

BIOTEKNOLOGI

FERMENTASI

Adi Rahmat

Jurusan Pendidikan Biologi

Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

Universitas Pendidikan Indonesia

Fermentation (ferment = rearrange)

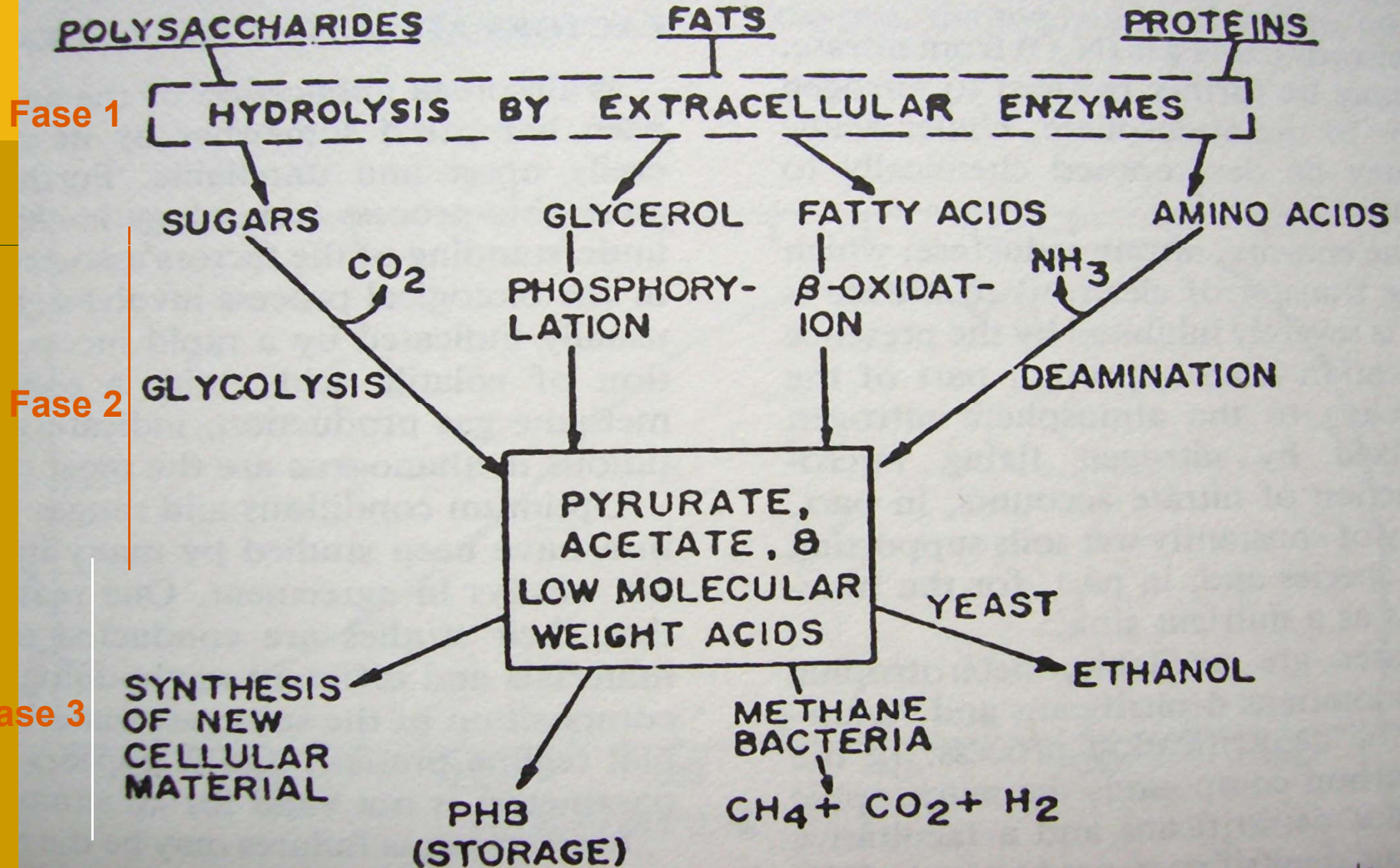
- Anaerobic Digestion -

A set of anaerobic reactions in which pyruvate generated by glycolysis is modified to ethanol, lactate, or some other organic end product.

