SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr M.G.R Medical University, Chennai

DEPARTMENT OF CARDIAC TECHNOLOGY

COURSE NAME: BIOCHEMISTRY

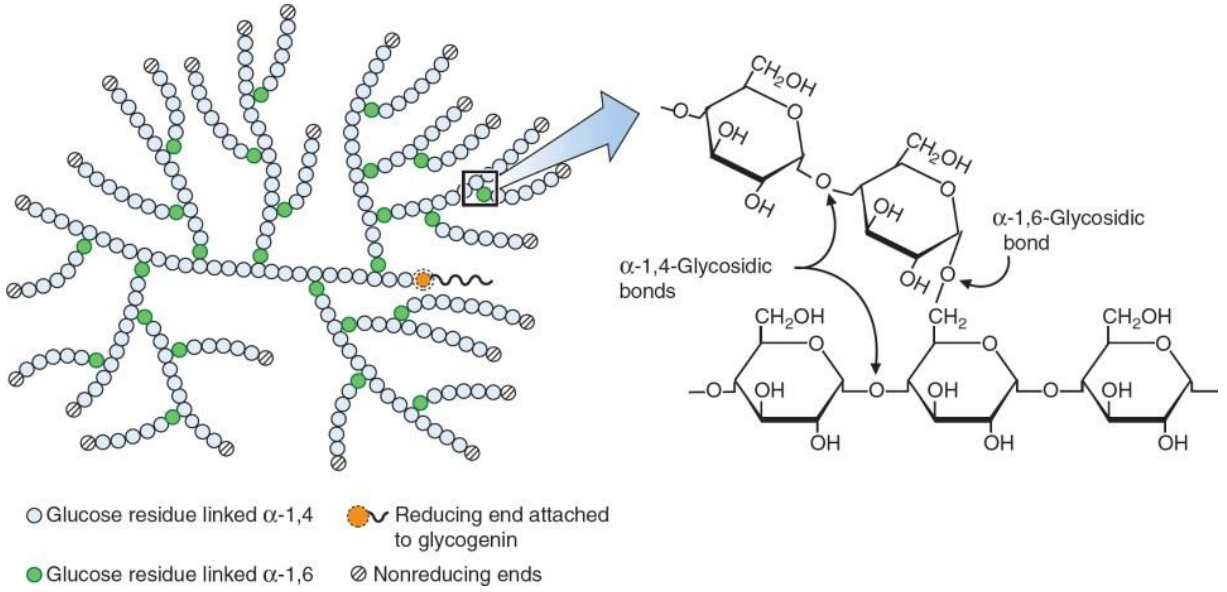
UNIT : 1

TOPIC : GLYCOGEN METABOLISM

FACULTY NAME: MITHRA V

GLYCOGEN

- Branched polysaccharide of glucose, serving as primary energy storage in animals and fungi.
- It is stored mainly in the liver (6-8%) and muscles (1-2%), with smaller amounts in the kidney, brain (astrocytes), and blood cells.
- It acts as a glucose reserve for maintaining blood sugar levels
- Provides energy during exercise or fasting.



FUNCTIONS OF GLYCOGEN

- **Liver**: Releases glucose to maintain blood sugar levels.
- **Muscles**: Provides energy for muscle activity.
- **Brain**: Stores glycogen in astrocytes, mobilized upon waking.
- **Other tissues**: Supports energy needs in kidneys, blood cells, and embryonic development.

HORMONAL REGULATING GLYCOGEN METABOLISM

- It primarily involves insulin and glucagon.
- Insulin promotes **glycogen synthesis** (glycogenesis),
- Insulin achieves this by promoting the dephosphorylation of glycogen synthase
- While glucagon stimulates **glycogen breakdown** (glycogenolysis).
- Glucagon activates glycogen phosphorylase, the enzyme that breaks down glycogen.

