Chhatrapati Shahu Ji Maharaj
University, Kanpur

**Answer Script Details**
**Barcode** 11552301

**Roll No.** 24062000472
**Total Mark** 58/75.00

**Exam** M.SC-III_ODD_EXAM_NOV_2025
**Subject** B040901T - Plant Physiology and Biochemistry

**Question wise Mark Summary**

| Q.No | Mark | Q.No | Mark | Q.No | Mark | Q.No | Mark |
|---|---|---|---|---|---|---|---|
| 1A | 4/5 | | | | | | |
| 1B | 4/5 | | | | | | |
| 1C | 4/5 | | | | | | |
| 1D | 4/5 | | | | | | |
| 1E | 4/5 | | | | | | |
| 1F | 4/5 | | | | | | |
| 1G | 4/5 | | | | | | |
| 1H | 4/5 | | | | | | |
| 1I | 4/5 | | | | | | |
| 2 | 0/15 | | | | | | |
| 3 | 0/15 | | | | | | |
| 4 | 0/15 | | | | | | |
| 5 | 11/15 | | | | | | |
| 6 | 0/15 | | | | | | |
| 7 | 0/15 | | | | | | |
| 8 | 11/15 | | | | | | |
| 9 | 0/15 | | | | | | |

# Chhatrapati Shahu Ji Maharaj University
## Kanpur, Uttar Pradesh

**PART-I**

Date of Exam: 03/12/25 Shift: III Room No.: 25
Paper Code: B040301 Subject: Plant Physiology & Biochemistry Year/Sem.: III
Name of Candidate: NANCY RATHI
Roll No.: 2 4 0 6 2 0 0 0 4 7 2
Signature of Candidate | Signature of Invigilator | COE Facsimile

**PART-II**

| MARKS OBTAINED | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Q | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| (a) | | | | | | | | | | |
| (b) | | | | | | | | | | |
| (c) | | | | | | | | | | |
| (d) | | | | | | | | | | |
| (e) | | | | | | | | | | |
| (f) | | | | | | | | | | |
| (g) | | | | | | | | | | |
| (h) | | | | | | | | | | |
| (i) | | | | | | | | | | |
| (j) | | | | | | | | | | |
| Total | | | | | | | | | | |
| Total Marks in Figures | | | | | | | | | | Max. Marks |
| Total Marks in Words | | | | | | | | | | |

B 0 4 0 3 0 1 T — Paper Code

Signature of Evaluator

**PART-III**

Course: MSC Botany III
Plant Physiology & Biochemistry
Session: 2025-26 Year/Semester: III
Subject: Plant Physiology & Biochemistry

Paper Code: B 0 4 0 3 0 1 T
Exam Date: 0 3 1 2 2 0 2 5
Name of Candidate: N A N C Y R A T H I
Father's Name: G A Y A P R A S A D R A I

महाविद्यालय का कोड College Code: K N 0 4
परीक्षा केन्द्र का कोड Exam Centre Code: K N 0 4
परीक्षा का प्रकार Type of Exam: Regular ● / Ex. Student ○ ; Private ○ / Back paper Exam ○

ANSWER BOOKLET NO.
11552301

B 0 4 0 5 0 1 T — Paper Code

**PART-IV**

Enrollment Number: C S J M A 2 4 0 0 0 1 3 1 6 5 8

परीक्षार्थी अनुक्रमांक संख्या Candidate's Roll Number: 2 4 0 6 2 0 0 0 4 7 2

Paper Code: B 0 4 0 3 0 1 T

Signature of Candidate
Signature of Invigilator
C S Facsimile
COE Facsimile

नोट : 1. परीक्षार्थी को निर्देशित किया जाता है कि आवरण पृष्ठ के पृष्ठ भाग पर अंकित सभी निर्देशों को सावधानी पूर्वक पढ़ें।
2. बॉक्स में भरी जाने वाली प्रविष्टियाँ काली स्याही से शुरू की जायें। 3. गोलों को काले या नीले बॉलपेन से भरा जायें।

## INSTRUCTIONS TO THE CANDIDATE FOR FILLING PART-I

1. Read the instructions carefully given on the answer script and admit card.
2. Write Date of Exam, Shift, Paper Code & Name of Subject Correctly.
3. Write Name & Roll No. Correctly.
4. Write Semester & Branch Correctly.

## INSTRUCTIONS TO THE CANDIDATE FOR FILLING PART-III

1. Use blue or black ball point pen for writing alphabets & numerals in ☐ Boxes.
2. Carefully study the example before you start marking.
3. As shown in the example below blacken the circles completely.

