

chemistry

Time: 3 Hrs

Marks:100

Please check whether you have got the right question paper.

- N.B: 1. All questions are compulsory.
2. Figures to right indicates full marks

- Q.1 Answer ANY FOUR of the following:**
- A** Discuss whether the addition of bromine to 2-butene is stereospecific or stereoselective. 5
- B** Explain the mechanism and stereochemistry of S_N1 reactions using suitable example. 5
- C** a) Write a note on enantiotopic ligands. 2
b) Explain the term: Prochiral centre 2
- D** Explain the stereochemistry of $KMnO_4$ oxidation of maleic acid and fumaric acid. 5
- E** a) What are α -amino acids? How are they classified? 3
b) Give preparation of alanine by Strecker synthesis. 2
- F** Explain stepwise synthesis of a tripeptide using Merrifield's solid phase synthesis method. 5
Give two advantages of this method of synthesis.
- Q.2 Answer ANY FOUR of the following:**
- A** Complete the following reaction, identify it and explain its mechanism: 5
- $$\begin{array}{c} \text{H}_3\text{C} \\ \diagdown \\ \text{C}=\text{N}-\text{OH} \\ \diagup \\ \text{C}_6\text{H}_5 \end{array} \xrightarrow{\text{conc. H}_2\text{SO}_4} ?$$
- B** What is Michael reaction? Explain the mechanism of the reaction. Identify the intermediate. 5
- C** Give reactions for the following: 3
- a)** Conversion of D-Glucose into D-Arabinose 2
b) Action of conc. HNO_3 on D-Glucose and D-Fructose 3
- D** a) Write stepwise reactions to show the action of phenylhydrazine on D-Fructose? 2
b) Explain the phenomenon of mutarotation in Glucose. 3
- E** a) Draw the Fischer projection of D-Fructose and convert to Haworth formula (β -pyranose form). 2
b) What are epimers? Draw the structure of anyone epimer of D-Glucose. 3
- F** Draw structures for the following: 5
- i) Enantiomer of D-Glucose
ii) Open chain structure of Aldotriose
iii) Product formed by action NaBH_4 on D-Glucose
iv) Chair conformation of β -D-Glucopyranose
v) Diastereomer of D-Glucose
- Q.3 Answer ANY FOUR of the following:**
- A** Explain the following terms: 5
- i) Finger print region
ii) Types of bending vibrations
- B** a) Explain how inductive effect plays an important role in deciding the value of chemical shift with a simple example? 3
b) Why TMS is used as a standard in PMR spectroscopy? 2
- C** a) Give the structure of pyrimidine bases present in DNA? 3
b) Distinguish between DNA & RNA? 2
- D** Explain the primary structure of nucleic acids? 5

E An organic compound has the molecular formula M.F: $C_8H_{10}O$. Determine the index of its hydrogen deficiency and deduce its structural formula from the following spectral data? **5**

IR Spectrum (cm^{-1}): 3500, 1600, 1570, 760 & 710

PMR Spectrum: (in δ ppm): 1.6(3H,d) , 4.2(1H, s, D_2O exchangeable) , 4.9 (1H,q) , 7.4 (5H,m) . Suggest a structure for the compound and justify your answer.

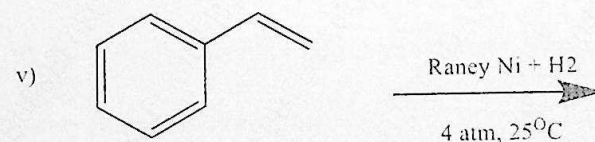
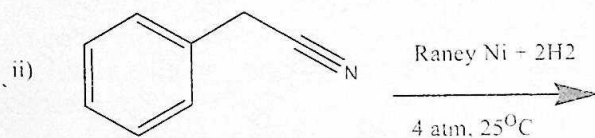
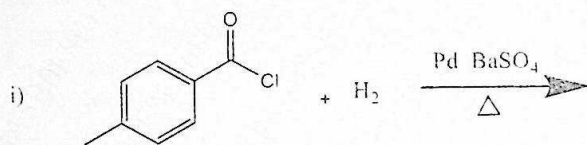
F An organic compound has the molecular formula M.F $C_9H_{10}O_2$. Determine the index of its hydrogen deficiency and suggest a structure for the compound. Justify your answer? **5**