A complex series of reaction which are catalyzed by a consortium of microorganism and accomplish the conversion of organic compound to the terminal products

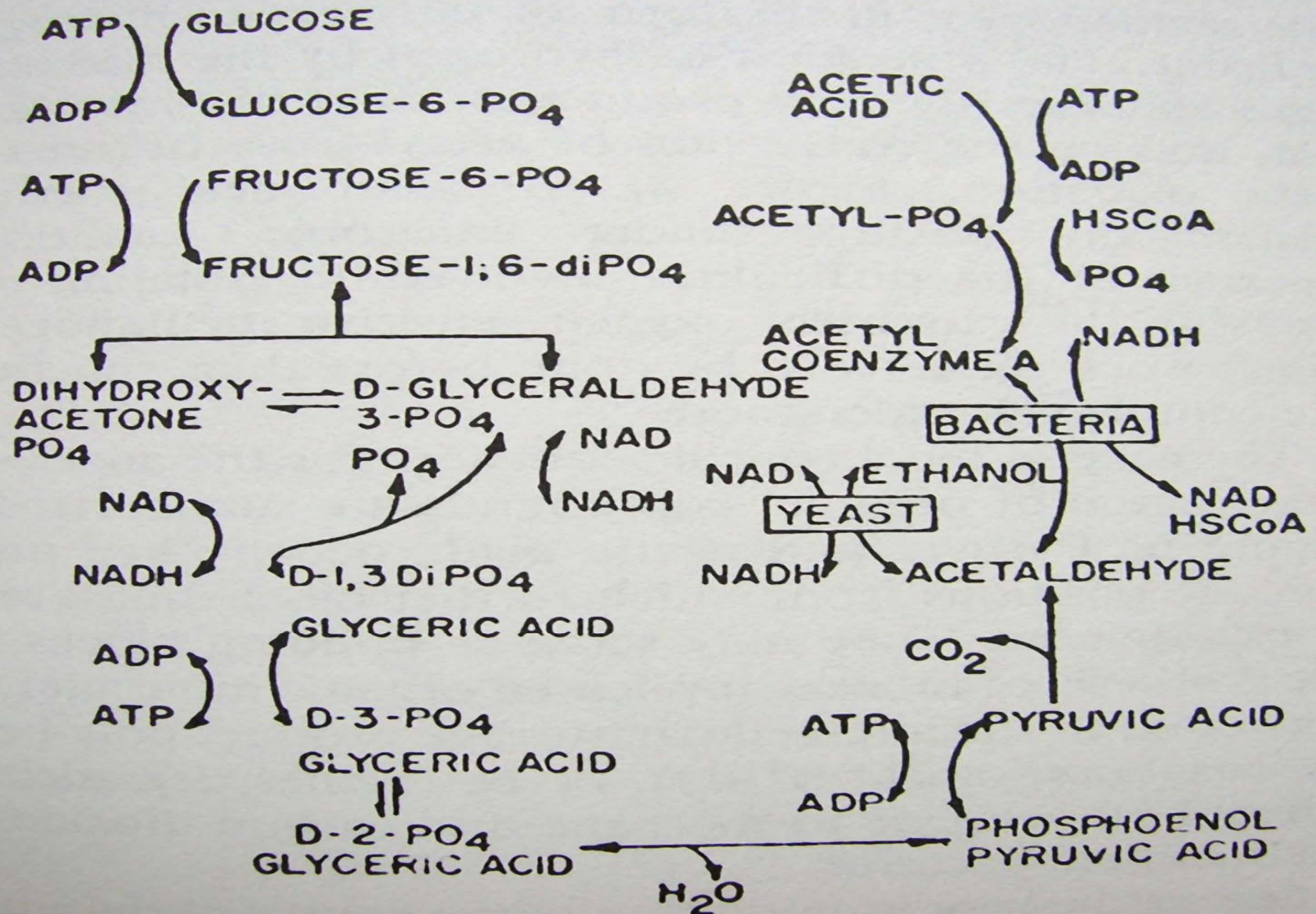
The sum of reactions which converts a wide array of substrate materials having carbon at various oxidation/reduction to one carbon molecules in the most oxidized (CO_2) and most reduced state