Correct method: ① ● ③ ④

Incorrect method: ✓ ✗ ◉ ④

4. Make no Stray marks on this sheet.
5. **DO NOT WRITE OR MARK ON THE BAR CODE.**

## परीक्षार्थी के लिए निर्देश

1. प्रवेश पत्र एवं उत्तर पुस्तिका पर दिये गये निर्देशों को ध्यान से पढ़ें।
2. कवर पृष्ठ के दूसरी तरफ कुछ न लिखें।
3. उत्तर पुस्तिका के पृष्ठों पर दोनों तरफ लिखें।
4. प्रश्न पत्र पर अपने अनुक्रमांक के अतिरिक्त कुछ न लिखें।
5. प्रश्न पत्र कोड एवं प्रश्न पत्र कोड सावधानी पूर्वक लिखें।
6. अपनी स्थिति स्पष्ट लिखें।
7. उत्तर पुस्तिका के पृष्ठों की संख्या देखें। अगर उत्तर पुस्तिका में पृष्ठ (1–24) से कम है या फटे हुए है, तो परीक्षा शुरू होने के पूर्व दूसरी उत्तर पुस्तिका ले लें।
8. प्रश्नपत्र को देख, यदि प्रश्नपत्र के विषय कोड, विषय का नाम तथा प्रश्न में कोई त्रुटि है तो उसके परीक्षा शुरू होने के 30 मिनट के अन्दर कक्ष निरीक्षक को तत्काल सूचित करें, उसके बाद विश्वविद्यालय द्वारा कोई कार्यवाही नहीं की जायेगी।
9. प्रश्नों के उत्तर लिखने के लिये पैंसिल का प्रयोग न करें।
10. B कोपी या अतिरिक्त ग्राफ नहीं दिया जायेगा।

## IN ORDER TO AVOID UFM (UNFAIR MEANS) :

1. The Roll No. and Answer Book no. found elsewhere or any other symbol found in the answer book will be treated as unfair means.
2. Any tempering of Bar Code and Booklet no shall be treated as Unfair Means.
3. Do Not bring the materials like slip of paper/mobile/digital diaries/ study material/ revision notes in examination hall. Possession of the mobiles/ digital diaries/ electronic watch and any other electronic gadget except memory less scientific calculator shall be considered as UFM case.
4. Do not keep or paste currency note in answer script it shall be consider as UFM.

## INSTRUCTIONS TO THE CANDIDATE

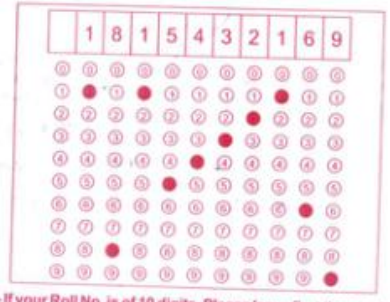
1. Read the instructions carefully given on the Question Paper, Admit Card & Answer Script.
2. Do not write anything on back side of the cover page.
3. Write on both sides of pages of answer book.
4. Do not write anything on question paper except Roll Number.
5. Write Paper Code & Question Paper Id carefully.
6. CHECK the number of pages (1-32) or any other kind of damage in your answer script, if found than change the answer script immediately before the commencement of examination.
7. CHECK the Question Paper for any kind of discrepancy e.g. Subject Code. Subject Name and Question of the Question Paper during first THIRTY MINUTES of the commencement of the exam, so that it can be corrected in TIME. After that no corrections shall be entertained by the university.
8. Do not use pencil for answering the question.
9. Write status correctly e.g. those appearing in carry over papers should fill in status as Carry Over. Those appearing as Ex-Students should fill in status as ex.
10. No supplementary answer book & graph paper will be provided.

## अनुचित साधन से बचने हेतु:

1. उत्तर पुस्तिका के निर्देशित स्थान को छोड़कर अनुक्रमांक एवं उत्तरपुस्तिका का क्रमांक कहीं और न लिखे तथा कोई भी चिन्ह न बनायें क्योंकि यह अनुचित साधन प्रयोग की परिधि में आता है।
2. उत्तर पुस्तिका के बारकोड अथवा उत्तर पुस्तिका संख्या पर छेड़ करने पर अनुचित साधन प्रयोग माना जायेगा।
3. परीक्षा कक्ष में निम्न वस्तुएं साथ न लायें, जैसे लिखे हुए कागज के टुकड़े, मोबाईल, डिजिटल डायरी, कोपी, पुस्तक यह सभी वस्तुएं जो अनुचित साधन के अन्तर्गत आती है। केवल संधोपित प्रश्नपत्र में ही मेमोरी लैस साइंटिफिक केल्कुलेटर ले जाने की अनुमन्यता होगी।
4. उत्तर पुस्तिकाओं में रूपये न रखें न ही उत्तर पुस्तिका में विषकायें। ऐसा करना अनुचित साधन प्रयोग की परिधि में आता है।

## INSTRUCTIONS TO THE CANDIDATE FOR FILLING PART-IV

1. Use blue or black ball point pen for writing alphabets & numberals in ☐ Boxes.
2. Use blue or black ball point pen for filling the circles.




