ Both A and R are true, but R is not the correct explanation of A.
- ✘ A is true, but R is false.
- ✔ A is false, and R is false.

Question Number : 7 Question Id : 6306801252567 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Match the following borazine structures with their corresponding descriptions.

Borazine structure	Description
P. $\text{C}_6\text{H}_{10}\text{B}_3\text{N}_3$ (Borazole)	A. A six-membered ring with alternating boron and nitrogen atoms, where certain atoms are bonded to aromatic groups that influence the molecule's resonance and steric properties.
Q. $\text{B}_3\text{N}_3\text{H}_6$ (Borazine)	B. A six-membered ring with alternating B and N atoms, where additional organic substituents modify the structure, reducing its resemblance to benzene.
R. $\text{B}_3\text{N}_3\text{Cl}_6$ (Chloroborazine)	C. A compound with a six-membered ring of alternating B and N atoms, where each N atom is bonded to a H atom, resembling the structure of benzene.
S. $\text{C}_6\text{H}_5\text{B}_3\text{N}_3$ (Phenylborazine)	D. A boron-nitrogen ring with hydrogen atoms replaced by a set of electronegative atoms that affect the compound's reactivity.

Options :

- ✔ P – B, Q – C, R – D, S – A
- ✘ P – D, Q – A, R – B, S – C

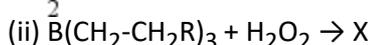
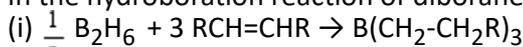
3. ✘ P – D, Q – C, R – A, S – B

4. ✘ P – B, Q – A, R – D, S – C

Question Number : 8 Question Id : 6306801234370 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In the hydroboration reaction of diborane with alkene, the reaction proceeds as follows.



Identify the product 'X' formed in this reaction.

Options :

1. ✔ $\text{RCH}_2\text{CH}_2\text{OH}$

2. ✘ RCH_2COOH

3. ✘ $\text{RCH}_2\text{COCH}_2\text{R}$

4. ✘ RCH_2CH_3

Question Number : 9 Question Id : 6306801237854 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements about the structure of closo-carboranes is correct?

Options :

1. ✘ Closo-carboranes consist of a cage-like structure where all vertices are occupied only by boron atoms.

2. ✔ Closo-carboranes have a polyhedral structure where carbon and boron atoms occupy vertices, and the structure follows the Wade–Mingos rules.

3. ✘ Closo-carboranes have a linear arrangement of boron and carbon atoms bonded alternately.

4. ✘ Closo-carboranes form a 2D honeycomb-like planar structure similar to graphene.

Question Number : 10 Question Id : 6306801243639 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following oxides would most likely exhibit acidic behaviour in aqueous solutions?

Options :

1. ✘ Na_2O

2. ✔ P_4O_{10}

3. ✘ CaO

4. ✘ Al_2O_3

Question Number : 11 Question Id : 6306801243672 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following is a typical synthesis method for thiazyl chloride (SNCl)?

Options :

1. ✔ Direct reaction of sulphur and nitrogen gases at high temperature

2. ✘ Reaction of thiazyl fluoride (SNF) with hydrogen chloride gas

3. ✘ Reaction of SCl_2 with N_2O_4

4. ✘ Reaction of sulphur tetrachloride with ammonia

Question Number : 12 Question Id : 6306801243718 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which method is commonly used to synthesize ortho-carborane starting from boron hydride?

Options :

1. High-temperature reaction with acetylene
2. Hydrogenation reaction
3. Acid-catalyzed cyclisation
4. Oxidation of boron compounds

Question Number : 13 Question Id : 6306801252589 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Match the following type of bonding in the carbides with suitable examples.

Bonding type	Example of carbides
P. Ionic carbide	A. Silicon carbide (SiC)
Q. Covalent carbide	B. Tungsten carbide (WC)
R. Interstitial carbide	C. Iron carbide (Fe ₃ C)
S. Metallic carbide	D. Sodium carbide (Na ₂ C)

Options :

1. P – B, Q – C, R – D, S – A
2. P – D, Q – A, R – B, S – C
3. P – D, Q – C, R – A, S – B
4. P – B, Q – A, R – D, S – C

Question Number : 14 Question Id : 6306801255943 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Read the given statement and conclusions and select the most appropriate option.

Statement:

Carboranes are polyhedral compounds consisting of boron, carbon, and hydrogen atoms, often used as precursors for designing boron-rich materials due to their unique stability and electronic properties.

Conclusions:

- I. The stability of carboranes is a result of delocalised bonding involving multicenter bonding interactions.
- II. Carboranes can be functionalised at carbon and boron sites to create derivatives with tailored electronic and chemical properties.

Options :

1. Only conclusion I is true
2. Only conclusion II is true
3. Both I and II are true
4. Neither I nor II is true

Question Number : 15 Question Id : 6306801237176 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Silicates have various structures due to the ways SiO₄⁴⁻ tetrahedra link together. Which of the following statements is correct regarding different types of silicate structures?

Options :

- ✘ In orthosilicates, SiO_4^{4-} tetrahedra share all four oxygen atoms with neighbouring tetrahedra, forming a 3D network.
- ✔ Pyrosilicates contain discrete $\text{Si}_2\text{O}_7^{6-}$ units, SiO_4^{4-} tetrahedra are linked by sharing a single oxygen atom.
- ✘ Sheet silicates consist of single chains of SiO_4^{4-} tetrahedra that are not connected to any other chains, resulting in a one-dimensional structure.
- ✘ In ring silicates, all oxygen atoms in each SiO_4^{4-} tetrahedra are shared with adjacent tetrahedra, forming continuous 2D sheets.

Question Number : 16 Question Id : 6306801237184 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements about polymorphic forms of phosphorus is correct?

Options :

- ✔ Black phosphorus has a layered structure and is the most thermodynamically stable allotrope.
- ✘ Red phosphorus is highly reactive in air and spontaneously ignites at room temperature.
- ✘ White phosphorus is stable in air but ignites only when heated to around 400°C in the absence of oxygen.
- ✘ White phosphorus consists of discrete P_4 tetrahedra, whereas red phosphorus is a polymeric form.

Question Number : 17 Question Id : 6306801237880 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following is NOT a polymorphic structure of phosphorus?

Options :

- ✘ White phosphorus
- ✘ Black phosphorus
- ✘ Red phosphorus
- ✔ Blue phosphorus

Question Number : 18 Question Id : 6306801243730 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which type of silicate structure does mica exhibit, contributing to its characteristic cleavage?

Options :

- ✘ Three-dimensional framework
- ✘ Double-chain silicate
- ✔ Sheet silicate
- ✘ Single-chain silicate

Question Number : 19 Question Id : 6306801243736 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In the context of carbon polymorphism, which statement best explains why diamond has a much higher melting point than graphite?

Options :

- ✘ Diamond's carbon-carbon bonds are much weaker than those in graphite.
- ✔ Diamond's 3D structure requires more energy to break the bonds, while graphite's 2D structure allows easier bond separation.
- ✘ The absence of covalent bonds in diamond makes it less stable than graphite.

4. ✖ Graphite contains more delocalized electrons than diamond, making it more stable.

Question Number : 20 Question Id : 6306801255965 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Read the given statement and conclusions and select the most appropriate option.

Statement:

Silicates are compounds containing silicon, oxygen, and one or more metals, where the silicon atom is tetrahedrally coordinated by oxygen atoms.

Conclusions:

- I. Silicates can form extended polymeric structures through the sharing of oxygen atoms between silicon-oxygen tetrahedra.
II. Silicates exhibit a variety of physical properties, such as high melting points and low solubility in water, due to the strong covalent bonds between silicon and oxygen atoms.

Options :

1. ✖ Only conclusion I is true
2. ✖ Only conclusion II is true
3. ✔ Both I and II are true
4. ✖ Neither I nor II is true

Question Number : 21 Question Id : 6306801237250 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following methods is commonly used as the initial step for the isolation of terpenes from plant materials?

Options :

1. ✔ Steam distillation
2. ✖ Filtration
3. ✖ Simple distillation
4. ✖ Sublimation

Question Number : 22 Question Id : 6306801243774 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

How are terpenoids classified?

Options :

1. ✖ Based on the number of carbon atoms
2. ✖ Based on the type of functional groups attached to the carbon chain
3. ✔ Based on the number of isoprene units in the molecule
4. ✖ Based on their colour and odour

Question Number : 23 Question Id : 6306801243808 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following fruits is a significant natural source of monoterpenoids?