IR Spectrum (cm^{-1}) : 3100 (broad), 1715, 1600, 750 & 710

PMR Spectrum: (in δ ppm): 1.5(3H,d) , 3.7(1H,q), 7.5 (m, 5H) , 11.8 (1H, s)

Q.4 Answer ANY FOUR of the following: **5**

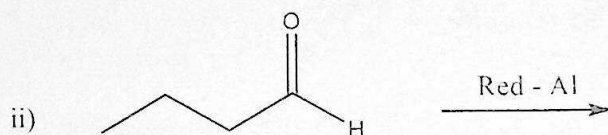
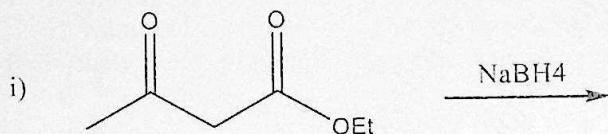
A Complete the following reactions



B a) What is Lindlar's catalyst? Explain its use in partial reduction of alkynes and its selectivity? **3**

2

b) Complete the following reactions:



C a) How are polymers classified on the basis of properties of polymers? 3

b) Give the preparation and uses of Nylon 6,6? 2

D a) Explain the following terms with examples 3

i) Plasticizers ii) Stabilizer iii) Fillers

b) Write the synthesis of Buna - S rubber. 2

E a) Explain reaction of epoxidation using m-CPBA. 3

b) Explain the allylic and benzylic bromination using NBS. 2

F a) Draw the structure and give one use of the following polymers- 3

i) Neoprene ii) Nylon 6 iii) Polyester

b) Write the structure and use of Ziegler Natta catalyst. 2

Q.5 A State whether the following are true or false: (any five) 5

a) The two faces in ethyl methyl ketone are homotopic in nature.

b) E₂ elimination reaction requires antiperiplanar geometry of the two leaving groups of substrates.

c) Epoxide contains a three membered heterocyclic ring with one oxygen atom present in the ring.

d) All stereospecific reactions are not stereoselective in nature.

e) The reactions where only one diastereomer of all the possible diastereomers of the product is formed, are known as diastereoselective reactions.

f) A dipeptide is formed from two α-amino acids.

g) K-phthalimide is used as one of the reactants in Gabriel's synthesis of α-amino acids.

h) Proteins are formed by ester linkages between different α-amino acids.

B Choose the most correct option to answer the following (ANY FIVE): 5

a) What is the intermediate formed in Pinacol-Pinacolone rearrangement?

i) Carbocation

iii) Carbanion

ii) Nitrene

iv) Carbene

b) What is the base catalysed rearrangement of α-haloketones to carboxylic acid derivatives called?

i) Beckmann reaction

iii) Favorski reaction

ii) Wittig reaction

iv) Michael reaction

c) Which of the following is an aldotetrose?

i) Mannose

iii) Xylose

ii) Threose

iv) Arabinose

d) Identify the anomer of α-D-Fructofuranose.

i) α-D-Fructopyranose

iii) β-D-Glucopyranose

ii) β-D-Glucofuranose

iv) β-D-Fructofuranose.

[Time : 3Hours]

[Total marks :100]

N.B. : (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

(3) Use of logarithmic table/non-programmable calculator is allowed .