**Note - If your Roll No. is of 10 digits. Please leave first three columns.**

Paper Code

01

## Section → B

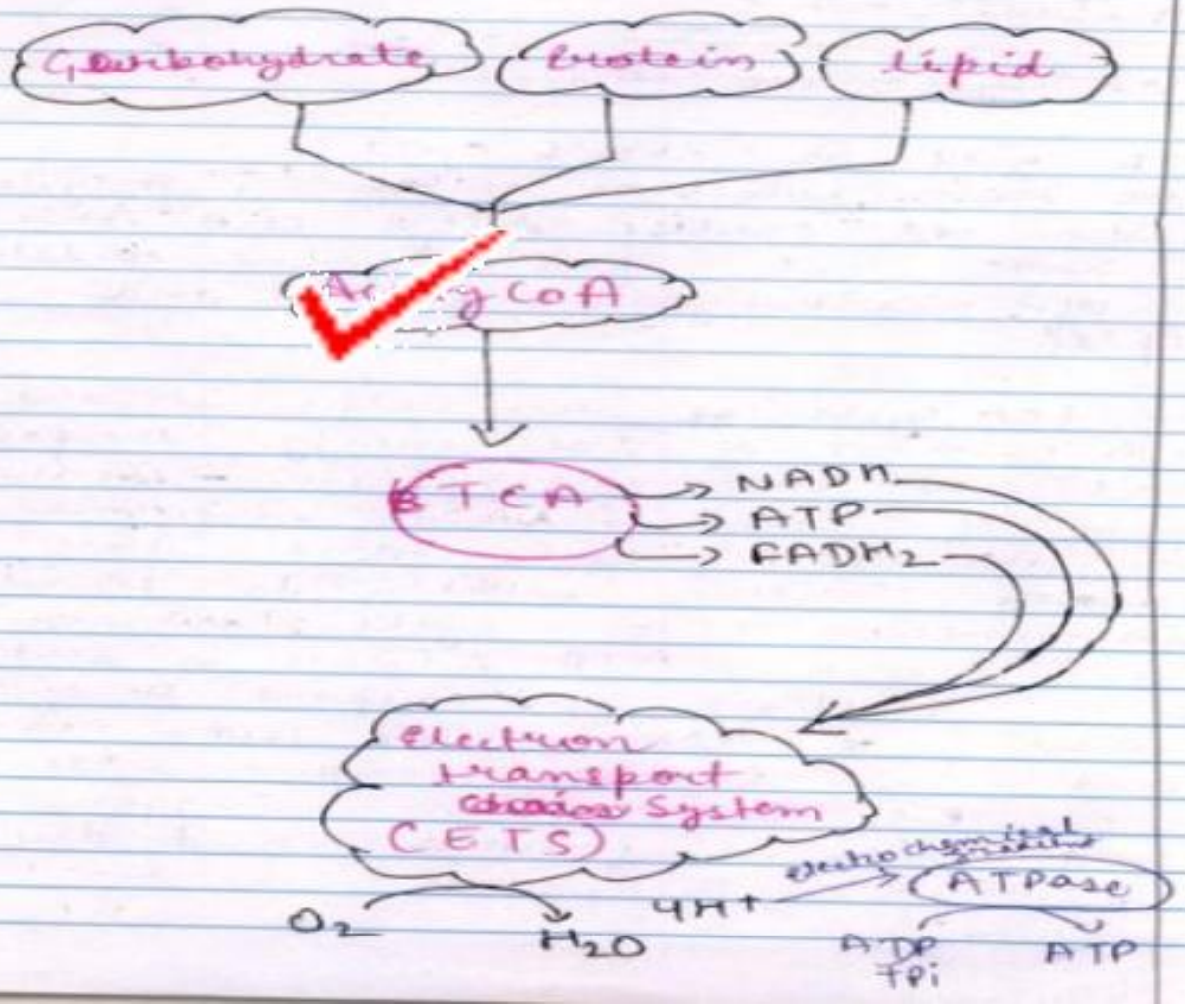
### Answer → 5

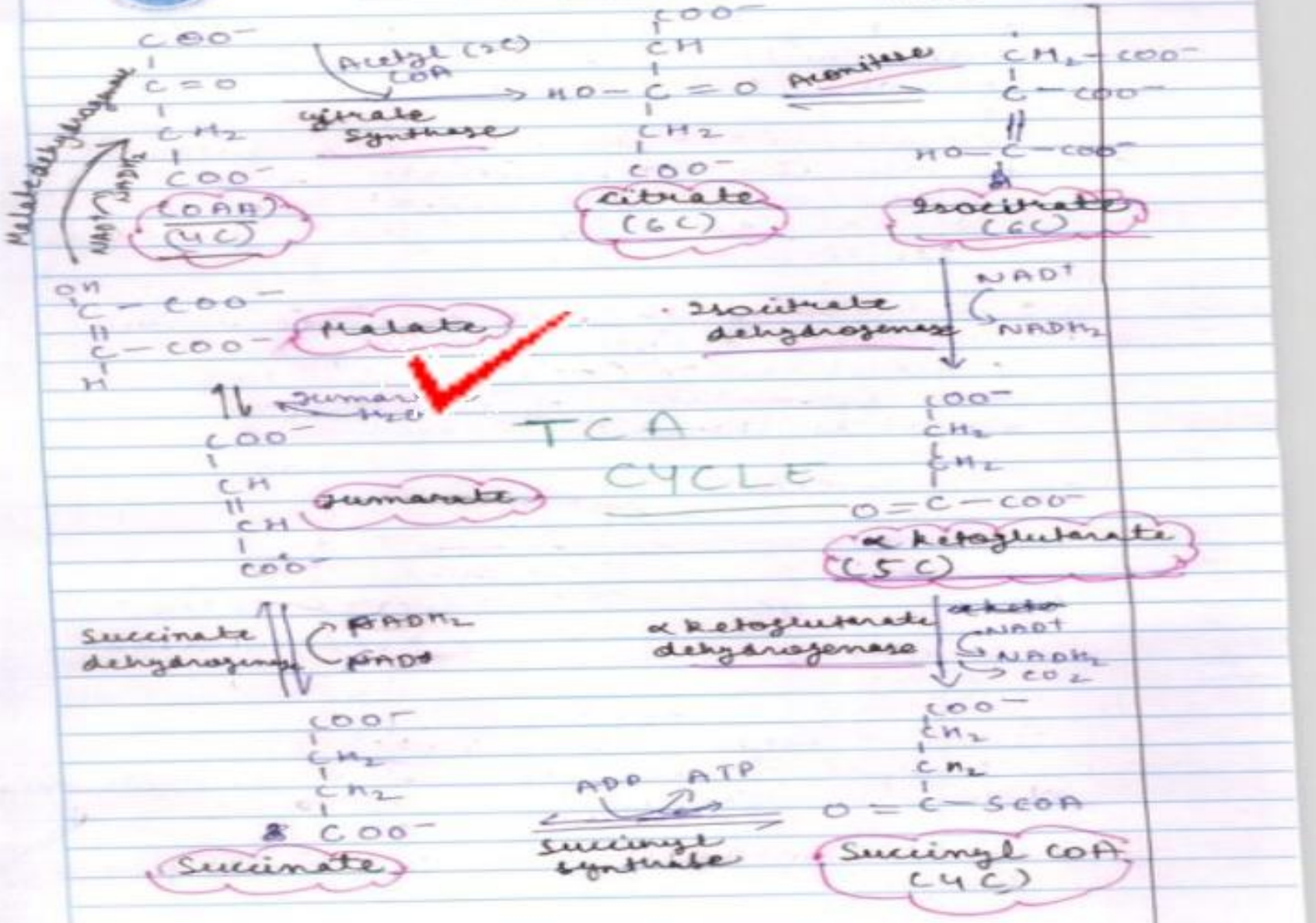
~~TCA cycle or Kreb's cycle.~~

TCA cycle or Kreb's cycle.
the Main function of the TCA cycle is to oxidise Acetyl COA which we have got from the oxidation of carbohydrate, protein and lipids.

the TCA cycle also helps in the getting most of the energy. therefore most of the energy i.e, in the form of ATP & NADH is formed in the TCA cycle and this energy which is formed in the TCA cycle i.e., NADH & ATP & FADH is sent to electron transport system where, and in electron transport system the e⁻s are given oxygen and water is formed and due

All this electron gradient elect electrochemical gradient is formed and ATPase comes into action and again ATP is formed from ADP + Pi.