Options :

1. ✖ Apple
2. ✔ Orange
3. ✖ Banana

4. ✖ Mango

Question Number : 24 Question Id : 6306801255985 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Read the given statement and conclusions and select the most appropriate option.

Statement:

Terpenoids are classified based on the number of isoprene units they contain.

Conclusions:

- I. Monoterpenoids contain two isoprene units.
- II. Sesquiterpenoids contain four isoprene units.

Options :

- 1. ✔ Only Conclusion I is true
- 2. ✖ Only Conclusion II is true
- 3. ✖ Both I and II are true
- 4. ✖ Neither I nor II is true

Question Number : 25 Question Id : 6306801237244 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following is true about the linkage of isoprene units in terpenoids?

Options :

- 1. ✔ The isoprene units are linked head-to-tail.
- 2. ✖ The isoprene units are linked tail-to-tail.
- 3. ✖ Isoprene units are not linked in terpenoids.
- 4. ✖ Isoprene units are linked through hydrogen bonds.

Question Number : 26 Question Id : 6306801237280 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

A statement is given, followed by two conclusions numbered I and II. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions can be drawn definitely from the given statement.

Statement

Terpenoids can be structurally determined using a combination of spectroscopic techniques, chemical methods, and comparative analysis with known compounds.

Conclusions

- I: Spectroscopic techniques like NMR, IR and Ultraviolet spectrophotometry provide detailed information about the molecular structure and functional groups in terpenoids.
- II: Chemical methods such as oxidation, reduction and degradation reactions help deduce the molecular framework and stereochemistry of terpenoids.

Options :

- 1. ✖ Only Conclusion I is correct.
- 2. ✖ Only Conclusion II is correct.
- 3. ✔ Both Conclusion I and Conclusion II are correct.
- 4. ✖ Neither Conclusion I nor Conclusion II is correct.

Question Number : 27 Question Id : 6306801237298 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Match the following terpenes (Column I) with their molecular formula (Column II) and characteristic features (Column III).

Column I Terpene	Column II Molecular Formula	Column III Characteristic Feature
(i) Cadinene	(a) $C_{15}H_{24}$	(p) Tricyclic diterpene with conjugated double bonds present in rings B and C
(ii) Abietic acid	(b) $C_{20}H_{30}O_2$	(q) Bicyclic sesquiterpene with a fused system of four- and nine-membered rings
	(c) $C_{20}H_{34}O_2$	(r) Bicyclic sesquiterpene with two non-conjugated double bonds
	(d) $C_{15}H_{18}$	(s) Tricyclic triterpene with conjugated double bonds present in rings B and C

Options :

- (i) - (a, r), (ii) - (b, p)
- (i) - (a, r), (ii) - (c, s)
- (i) - (d, r), (ii) - (b, p)
- (i) - (a, q), (ii) - (c, p)

Question Number : 28 Question Id : 6306801243834 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following compounds is NOT synthesised from two isoprene units and also not a major component of essential oils?

Options :

- Myrcene
- Limonene
- Linalool
- Camphor

Question Number : 29 Question Id : 6306801256006 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Read the given statement and conclusions and select the most appropriate option.

Statement:

Terpenoids, also known as isoprenoids, are a diverse class of naturally occurring organic compounds primarily derived from plants and some microorganisms.

Conclusions:

- All terpenoids are exclusively found in plants.
- Terpenoids are biosynthesised through the assembly of isoprene units.

Options :

- Only conclusion I is true
- Only conclusion II is true
- Both I and II are true
- Neither I nor II is true

Question Number : 30 Question Id : 6306801237254 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Read the given statements of Assertion (A) and Reason (R) carefully and select the correct option.

(A): During fractional distillation to isolate terpenoids from essential oils, monoterpenoid hydrocarbons typically distill first.

(R): Monoterpenoid hydrocarbons have lower boiling points, allowing them to separate earlier during distillation.

Options :

1. ✓ Both A and R are true, and R is the correct explanation for A.
2. ✗ Both A and R are true, but R is not the correct explanation for A.
3. ✗ A is true but R is false.
4. ✗ A is false but R is true.

Question Number : 31 Question Id : 6306801237293 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

During the structure elucidation of Zingiberene, which of the following observations does NOT support that Zingiberene is a sesquiterpene hydrocarbon with a monocyclic structure?

Options :

1. ✗ Catalytic hydrogenation converts Zingiberene into hexahydrozingiberene.
2. ✗ The molecular refractivity index of Zingiberene corresponds to a monocyclic structure.
3. ✗ Ozonolysis of Zingiberene yields acetone, levulinic acid and succinic acid.
4. ✓ Reaction with ozone forms a tri-ketone, suggesting a monocyclic structure.

Question Number : 32 Question Id : 6306801243858 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

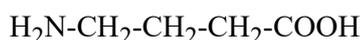
Which reaction is commonly utilised to modify the carboxylic acid group in abietic acid to form its methyl ester derivative?

Options :

1. ✗ Friedel-Crafts acylation
2. ✗ Claisen rearrangement
3. ✓ Fischer esterification
4. ✗ Wolff-Kishner reduction

Question Number : 33 Question Id : 6306801237348 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following is the correct IUPAC name of the given gamma amino acid?



Options :

1. ✗ 4-aminopropanoic acid
2. ✓ 4-aminobutyric acid
3. ✗ 3-aminobutyric acid
4. ✗ 3-aminopropanoic acid

Question Number : 34 Question Id : 6306801237574 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following methods can be used for the synthesis of leucine?

Options :

1. ✘ Nitration of isoleucine
2. ✘ Friedel-Crafts acylation
3. ✘ Decarboxylation of valine
4. ✔ Strecker synthesis

Question Number : 35 Question Id : 6306801240314 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

At physiological pH (around 7.4), the amino acid glycine predominantly exists in which form due to its amphoteric nature?

Options :

1. ✘ Fully protonated form (both amino and carboxyl groups protonated)
2. ✘ Fully deprotonated form (both amino and carboxyl groups deprotonated)
3. ✔ Zwitterionic form (amino group protonated and carboxyl group deprotonated)
4. ✘ Only as a carboxylate anion (carboxyl group deprotonated, amino group neutral)

Question Number : 36 Question Id : 6306801243922 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements about amino acids is correct?

Options :

1. ✘ All amino acids have their amino group attached to the alpha carbon.
2. ✔ Amino acids are amphoteric molecules due to the presence of both acidic and basic groups.
3. ✘ Only non-polar amino acids are used in protein synthesis.
4. ✘ Amino acids cannot exist as zwitterions in solution.

Question Number : 37 Question Id : 6306801243934 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Alpha amino acids are classified based on the nature of their side chains. Which of the following amino acids is classified as a non-polar, aliphatic amino acid?

Options :

1. ✔ Glycine
2. ✘ Serine
3. ✘ Lysine
4. ✘ Glutamine

Question Number : 38 Question Id : 6306801245707 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which functional groups are present in valine?

Options :

1. ✔ Amine and carboxylic acid
2. ✘ Ketone and carboxylic acid
3. ✘ Alcohol and amine
4. ✘ Amine and aldehyde

Question Number : 39 Question Id : 6306801247185 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Select the option that is true regarding the following two statements labelled Assertion (A) and Reason (R).

Assertion (A): Glycine is an α -amino acid.

Reason (R): The malonic ester synthesis involves a step where ammonia reacts with the α -bromoester intermediate.

Options :

- ✘ Both A and R are true, and R is the correct explanation of A.
- ✔ Both A and R are true, but R is not the correct explanation of A.
- ✘ A is true, but R is false.
- ✘ A is false, but R is true.

Question Number : 40 Question Id : 6306801256048 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Read the given statement and conclusions and select the most appropriate option.

Statement:

Amino acids can be classified based on the nature of their side chains into groups such as nonpolar, polar, acidic, and basic.

Conclusions:

- I. Nonpolar amino acids have hydrophobic side chains that tend to avoid water.
- II. Acidic amino acids contain side chains that carry a positive charge at physiological pH.

Options :

- ✔ Only conclusion I is true
- ✘ Only conclusion II is true
- ✘ Both I and II are true
- ✘ Neither I nor II is true

Question Number : 41 Question Id : 6306801237356 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

A statement is given, followed by two conclusions numbered I and II. Assuming that the information given in the statement is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions can be drawn definitely from the given statement.

Statement

Essential amino acids cannot be synthesised by the human body and must be obtained from dietary sources.

Conclusions

- I: If a person's diet lacks essential amino acids, protein synthesis in the body will be affected.
- II: All amino acids required for protein synthesis are essential.

Options :

- ✔ Only Conclusion I is correct.
- ✘ Only Conclusion II is correct.
- ✘ Both Conclusion I and Conclusion II are correct.
- ✘ Neither Conclusion I nor Conclusion II is correct.

