

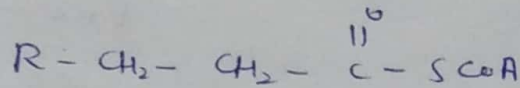
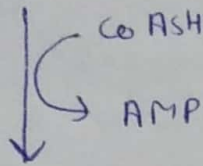
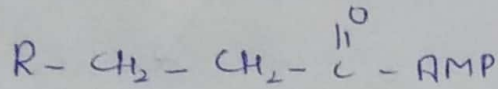
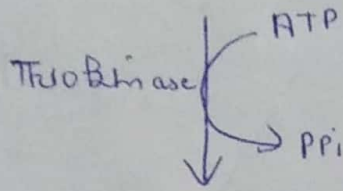
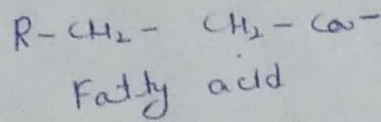
Biosynthesis of Triacylglycerol TAG

Most of the fatty acids ingested or synthesized by an organism has 2 fates. ① Incorporation into triacylglycerol for storage ② Incorporation into phospholipid components of membrane.

The partitioning b/w these alternative fates depends on organism's current needs. During rapid growth, synthesis of new membrane requires the production of membrane phospholipids. When organism has plenty of energy supply but is not actively growing, it shunt most of its fatty acids into storage fats.

- TAG synthesis mostly occur in liver & adipose tissues.
- Glycerol & fatty acids must be activated prior to triacylglycerol synthesis.
- Glycerol must be converted into glycerol-3-Phosphate

