

Q)

Cobalamin (Vitamin B₁₂)

{ Antipernicious
anemia Vitamin }

It is only synthesized by microorganisms & not animals or plants.

Chemistry - only vitamin with a complex structure.

Also called as "Cyanocobalamin"

consist of "Corrin ring" with "Co" in it.

- The corrin ring has 4 pyrrole rings just like porphyrin in which (A-D) are directly linked together whereas (B-C) are joined together by Methylated Bridge.
- Co atom coordinated state is (+2), it is bonded to 4 nitrogen of other pyrrole rings.
- The cobalt group also contain 1st substituent group located above the plane of corrin ring - they can be :-
 - 1 Cyanide in "Cyanocobalamin" (V_{12a})
 - 2 Hydroxyl in "Hydroxycobalamin" (V_{12b})
 - 3 Nitrite in "Nitrocobalamin" (V_{12c})
- Coenzymes - Methylcobalamin
- 5 - Deoxyadenosyl cobalamin

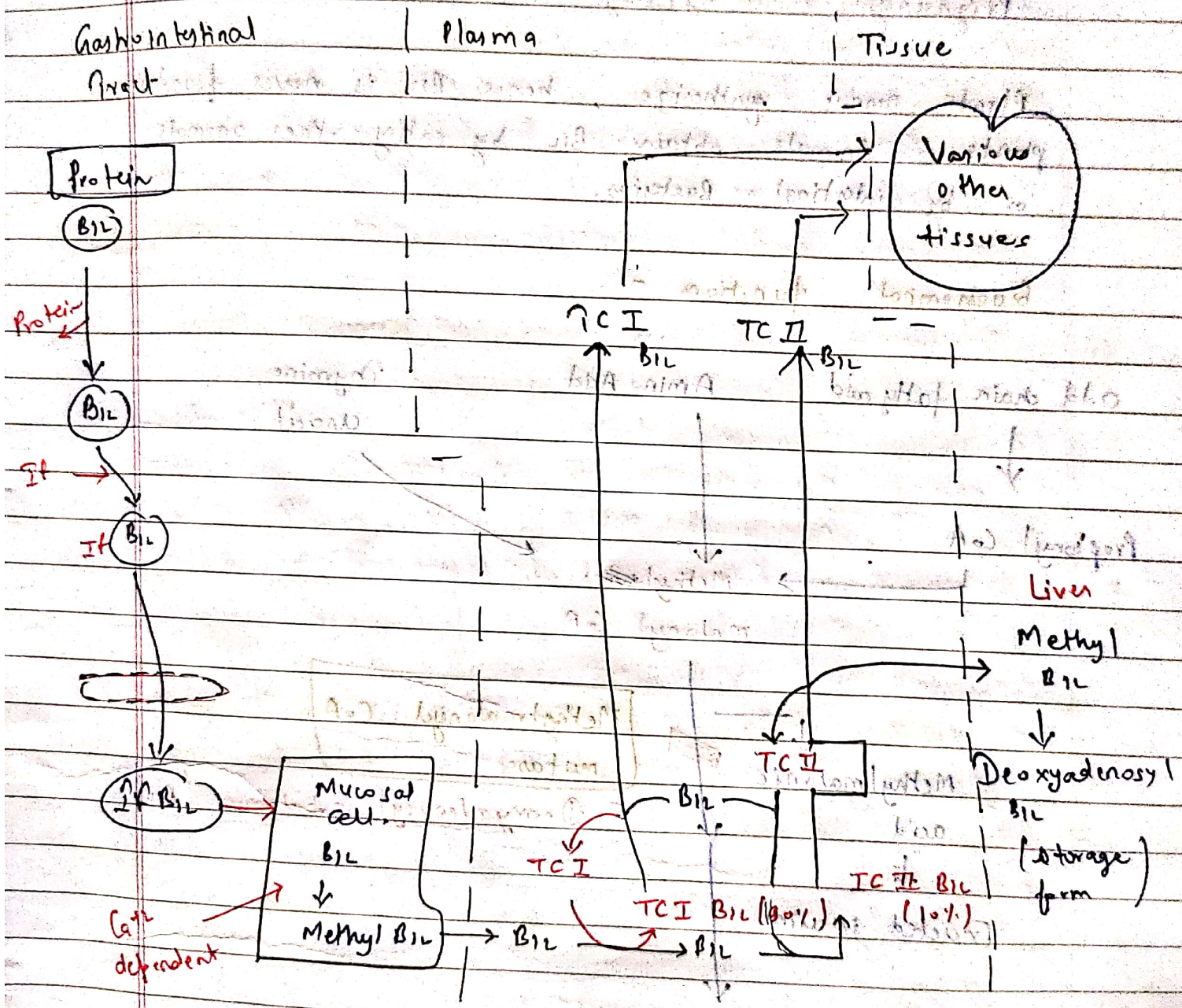
Absorption, transport & storage

- Vitamin B₁₂ is present in diet in bound form to proteins. It is liberated by the enzymes in stomach & binds to cobalophilin. In duodenum Cobalophilin B₁₂ is hydrolysed to release Vitamin B₁₂.

a protein
peaked
in
duodenum

The dietary source of B₁₂ is known as "Extrinsic factor of"

Castle The stomach secretes a special protein called "Intrinsic factor".