Question Number : 42 Question Id : 6306801237377 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which set includes only neutral amino acids?

Options :

- ✓ Glycine, serine, threonine
- ✗ Alanine, lysine, tyrosine
- ✗ Phenylalanine, glutamate, arginine
- ✗ Valine, histidine, cysteine

Question Number : 43 Question Id : 6306801237450 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following is the correct sequence of reactions in the Strecker synthesis of glycine?

Options :

- ✗ Formaldehyde $\xrightarrow[\text{(ii) NH}_3]{\text{(i) HCN}}$ α -Keto acid $\xrightarrow{\text{H}^+/\text{H}_2\text{O}}$ Glycine
- ✓ Formaldehyde $\xrightarrow[\text{(ii) NH}_3]{\text{(i) HCN}}$ α -Amino nitrile $\xrightarrow{\text{H}^+/\text{H}_2\text{O}}$ Glycine
- ✗ Glyoxylic Acid $\xrightarrow{\text{NH}_3}$ Imines $\xrightarrow{\text{H}_2/\text{Pd}}$ Glycine
- ✗ Acetic acid $\xrightarrow[\text{(ii) NH}_3]{\text{(i) Cl}_2/\text{P}}$ Glycine

Question Number : 44 Question Id : 6306801237600 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following is the primary reason why amino acids generally have higher melting points than many organic compounds?

Options :

- ✗ The high polarity of amino acids contributes to stronger van der Waals forces.
- ✗ The peptide bond present in amino acids leads to higher melting points.
- ✓ Amino acids are zwitterions in the solid state, which leads to strong ionic interactions.
- ✗ Amino acids form strong hydrogen bonds due to their amino and carboxyl groups.

Question Number : 45 Question Id : 6306801238988 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

_____ is both a natural and an essential amino acid.

Options :

- ✗ Alanine
- ✓ Phenylalanine
- ✗ Tyrosine
- ✗ Proline

Question Number : 46 Question Id : 6306801243930 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In the following question, a statement is provided, followed by two conclusions. Read the statements carefully to determine which of the given conclusion(s) logically follow(s) based on the information provided in the statement.

Statement: Natural amino acids include both essential and non-essential amino acids found in proteins.

Conclusion I: All natural amino acids are essential for human health.

Conclusion II: Non-essential amino acids can be synthesised by the human body from other compounds.

Options :

- ✘ Only Conclusion I is correct.
- ✔ Only Conclusion II is correct.
- ✘ Both Conclusions I and II are correct.
- ✘ Neither Conclusion I nor II is correct.

Question Number : 47 Question Id : 6306801245665 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements correctly describes the secondary structure of proteins?

Options :

- ✘ It refers to the sequence of amino acids in a protein.
- ✔ It involves α -helices and β -pleated sheets formed by hydrogen bonding.
- ✘ It is stabilised by disulfide bonds between amino acid residues.
- ✘ It is the final three-dimensional structure of the protein.

Question Number : 48 Question Id : 6306801245686 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Match the solubility of amino acids (Column A) with their isoelectric points (pI) (Column B).

Amino Acid (Column A)	Solubility at pI (Column B)
(A) Glycine	(1) Lowest solubility
(B) Glutamate	(2) Variable solubility
(C) Lysine	(3) Soluble in basic pH
(D) Histidine	(4) Soluble in acidic pH variable solubility

Options :

- ✔ A-1 ; B-4 ; C-3 ; D-2
- ✘ A-4 ; B-3 ; C-1 ; D-2
- ✘ A-3 ; B-4 ; C-2 ; D-1
- ✘ A-2 ; B-1 ; C-4 ; D-3

Question Number : 49 Question Id : 6306801247194 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which aldehyde is used in Strecker's synthesis to produce glycine?

Options :

- ✔ Formaldehyde
- ✘ Acetaldehyde
- ✘ Benzaldehyde
- ✘ Propionaldehyde

Question Number : 50 Question Id : 6306801247203 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following steps completes the conversion of α -aminonitrile to alanine in Strecker's synthesis?

Options :

- ✘ Oxidation
- ✘ Reduction
- ✔ Hydrolysis
- ✘ Decarboxylation

Question Number : 51 Question Id : 6306801252497 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Match the amino acid with the characteristic of its side chain that affects its solubility in water.

Amino acids	Characteristic of side chain
P. Serine	A. Contains a sulfur atom in the side chain
Q. Cysteine	B. Contains a polar hydroxyl group
R. Isoleucine	C. Contains an amide group
S. Glutamine	D. Branched, aliphatic, hydrophobic, non-polar side chain

Options :

- ✘ P – B, Q – C, R – A, S – D
- ✘ P – C, Q – A, R – D, S – B
- ✘ P – D, Q – A, R – B, S – C
- ✔ P – B, Q – A, R – D, S – C

Question Number : 52 Question Id : 6306801237367 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements is/are correct regarding acidic amino acids?

- Acidic amino acids contain two amino groups and one carboxyl group.
- Acidic amino acids have a net negative charge at physiological pH.
- Acidic amino acids are nonpolar due to their hydrophobic side chains.
- Glutamic acid and Arginine are classified as acidic amino acids.

Options :

- ✔ Only B
- ✘ Only B and C
- ✘ Only B and D
- ✘ Only A, B and C

Question Number : 53 Question Id : 6306801237406 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

What is the major product obtained when acetic acid undergoes bromination by the Hell-Volhard-Zelinsky (HVZ) reaction, followed by reaction with ammonia and subsequent hydrolysis of the intermediate ammonium salt?

Options :

- ✘ Alanine
- ✔ Glycine
- ✘ Asparagine
- ✘ Valine

Question Number : 54 Question Id : 6306801237618 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements about the salt-like character of amino acids are correct?

- Amino acids exist as zwitterions at their isoelectric point, carrying both positive and negative charges.

- B. In the solid state, amino acids exhibit ionic interactions, resulting in high melting points.
- C. The salt-like character of amino acids makes them insoluble in polar solvents like water.
- D. Amino acids can react with each other in an acid-base neutralisation reaction to form a salt-like structure.

Options :

1. ✖ Only A and D
2. ✖ Only A and B
3. ✔ Only A, B and D
4. ✖ All the statements are correct

Question Number : 55 Question Id : 6306801237630 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Match the following reactions of α -amino acids (Column I) with their products (Column II).

	Column I (Reactions)		Column II (Products)
(i)	α -Amino acid + Ninhydrin	(a)	N-acyl aminoacids
(ii)	α -Amino acid + Alcohol + HCl	(b)	Ruhemann's purple
(iii)	α -Amino acid + Acetyl chloride	(c)	Dinitrophenylamino acids
(iv)	Amino acid + Sanger's reagent	(d)	Ester

Options :

1. ✖ (i)-(b); (ii)-(c); (iii)-(d); (iv)-(a)
2. ✖ (i)-(c); (ii)-(b); (iii)-(a); (iv)-(d)
3. ✖ (i)-(a); (ii)-(b); (iii)-(c); (iv)-(d)
4. ✔ (i)-(b); (ii)-(d); (iii)-(a); (iv)-(c)

Question Number : 56 Question Id : 6306801239016 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following reactions is involved in the synthesis of glycine from chloroacetic acid?

Options :

1. ✖ Gabriel phthalimide synthesis
2. ✖ Hofmann bromamide reaction
3. ✔ Nucleophilic substitution with ammonia
4. ✖ Strecker synthesis

Question Number : 57 Question Id : 6306801240318 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

For an amino acid with both an amino group ($-\text{NH}_2$) and a carboxyl group ($-\text{COOH}$), which of the following statements about its isoelectric point (pI) is correct?

Options :

1. ✖ The isoelectric point occurs at the pH where the amino acid exists solely as a zwitterion.
2. ✔ The isoelectric point is calculated as the average of the pKa values for the amino group and the carboxyl group.
3. ✖ The pI of an amino acid is the pH at which the molecule has the maximum net charge.
4. ✖ The pI depends only on the side chain functional group, not on the amino and carboxyl groups.

Question Number : 58 Question Id : 6306801243937 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In the following questions, a statement is provided, followed by two conclusions. Read the statements carefully to determine which of the given conclusions logically follow based on the information provided in the statement.

Statement: Arginine is considered a conditionally essential amino acid because it is synthesised in the human body but may require supplementation during periods of rapid growth or illness.

Conclusion I: Arginine is always classified as a non-essential amino acid in adults.

Conclusion II: In times of increased metabolic demand, dietary intake of arginine can become necessary.