1. Attempt **any four** of the following:
- | | | |
|----|---|------|
| A. | What is crystal field splitting? Explain with reference to square planar complexes. | 5 |
| B. | Explain why $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ is a high spin and $[\text{Fe}(\text{CN})_6]^{3-}$ is a low spin complex. | 5 |
| C. | Explain the following with respect to the factors affecting crystal field splitting parameter. | |
| | i] Geometry of the complex | 21/2 |
| | ii] Nature of the ligands . | 21/2 |
| D. | Explain the term crystal field stabilization energy [CFSE]. Calculate CFSE for d^3 and d^8 configurations in strong field octahedral complexes. | 5 |
| E. | Discuss in brief the merits and demerits of Crystal Field theory. | 5 |
| F. | Discuss any two experimental evidences which proves covalent bonding in the metal complexes. | 5 |
2. Attempt **any four** of the following:
- | | | |
|----|--|---|
| A. | Draw and explain a neat labelled molecular orbital diagram for hexacyano ferrate (II) ion. $[\text{Fe}(\text{CN})_6]^{4-}$ | 5 |
| B. | Discuss the effect of π bonding on Δ_0 values of octahedral complexes with ligands having filled π orbital. | 5 |
| C. | What are chelating agents? Discuss their effect on stability of complexes. | 5 |
| D. | Write a note on the Associative mechanism for ligand substitution reaction. | 5 |
| E. | What is Russell-Saunders (<i>LS</i>) coupling? Explain with suitable example. | 5 |
| F. | i. Calculate the ground state term for d^1 configuration of Ti^{3+} . | 3 |
| | ii. Explain spin multiplicity for two electrons. | 2 |
3. Attempt **any four** of the following:
- | | | |
|----|--|---|
| A. | Write a note on ionic organometallic compound. | 5 |
| B. | How will you prepare organometallic compound by Transmetallation reaction? | 5 |
| C. | Explain the complex formation reaction for the organometallic compound. | 5 |
| D. | What is ferrocene? Explain structure of ferrocene according to valence bond theory. | 5 |
| E. | Discuss homogeneous catalysis with suitable example. | 5 |
| F. | Discuss the following steps involved in hydrogenation of alkene using Wilkinson's catalyst. a) oxidative addition b) alkene coordination. | 5 |

4. Attempt **any four** of the following:
- | | | |
|----|--|---|
| A. | What is meant by term metallurgy? Explain self-reduction process in pyrometallurgy. | 5 |
| B. | Define roasting. Explain different types of roasting methods used for extraction of ore. | 5 |
| C. | Describe electrolytic refining of copper with suitable diagram. | 5 |
| D. | Explain with suitable diagram Froth floatation process for concentration of ore. | 5 |
| E. | Discuss the structure of $XeOF_4$ molecules on the basis of VSEPR theory. | 5 |
| F. | Give an account of $Na^+ - K^+$ ion pump with suitable diagram. | 5 |
5. Answer the following:
- | | | |
|----|---|---|
| A. | Select whether the following statements are true or false (Any five) | 5 |
| a. | Splitting of d - orbitals is maximum in tetrahedral complexes. | |
| b. | Triply degenerate set of d_{xy}, d_{yz}, d_{zx} are called as t_{2g} orbitals. | |
| c. | The value of $10Dq$ does not depend on the nature of central metal atom. | |
| d. | In octahedral complexes, due to the crystal field splitting, orbital with maximum energy is $d_{x^2 - y^2}$. | |
| e. | In the absorption spectrum of $[Ti(H_2O)_6]^{3+}$, one transitions are possible. | |
| f. | In an octahedral complex, metal ion with d^2 configuration has CFSE value $- 8 dq$. | |
| g. | Electrons prefer to pair up in e_g orbital when $\Delta_0 < P$. | |
| h. | The effect of ligands in expanding the d-electron cloud is called Jahn -Teller effect . | |
| B. | Fill in the blank with appropriate words given in the bracket (Any five) | 5 |
| | [weakening, isomerization, unpaired electrons, microstates, even and symmetrical, less stable, two, bonding] | |
| a. | The term gerade corresponds to _____ | |
| b. | If the matching orbitals overlap combines with maximum positive overlap, they form _____ molecular orbitals. | |
| c. | Presence of bulky ligands in a chelate results in _____ of metal ligand bond. | |
| d. | The complexes with forced configurations are _____ | |
| e. | The reactions which involve structural changes are called _____ reactions. | |
| f. | With respect to octahedral complexes, dissociative mechanism can be considered as _____ step mechanism. | |
| g. | The allowed combinations of m_l and m_s for electrons are called _____ | |
| h. | A transition is said to be spin forbidden, if it involves different number of _____ | |