GLYCOGENESIS (SYNTHESIS)

- Converts glucose to glycogen for storage in liver and muscles when glucose levels are high (e.g., after meals).
- **Key enzymes:**

i) Glucokinase/hexokinase (forms glucose-6-phosphate),

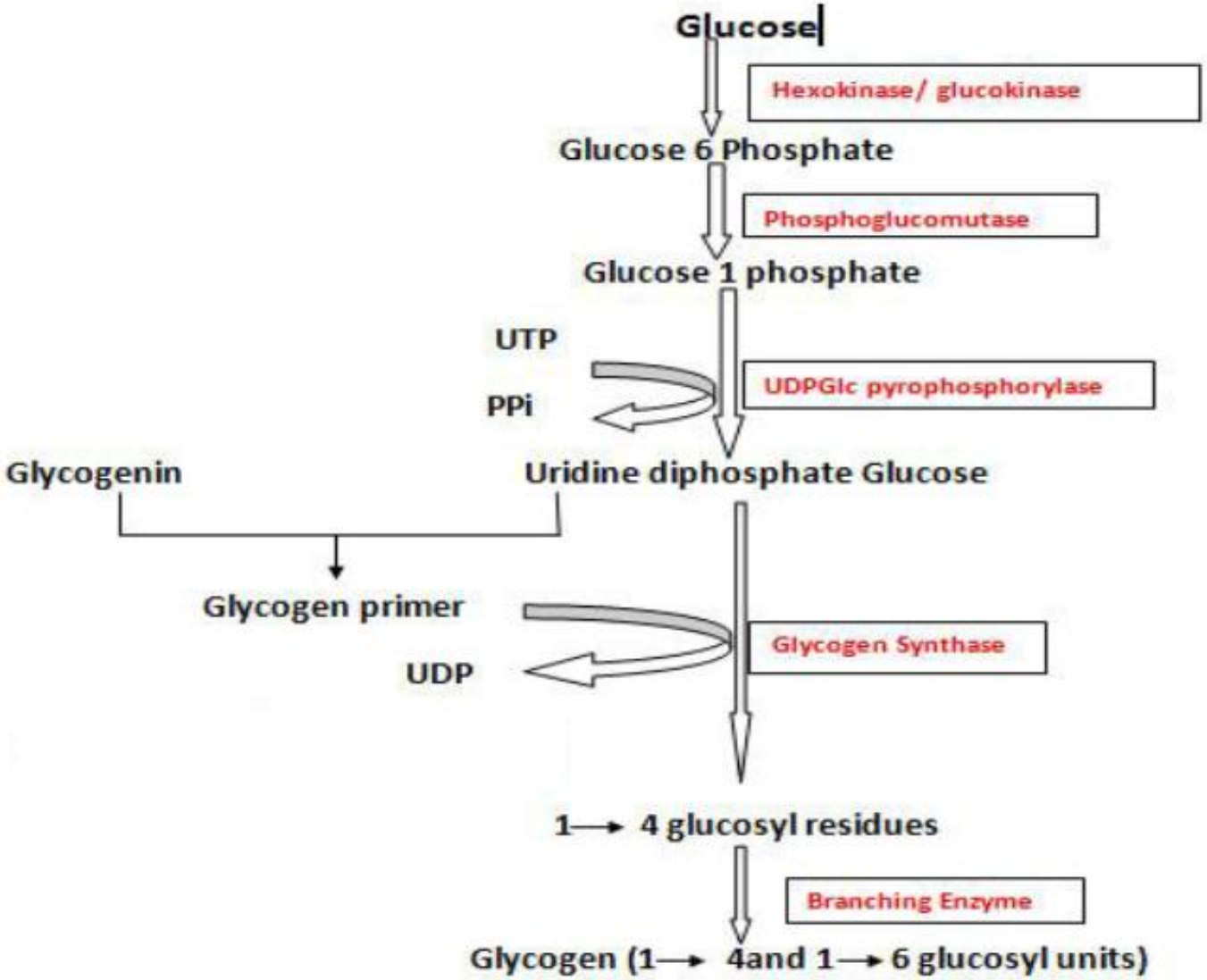
ii) Phosphoglucomutase (converts to glucose-1-phosphate),

iii) Glycogen synthase (adds glucose to glycogen chain).

iv) Uridine triphosphate (UTP) provides energy, forming UDP-glucose.