Options :

- ✘ Only Conclusion I is correct.
- ✔ Only Conclusion II is correct.
- ✘ Both Conclusions I and II are correct.
- ✘ Neither Conclusion I nor II is correct.

Question Number : 59 Question Id : 6306801243946 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which reagent is used to synthesise α -amino acids from α -halo carboxylic acids?

Options :

- ✔ Ammonia
- ✘ Sodium hydroxide
- ✘ Hydrogen peroxide
- ✘ Sodium chloride

Question Number : 60 Question Id : 6306801245673 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Why does the solubility of an amino acid decrease at its isoelectric point?

Options :

- ✘ The amino acid forms ions that aggregate.
- ✔ The amino acid forms a zwitter ion, reducing its interaction with water molecules.
- ✘ The amino acid becomes entirely nonpolar.
- ✘ The amino acid completely dissociates.

Question Number : 61 Question Id : 6306801237648 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In the context of solvent-free organic synthesis, which of the following techniques is NOT used?

Options :

- ✘ Ball milling of solid reactants
- ✘ Solid-state reactions on heating
- ✘ Solid-state reactions using solid supports
- ✔ Reactions involving liquid-phase solvents

Question Number : 62 Question Id : 6306801240950 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Match the green oxidation reactions in Column I with their corresponding products in Column II:

	Column I Oxidation Reactions		Column II Products

(i)	Sonication of a secondary alcohol with KMnO_4 in hexane	(a)	Carboxylic acid
(ii)	Microwave irradiation of benzaldehyde in air	(b)	Benzoic acid
(iii)	Microwave irradiation of primary alcohols sodium tungstate in 30% aqueous hydrogen peroxide.	(c)	Ketone

Options :

- ✘ i - a, ii - b, iii - c
- ✘ i - b, ii - a, iii - c
- ✘ i - c, ii - a, iii - b
- ✔ i - c, ii - b, iii - a

Question Number : 63 Question Id : 6306801241117 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In the microwave-assisted Sonogashira coupling reaction, which of the following is used as catalyst for carrying out solvent free reaction?

Options :

- ✔ Palladium-doped alumina in the presence of triphenyl phosphine
- ✘ Pyrophosphoric acid
- ✘ MnO_2 impregnated on silica
- ✘ Diphenylcarbonate and tin catalyst

Question Number : 64 Question Id : 6306801244379 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In the following questions, a statement is provided followed by a conclusion. Read the statement carefully to determine whether the conclusion logically follows based solely on the information given in the statement and choose the most appropriate option.

Statement: Solvent-free Wittig reactions improve the reaction yield.

Conclusion: The absence of solvent reduces side reactions and facilitates direct reactant interaction.

Options :

- ✘ Only the statement is true.
- ✘ Only the conclusion is true.
- ✔ Both the statement and the conclusion are true.
- ✘ Both the statement and the conclusion are false.

Question Number : 65 Question Id : 6306801244388 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which reducing agent is commonly used in solvent-free reduction of ketones to secondary alcohols?

Options :

- ✔ Sodium borohydride
- ✘ Lithium aluminium hydride
- ✘ Zinc and hydrochloric acid
- ✘ Palladium on carbon

Question Number : 66 Question Id : 6306801247896 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In the solvent-free Strecker reaction, which of the following is the key feature?

Options :

- The reaction produces an imidazole intermediate.
- An aldehyde or ketone reacts with ammonium cyanide and a cyanide salt.
- A base is required to facilitate the reaction.
- The reaction occurs exclusively in the presence of water.

Question Number : 67 Question Id : 6306801252601 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Select the correct answer option based on the following assertion and reasoning.

Assertion (A): Ultrasound-assisted green synthesis is considered a sustainable approach for solvent-free reactions.

Reason (R): The acoustic cavitation generated by ultrasound produces high-energy conditions that eliminate the need for solvents and high reaction temperatures.

Options :

- Both A and R are true, and R is the correct explanation of A.
- Both A and R are true, but R is not the correct explanation of A.
- A is true, but R is false.
- A is false, but R is true.

Question Number : 68 Question Id : 6306801239301 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements about solid-state reactions using solid supports is correct?

Options :

- Solvents like water, alcohol, or methylene chloride are used to dissolve reactants before adsorption onto solid supports.
- Solid-state reactions do not require the use of adsorbents such as silica gel, alumina, or phyllosilicates.
- Solid-state reactions are exclusively performed using solvents and cannot proceed under solvent-free conditions.
- Solvents like water, alcohol, or methylene chloride are never used in solid-state reactions using solid supports.

Question Number : 69 Question Id : 6306801241133 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

What is the main product of alkylating 2-thiopyridine with a phase-transfer catalyst?

Options :

- N-alkylated product
- S-alkylated product
- N, S-dialkylated product
- C-alkylated product

Question Number : 70 Question Id : 6306801244358 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following is a key advantage of solvent-free C-alkylation reactions?

Options :

1. ✘ Higher reaction temperatures
2. ✔ Reduced waste generation
3. ✘ Increased use of organic solvents
4. ✘ Longer reaction times

Question Number : 71 Question Id : 6306801244405 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In solvent-free conditions, what acts as the catalyst for the Biginelli reaction?

Options :

1. ✔ Lewis acids like FeCl_3
2. ✘ Bases like NaOH
3. ✘ Organometallic compounds
4. ✘ Ionic liquids

Question Number : 72 Question Id : 6306801247838 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In solvent-free C-alkylation reactions, which of the following factors primarily facilitates the reaction?

Options :

1. ✘ High-pressure gaseous environment
2. ✘ Use of a non-volatile liquid reagent to act as a pseudo-solvent
3. ✘ Introduction of an inert gas atmosphere to stabilise intermediates
4. ✔ Mechanical energy such as grinding or ball milling

Question Number : 73 Question Id : 6306801247863 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In ultrasound-assisted solvent-free green synthesis, what is the primary mechanism by which ultrasound accelerates chemical reactions?

Options :

1. ✘ Direct transfer of ultrasonic energy to chemical bonds
2. ✘ Continuous agitation of reactants to ensure uniform mixing
3. ✔ Generation of high temperatures and pressures due to acoustic cavitation
4. ✘ Release of reactive radicals that directly attack reactants

Question Number : 74 Question Id : 6306801247878 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In solvent-free hydroboration, the anti-Markovnikov addition of boron to alkenes occurs primarily due to _____.

Options :

1. ✔ polarity
2. ✘ pressure
3. ✘ solvent
4. ✘ temperature

Question Number : 75 Question Id : 6306801241126 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements is INCORRECT regarding the Stille reaction in the context of green synthesis?

Options :

- The reaction involves the coupling of alkenyl and aryl halides with organostannanes in the presence of a palladium catalyst.
- Replacing conventional solvents with ionic liquids or water can improve the reaction's sustainability while retaining high efficiency.
- The use of organotin reagents in the Stille reaction aligns with green chemistry principles due to their low environmental impact.
- Microwave-assisted Stille reactions contribute to greener practices by reducing energy consumption and reaction times.

Question Number : 76 Question Id : 6306801241137 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements regarding N-alkylation reactions in organic synthesis are correct?

- In these reactions, an alkyl group is transferred to a nitrogen atom, forming a carbon-nitrogen bond, commonly involving compounds like amines, amides, or nitrogenous bases.
- These reactions proceed efficiently under solvent-free, microwave, or sonication conditions when phase-transfer catalysts (PTCs) are used.
- Aziridines, which are prone to decomposition under conventional conditions, can undergo quantitative alkylation under phase-transfer catalytic (PTC) conditions.
- Adenine alkylation under PTC conditions (e.g., with methyltricaprylammonium chloride) selectively yields the N9-isomer, which is important in pharmaceutical synthesis.

Options :

- Only A and B are correct.
- Only A and C are correct.
- Only A, B and C are correct.
- All statements are correct.

Question Number : 77 Question Id : 6306801244329 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which type of reaction is commonly enhanced by phase transfer catalysts in solvent-free conditions?

Options :

- Nucleophilic substitution reactions involving ionic compounds
- Radical polymerisation reactions
- Homogeneous catalysis reactions
- Photochemical reactions

Question Number : 78 Question Id : 6306801244369 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In a solvent-free Darzen's reaction, why is it advantageous to avoid the use of organic solvents?

Options :

- It reduces the need for high temperatures.
- It decreases the environmental impact by eliminating waste solvents.
- It increases the rate of the reaction by providing more reactive intermediates.
- It prevents side reactions from occurring.

Question Number : 79 Question Id : 6306801244408 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following substrates is the most challenging for a Suzuki reaction under solvent-free conditions?