- C. Select and write the appropriate answer . (Any five) 5
- _____ is the example of organometallic compound.
a) CH_4 b) H_2O c) CH_3MgCl d) CH_3Cl
 - In preparation of organometallic compound by metallation reaction, Hydrogen from R-H is replaced by _____.
a) carbon b) metal c) non-metal d) nitrogen
 - In the complex formation reaction of organometallic compound, organometallic compound acts as _____.
a) Lewis acid b) Lewis base c) Arrhenius acid d) Arrhenius base
 - _____ is the best example of metallocene.
a) Ferrocene b) Ferric chloride c) Ferrous sulphate d) Ferric Hydroxide
 - According to valence bond theory, ferrocene is _____.
a) Diamagnetic b) paramagnetic c) ferromagnetic d) antiferromagnetic
 - _____ is known as Wilkinson's Catalyst $\text{RhCl}_3(\text{PPh}_3)$
a) $\text{RhCl}_3(\text{PPh}_3)$ b) $\text{RhCl}(\text{PPh}_3)_3$ c) $\text{RhCl}_2(\text{PPh}_3)_2$ d) $\text{Rh}(\text{PPh}_3)_4$
 - In Homogeneous catalysis, if reactants and products are in gaseous phase then catalyst may be in _____ phase only
a) solid b) liquid c) gaseous d) changing
 - Ferrocene can be prepared by oxidation of cyclopentadienyl Grignard Reagent with _____.
a) KOH b) HCl c) FeCl_3 d) NaCl

D. Match the column: (Any five) 5

a.	Azurite	i.	Pyramidal geometry
b.	Gangue	ii.	Calcium deficiency
c.	Smelting	iii.	Square Planar Geometry
d.	XeF_4	iv.	Used in electronic tubes
e.	XeO_3	v.	Pyrometallurgical reduction
f.	Krypton-85	vi.	Purification of metal
g.	Rickets	vii.	Copper Ore
h.	Oxygen transfer	viii.	Concentration of Ore
		ix.	Non-Metallic Impurities
		x.	Heamoglobin

[Time: 3Hours]

[Total marks: 100]

N.B. : (1) All questions are compulsory.

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(3) Use of logarithmic table/non-programmable calculator is allowed.

Physical Constants:

$$N = 6.023 \times 10^{23}$$

$$\text{Charge on electron} = 1.66 \times 10^{-19} \text{ C}$$

$$F = 96500 \text{ coulombs}$$

$$\text{Mass of an electron} = 9.1 \times 10^{-31} \text{ kg}$$

$$c = 3 \times 10^8 \text{ m/s}$$

$$2.303RT / F = 0.05916 \text{ at } 298\text{K}$$

$$R = 8.314 \text{ J / K/mol}$$

$$\pi = 3.142$$

$$h = 6.626 \times 10^{-34} \text{ J.s}$$

1. Attempt any four of the following:
 - A. Write a note on liquid junction potential. Give functions of salt bridge. 5
 - B. What are galvanic cells? Classify them. 5
 - C. Derive an expression for the emf of electrolyte concentration cell with transference reversible to cation. 5
 - D. Derive an expression for the emf of electrode concentration cell reversible to anion. 5
 - E. Explain the terms i) Polarization ii) Decomposition potential 5
 - F. Define overvoltage. In electrolysis of 2 N sulfuric acid, the hydrogen overvoltage at lead cathode was found to be 0.64 V at 298 K for a given current density. What will be the hydrogen overvoltage if the current density is increased to twice its present value for the same cathode under same condition. (Given: $b = 0.12$) 5

2. Attempt any four of the following:
 - A. How are polymers classified on the basis of physical properties? 5
 - B. Explain the method for determination of molecular weight of polymers. 5
 - C. Write a note on curing agents. 5
 - D. What are stabilisers? Explain with examples. 5
 - E. What is LEP? How are they prepared? 5
 - F. Equal weights of polymer molecules each of molecular weight 40,000 g/mol and 50,000 g/mol are mixed. Calculate \bar{M}_n and \bar{M}_w . 5

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| F. | Define overvoltage. In electrolysis of 2 N sulfuric acid, the hydrogen overvoltage at lead cathode was found to be 0.64 V at 298 K for a given current density. What will be the hydrogen overvoltage if the current density is increased to twice its present value for the same cathode under same condition. (Given: $b = 0.12$) | 5 |

2. Attempt **any four** of the following:

- | | | |
|----|--|---|
| A. | How are polymers classified on the basis of physical properties? | 5 |
| B. | Explain the method for determination of molecular weight of polymers. | 5 |
| C. | Write a note on curing agents. | 5 |
| D. | What are stabilisers? Explain with examples. | 5 |
| E. | What is LEP? How are they prepared? | 5 |
| F. | Equal weights of polymer molecules each of molecular weight 40,000 g/mol and 50,000 g/mol are mixed. Calculate M_n and M_w . | 5 |