Sources

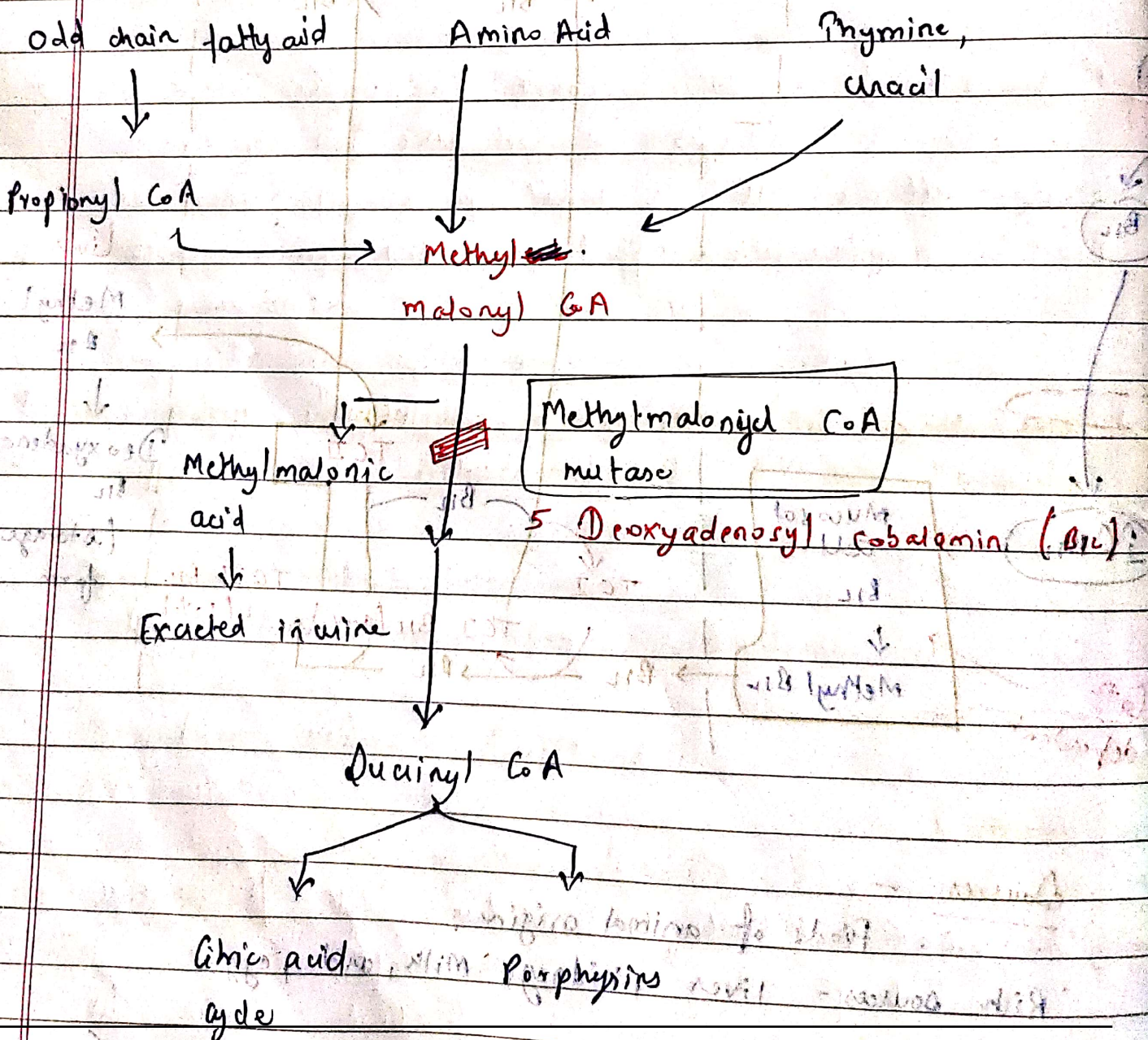
foods of animal origin.
 Rich sources - liver, kidney, milk, and eggs.

Milk better than ~~www.FirstRanker.com~~ Her Man Milk ✓

RDA
 Adult = 1-2 $\mu\text{g/day}$
 Children = 0.5-1.5 $\mu\text{g/day}$
 Pregnancy = 3 $\mu\text{g/day}$

Plants cannot synthesize, hence B12 is never found in plants. Animals obtain B12 by eating other animals or by intestinal Bacteria.

Biochemical functions -



Deficiency symptoms -

- Pernicious Anemia - Characterised by low Hb levels, decreased no. of erythrocytes & neurological manifestation.
 - a) Autoimmune destruction of gastric parietal cells that secrete intrinsic factor.
 - b) Hereditary malabsorption of vitamin B₁₂.
 - c) Partial or total gastrectomy these individual become B₁₂ deficient.
 - d) Dietary deficiency found in strict vegetarians.
- * Pernicious anemia is more a defect of stomach than due to a defici of Vit B₁₂.

MCC B₁₂ deficiency is also associated with neuronal degeneration & vitamin B₁₂ deficiency of nervous system.

Symptoms - Numbness of fingers, loss of memory etc.

1. The biosyn of fatty acid required for myelin is impaired because Methylmalonyl CoA acts as a competitive inhibitor of Malonyl CoA in FA-syn.
2. Methylmalonyl CoA can substitute malonyl CoA in FA syn, ∴ disturbed FA syn.
3. The excretion of methylmalonic acid in urine & estimation of serum B₁₂ level are used to assess B₁₂ deficiency.

Treatment -

Vit B₁₂ Administered intramuscularly; folic acid administration can also reverse hematological abnormalities observed in B₁₂ defi. However, neurological symptoms persist, ∴ Vit B₁₂ + folate is given to patients suffering from Megaloblastic anemia.