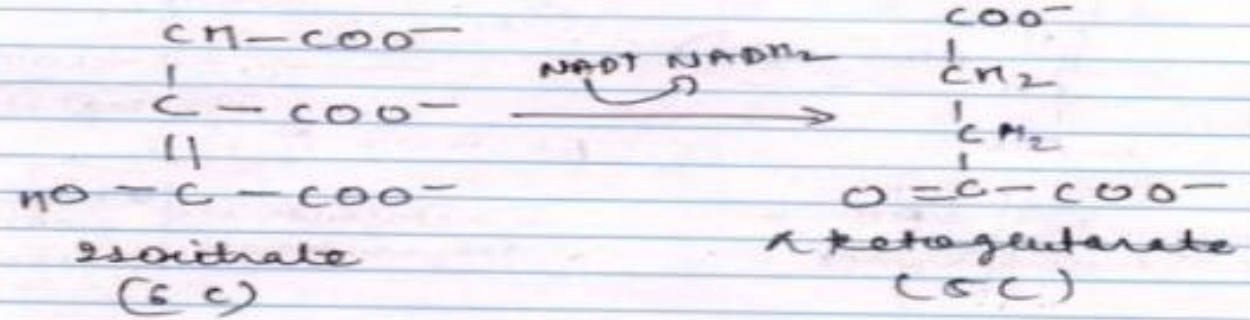


In TCA cycle first ~~first~~ ~~&~~ 4C OAA with (2C) Acetyl CoA forms (6C) citrate.

&

citrate with the enzyme Aconitase forms isomer isocitrate And also the intermediate is formed in b/w that is called cis aconitase.

Isocitrate with the enzymatic activity isocitrate dehydrogenase forms $\alpha$ ketoglutarate (5C) and here the formation of $NADH_2$ from $NAD^+$ is there.

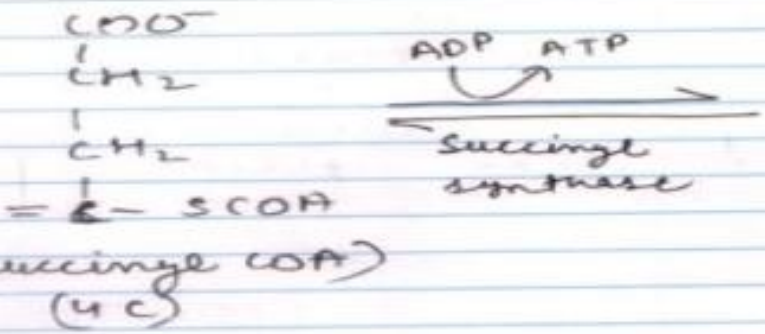



Isocitrate (6C)

α ketoglutarate (5C)

(5C) α ketoglutarate with the enzyme action of α ketodehydrogenase forms ~~Acetyl~~ succinyl $CoA^{SH}$ and

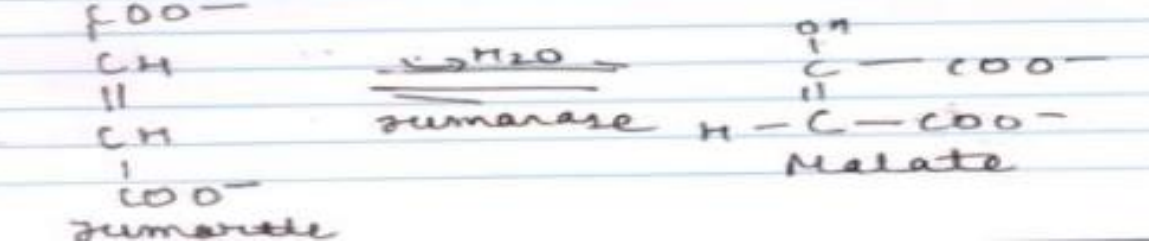
also $NADH_2$ from $NAD^+$ is formed here.



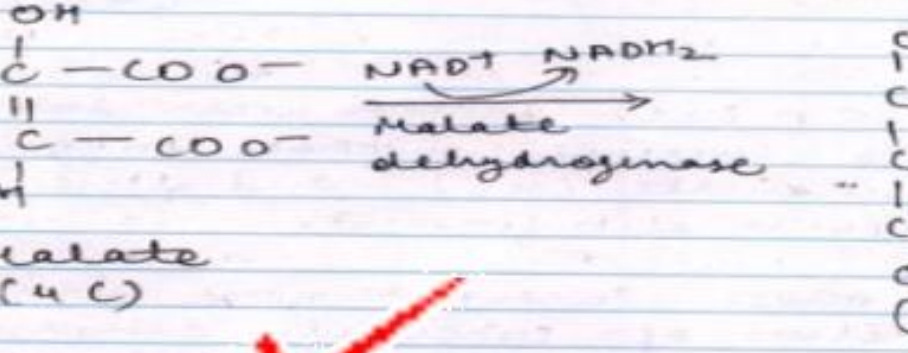

Succinyl COA (4C) further with the action of succinyl synthase enzyme forms succinate (4C) and there ADP | ATP is also formed.

Succinyl COA Succinate now with the action of succinate dehydrogenase forms fumarate (4C) here there is the formations of $FADH_2$ also.

fumarate now with the help of enzyme fumarase and water forms Malate.