Options :

1. ✘ Aryl iodides
2. ✘ Aryl bromides
3. ✔ Aryl chlorides
4. ✘ Vinyl boronic acids

Question Number : 80 Question Id : 6306801247856 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In the solvent-free Darzens reaction, which of the following conditions is essential for epoxide formation?

Options :

1. ✘ A strong acid to catalyse the reaction
2. ✔ A base to generate the enolate intermediate
3. ✘ A Lewis acid to stabilise the carbonyl group
4. ✘ A solvent to dissolve the reactants

Question Number : 81 Question Id : 6306801244411 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following transitions typically requires the highest energy in a molecule?

Options :

1. ✘ $\pi \rightarrow \pi^*$
2. ✘ $n \rightarrow \pi^*$
3. ✔ $\sigma \rightarrow \sigma^*$
4. ✘ $\pi \rightarrow \sigma^*$

Question Number : 82 Question Id : 6306801250018 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which property of manganese ions allows their quantification in UV-Vis spectroscopy?

Options :

1. ✘ Fluorescence
2. ✘ Paramagnetic behaviour
3. ✔ Characteristic absorption spectrum
4. ✘ High oxidation potential

Question Number : 83 Question Id : 6306801238316 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Read the given statement and conclusions carefully. Assuming that the information given in the statement is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusion(s) can be drawn definitely from the given statement.

Statements:

A solution in a 1 cm cuvette has a transmittance of 25% when measured at 400 nm. Given: $\log 4 = 0.602$.

Conclusions:

I. The absorbance of the solution is 0.60.

II. The solution transmits 25% of the incident light intensity at the specified wavelength.

Options :

- ✘ Only Conclusion I is correct.
- ✘ Only Conclusion II is correct.
- ✔ Both Conclusion I and Conclusion II are correct.
- ✘ Neither Conclusion I nor Conclusion II is correct.

Question Number : 84 Question Id : 6306801238323 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Match the following spectrophotometer types (Column I) with their respective features (Column II).

	Column I (Spectrophotometer)		Column II (Features)
(i)	Single Beam Spectrophotometer	(a)	Simultaneously compares sample and reference
(ii)	Double Beam Spectrophotometer	(b)	Requires a single light path
		(c)	Uses two detectors
		(d)	Measures the sample and reference separately, one after the other

Options :

- ✘ (i)-(d, c); (ii)-(a, b)
- ✘ (i)-(a, c); (ii)-(b, d)
- ✔ (i)-(b, d); (ii)-(a, c)
- ✘ (i)-(a, b); (ii)-(c, d)

Question Number : 85 Question Id : 6306801244415 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In the following questions, a statement is provided followed by a conclusion. Read the statement carefully to determine whether the conclusion logically follows based solely on the information given in the statement and choose the most appropriate option.

Statement: In spectroscopic analysis, transmittance decreases with an increase in solute concentration.

Conclusion: Higher solute concentrations lead to greater absorption of light.

Options :

- ✔ Both statement and conclusion are true, and the conclusion explains the statement.
- ✘ Both statement and conclusion are true, but the conclusion does not explain the statement.
- ✘ The statement is true, but the conclusion is false.
- ✘ Both statement and conclusion are false.

Question Number : 86 Question Id : 6306801244419 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In the given question two statements are provided: Assertion (A) and Reason (R). Read both statements carefully, determine their relationship and choose the most appropriate option.

Assertion (A): The molar absorptivity of a compound changes with the solvent used.

Reason (R): Solvent interactions can alter the energy levels of molecular orbitals involved in electronic transitions.

Options :

1. ✓ Both A and R are true, and R is the correct explanation of A.
2. ✗ Both A and R are true, but R is not the correct explanation of A.
3. ✗ A is true, but R is false.
4. ✗ A is false, but R is true.

Question Number : 87 Question Id : 6306801249942 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following can cause deviations from the Beer-Lambert law?

Options :

1. ✓ Stray light in the spectrophotometer
2. ✗ Use of a standard quartz cuvette
3. ✗ A perfectly monochromatic light source
4. ✗ Dilute solutions

Question Number : 88 Question Id : 6306801249966 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

If a solution has a transmittance of 50%, what is its absorbance?

Options :

1. ✓ 0.3
2. ✗ 0.5
3. ✗ 1.0
4. ✗ 2.0

Question Number : 89 Question Id : 6306801238165 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements regarding the electronic spectra of $K_2Cr_2O_7$ (potassium dichromate) is/are correct?

- A. The absorption in the UV-Vis region is primarily due to metal-to-ligand charge transfer (MLCT) transitions.
- B. The colour of $K_2Cr_2O_7$ is due to d-d transitions of chromium in the $Cr_2O_7^{2-}$ ion.
- C. The electronic spectrum shows intense absorption peaks in the visible range due to chromium 3d–4s transitions.
- D. The absorption in the UV-Vis region is primarily due to ligand-to-metal charge transfer (LMCT) transitions.

Options :

1. ✗ A and B
2. ✗ B and D
3. ✗ A and C
4. ✓ Only D

Question Number : 90 Question Id : 6306801238168 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

A solution exhibits an absorbance of 0.6 at a wavelength of 400 nm in a 1 cm cuvette. The molar absorptivity (ϵ) of the compound at this wavelength is $3 \times 10^3 \text{ L mol}^{-1}\text{cm}^{-1}$. What is the concentration of the compound in the solution?

Options :

1. ✗ $2.0 \times 10^{-3} \text{ mol/L}$
2. ✓ $2.0 \times 10^{-4} \text{ mol/L}$

3. ✘ 6.0×10^{-3} mol/L

4. ✘ 6.0×10^{-4} mol/L

Question Number : 91 Question Id : 6306801244427 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

What advantage does the use of a photodiode array detector provide in double-beam spectrophotometers?

Options :

1. ✘ Reduced cost of analysis

2. ✔ Simultaneous measurement across multiple wavelengths

3. ✘ Enhanced beam splitting efficiency

4. ✘ Improved mechanical stability

Question Number : 92 Question Id : 6306801249989 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

What is the molar absorptivity if a 0.01 M solution gives an absorbance of 0.2 in a 1 cm cuvette?

Options :

1. ✘ $10 \text{ L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$

2. ✔ $20 \text{ L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$

3. ✘ $200 \text{ L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$

4. ✘ $100 \text{ L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$

Question Number : 93 Question Id : 6306801239000 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following materials is commonly used as the stationary phase in gas-liquid chromatography (GLC)?

Options :

1. ✘ Silica gel

2. ✘ Inert gas

3. ✔ A liquid coated on an inert solid support

4. ✘ Active carbon

Question Number : 94 Question Id : 6306801239018 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following acts as the stationary phase in paper chromatography?

Options :

1. ✘ The solvent

2. ✘ The paper itself

3. ✔ Water retained in the paper fibres

4. ✘ The solutes being separated

Question Number : 95 Question Id : 6306801240347 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following directly leads to an increase in the resolution of a chromatographic column?

Options :

- ✘ Decreasing the particle size of the stationary phase
- ✘ Decreasing the column length
- ✘ Using a less polar solvent as the mobile phase
- ✔ Decreasing the mobile phase flow rate

Question Number : 96 Question Id : 6306801240366 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following is most directly involved in the separation of components during the development of a chromatogram?

Options :

- ✘ The solubility of the components in the mobile phase
- ✘ The rate at which the components react with each other
- ✔ The interaction between the components and the stationary phase
- ✘ The colour of the components in the mixture

Question Number : 97 Question Id : 6306801240392 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following is the primary principle behind the separation technique used in chromatography?

Options :

- ✘ Components are separated based on their different boiling points.
- ✔ Components are separated based on their difference in solubility in the mobile phase.
- ✘ Components are separated based on their ability to form chemical bonds.
- ✘ Components are separated based on their difference in colour.

Question Number : 98 Question Id : 6306801244487 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

What is the role of a mobile phase in chromatography?

Options :

- ✘ To act as a solvent for the stationary phase
- ✔ To carry the analytes through the stationary phase
- ✘ To separate analytes chemically
- ✘ To evaporate the solvent

Question Number : 99 Question Id : 6306801245253 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Select the option that is true regarding the following two statements labelled Assertion (A) and Reason (R).

Assertion (A): The Van Deemter equation describes the relationship between plate height and the flow rate in a chromatography column.

Reason (R): Plate height is inversely proportional to column efficiency.

Options :

- ✔ Both A and R are true, and R is the correct explanation of A.
- ✘ Both A and R are true, but R is not the correct explanation of A.
- ✘ A is true, but R is false.
- ✘ A is false, but R is true.

