FATTY ACID METABOLISM:

FATTY ACIDS HAVE MANY ROLES IN BIOCHEMISTRY:

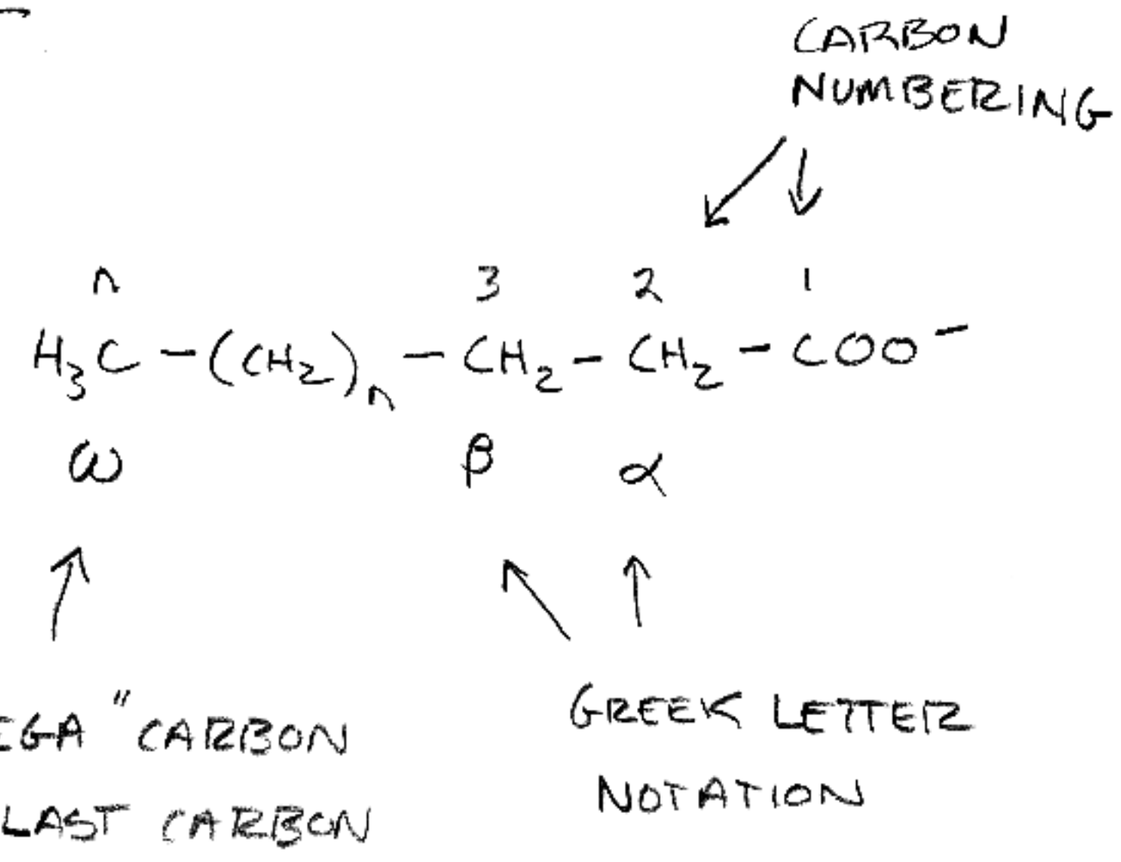
- BIOLOGICAL MEMBRANES
- ENERGY STORAGE
- HORMONE PRODUCTION (EICOSANOIDS)
  - PROSTAGLANDINS
  - LEUKOTRIENES
  - THROMBOXANES
  - PROSTACYCLIN

FATTY ACIDS ARE LONG CHAIN MONOCARBOXYLIC ACIDS. THERE ARE HUNDREDS OF NATURALLY OCCURING FATTY ACIDS, BUT THERE ARE ONLY FIVE THAT ARE VERY COMMON:

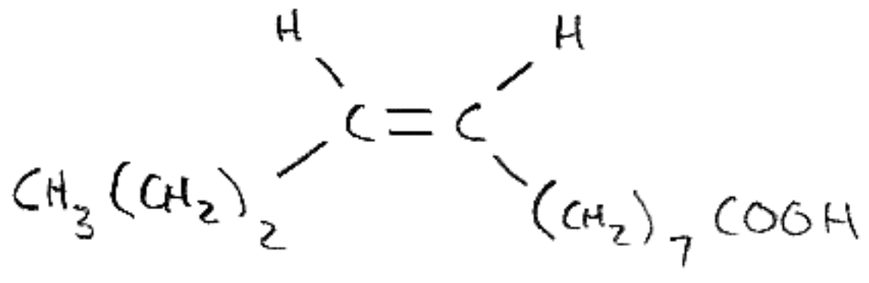
COMMON NAME:	SYSTEMATIC NAME:	FORMULA:	ABBREVIATION:
LAURIC ACID	DODECANOIC ACID	$CH_3(CH_2)_{10}COOH$	12:0
PALMITIC ACID	HEXADECANOIC ACID	$CH_3(CH_2)_{14}COOH$	16:0
STEARIC ACID	OCTADECANOIC ACID	$CH_3(CH_2)_{16}COOH$	18:0
OLEIC ACID	CIS-9-OCTADECANOIC ACID	$CH_3(CH_2)_7CH=CH(CH_2)_7COOH$	18:1
LINOLEIC ACID	CIS-9,12-OCTADECANOIC ACID	$CH_3(CH_2)_4(CH=CHCH_2)_2(CH_2)_6COOH$	18:2

FATTY ACIDS THAT DO NOT CONTAIN DOUBLE BONDS ARE TERMED SATURATED, WHILE THOSE THAT CONTAIN DOUBLE BONDS ARE TERMED UNSATURATED.

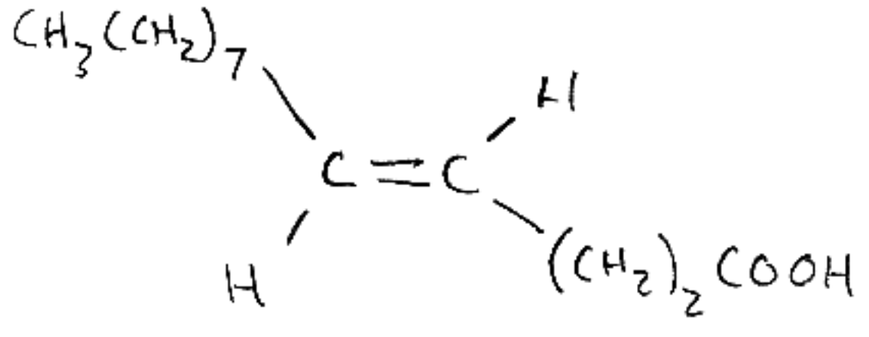
NOTATION:



DOUBLE BONDS IN NATURE ARE ALMOST ENTIRELY CIS:



"CIS"



"trans"

OMEGA-3 & OMEGA-6 FATTY ACIDS:

$CH_3CH_2CH=CHCH_2CH=CH(CH_2)_nCH=CH(CH_2)_7COOH$

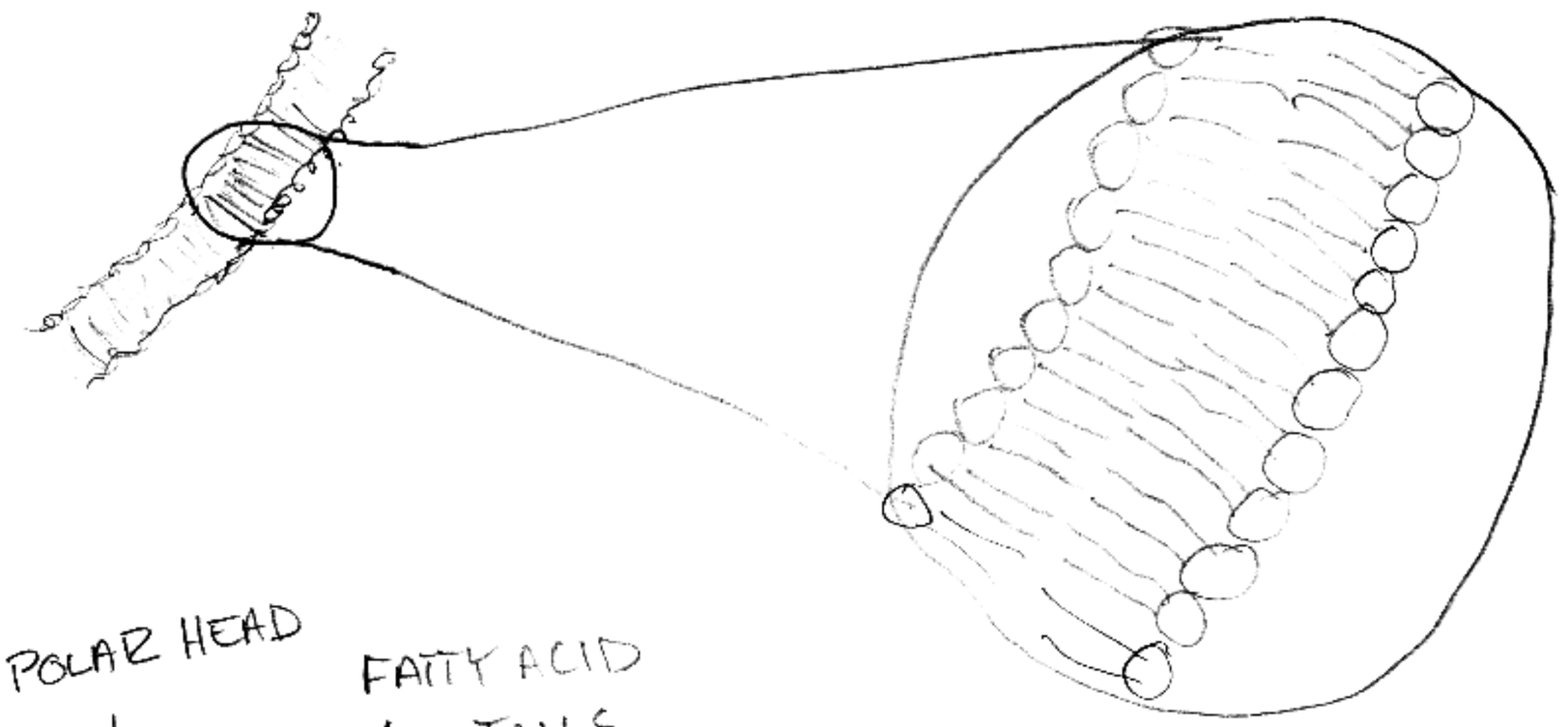
↑ ω-3 ↑ ω-6 ↑ CIS-9

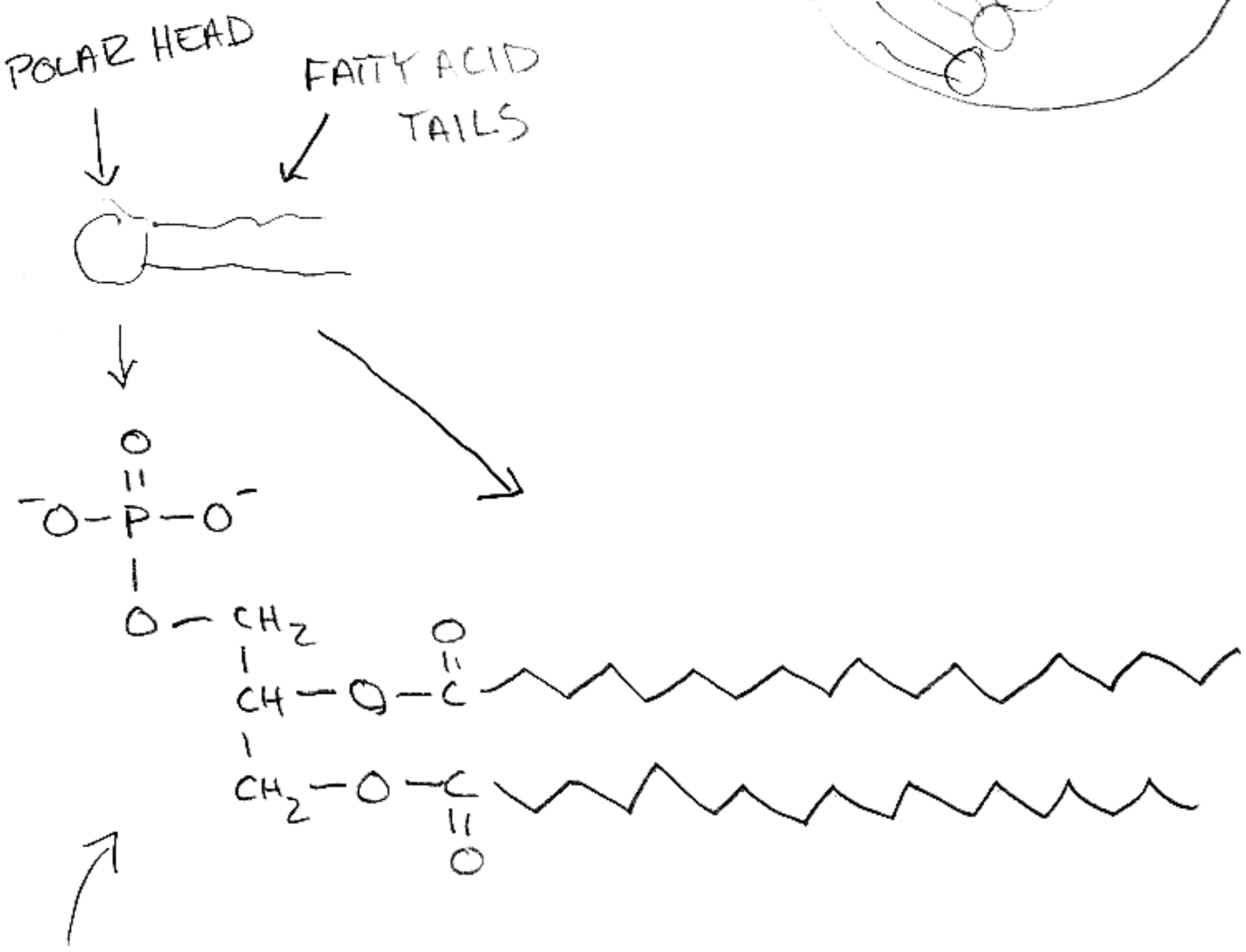
THESE DOUBLE BONDS MUST COME IN DIET

MAMMALS CAN ONLY INTRODUCE DOUBLE BONDS TO CARBON 9

WE MOST OFTEN SEE F.A. IN PHOSPHOLIPIDS & TRIGLYCERIDES:

PHOSPHOLIPIDS (PHOSPHOACYLGLYCEROLS) – BIOLOGICAL MEMBRANES

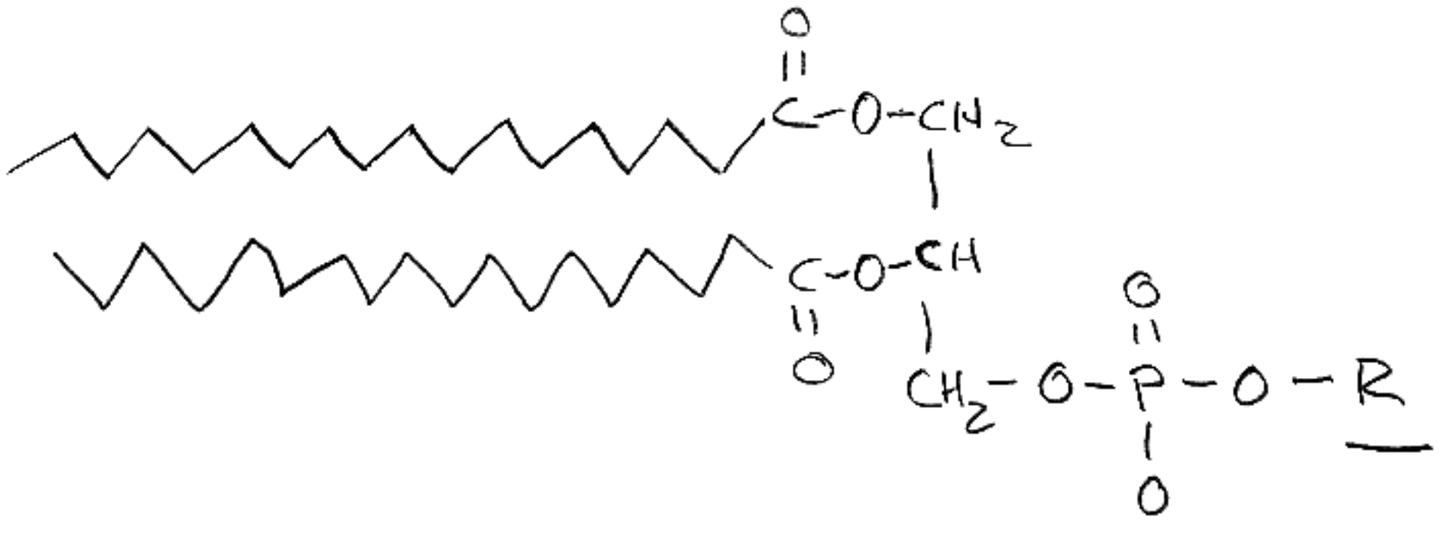




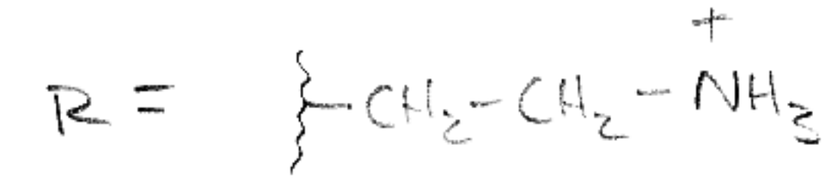
PHOSPHATIDATE (PHOSPHATIDIC ACID)

KINKS IN FATTY ACID CHAINS MAKE MEMBRANES MORE FLUID: LESS TIGHTLY PACKED TOGETHER SO LESS INTERMOLECULAR ATTRACTIONS.

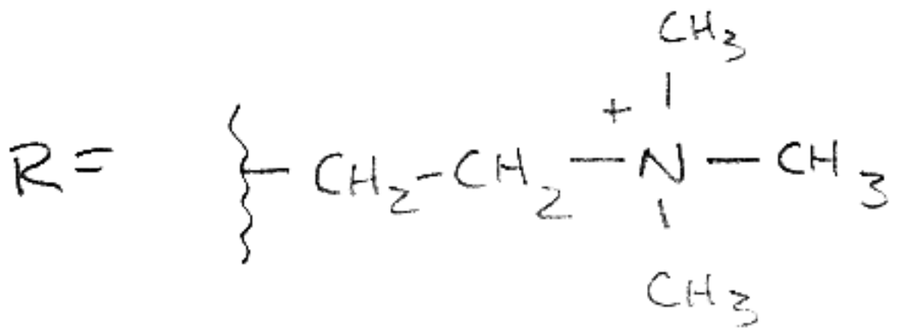
PHOSPHATIDIC ACID IS OFTEN DERIVATIZED:



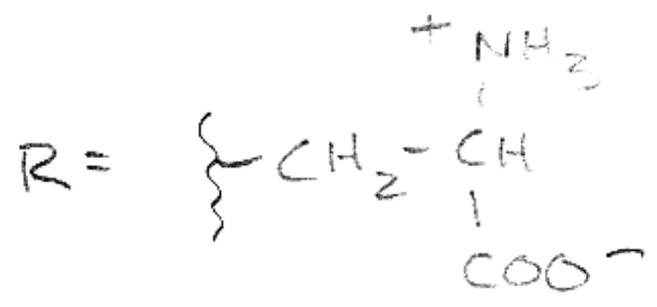
PHOSPHATIDYLETHANOLAMINE:



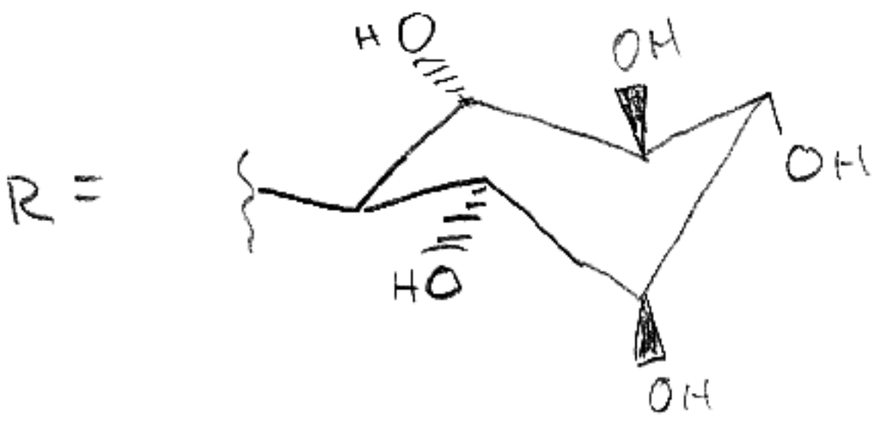
PHOSPHATIDYLCHOLINE:



PHOSPHATIDYLSERINE:



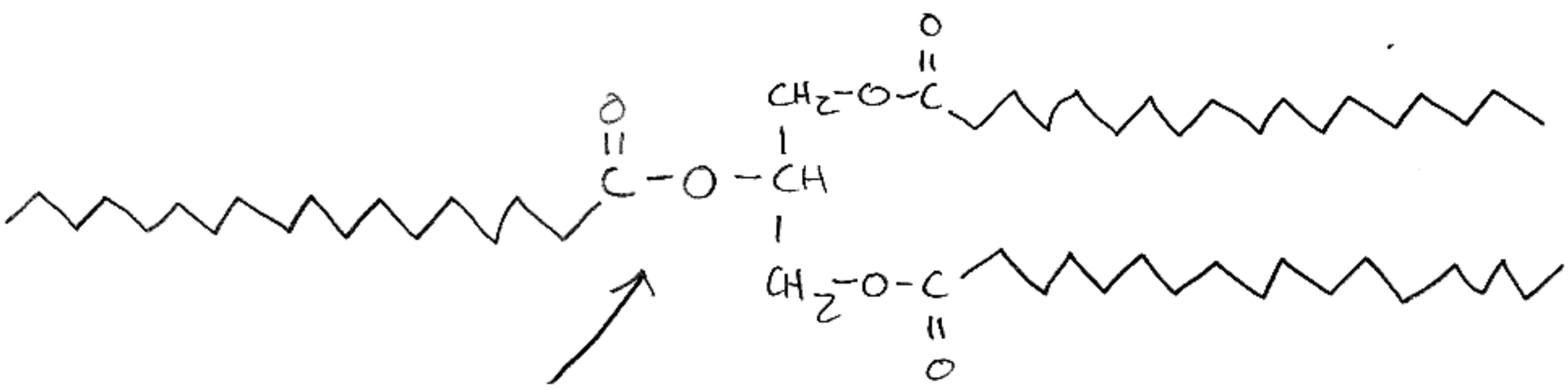
PHOSPHATIDYL-INOSITOL:



MOST COMMON F.A. IN P.L.'s

- PALMITIC ACID
- STEARIC ACID
- OLEIC ACID

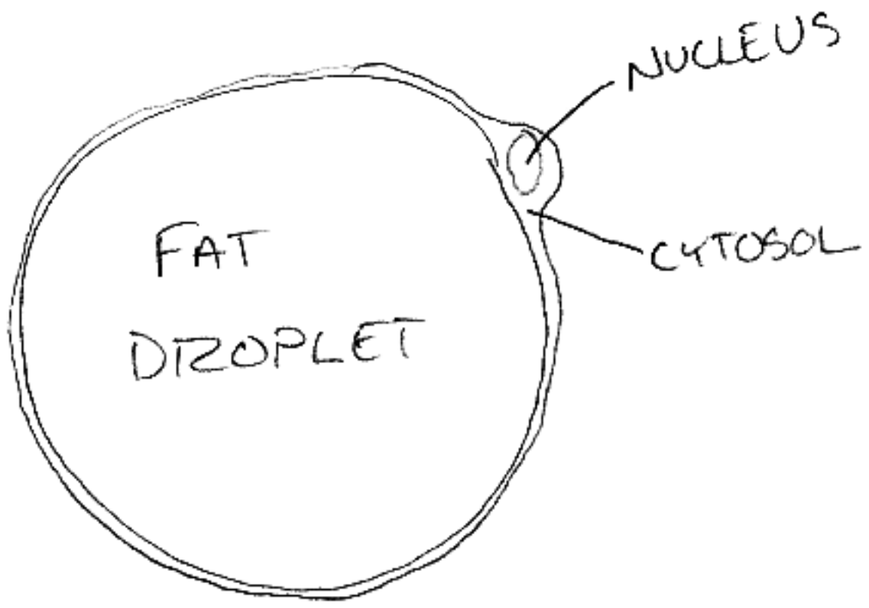
TRIGLYCERIDES (TRIACYLGLYCEROLS) – ENERGY STORAGE



* NOTICE – UNCHARGED

CAN FORM LARGE DROPS FOR STORAGE IN CYTOSOL OF ADIPOCYTES (FAT CELLS)