Now Malate here with the help of the enzyme Malate dehydrogenase forms OAA again and here reduction of $NAD^+$ also takes place.




Malate (4C) — OAA (4C)

So; in TCA cycle we get OAA again but Acetyl CoA is not formed again by this cycle.

## Section → C

## Answer → 8

the Enzymes are the Biological Catalyst which synthesize the reactions.

Enzymes are needed in small amount and they work • the Enzymes do not mix with substrate during this process. the Main function of the enzyme is to reduce → Activation energy in the transition state and so that the product is formed easily.

### Mechanism and Regulation of Enzyme and Michadis Menten constant (Km)

$$[E] + [S] \rightleftharpoons [ES] \longrightarrow E + P.$$

Enzyme — Substrate — Enzyme substrate complex — Enzyme Product

the Enzyme as we all know, it

Catalysis the reaⁿ, so there first Enzyme binds with substrate. Now after enzyme has bind to the substrate there is the formation of enzyme substrate complex.

Enzyme substrate complex is formed after that enzyme does its work and Now product is formed & enzyme is free without binding with substrate.

the mechanism of the enzyme was explained the Michalis Menten equation.

Michalis Menten equations is for 1 enzyme and 1 substrate. Michalis Menten eqⁿ is not for the regulatory enzymes as it has many substrates are involved.

So, As we know,

$$[E] + [S] \underset{K_{-1}}{\overset{K_1}{\rightleftharpoons}} [ES] \xrightarrow{K_2} [E] + [P]$$

Enzyme — Substrate — Enzyme substrate complex — Enzyme + product

$V_0 = K_2 [ES]$ — ①

$E_T = E_{free} + ES$

(total enzyme) (free enzyme) (enzyme substrate complex)

$K_1$ → rate of forward reaction; when Enzyme substrate complex is formed.

$K_{-1}$ → rate of Backward reaction when (enzyme is free)

$K_2$ → rate of forward reaction (when product is formed and enzyme is free).

So;

Rate of forward reaction = Rate when Enzyme is bind

$K_1 [E][S] = [K_{-1} + K_2][ES]$

$\frac{[E][S]}{[ES]} = \frac{[K_{-1} + K_2]}{K_1} = K_m$

Here; $K_m$ = Michalis Menten constant

$K_m = \frac{[E][S]}{[ES]}$

We know; $E_T$ (total enzyme) = $E_{free} + ES$

therefore putting its value here

$K_m = \frac{[E_T - ES][S]}{[ES]}$

$$[ES) = \frac{[E_T - [ES] - [S]}{K_m}$$

$$K[ES] = \frac{[E_T][S]}{K_m + [S]}$$

$$V_o = \frac{K_2 [ES]\ [S)}{K_m + [S]}$$

$$\boxed{V_o = \frac{V_{max}\ [S]}{K_m + [S]}}$$

If $V_o = \frac{V_{max}}{2}$

$$\frac{V_{max}}{2} = \frac{V_{max}\ [S]}{K_m + [S]}$$

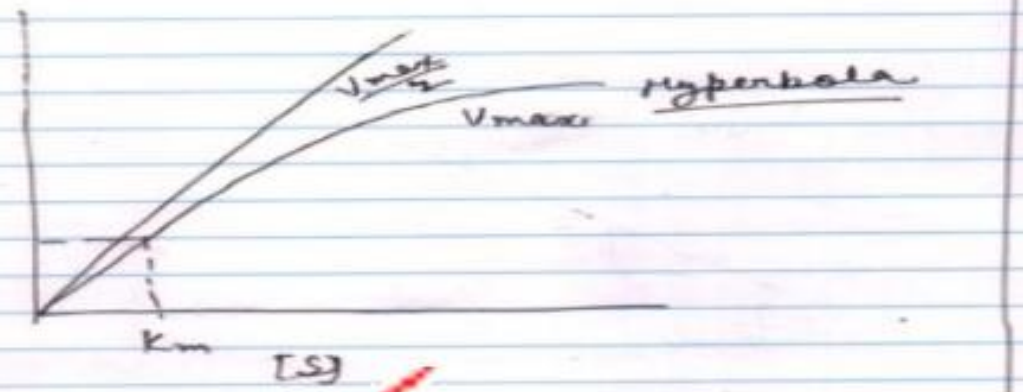
$$K_m + [S] = 2[S]$$

$$K_m = 2[S] - [S]$$

$$K_m = [S]$$

So; when; $V_o = V_{max}$
then $K_m = [S]$
(Michaelis Menten constant
is equals to substrate.