Question Number : 100 Question Id : 6306801245310 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

How is column chromatography applied in natural product research?

Options :

1. ✘ Estimation of protein concentration
2. ✔ Separation and isolation of bioactive compounds
3. ✘ Testing for toxicity of compounds
4. ✘ Determining the specific heat of a substance

Question Number : 101 Question Id : 6306801238976 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Read the given statement and conclusions carefully. Assuming that the information given in the statement is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusion(s) can be drawn definitely from the given statement.

Statement:

The retardation factor (R_f) in thin-layer chromatography (TLC) is defined as the ratio of the distance traveled by the solute spot to the distance traveled by the solvent front.

Conclusions:

I. The R_f value is always less than or equal to 1.

II. A lower R_f value indicates greater affinity of the solute for the mobile phase compared to the stationary phase.

Options :

1. ✔ Only Conclusion I is correct.
2. ✘ Only Conclusion II is correct.
3. ✘ Both Conclusion I and Conclusion II are correct.
4. ✘ Neither Conclusion I nor Conclusion II is correct.

Question Number : 102 Question Id : 6306801238989 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Read the given statement and conclusions carefully. Assuming that the information given in the statement is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusion(s) can be drawn definitely from the given statement.

Statement:

In thin-layer chromatography (TLC), sample application involves placing the sample in a small spot on the stationary phase.

Conclusions:

I. The sample should be applied using a fine capillary tube to achieve a small, concentrated spot.

II. The sample should be applied in a large volume to ensure enough substance is available for detection.

Options :

1. ✔ Only Conclusion I is correct.
2. ✘ Only Conclusion II is correct.
3. ✘ Both Conclusion I and Conclusion II are correct.
4. ✘ Neither Conclusion I nor Conclusion II is correct.

Question Number : 103 Question Id : 6306801239039 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Match the components of a high-performance liquid chromatography (HPLC) system (Column A) with their primary functions (Column B).

	Column I Components		Column II Functions
(i)	Pump	(a)	Introduces the sample into the mobile phase
(ii)	Injector	(b)	Monitors the eluted analytes using signals
(iii)	Column	(c)	Maintains a precise flow of the mobile phase
(iv)	Detector	(d)	Separates analytes based on their affinities

Options :

1. ✘ (i)-(c); (ii)-(b); (iii)-(a); (iv)-(d)
2. ✘ (i)-(b); (ii)-(c); (iii)-(d); (iv)-(a)
3. ✘ (i)-(a); (ii)-(c); (iii)-(b); (iv)-(d)
4. ✔ (i)-(c); (ii)-(a); (iii)-(d); (iv)-(b)

Question Number : 104 Question Id : 6306801239044 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements are correct regarding the separation column of HPLC?

- A. Most column housings are made of stainless steel, as it is compatible with a wide range of solvents.
- B. Columns packed with smaller particles are more efficient but require higher operating pressures.
- C. The separation column is packed with fine silica or polymer particles to provide a large surface area for analyte interaction.
- D. Temperature control of the column enhances efficiency by improving analyte diffusivity.

Options :

1. ✘ Only A and C
2. ✘ Only B And C
3. ✘ Only A, C and D
4. ✔ All the statements are correct

Question Number : 105 Question Id : 6306801240336 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

During the development of a chromatographic plate, which of the following factors is most important in preventing the solvent from running off the top of the plate?

Options :

1. ✘ The type of stationary phase used
2. ✘ The amount of sample applied to the plate
3. ✘ The rate at which the solvent moves up the plate
4. ✔ The height of the solvent in the development chamber

Question Number : 106 Question Id : 6306801240354 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In thin-layer chromatography (TLC), if the R_f value of a compound is 0.75, what can be inferred about the compound's interaction with the stationary phase and the mobile phase?

Options :

- ✘ The compound interacts strongly with the stationary phase and weakly with the mobile phase.
- ✔ The compound interacts weakly with the stationary phase and strongly with the mobile phase.
- ✘ The compound moves at the same rate as the solvent front.
- ✘ The compound has a high solubility in the stationary phase.

Question Number : 107 Question Id : 6306801240428 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following applications is NOT typically associated with High-Performance Liquid Chromatography (HPLC)?

Options :

- ✘ Determination of caffeine in beverages
- ✔ Analysis of volatile organic compounds in air
- ✘ Quantification of pharmaceutical drugs
- ✘ Separation of proteins in biological samples

Question Number : 108 Question Id : 6306801244497 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

During plate development in chromatography, why is it essential to maintain a closed system for the solvent and plate?

Options :

- ✔ To minimise solvent evaporation
- ✘ To allow faster separation
- ✘ To reduce analyte degradation
- ✘ To maintain constant temperature

Question Number : 109 Question Id : 6306801244502 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In high-performance liquid chromatography (HPLC), what is the primary function of a guard column?

Options :

- ✘ To increase resolution
- ✘ To remove impurities from the sample
- ✔ To prevent damage to the main analytical column
- ✘ To control the flow rate

Question Number : 110 Question Id : 6306801245266 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

What could be the primary reason for tailing spots in ascending chromatography?

Options :

- ✘ High temperature in the development chamber
- ✘ Uneven spotting of the sample
- ✘ Use of a highly volatile mobile phase
- ✔ Overloading the stationary phase

Question Number : 111 Question Id : 6306801245317 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In a gradient elution program, what is the potential consequence of having a steep gradient slope?

Options :

1. ✓ Decreased resolution between peaks
2. ✗ Increased retention time for all analytes
3. ✗ Uniform peak widths for all compounds
4. ✗ Enhanced detection sensitivity

Question Number : 112 Question Id : 6306801239008 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In gas-liquid chromatography (GLC), which of the following is correct regarding the effect of column temperatures on the resolution of the sample components?

Options :

1. ✗ Higher temperatures improve resolution by allowing components to spend more time in the gas phase.
2. ✗ Lower temperatures decrease resolution due to fast elution of components insufficient separation.
3. ✓ Higher temperatures reduce resolution due to faster elution and insufficient separation.
4. ✗ Lower temperatures improve resolution by allowing components to spend more time in the gas phase.

Question Number : 113 Question Id : 6306801239024 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Select the option that is true regarding the following two statements labelled Assertion (A) and Reason (R).

Assertion (A): In radial paper chromatography, the development of the chromatogram occurs outward toward the periphery of the circular paper.

Reason (R): In this technique, the sample is applied at the centre of the circular paper, and the mobile phase spreads radially outward, facilitating separation.

Options :

1. ✓ Both A and R are true, and R is the correct explanation of A.
2. ✗ Both A and R are true, and R is not the correct explanation of A.
3. ✗ A is true, but R is false.
4. ✗ A is false, and R is true.

Question Number : 114 Question Id : 6306801240378 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In descending thin-layer chromatography (TLC), which of the following factors is primarily responsible for the rate of separation of the components of the sample?

Options :

1. ✗ The rate at which the solvent evaporates from the stationary phase
2. ✓ The partition coefficient of the components between the stationary phase and the solvent
3. ✗ The solubility of the components in the stationary phase
4. ✗ The temperature gradient across the stationary phase

Question Number : 115 Question Id : 6306801240404 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following factors primarily determines the efficiency of a chromatographic column?

Options :

1. ✓ The particle size of the stationary phase
2. ✗ The temperature of the laboratory
3. ✗ The polarity of the stationary phase
4. ✗ The solvent's refractive index

Question Number : 116 Question Id : 6306801240414 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements correctly describes the role of the pump in a high-performance liquid chromatography (HPLC) delivery system?

Options :

1. ✗ It prevents fluctuations in the pressure of the stationary phase.
2. ✗ It ensures uniform mixing of the stationary phase with the mobile phase.
3. ✓ It provides a steady and precise flow of the mobile phase to the column, even under high pressures.
4. ✗ It controls the temperature of the mobile phase to maintain column efficiency.

Question Number : 117 Question Id : 6306801245258 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In thin-layer chromatography (TLC), why is it crucial to keep the solvent level below the sample spot during the experiment?

Options :

1. ✓ To prevent the sample from dissolving in the solvent
2. ✗ To allow proper capillary action of the mobile phase
3. ✗ To improve interaction with the stationary phase
4. ✗ To avoid streaking of the sample

Question Number : 118 Question Id : 6306801245302 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

What is the function of a gradient elution program in liquid chromatography?

Options :

1. ✗ To maintain a constant flow rate of the mobile phase
2. ✓ To increase the polarity of the mobile phase gradually for better separation
3. ✗ To reduce the retention time of volatile analytes
4. ✗ To equilibrate the stationary phase during separation

Question Number : 119 Question Id : 6306801245333 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Match the sample introduction methods (Column A) with their key applications or advantages (Column B).

Column A	Column B
A. Headspace analysis	1. Eliminates sample degradation for sensitive ana
B. Matrix-assisted laser desorption	2. Sample introduction for MALDI-MS
C. Cold on-column injection	3. Analysis of volatile organic compounds (VOCs)
D. Purge-and-trap	4. Enhances detection of water-soluble volatile analytes

Options :

1. ✗ A - 4, B - 1, C - 3, D - 2
2. ✓ A - 3, B - 2, C - 1, D - 4

3. ✖ A - 1, B - 2, C - 3, D - 4

4. ✖ A - 2, B - 3, C - 1, D - 4

Question Number : 120 Question Id : 6306801238143 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In photosynthesis, how does chlorophyll transfer energy after absorbing light?

Options :

1. ✖ Chlorophyll molecules collide and transfer energy.
2. ✔ Chlorophyll absorbs light and transfers excited electrons to another molecule.
3. ✖ Chlorophyll emits light and transfers energy to another molecule.
4. ✖ Chlorophyll reacts with water to transfer energy.

Question Number : 121 Question Id : 6306801250035 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Quantum yield is defined as the _____.

Options :

1. ✖ number of photons absorbed per mole of substance
2. ✔ number of molecules reacted per photon absorbed
3. ✖ number of photons emitted per mole of substance
4. ✖ number of photons absorbed per photon emitted

Question Number : 122 Question Id : 6306801250045 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

What is the typical quantum yield for a phosphorescence process?

Options :

1. ✖ 0
2. ✔ 0.1 – 0.3
3. ✖ 1
4. ✖ Greater than 1

Question Number : 123 Question Id : 6306801238007 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements is correct regarding the Grotthuss-Draper law and the Stark-Einstein law?

Options :

1. ✔ Grotthuss-Draper law: only absorbed light causes a reaction; Stark-Einstein law: one photon excites one molecule to an activated state.
2. ✖ Grotthuss-Draper law: absorbed light is effective; Stark-Einstein law: multiple photons form one product molecule.
3. ✖ Grotthuss-Draper law: explains energy transfer; Stark-Einstein law: concerns absorption wavelength.
4. ✖ Grotthuss-Draper law: light intensity affects the rate; Stark-Einstein law: photons don't affect product yield.

Question Number : 124 Question Id : 6306801238102 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements about fluorescence is correct?

Options :

1. ✓ Fluorescence occurs when a molecule in the excited singlet state returns to the ground state by emitting radiation.
2. ✘ Fluorescence involves the transition of an electron from the triplet excited state to the singlet ground state.
3. ✘ Fluorescence emission always occurs at a shorter wavelength than the absorbed light.
4. ✘ Fluorescence requires intersystem crossing from the singlet excited state to the triplet excited state.

Question Number : 125 Question Id : 6306801245351 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In this question, a statement is provided, followed by a conclusion. Read the statement carefully to determine whether the conclusion logically follows based solely on the information given in the statement and select the most appropriate option.

Statement: The Stark–Einstein law is valid only for the primary photochemical step.

Conclusion: Photochemical reactions with multiple intermediate steps follow the Stark–Einstein law at every step.

Options :

1. ✓ Only the statement is true.
2. ✘ Only the conclusion is true.
3. ✘ Both the statement and the conclusion are true.
4. ✘ Both the statement and the conclusion are false.

Question Number : 126 Question Id : 6306801245390 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In the photochemical hydrogen-chlorine reaction, the chain termination step occurs when:

Options :

1. ✓ two chlorine radicals combine to form a chlorine molecule
2. ✘ a chlorine radical reacts with a hydrogen radical to form hydrochloric acid
3. ✘ a chlorine radical reacts with a hydrogen molecule
4. ✘ a hydrogen radical combines with a hydrogen molecule

Question Number : 127 Question Id : 6306801256172 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Match the following terms from the Jablonski diagram with their corresponding descriptions.

Term	Description
P. Fluorescence	A. Transition from an excited singlet state to the ground state with the release of energy as heat
Q. Intersystem crossing	B. Transition between states of different multiplicity
R. Phosphorescence	C. Radiative transition from the excited triplet state to the ground state
S. Internal conversion	D. Radiative transition from an excited singlet state to the ground state

Options :

1. ✓ P - D, Q - B, R - C, S - A
2. ✘ P - A, Q - C, R - D, S - B
3. ✘ P - C, Q - A, R - B, S - D
4. ✘ P - B, Q - D, R - A, S - C

Question Number : 128 Question Id : 6306801238012 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following is NOT a step in a photochemical reaction mechanism?

Options :

- ✘ Absorption of a photon to excite the molecule from the ground state
- ✘ Transition from singlet excited state to triplet excited state via intersystem crossing
- ✔ Thermal excitation of the molecule in the ground state before photon absorption
- ✘ Chemical reaction in the excited state leading to product formation

Question Number : 129 Question Id : 6306801256158 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

The hydrogen-bromide reaction is an example of a photochemical reaction. Consider the following assertion and reason statements and select the most appropriate option.

Assertion (A): The photochemical reaction between hydrogen and bromine is slower compared to the reaction between hydrogen and chlorine.

Reasoning (R): The bond dissociation energy of Br_2 is lower than that of Cl_2 .

Options :

- ✘ Both A and R are true, and R is the correct explanation of A.
- ✘ Both A and R are true, but R is not the correct explanation of A.
- ✔ A is true, but R is false.
- ✘ A is false, but R is true.

Question Number : 130 Question Id : 6306801237675 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following is true regarding the hybridisation of all the ring atoms in pyrrole (4 carbons + 1 nitrogen)?

Options :

- ✔ All the ring atoms (carbon and nitrogen) are sp^2 hybridised
- ✘ Carbon atoms are sp^2 hybridised where as nitrogen atom is sp hybridised
- ✘ Carbon atoms are sp hybridised where as nitrogen atom is sp^2 hybridised
- ✘ Carbon atoms are sp^2 hybridised where as nitrogen atom is sp^3 hybridised

Question Number : 131 Question Id : 6306801237724 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Match the reactants in Column I with their corresponding products in Column II based on the Paul-Knorr synthesis of heterocyclic compounds.

	Column I Reactants		Column II Product
(i)	1,4-Diketone + Ammonia	(a)	Thiophene
(ii)	1,4-Diketone + excess source of Sulphur	(b)	Furan
(iii)	1,4-Diketone + Acid	(c)	Pyrrole

Options :

- ✘ (i) - (a), (ii) - (b), (iii) - (c)
- ✘ (i) - (d), (ii) - (a), (iii) - (c)
- ✔ (i) - (c), (ii) - (a), (iii) - (b)
- ✘ (i) - (c), (ii) - (b), (iii) - (a)

Question Number : 132 Question Id : 6306801237759 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

In pyrrole, the major product of an electrophilic substitution reaction occurs at:

Options :

1. ✓ the 2-position because it is stabilised by three resonance structures
2. ✗ the 2-position because it is stabilised by two resonance structures
3. ✗ the 3-position because it is stabilised by three resonance structures
4. ✗ the 3-position because it is stabilised by two resonance structures

Question Number : 133 Question Id : 6306801245414 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements is correct regarding heterocyclic compounds?

Options :

1. ✗ All heterocyclic compounds are non-aromatic.
2. ✗ A compound with oxygen, sulfur or nitrogen in its ring is always heterocyclic.
3. ✓ Heterocyclic compounds can have both aromatic and non-aromatic forms.
4. ✗ Only six-membered rings can form stable heterocyclic structures.

Question Number : 134 Question Id : 6306801252622 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Match the following syntheses with the suitable chemicals used and select the correct option.

Syntheses	Chemical species
P. Reactants for furan synthesis	A. Furan or pyrrole
Q. Reactants for pyrrole synthesis	B. Acid
R. Catalyst for Paal-Knorr synthesis	C. 1,4-dicarbonyl compound + diol
S. Product of Paal-Knorr synthesis	D. 1,4-dicarbonyl compound + NH ₃

Options :

1. ✗ P – C, Q – A, R – D, S – B
2. ✗ P – B, Q – D, R – A, S – C
3. ✓ P – C, Q – D, R – B, S – A
4. ✗ P – B, Q – C, R – A, S – D

Question Number : 135 Question Id : 6306801256129 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Read the given statement and conclusions and select the most appropriate option.

Statement:

Thiophene and pyrrole are five-membered heterocyclic aromatic compounds with sulfur and nitrogen atoms as heteroatoms, respectively.