FAT CELL:



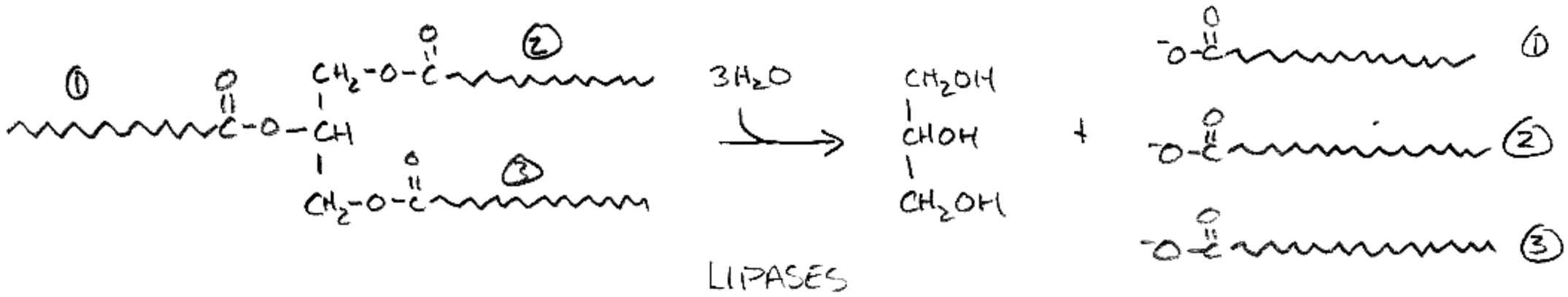
WHY STORE ENERGY AS FAT ?

TRIGLYCERIDES CONTAIN FAR MORE ENERGY BY MASS THAN CARBOHYDRATES:

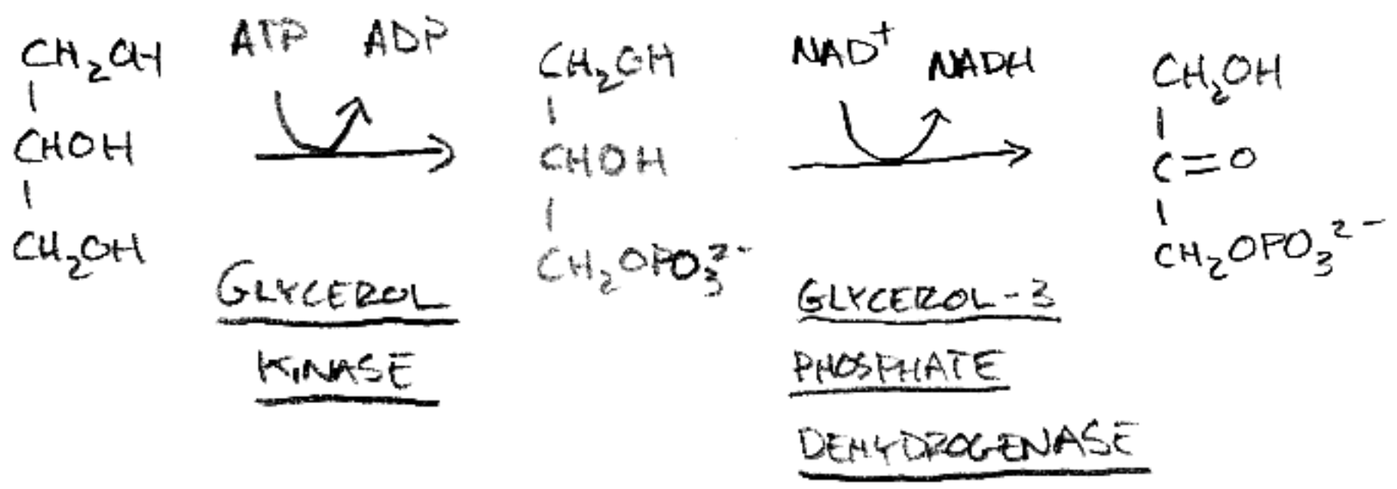
TRIGLYCERIDES CONTAIN ~ 6 TIMES MORE ENERGY THAN AN EQUAL MASS OF GLYCOGEN

CATABOLISM OF TRIGLYCERIDES:

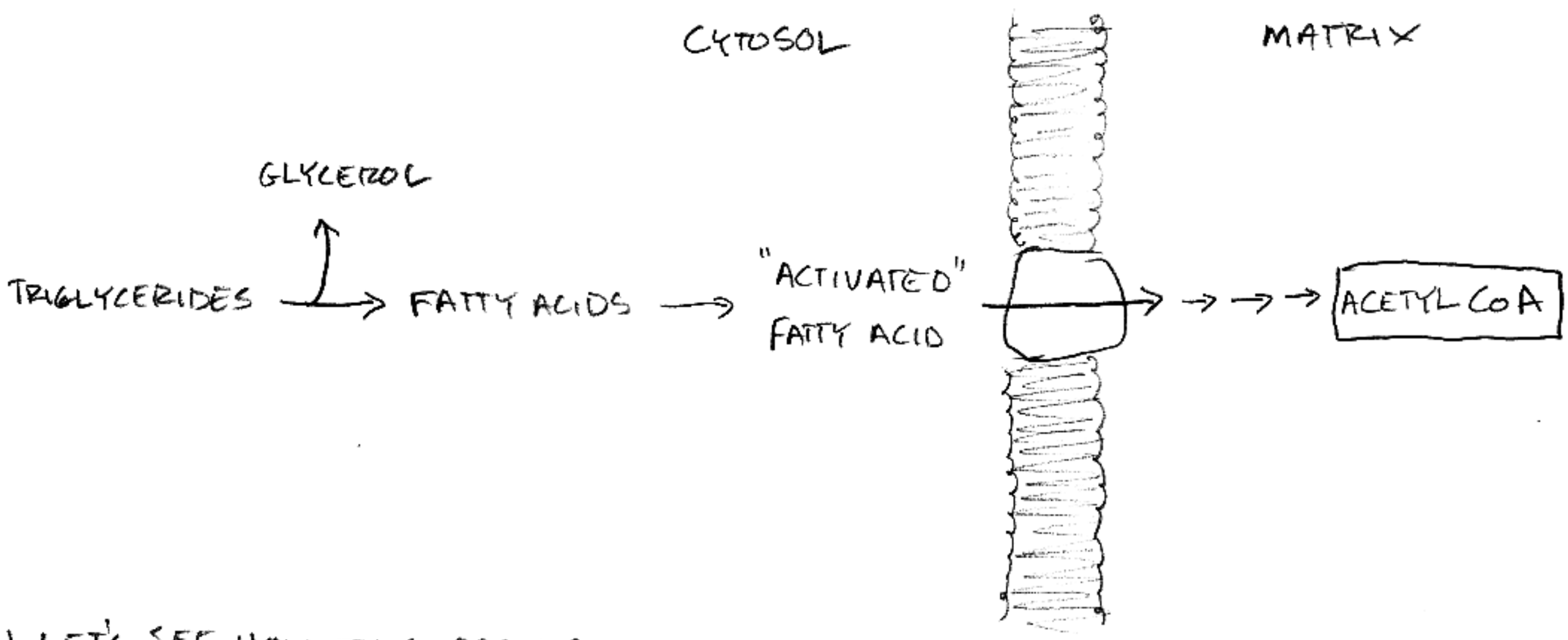
- STIMULATED BY EPINEPHRIN, NOREPINEPHRIN, GLUCAGON & SOME OTHERS



GLYCEROL IS CONVERTED TO DIHYDROXYACETONE PHOSPHATE:



FATTY ACIDS ARE CONVERTED TO ACETYL CoA:



NOW LET'S SEE HOW THIS OCCURS.