- Branching enzyme creates α-1,6 glycosidic bonds for glycogen branching.
- Regulation of glycogenesis - Key enzyme of Glycogenesis- **Glycogen Synthase**

Glycogenesis steps



GLYCOGENOLYSIS (BREAKDOWN)

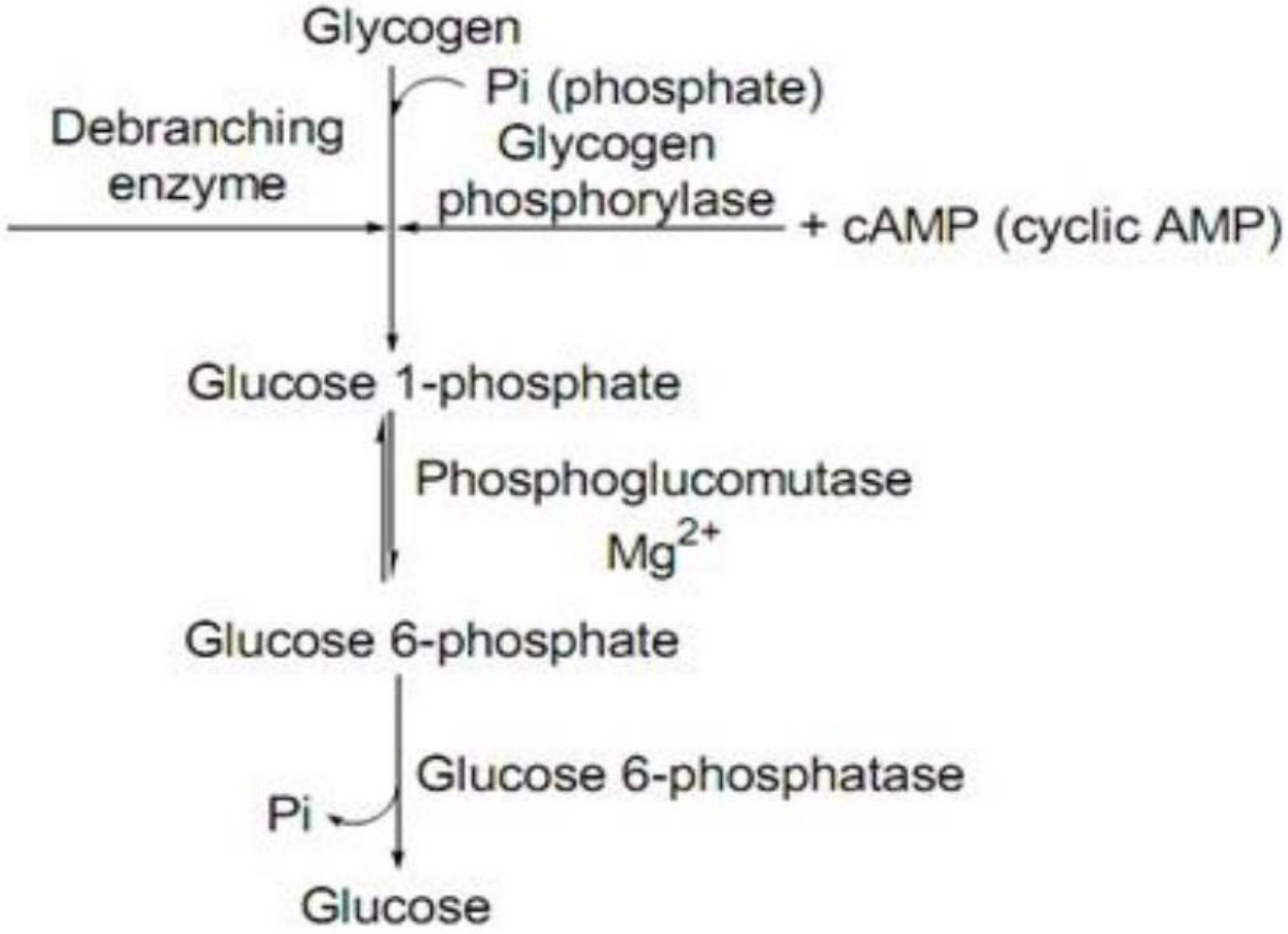
- Breaks glycogen into glucose when levels are low (e.g., fasting or exercise).
- **Key enzymes:**

i) Glycogen phosphorylase (releases glucose-1-phosphate),

ii) Phosphoglucomutase (converts to glucose-6-phosphate),

iii) Glucose-6-phosphatase (hydrolyzes to free glucose in the liver).

- Regulation of Glycogenolysis - Key enzyme of Glycogenolysis- **Glycogen Phosphorylase**


Glycogen
Pi (phosphate)
Debranching enzyme
Glycogen phosphorylase
+ cAMP (cyclic AMP)
Glucose 1-phosphate
Phosphoglucomutase
Mg^{2+}
Glucose 6-phosphate
Glucose 6-phosphatase
Pi
Glucose

REFERENCES

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THANK YOU