Conclusions:

- I. The lone pair on the nitrogen atom in pyrrole contributes to the aromaticity of the molecule.
- II. Thiophene and pyrrole exhibit similar aromaticity because both follow Hückel's rule for aromaticity.

Options :

1. ✗ Only conclusion I is true
2. ✗ Only conclusion II is true

3. ✓ Both I and II are true
4. ✗ Neither I nor II is true

Question Number : 136 Question Id : 6306801237719 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

In this question, a statement of (A) is followed by a statement of (R). Which of the following is correct option?

(A): Pyrroles can be synthesized by reacting 1,4-dicarbonyl compounds with ammonia or primary amines.

(R): Successive nucleophilic addition, cyclisation, and dehydration lead to pyrrole formation.

Options :

1. ✓ Both A and R are true, and R is correct explanation of A
2. ✗ Both A and R are true, but R is not correct explanation of A
3. ✗ A is true but R is false
4. ✗ A is false and R is true

Question Number : 137 Question Id : 6306801237746 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Pyrrole is known to be a weak acid and a weak base. Which of the following statements does NOT support pyrrole's behaviour as both a weak acid and a weak base?

Options :

1. ✗ When pyrrole is heated with metallic potassium in n-heptane as a solvent, stable potassium pyrrolide is formed.
2. ✗ The lone pair on the nitrogen atom in pyrrole is delocalised, decreasing its availability for protonation.
3. ✗ The N-H bond in pyrrole is weak due to the delocalisation of the nitrogen lone pair.
4. ✓ The lone pair on nitrogen in pyrrole is localised, making it a weak base.

Question Number : 138 Question Id : 6306801237770 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which product is formed when pyrrole reacts with acetyl nitrate at low temperature?

Options :

1. ✓ 2-Nitropyrrole
2. ✗ 3-Nitropyrrole
3. ✗ 2-Acetylnitropyrrole
4. ✗ 3-Acetylnitropyrrole

Question Number : 139 Question Id : 6306801245590 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which position of the pyrrole ring is most reactive towards halogenation?

Options :

1. ✓ 2-position
2. ✗ 3-position
3. ✗ 4-position
4. ✗ 1-position

Question Number : 140 Question Id : 6306801245609 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Match the following observations related to the aromaticity of pyridine (Column A) with their consequences (Column B).

Column A	Column B
i) Nitrogen's electronegativity	(a) Acts as a weak base
(ii) Planar structure of pyridine	(b) Stabilises the aromatic π -electron system
(iii) Aromatic π -electron count	(c) Six π -electrons ensure aromaticity
(iv) Lack of hydrogen bonding on nitrogen	(d) Enhances reactivity with electrophiles

Options :

- ✓ (i)-a ; (ii)-b ; (iii)-c ; (iv)-d
- ✗ (i)-b ; (ii)-a ; (iii)-d ; (iv)-c
- ✗ (i)-c ; (ii)-b ; (iii)-a ; (iv)-d
- ✗ (i)-a ; (ii)-d ; (iii)-c ; (iv)-b

Question Number : 141 Question Id : 6306801247762 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following statements correctly describes the aromatic character of heterocyclic compounds?

Options :

- ✓ A compound is aromatic if it follows Huckel's rule, which requires $4n+2$ π -electrons, where n is a whole number.
- ✗ A compound is aromatic if it has alternating single and double bonds between atoms in a ring.
- ✗ A compound is aromatic if it contains at least one heteroatom (such as nitrogen or oxygen) in the ring structure.
- ✗ A compound is aromatic if it has a conjugated system but does not follow Huckel's rule.

Question Number : 142 Question Id : 6306801247809 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Pyridine is an aromatic heterocyclic compound. Which of the following statements about its aromaticity is true, considering the electronic structure and orbital contributions of its nitrogen atom?

Options :

- ✗ Pyridine is aromatic because it satisfies Hückel's rule and all its π -electrons, including the lone pair on nitrogen, participate in the delocalised π -system.
- ✗ Pyridine is aromatic because the sp^2 hybridised nitrogen contributes 1 p-orbital electron to the π -system, and its lone pair resides in the same plane as the π -electron cloud.
- ✓ Pyridine is aromatic because it satisfies Hückel's rule, with six π -electrons from the five carbon atoms and one electron from the nitrogen atom's p-orbital.
- ✗ Pyridine is non-aromatic because the lone pair on nitrogen resides in an sp^3 orbital, preventing conjugation.

Question Number : 143 Question Id : 6306801252637 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Match the following heterocyclic compounds with the correct reagents or reaction conditions for nitration or sulfonation under mild conditions.

Heterocyclic Compounds	Reagents/Reaction Conditions
P. Nitration of pyridine	A. Fuming H_2SO_4 at low temperature
Q. Sulfonation of thiophene	B. Dilute HNO_3 at low temperature
R. Nitration of pyrrole	C. H_2SO_4 and SO_3 in mild conditions
S. Sulfonation of furan	D. Acetic anhydride and HNO_3

Options :

- ✗ P – D, Q – A, R – B, S – C

- ✓ P – B, Q – A, R – D, S – C
- ✗ P – D, Q – C, R – A, S – B
- ✗ P – B, Q – D, R – A, S – C

Question Number : 144 Question Id : 6306801237789 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Select the option that is correct regarding the following two statements labelled Assertion (A) and Reason (R).

Assertion (A): Pyridine undergoes electrophilic substitution reactions at the meta position with respect to nitrogen.

Reason (R): The electron-withdrawing nature of the nitrogen atom deactivates the ortho and para positions.

Options :

- ✓ Both A and R are true, and R is the correct explanation of A.
- ✗ Both A and R are true, but R is not the correct explanation of A.
- ✗ A is true, but R is false.
- ✗ A is false, and R is true.

Question Number : 145 Question Id : 6306801237803 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following correctly describes the site of reactivity in pyrrole and pyridine?

Options :

- ✗ Pyrrole prefers electrophilic substitution at the 3-position, while pyridine prefers nucleophilic substitution at the 2-position.
- ✓ Pyrrole prefers electrophilic substitution at the 2-position, while pyridine prefers nucleophilic substitution at the 2-position.
- ✗ Pyrrole prefers nucleophilic substitution at the 2-position, while pyridine prefers electrophilic substitution at the 3-position.
- ✗ Both pyrrole and pyridine react similarly at the 2-position.

Question Number : 146 Question Id : 6306801237812 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

Which of the following reactions is INCORRECTLY matched with its product?

Options :

- ✗ Pyridine + NaNH_2 at 100°C \rightarrow 2-Aminopyridine
- ✗ Pyridine + NaOH at very high temperature \rightarrow 2-Pyridone
- ✓ Pyridine + $\text{C}_6\text{H}_5\text{Li}$ at 100°C \rightarrow 3-Phenyllithium
- ✗ Pyridine + Br_2 in oleum \rightarrow 3-Bromopyridine

Question Number : 147 Question Id : 6306801245597 Question Type : MCQ Option Shuffling : Yes Correct Marks : 2 Wrong Marks : 0.66

How does the nitrogen atom in pyridine affect its electron density compared to benzene?

Options :

- ✗ Increases electron density in the ring
- ✓ Decreases electron density in the ring
- ✗ Does not affect electron density
- ✗ Makes the ring neutral

Question Number : 148 Question Id : 6306801247788 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

The Diels-Alder reaction of furan (diene) and maleic anhydride (dienophile) yields a bicyclic adduct. Which of the following statements about the reaction is true?

Options :

1. ✘ The reaction proceeds through an anti-aromatic transition state.
2. ✔ The reaction product consists of a single regioisomer due to the symmetry of maleic anhydride.
3. ✘ The reaction is irreversible under mild conditions due to the high energy of the transition state.
4. ✘ Furan reacts sluggishly in Diels-Alder reactions because it has aromatic stabilisation.

Question Number : 149 Question Id : 6306801247795 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Pyridine is more basic than benzene because _____.

Options :

1. ✘ the lone pair on the nitrogen atom in pyridine is part of the aromatic system
2. ✔ the lone pair on the nitrogen atom in pyridine is not part of the aromatic system and is available for protonation
3. ✘ pyridine has a higher electron density due to resonance donation from nitrogen
4. ✘ pyridine is not aromatic, allowing the nitrogen to act as a stronger base

Question Number : 150 Question Id : 6306801247815 Question Type : MCQ Option Shuffling : Yes

Correct Marks : 2 Wrong Marks : 0.66

Which of the following methods is used for synthesising a furan derivative?

Options :

1. ✘ Fischer Indole synthesis
2. ✔ Paal-Knorr synthesis
3. ✘ Ullmann coupling reaction
4. ✘ Wurtz reaction