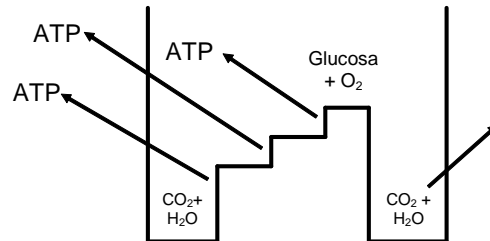


## Supplemental material 2: Quizzes

### Question in the 2009 exam

The following box represents the oxidation of glucose to  $\text{CO}_2$  and  $\text{H}_2\text{O}$



- In this reaction, which have more entropy, reactants or products?
- What is produced on the right path and is represented by an arrow?
- Represent the activation energy in the box for both, the left and right paths.
- What would you do to guide the reaction through the right path
- Mention three steps in the left path where the free energy is used to produce ATP

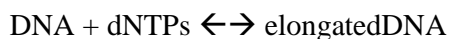
### Question in the 2010 exam

The reaction  $\text{glucogen} + \text{Pi} \rightarrow \text{glucose-1-phosphate}$  (catalyzed by the glucogen phosphorylase) has a slightly positive  $\Delta G^\circ$  (+1 kcal/mol)

- Represent with a box the reaction in hepatocytes in the presence of insulin.
- Represent with a box the reaction in hepatocytes in the absence of insulin and the presence of glucagon.

### Question in the 2011 exam

The telomerase is a retrotranscriptase that elongates the chromosome ends. This enzyme has a sort RNA sequence in its structure.



-Represent this reaction with a box in the presence and in the absence of telomerase

-Answer the following questions

- The telomerase decreases the activation energy of the reaction only when a dNTP complementary to its own RNA enters into the active center of the enzyme (true?) ...
- The telomerase alters the  $\Delta G^\circ$  of the reaction only when a dNTP complementary to its own RNA enters into the active center of the enzyme (true?)....
- The information used for the telomerase to elongate the DNA ends is coded in its RNA (true?)....

d) If the activation energy of the reaction were zero, the chromosomes would be elongated with random sequences in the presence or absence of telomerase (true?)....

### Questions in the pre-post test

#### PRE

The following is an endothermic reaction. Decide which of the following sentences are true or false



- a- An enzyme that catalyses this reaction will increase the amount of B in the equilibrium
- b- If the activation energy of the reaction is decreased, the amount of B in the equilibrium will increase
- c- If a reaction that consumes B is included in the system, A will be also consumed
- d- An increase of temperature will cause a decrease of A in the equilibrium
- e- Before reaching the equilibrium, an increase of temperature will cause an increase of the reaction rate of conversion of A in B.
- f- The temperature increases the reaction rate by decreasing the activation energy
- g- The temperature increases the reaction rate of this reaction only because it is endothermic
- h- An enzyme that catalyses this reaction increases the reaction rate because it decreases the activation energy.

#### POST

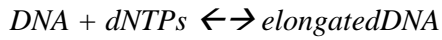
The following is a reaction with a positive  $\Delta G^\circ$ . Select the combination of  $\Delta S^\circ$  and  $\Delta H^\circ$  that you prefer and represent the reaction with a box. Include in the box the activation energy. According to the box chosen, decide which of the following sentences are true or false



- a- An enzyme that catalyses this reaction will increase the amount of B in the equilibrium
- b- If the activation energy of the reaction is decreased, the amount of B in the equilibrium will increase
- c- If a reaction that consumes B is included in the system, A will be also consumed
- d- An increase of temperature will cause a decrease of A in the equilibrium
- e- Before reaching the equilibrium, an increase of temperature will cause an increase of the reaction rate of conversion of A in B.
- f- The temperature increases the reaction rate by decreasing the activation energy
- g- The temperature increases the reaction rate of this reaction only when  $\Delta H$  is positive
- h- An enzyme that catalyses this reaction increases the reaction rate because it decreases the activation energy

**Criteria for the classifications of answers for the question in Fig. 7 (“2011-box”)**

*The telomerase is a retrotranscriptase that elongates the chromosome ends. This enzyme has a sort RNA sequence in its structure.*



*-Represent this reaction with a box in the presence and in the absence of telomerase*

Correct answers

Boxes showing products with lower H and lower S. The difference between the boxes in the presence and absence of telomerase should be only in the activation energy.

Wrong answers

Boxes that fail to represent the difference of H and S between reagents and products and that fail to identify that the enzyme cannot change the box shape, but only the activation energy.

“On the right track” answers

Boxes with defects on the representation of  $\Delta H$  or  $\Delta S$ , but with a correct change in the activation energy in the presence of telomerase.

Boxes with a correct shape, but with wrong changes in the box in the presence and absence of the enzyme (for example, an increase of S in products).