The Primary Metabolism Pathway



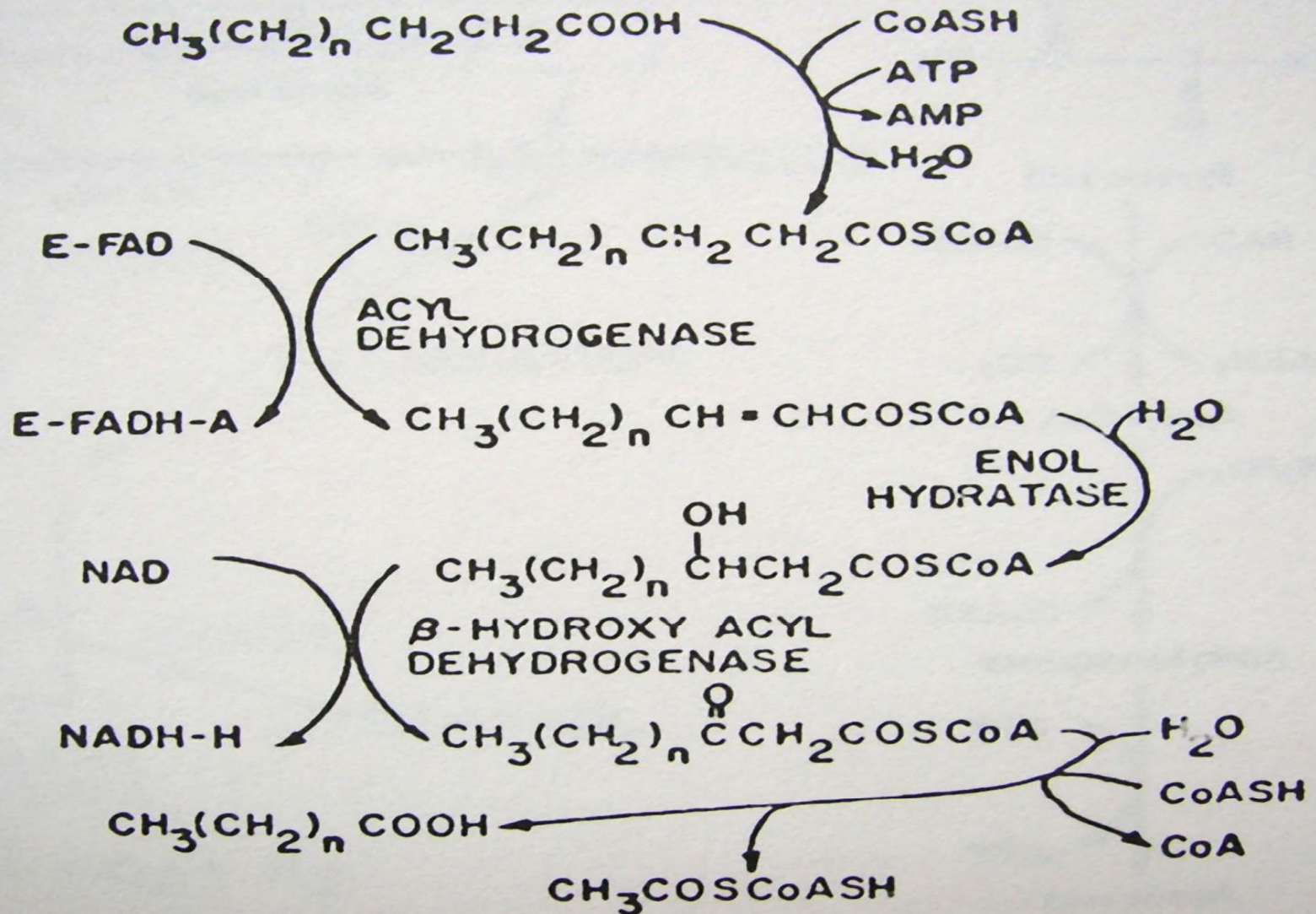
• Fase 2

Substrat Karbohidrat - Glikolisis



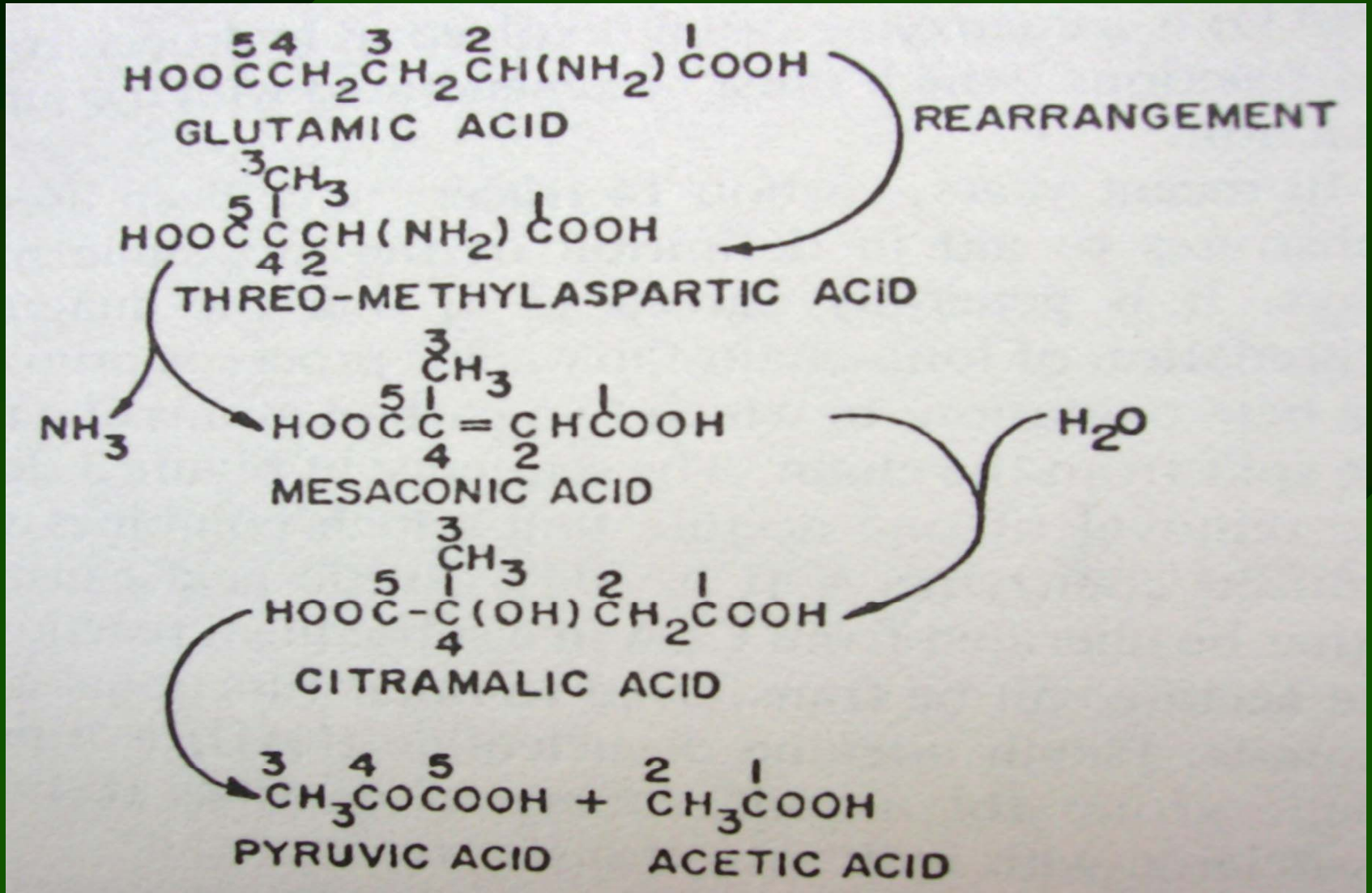
• Fase 2