Ls the graph formed is → hyperbola




- If $K_m >>> [S]$ then $V_0 = \frac{V_{max}}{K_m}$

- If $K_m << [S]$

$V_0 = V_{max}[S]$

$V_0 = [S]$

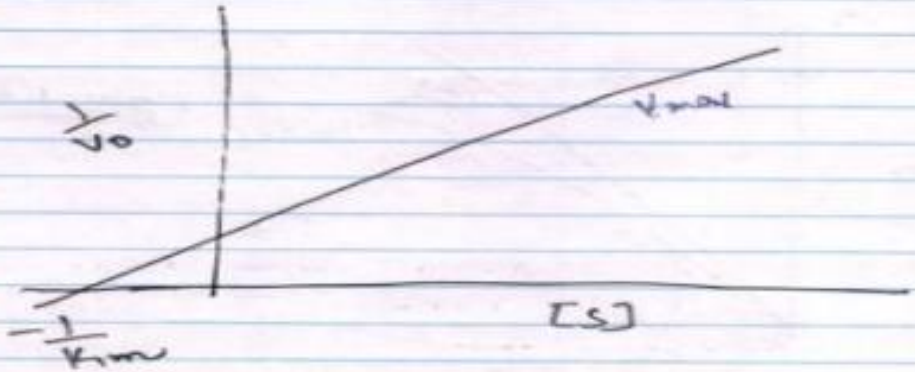
↳ To find the correct value of Michaelis Menten equation double reciprocal method is used which was given by line weaver.

$$\frac{1}{V_0} = \frac{K_m + [S]}{V_{max}[S]}$$

$$\frac{1}{V_0} = \frac{K_m + [S]}{V_{max}} \times \frac{1}{[S]}$$

$$\frac{1}{V_0} = \frac{K_m}{V_{max}[S]} + \frac{[S]}{V_{max}[S]}$$

$$\frac{1}{V_0} = \frac{K_m}{V_{max}[S]} + \frac{1}{V_{max}}$$




the graph formed when double reciprocal method is used

i) More the affinity of the substrate to enzyme less is the Km.

ii) Less the affinity of substrate to enzyme more is Km.

## Section A

**Ans A**

Palmitic acid is eg of → saturated f.A

Saturated fatty acids are those fatty acids which do not have double bond. they have single bond.

Saturated fatty acid have high melting point in comparision to unsaturated fatty acid.

eg:- $CH_3 - CH_2 - CH_2 - COOH$

(saturated fatty acid)

As it only has σ bond

Saturated fatty are mostly

↳ solid, crystalline at room temperature.

(almitic acid, ~~myristic acid~~ etc are ~~non~~ S.f.A.

unsaturated fatty acid

↳ they have double bonds with them.

the M.P of unsaturated fatty acid is more that that of for saturated fatty acid.

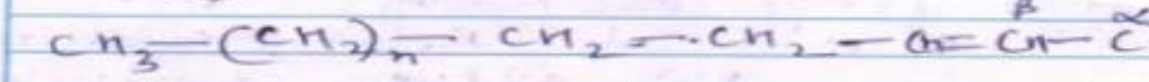
unsaturated fatty acid have σ as well as π bond.

↳ mostly unsaturated (cis unsaturated) fatty acid are
↳ liquid at room temp.

we use → anoic in suffix for
↳ Saturated fatty acid

we use → enoic in the suffix for
↳ unsaturated fatty acid.

example of unsaturated acid
↳



(unsaturated fatty acid)

Linoleic, Linolenic acid are some eg of USFA (unsaturated fatty acid)

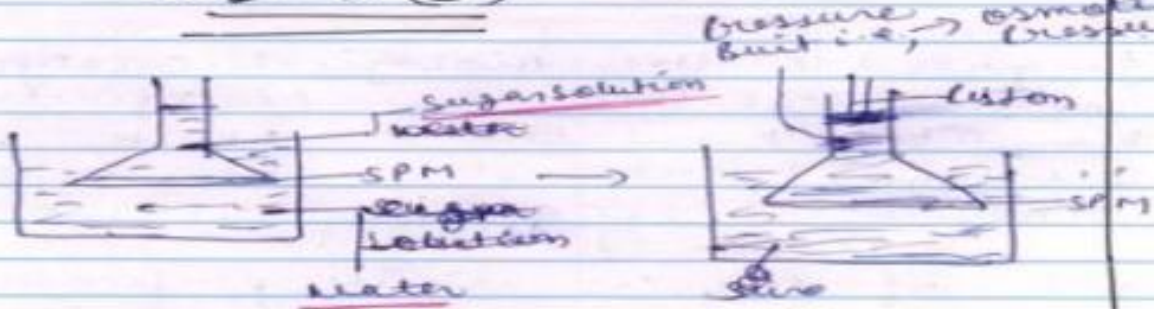
Ans. (B)

Enzymes are the biological catalyst which catalyse the Biological reacts we all know that · isoenzyme are also the type of enzyme · isoenzyme is the set of enzymes which performs similar functions but there structure is little differ from one another

e.g:- Lactose dehydrogenase enzymes ( these enzymes (1, 2 etc.) they all perform similar functions but their structure is different from one another ·

Like all enzymes isoenzyme also reduces activation energy of the transition state · and like other enzymes it does not bind with product or mix as with product ·

Ans → (C)




from above figure, there is a beaker; in funnel there is a sugar solution and the beaker have water. so normally what would happen the solution will be the movement of from higher concentrations to lower concentration so here, that water is trying to go sugar.

the water will by more from higher concentration to lower concentration of the . but as there is piston pressure from above water will not able to enter the funnel.