3. Attempt **any four** of the following:
- A. What is an operator? How is multiplication of operators carried out? Show that the following pairs of operator commute. 5
 $\frac{d^2}{dx^2}$ and $\frac{d}{dx}$ on $f(x) = \sin x$
- B. What are the salient features of a black body radiation? How does classical theory explain the variation of intensity with respect to Temperature? 5
- C. Explain the Planck's theory of quantisation. 5
- D. The work function of silver metal is 4.7 eV. Calculate the Kinetic energy and velocity of the electron ejected when a radiation of wavelength 300 nm is incident on the silver surface. Will photoelectrons be observed? 5
- E. Explain the Structure of Solar cell with the help of diagram. 5
- F. Explain how Hydrogen be generated by direct electrolysis of water. 5
4. Attempt **any four** of the following:
- A. Explain the term nuclear spin in NMR. 5
- B. Explain spin-spin and spin-lattice relaxation in NMR. 5
- C. Explain the principle and fundamental equation of NMR. 5
- D. Explain the principle of ESR spectroscopy. 5
- E. Write a note on ESR spectrometer. 5
- F. Explain the ESR spectra of hydrogen. 5
5. Answer the following:
- A. Select whether the following statements are true or false (**Any five**) 5
- For galvanic cells the value of E°_{cell} is always greater than 1.
 - In case of concentration cells both half cells are chemically identical with differing in concentrations.
 - The value of the hydrogen overvoltage for lead cathode is less than platinum cathode under same conditions.
 - Liquid junction potential cannot be removed completely, but it can be minimised.
 - For sulfuric acid the activity can be represented as $a = (m \cdot \gamma_{\pm})^2$
 - For ideal solution, the value of activity coefficient is always equal to one.
 - With change in pH of solution the value of overvoltage remains same.
 - The cell represented as, $\text{Zn} / \text{ZnSO}_4 \parallel \text{AgNO}_3 / \text{Ag}$ is an example of chemical cell.
- B. Fill in the blank with appropriate words given in the bracket. (**Any five**) 5
- is a linear polymer.
(Polyester, glycogen, bakelite, starch)
 - is a thermoplastic polymer.
(PVC, starch, nylon, cellophane)
 - The repeated unit in a polymer is called-----
(Monomer, elastomer, fibres, resin)
 - is used as adhesives.
(Liquid resin, fibres, rubber, nylon)

- e. Polymers having long range elasticity are called-----
(Elastomers, gum, nylon, protein)
- f. Weight average molar mass is denoted as-----
(M_w , M_n , M_z , M_v)
- g. LED is made of -----material.
(semi-conductor, nylon, terylene, rubber)
- C. Select and write the appropriate answer. (Any five)
- a. Newton's law of mechanics is the backbone of
- Quantum mechanics
 - Classical mechanics
 - Wave mechanics
 - Body mechanics
- b. Total radiation emitted per unit surface area is called.
- Energy
 - Intensity
 - Power
 - Surface energy
- c. The waves which do not travel in vacuum.
- Matter
 - Translational
 - Rotational
 - vibrational
- d. A -wave function contains information about
- Volume occupied by a particle.
 - location and motion of particle
 - area occupied by the particle.
 - shape of the particle
- e. Schrodinger equation is a
- First order differential equation.
 - Second order differential equation.
 - Partial differential equation.
 - Nonlinear differential equation.
- f. Hamiltonian is given by.
- Kinetic Energy
 - Potential energy
 - Sum of kinetic and potential energy
 - momentum
- g. One of the ways to tap solar energy is
- stark effect
 - Photovoltaic effect
 - Einstein effect
 - Compton effect
- h. The band possessed by valence electrons is called
- Valence band
 - Conduction band
 - Forbidden energy gap.
 - Equivalent band

5

D.

Match the column (Any five)

5

- | | | | |
|----|----------------------------------|-------|-----------------------------|
| a. | ${}^6\text{C}^{13}$ | i. | ω_0 |
| b. | ${}^7\text{N}^{14}$ | ii. | Solvent in NMR spectrometer |
| c. | Angular velocity | iii. | $I=0$ |
| d. | ${}^6\text{C}^{12}$ | iv. | $I=1$ |
| e. | CCl_4 | v. | ESR spectra |
| f. | Hyperfine splitting of deuterium | vi. | $I=1/2$ |
| g. | γ | vii. | 2 peaks |
| | | viii. | 3 peaks |
| | | ix. | Gyromagnetic ratio |
| | | x. | Spin quantum number |

RIZVI COLLEGE OF ARTS, SCIENCE AND COMMERCE.

