



Medical Committee
The University of Jordan



SLIDE



SHEET

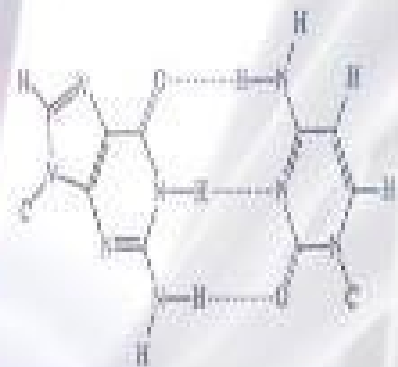


SLIDE : 6- regulation



DR.NAME: Dr. Nayef

Biochemistry



Majida Al-Foqaraa'

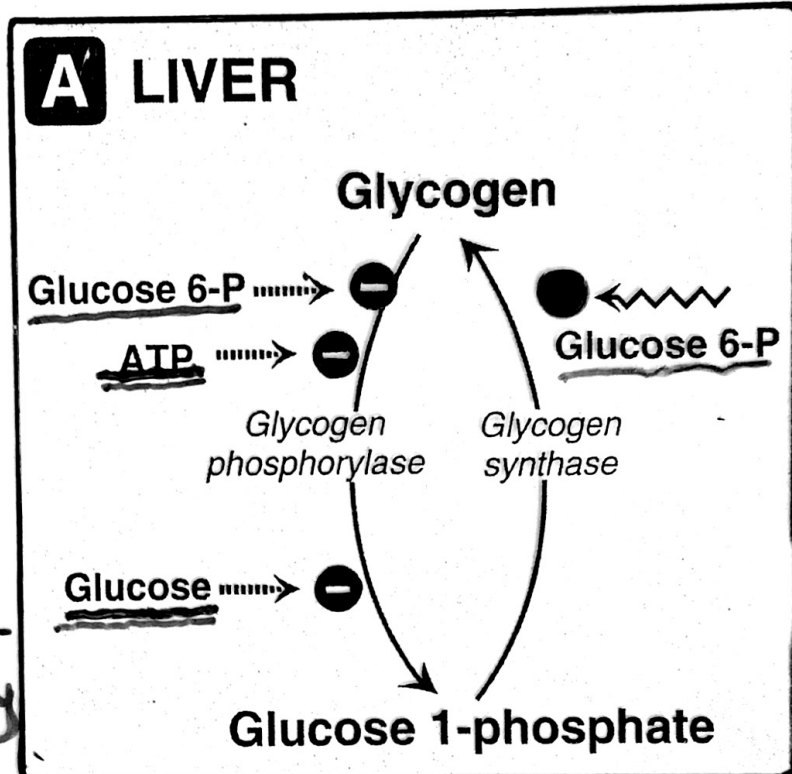
Regulation of Glycogen Synthesis and Degradation

A. Allosteric Regulation

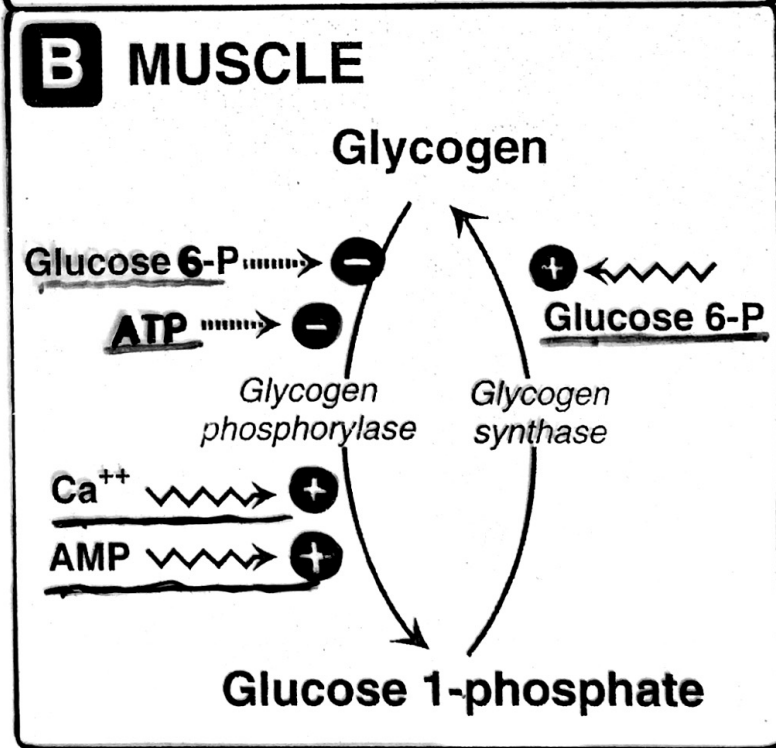
- During Well-fed state
 $\text{Glu} \uparrow$, $\text{G6P} \uparrow$
 $\text{ATP} \uparrow$