So the osmotic pressure is the pressure which is applied to stop osmosis. whenever osmotic pressure will be high the osmosis will be low.

Ans → D

Active transport is the transport where the transpiration is low and therefore plants can not use that force Active transport need energy. there are two types of the theories for this there is → Non osmotic Active transport and osmotic active transport.

In osmotic Active transport there is need for the transport from low conc$^{n}$ to high conc$^{n}$ which is not possible without energy and therefore there will be need for the energy in the form of ATP.

Passive transport

· In passive transport there is movement from high conc^n to low concentration therefore there is no need of energy.
In plants the transport happens as there is transpiration pull so it is very easy.

Ans E

Glucose and fructose Both are the sugars and they are very important for living beings we all know that. But then the question we arises what makes Glucose different from fructose as both are sugars.
and
↳ Glucose and fructose not only both sugars. they both have 6 carbon number also.

But inspite of these similarities Glucose and sugars are different and

P.T.O

the Major difference is)

Glucose has ⟶ Aldehyde group

fructose has ⟶ Ketone group

and these Aldehyde (CHO) and Ketone (C=O) group make them different from Carbohydrates.

## Answer F

We know, chlorophyll a and b both are very abundant in the plants.

| Chlorophyll a | Chlorophyll b |
|---|---|
| ↳ the chlorophyll a has ~~formula~~ formula $C_{55}H_{72}O_5N_4Mg$ | ↳ the chlorophyll b has the formula $C_{55}H_{70}O_6N_4Mg$. |
| ↳ chlorophyll a has $-CH_3$ group in B ring. | ↳ chlorophyll b has $-CHO$ (aldehyde) group in B ring. |

| | |
|---|---|
| b) Mostly the chlorophyll ~~absorbs~~ is ~~formation~~ the Red region wavelength light. | Majorly Chlorophyll b absorbs Blue region / violet region light. |
| b) Chlorophyll a forms the reaction center in the photosystem. | ~~Chlorophyll b does~~ ~~forms the~~ chlorophyll b does not forms the reactions center in the P.S. chlorophyll b can only be accessory pigments |
| b) Mostly All oxygenic ~~filling~~ photosynthetic organism have Chl a | b) All oxygenic photosynthetic organisms does not have Chl b |

## Ans 6.

Respiratory Quotient is the ratio of the number of moles carbon dioxide evolved to the number of moles oxygen evolved.

$$RQ = \frac{\text{no. of moles } CO_2 \text{ evolved}}{\text{no. of moles } O_2 \text{ consumed}}$$

the diff substrates have different RQ. eg Carbohydrate, Organic acids, Proteins, fatty acids, all have different Respiratory Quotient.

the Respiratory Quotient of the carbohydrate is 1. As the no. of oxygen consumed is equal to number of moles of the carbon dioxide evolved.

the RQ of protein is 0.8; which the RQ is less than Carbohydrates.

Ans H

In dark reaⁿ the fixation of carbon dioxide happens. and carbon dioxide is converted into Glucose and after that into starch for storage. as the food in the plants is stored in the form of starch.

the fixation of $CO_2$ in can occur by C3 pathway or C4 pathway depending upon the $CO_2$ accepting enzyme which can be RuBisCO or PEPcarboxylase.

the number of moles of ATP and NADPH required to fix 1 mole of $CO_2$ in dark reaⁿ is

9 ATP molecules are required
6 NADPH molecules are required

for 2 moles of Glucose
↳ 18 ATP
↳ 12 NADPH

## Answer → I

Plant growth hormones are the substances which are produced both naturally and artificially by plant.

- Some they are to regulate several functions in the plants.

* the Naturally secreted PGR which are produced by the plants are:—
  - Auxin
  - Cytokinin
  - Ethylene
  - Gibberellin
  - Abscisic acid

Gibberellin is also a plant growth hormone as mentioned earlier.

Gibberellin is antagonist of Auxin

Gibberellin is used in tissue culture.

Gibberellin is used so the the plants elongate.

Gibberellin is used for inducing flowering.

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