Substrat Lemak - β -Oksidasi



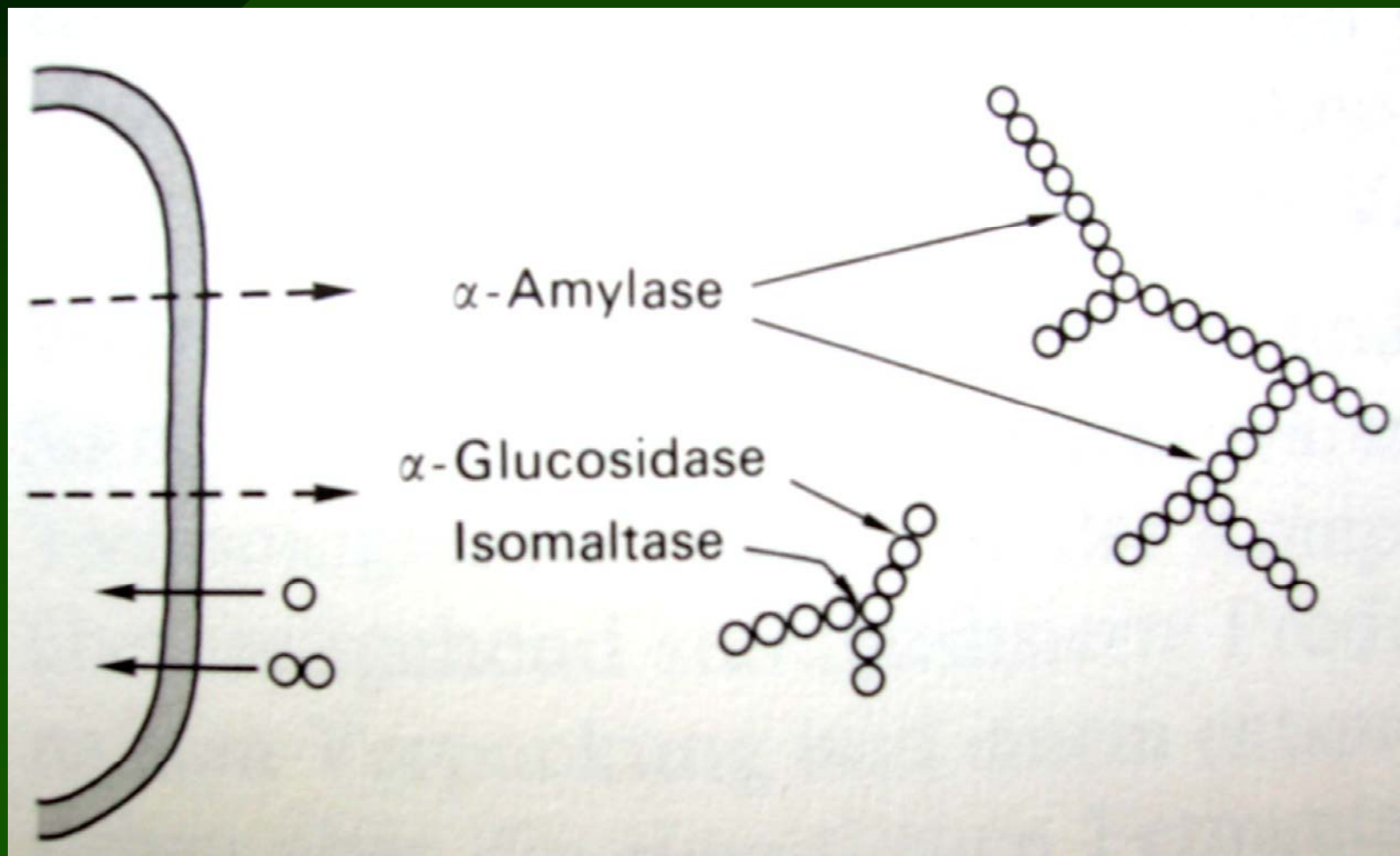
•Fase 2

Substrat protein



• Fase 1

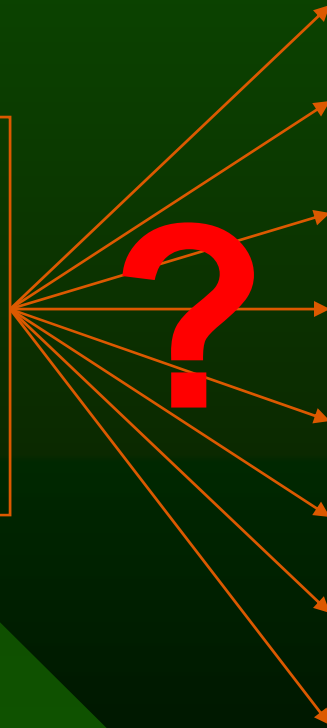
Extracellular Hydrolysis



• Fase 3

The organic end product of fermentation

Low molecular weight compounds
(intermediate compounds)



Gas Methan
Etanol - alkohol
Asam laktat
Asam cuka
Asam sitrat
Asam amino
?
?

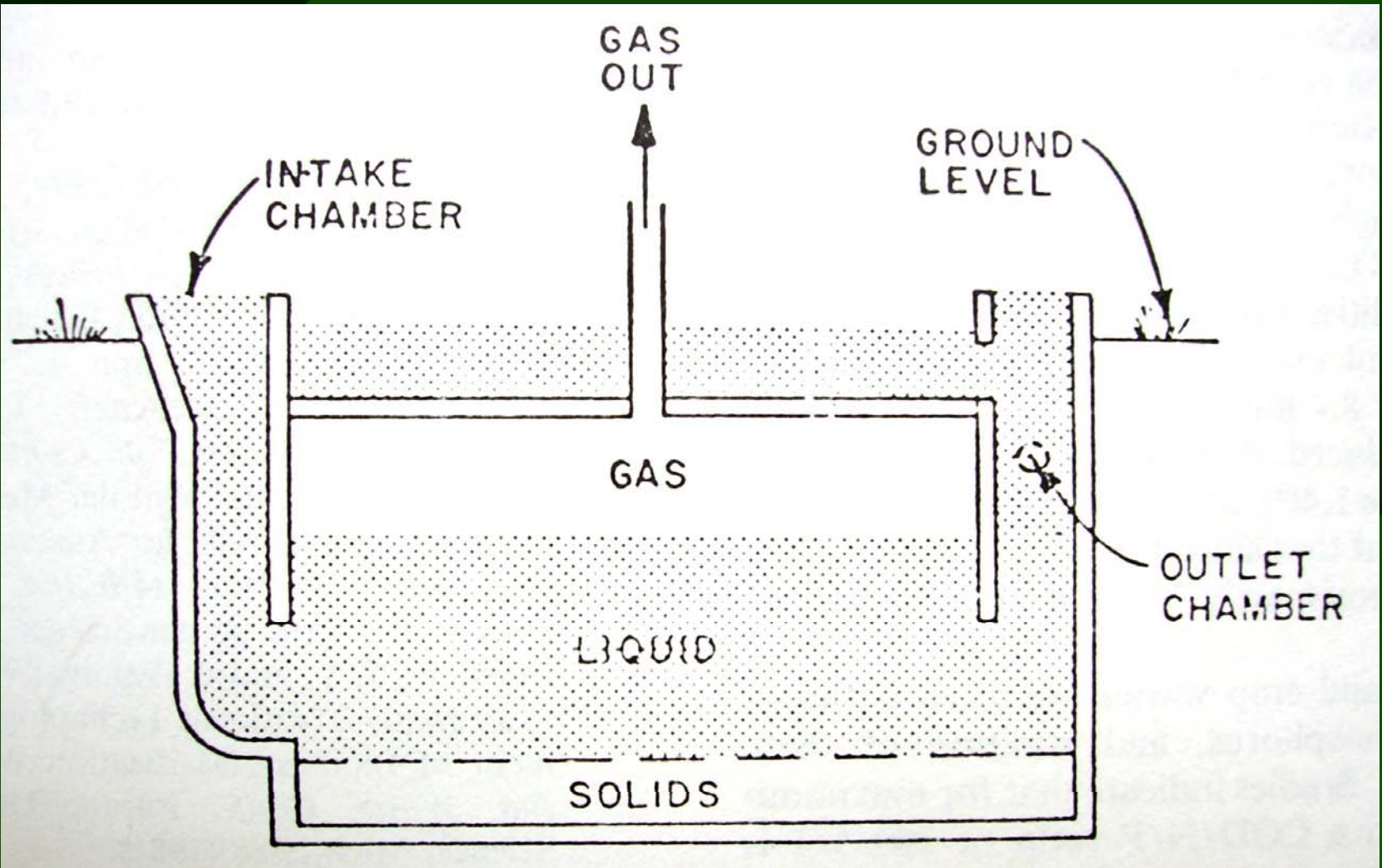
Produk, bahan baku, dan mikroorganism

No.	Produk Fermentasi	Bahan Baku	Mikroorganism
1.	Anggur/Wine	Anggur, apel, dan buah-buahan lain	<i>Saccharomyces sereviceae</i>
2.	Asam asetat	Wine,	<i>Acetobacter aceti</i> , <i>A. pateurianus</i> , <i>A. hansenii</i> , <i>Gluconobacter oxydans</i>
3.	Sayur masam	Kol dan sayuran sejenis	<i>Leuconostoc mesenteroides</i> , <i>Lactobacillus plantarum</i> , <i>L. brevis</i>
4.	Minyak olive	Buah olive	<i>Lactobacillus</i> , <i>Leuconostoc</i> , <i>Pediococcus</i>
5.	Jus sayuran	Bit, wortel, sayuran lain	<i>Streptococcus lactis</i> , <i>Lactobacillus casei</i> , <i>L. bavaricus</i>
6.	Coklat	Biji coklat	Hefen (jamur), bakteri asam susu dan asam asetat, <i>Bacillus</i>
7.	Kopi	Biji kopi	Enterobakterien, bakteri asam susu dan hefen.
8.	Kecap	Kacang kedelai, beras	<i>Aspergillus oryzae</i> , <i>Lactobacillus</i> , <i>Pediococcus</i> , <i>Zygosaccharomyces rouxii</i> , <i>Torulopsis</i>

No.	Produk Fermentasi	Bahan Baku	Mikroorganism
9.	Susu kental	Susu	<i>Streptococcus lactis</i> ssp. <i>cremoris</i> dan <i>diacetylactis</i> , <i>Leuconostoc meesenteroides</i> ssp <i>cremoris</i>
10.	Joghurt	Susu	<i>Streptococcus salivarius</i> ssp <i>thermophilus</i> , <i>Lactobacillus delbruckii</i> ssp <i>bulgaricus</i>
11.	Kefir	Susu	<i>Candidi kefir</i> , <i>Lactobacillus kefir</i> , <i>L. acidophilus</i> , <i>Streptococcus lactis</i> .
12.	Keju segar (lembek)	Susu	<i>Streptococcus salivarius</i> ssp <i>thermophilus</i> , <i>Lactobacillus delbruckii</i> ssp <i>bulgaricus</i>
13.	Keju Limburger	Susu	<i>Brevibacterium linens</i>
14.	Keju Camembert	Susu	<i>Penicillium caseicolum</i> , <i>P. camembertii</i> , <i>P. roquefortii</i>
15.	Keju keras (Emmentaler)	Susu	<i>Streptococcus salivarius</i> ssp <i>thermophilus</i> , <i>Lactobacillus helveticus</i> , <i>Propionibacterium freudenreichii</i>
16.	Sosis	Daging	<i>Lactobacillus</i> , <i>Staphylococcus</i> , <i>Micrococcus varians</i>
17.	Anchosen (ikan)	Ikan Hering, Sardine	<i>Staphylococcus</i>

Bioreactor - Gas

(Methanobacterium, Methanosarcinae, Methanotherix)



How it works?