BANDRA WEST, MUMBAI

TYS-001

SEM-VI, APPLIED COMPONENT, APRIL 2023.

230425-

NOTE: All questions are compulsory.

MARKS -100

Figures to the right indicate full marks.

TIME - 3 HOURS

Q.1. ATTEMPT ANY 4 OUT OF 6.

[20 Marks]

- Define drug. Explain lipinski's rule of five in detail.
- Explain anti-infective properties of curcumin.
- What is excretion of drug and explain its various routes.
- Give the synthesis and uses of levofloxacin.
- What is malaria. Give its symptoms and causes.
- Give the synthesis and uses of fluconazole.

Q.2. ATTEMPT ANY 4 OUT OF 6.

[20 Marks]

- Give the synthesis and uses of metronidazole.
- Which two antibiotics are commonly used in TB? Give their properties and side effects.
- Give the synthesis and uses of ethambutol.
- Explain the causes & therapy for cancer.
- What is AIDS? Give its symptoms and diagnostic tests.
- Explain the antibacterial activity of silver nanoparticles.

Q.3. ATTEMPT ANY 4 OUT OF 6.

[20 Marks]

- Give the synthesis and uses of Orange IV.
- Give the synthesis and uses of Auramine-O.
- Give the synthesis and uses of Indigo.
- Give the synthesis and uses of Malachite Green.
- Give the synthesis and uses of Indanthrene Blue.
- Explain the physical process in the primary remediation of wastewater in detail.

Q.4. ATTEMPT ANY 4 OUT OF 6.

[20 Marks]

A. Draw the structure of the following dyes.

i) Eosin

ii) Methyl orange

iii) phenolphthalein

iv) Erythrosin

v) Lawsone.

B. What are DNA markers? Give its important applications.

C. What are the requirements of dyes used as cosmetics? Give examples.

D. Explain the duties and responsibilities of FDA & FSSAI.

E. Explain the various types of security inks?

F. Explain the distinguish between dyes and pigments.

Q.5. A. MCQ (any 5)

[5 marks]

1. A compound which is ready for clinical trial is called _____.
(Test drug, clinical drug, pro drug)
2. Penicillin was isolated by _____.
(Alexander Fleming, Florey and Cain, Stephens Hawkins)
3. pH of plasma usually is _____.
(5.5; 7.4; 9.0)
4. Chemical agents which destroy pathogenic organisms to cure diseases are called _____ agents.
(Reducing; Chemotherapeutic; Oxidizing)
5. Bacteria which retain the colour of crystal violet are called _____ bacteria.
(Gram-neutral; Gram-positive; Gram-negative)
6. Quartan malarial fever repeats after every _____ hour.
(24; 48; 72)
7. Different species of plasmodium after entering human body attacks _____.
(WBC; RBC; Eosinophils)
8. Meningitis is caused by fungus _____.
(Cryptococci; yeast; candida)

B.State TRUE OR FALSE. (Any 5)

[5 marks]

1. Amoebic dysentery do not cause abdominal pain.
2. Acronym BCG stands for Bacillus Calmette Guerin.
3. Cis platin is used in the treatment of various forms of cancer.
4. AIDS by itself is not a separate disease.
5. Folic acid is synthesized from 4-Chloro acetophenone.
6. Diamond is a good conductor of electricity.
7. Bio medical waste are not to be mixed with the other wastes.

C. Match the column. (Any 5)

[5 marks]

A	B
1. Monazo dye	Naphthol yellow S
2. Nitroso dye	Orange IV
3. Triphenyl methane	Indanthrene blue
4. Nitro dye	Methylene blue
5. Diphenyl methane	Gambine Y
6. Bisazo dye	Acid magenta
7. Thiazine dye	Malachite green
8. Anthraquinone dye	Congo red

D. State TRUE OR FALSE. (Any 5)

[5 marks]

1. A pigment cannot be formed on the substrate itself.
2. Toner is obtained by adding inert substrates to dyes.
3. Hair becomes grey due to deficiency of melanin.
4. Indelible ink contains mainly silver nitrate solution.
5. Arlabs was the first dyestuff industry in India.
6. A pigment cannot be converted into a dye.
7. Leather is made up of fibrous protein called collagen.