- Activation of glycogen degradation in muscle by Ca^{2+}

- Activation of Glycogen degradation in muscle by 5-AMP

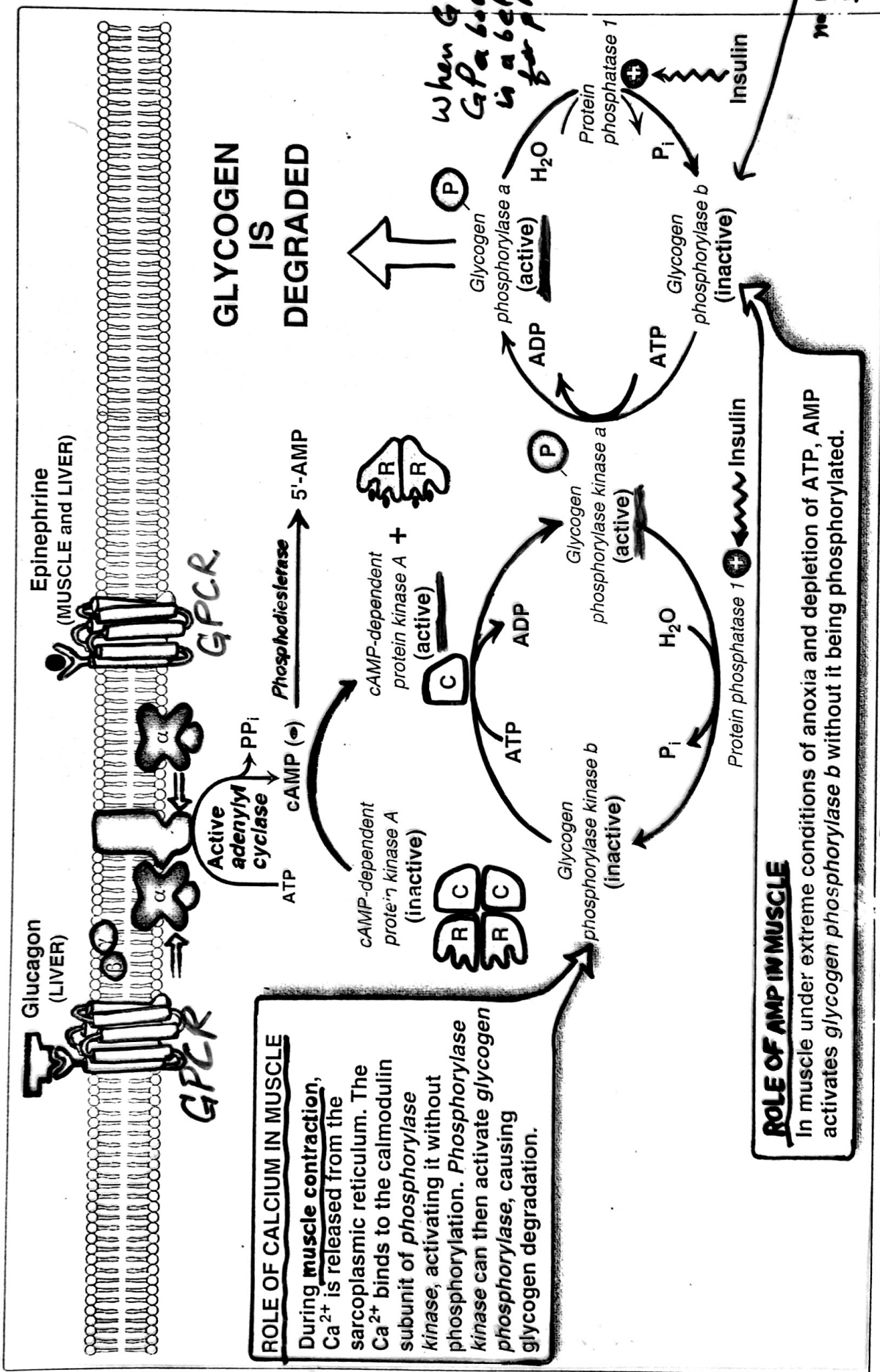


Well fed :-
 synthesis \uparrow
 Degradation \downarrow
 High Energy
 $H^+ \rightleftharpoons [S] = \text{Glu}$
Fasting :-
 Synthesis \downarrow
 Degradation \uparrow
 (low energy, low glu)



Exercise :-
 Degradation \uparrow

Activation of Glycogen Degradation by cAMP-directed Pathway

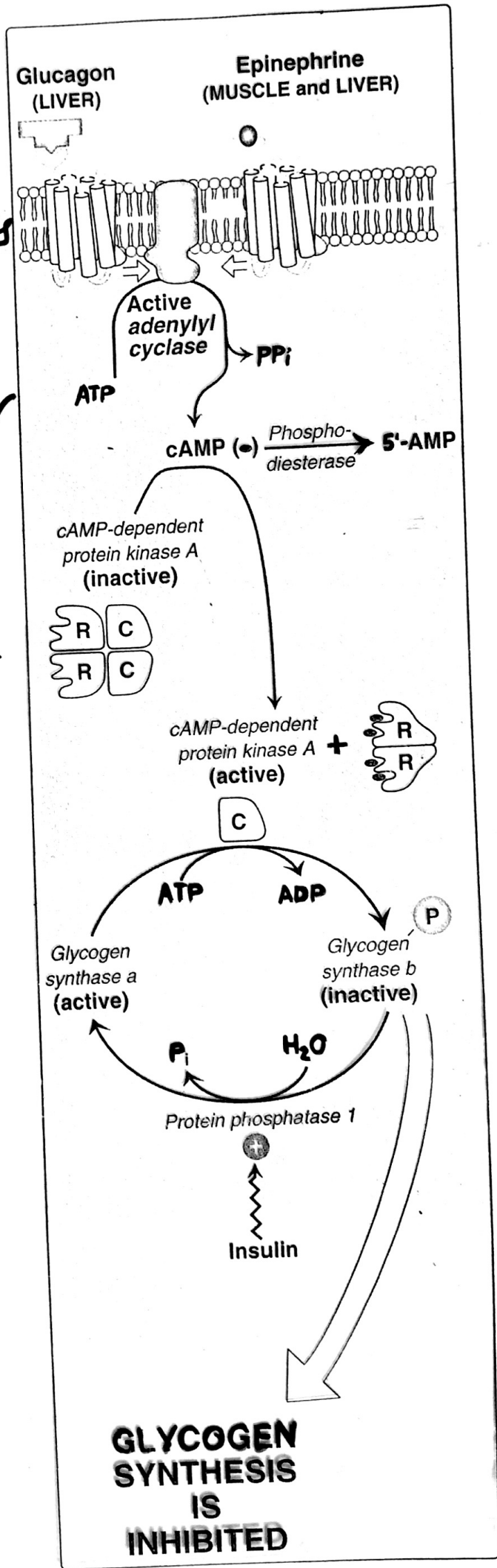


- 1- Activation of Protein Kinase A
- 2- Activation of Phosphorylase Kinase
- 3- Activation of Glycogen Phosphorylase

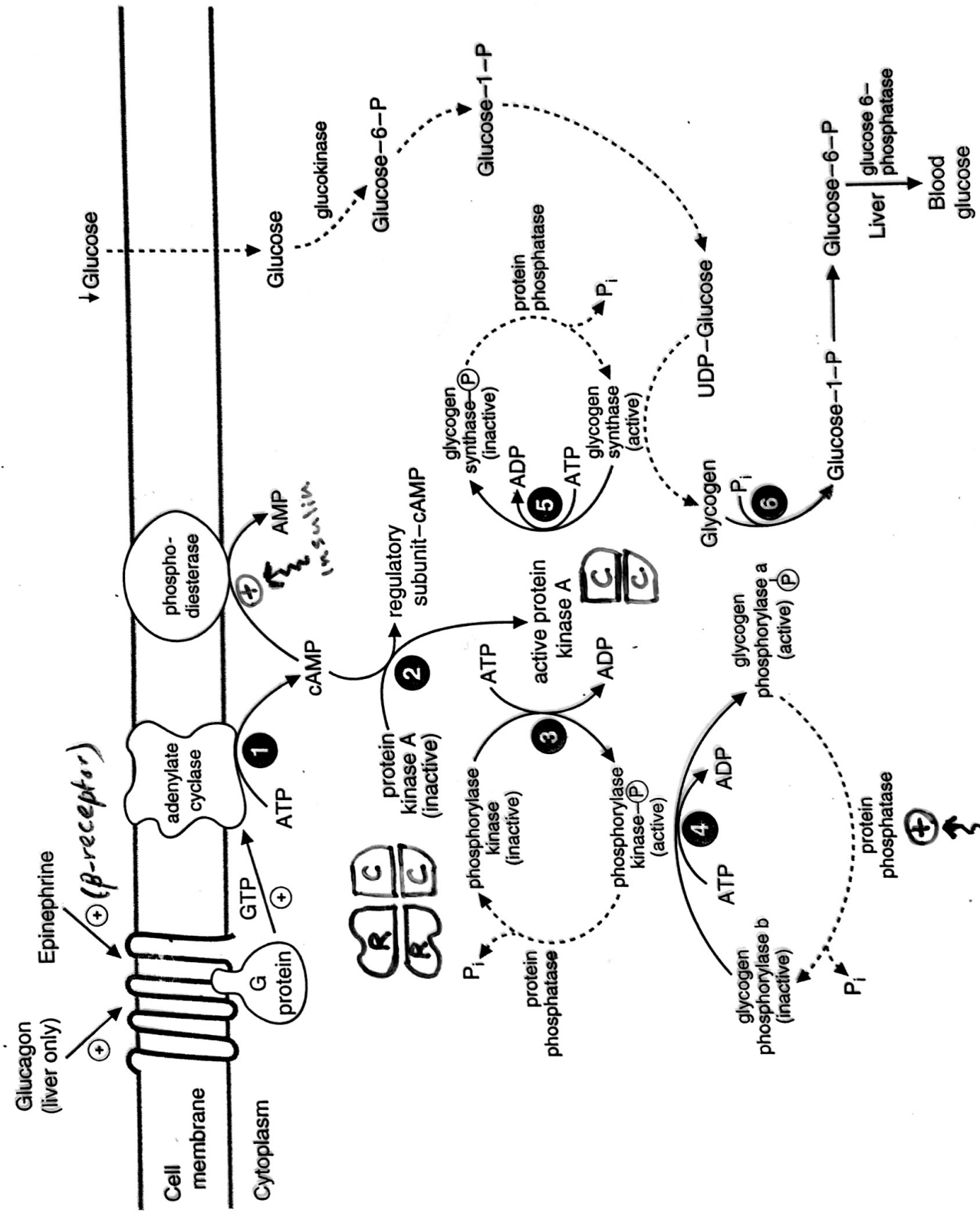
Hormonal Regulation of Glycogen Synthesis

- Inhibition by C-AMP mediated process

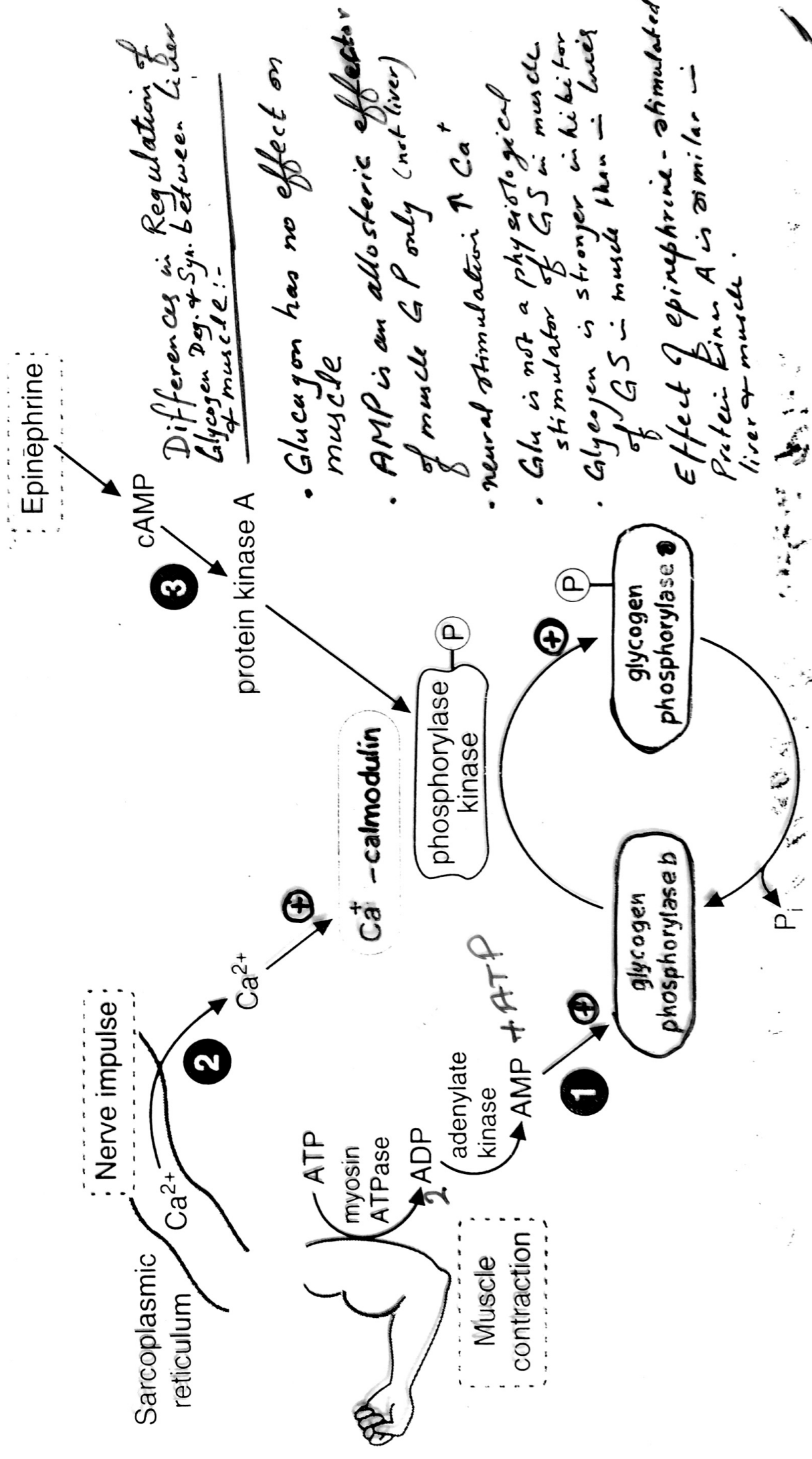
- Inhibition by other Protein Kinases (CAMP independent)



Regulation of Glycogen Synthesis and Degradation in the Liver:-



Activation of Muscle Glycogen Phosphorylase During Exercise



Differences in Regulation of Glycogen Deg. & Syn. between Liver & muscle:-

- Glucagon has no effect on muscle
- AMP is an allosteric effector of muscle G P only (not liver)
- neural stimulation \uparrow Ca^{2+}
- Glu is not a physiological stimulator of G S in muscle
- Glycogen is stronger inhibitor of G S in muscle than in liver
- Effect of epinephrine - stimulated Protein Kinase A is similar in liver & muscle.

Calmodulin mediates many effects of intracellular Ca^{2+}

Epinephrine \rightarrow α -agonist receptor
 \rightarrow \uparrow phospholipase C

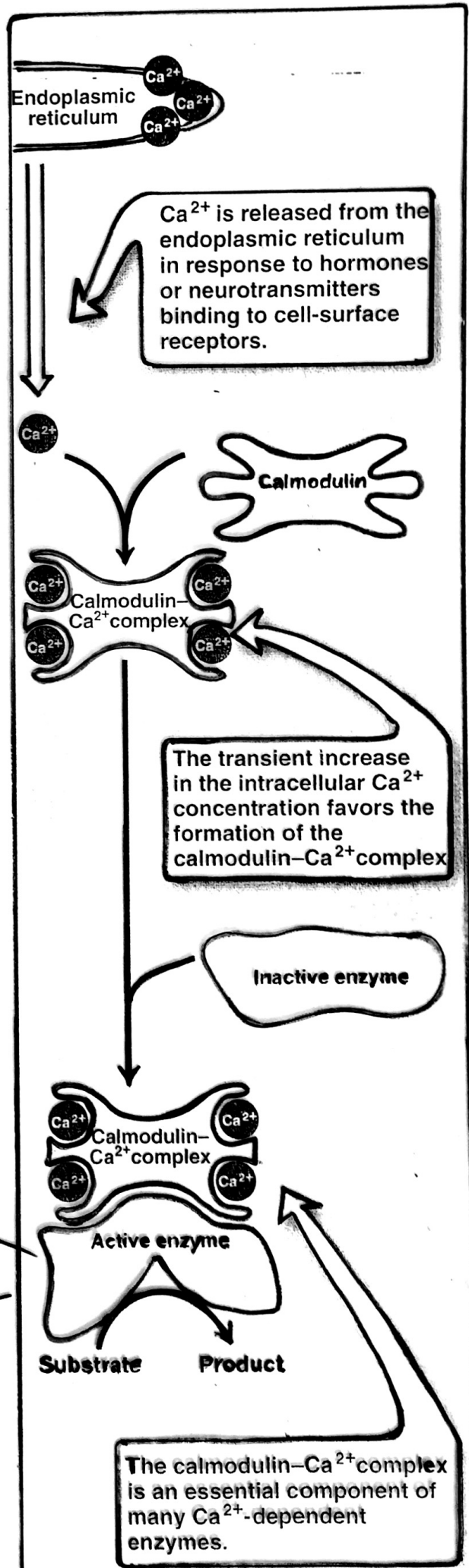
PIP_2 $\xrightarrow{\text{phospholipase C}}$ \rightarrow DAG
 \rightarrow IP_3

$IP_3 \rightarrow E.R. \rightleftharpoons Ca^{2+}$

Ca^{2+} also activate protein kinase C

Calmodulin-dependent protein kinase

phosphorylase kinase



Regulation of Glycogen Synthesis and Degradation by Epinephrine and Ca^{2+} in the Liver