Activation of fatty acid to acyl CoA



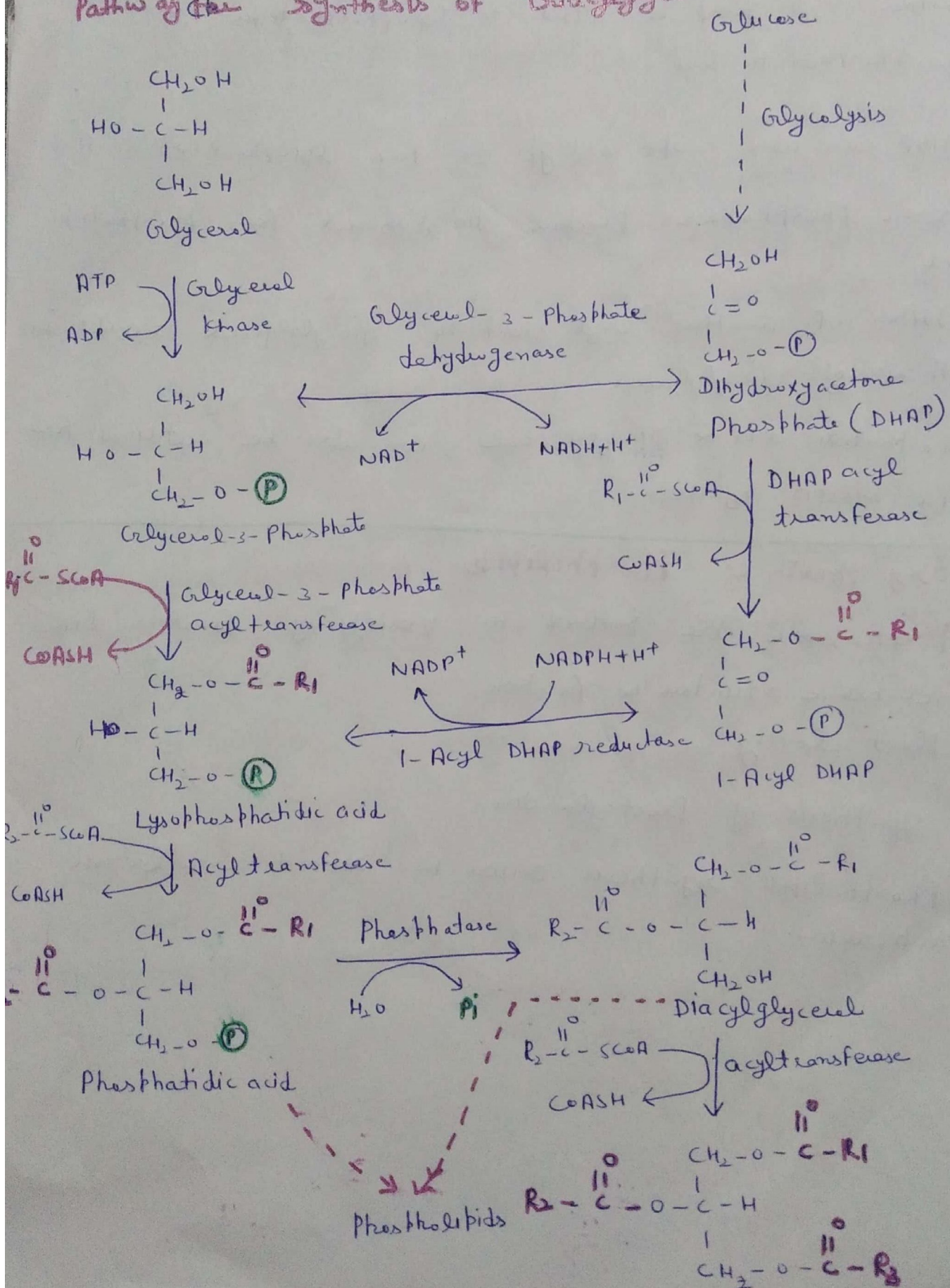
Acyl CoA

Synthesis of Glycerol-3-phosphate

1. In liver, glycerol is activated by glycerol kinase.
2. In liver & Adipose tissues Glucose serves as precursor for glycerol-3-phosphate.

3. Dihydroxyacetone Phosphate (DHAP) produced in glycolysis is reduced to glycerol-3-Phosphate by Glycerol-3-Phosphate dehydrogenase

Pathway for synthesis of Triacylglycerol



Addition of acyl group to form TAG

- Glycerol-3-Phosphate acyltransferase catalyzes the transfer of acyl group to produce lysophosphatidic acid.
- Another acyl group is added to lysophosphatidic acid to form phosphatidic acid.
- DHAP can also accept acyl gp. to form lysophosphatidic acid.
- Enzyme phosphatase produce diacylglycerol from phosphatidic acid.
- Addition of another acyl group to diacylglycerol results in synthesis of triacylglycerol.
- Phosphatidic acid & diacylglycerol can also be utilized for phospholipid synthesis.

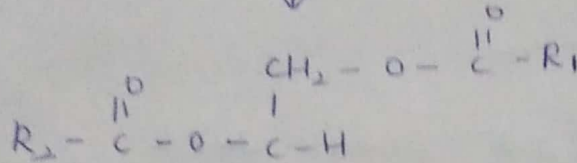
Biosynthesis of Phospholipids

- Phospholipids are involved in variety of functions like
 - membrane structure & function
 - blood clotting
 - synthesis of prostaglandins
- Phospholipid synthesis occurs in smooth endoplasmic reticulum.

Synthesis of Phospholipids

Glycerol-3-Phosphate
(or dihydroxyacetone phosphate)

↓ *From Pathway of RNA synthesis*

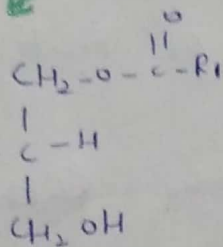


CH₂-O-(P)
Phosphatidic acid

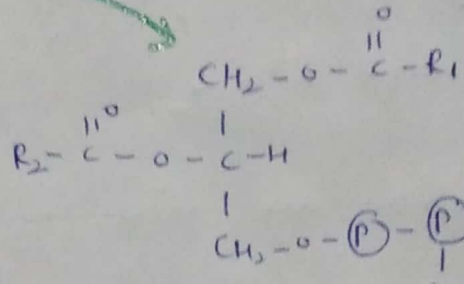
CTP phosphatidate
Cytidyltransferase

Phosphatidate
Phosphohydrolase

CTP → PPI



1,2 Diacylglycerol

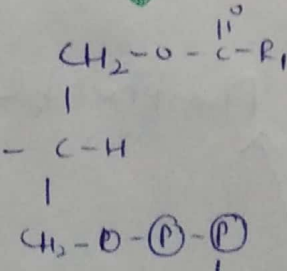


CDP-diacylglycerol

Inositol

Glycerol-3-Phosphate

CDP Diacylglycerol Inositol transferase



Phosphatidyl Inositol

Phosphatidyl glycerol-3-Phosphate

H₂O → PPI

Phosphatidyl glycerol

Phosphatidyl diacylglycerol

Cardiolipin

(Diphosphatidyl-glycerol)

Choline/
Ethanolamine

Choline
Kinase → ATP → ADP

Phosphocholine

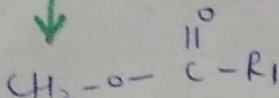
Phosphoethanolamine

Phospho-Choline
Cytidyl transferase

CDP-choline

CDP-ethanolamine

Phosphocholine
Diacylglycerol transferase



Choline/
Ethanolamine

Phosphatidyl choline

Phosphatidyl ethanolamine

① Synthesis of Phosphatidyl choline & Phosphatidyl ethanolamine

Choline & Ethanolamine

↓ Ist of all get phosphorylated

CDP Choline & CDP Ethanolamine

Combine with
1,2 diacylglycerol

Phosphatidyl choline

Phosphatidyl ethanolamine

- These reactions are shown in the ~~beta~~ pathway

② Synthesis of Phosphatidylserine:

Phosphatidylethanolamine exchange its ethanolamine group with free serine to ~~form~~ undergo decarboxylation as:

