CONCEPT: LIVER VS MUSCLE GLYCOGEN PHOSPHORYLASE

Allosteric Regulation of Liver Glycogen *Phosphorylase a*

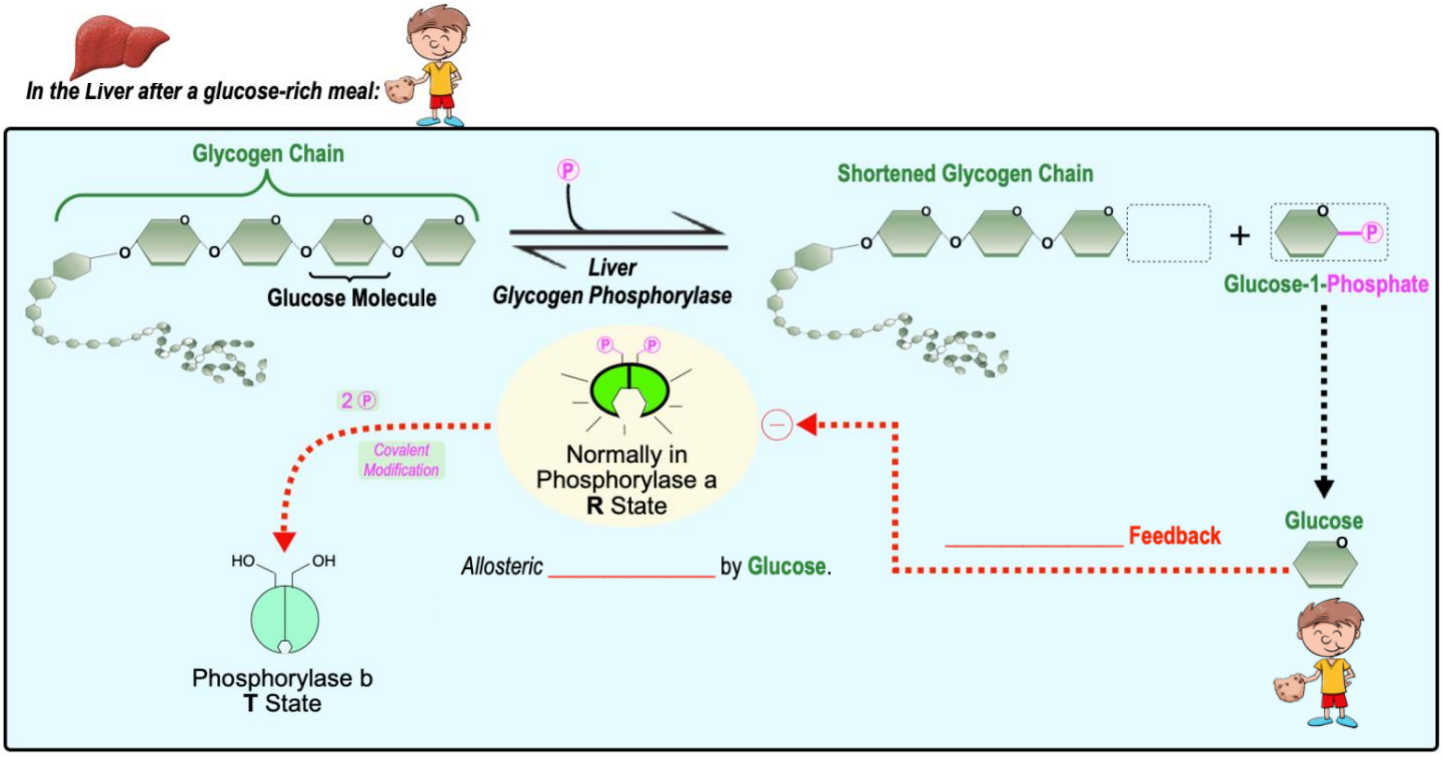
●Role of *glycogen breakdown* in the _____: to form glucose for export to *other tissues* when blood glucose is _____.

□ Therefore, in the Liver, the "default" glycogen phosphorylase is *phosphorylase* ____.

□ *Phosphorylase a*: stay _____ & keep providing glucose to *other tissues* unless allosterically *signaled* to stop.

●If blood [glucose] is _____, *glucose* acts as an *allosteric* _____ to *phosphorylase a* (*negative feedback*).

□ *Liver phosphorylase a* only reverts back to its *inactive* __ *state* when it already detects sufficiently *high* [glucose].



PRACTICE: A patient comes into your clinic suffering from anorexia nervosa. Her mother brought her in concerned as the patient has not eaten in over 3 days. She has the classic presentation including low body weight, decreased muscle mass, decreased glycogen, and decreased fat stores, and she is anemic (low red blood cell count). What would be the expected phosphorylation state and activity of the patient's liver glycogen phosphorylase?

a) Phosphorylated & active.
b) Dephosphorylated & active.
c) Phosphorylated & inactive.
d) Dephosphorylated & inactive.

CONCEPT: LIVER VS MUSCLE GLYCOGEN PHOSPHORYLASE

Allosteric Regulation of Muscle Glycogen *Phosphorylase b*

●Role of *glycogen breakdown* in _____ tissues: to form glucose/energy for itself *ONLY* during a *muscle contraction*.

□ Therefore, in *muscle tissues*, the "default" glycogen phosphorylase is *phosphorylase* ____.

□ *Phosphorylase b*: stay _____ unless allosterically *signaled* to create energy for a *muscle contraction*.

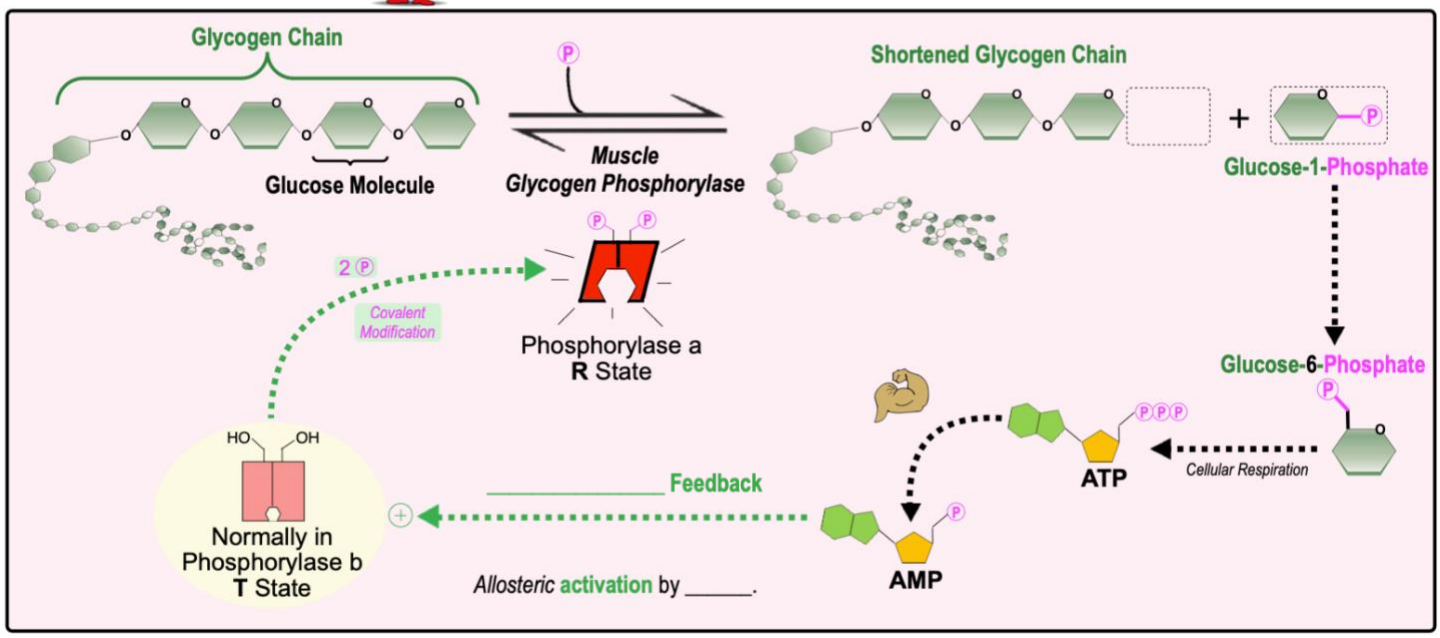
●Muscle phosphorylase: *sensitive* to regulation by G6P, ATP & AMP due to drastic energy changes during contraction.

□ ___ [G6P] & [ATP] indicate ___ energy (relaxation). □ ___ [AMP] indicates ___ energy (contraction).

●During contractions (*depleting energy* in cell), resulting *AMP allosterically* _____ *phosphorylase b* (+ *feedback*).

□ *Muscle phosphorylase b* only reverts to its *active* ____ *state* when it detects *low* energy due to contractions.

During Intense Muscle Contraction:



●During relaxation (*energy build-up* in cell), resulting G6P & *ATP allosterically* _____ *phosphorylase b* (**-** *feedback*).

●Liver phosphorylase: *insensitive* to regulation by G6P, ATP, & AMP since liver does not undergo drastic energy changes.

PRACTICE: Muscle glycogen phosphorylase displays multiple modes of allosteric regulation. Which of the following is true?

a) AMP promotes conversion of R to T state.
b) ATP favors the conversion of the T to R state.
c) G6P promotes conversion of the T to R state.
d) If ATP is needed, phosphorylation converts the enzyme from the phosphorylase b to the phosphorylase a form.
e) Phosphorylation is mediated by phosphoprotein phosphatase 1.