Hi friend, this isn't the best pdf because I used Ctrl+P on CCLE, which means that some questions are cut off and there is cursed text in places. Just ignore the cursed text, and try your best to understand. All answers present are correct.

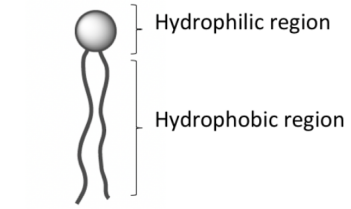
Started on	Friday, 24 April 2020, 4:23 PM PDT
State	Finished
Completed on	Friday, 24 April 2020, 4:42 PM PDT
Time taken	19 mins 17 secs

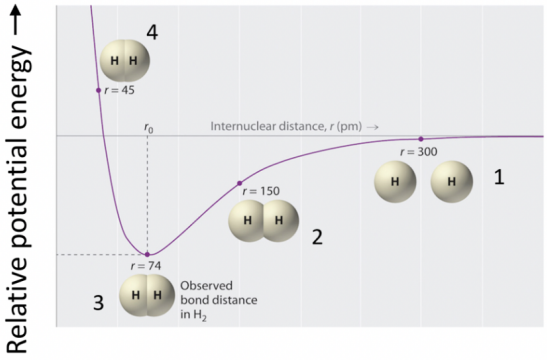
Information

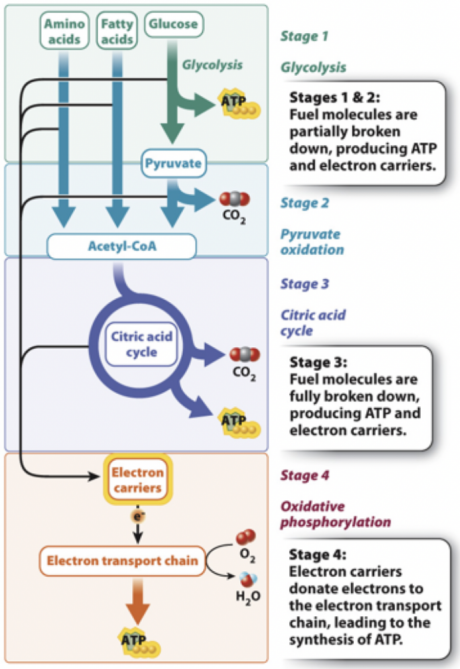
In addition to the figures associated with different problems throughout the exam, you may refer to the following figures if you find them useful:

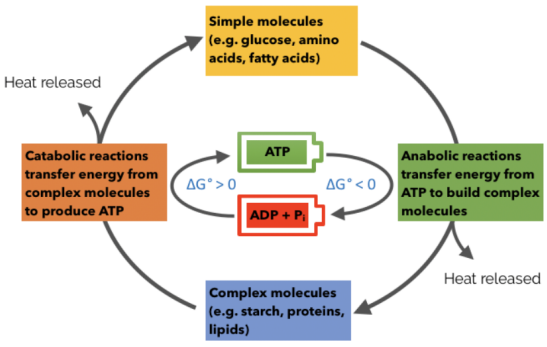
$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$$

$$\Delta G = \Delta G^o + RT \ln Q$$

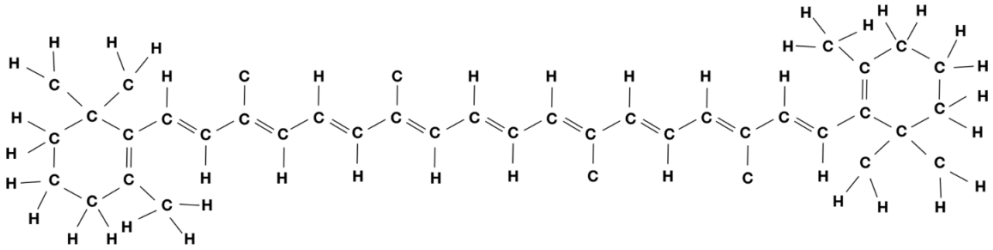




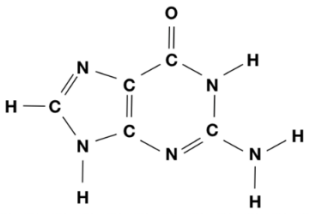




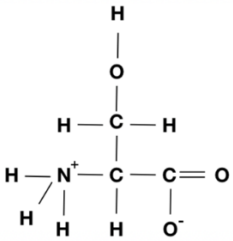
additional hydrogen atoms not shown in the diagrams.



Beta-Carotene, an orange pigment that is found in carrots and other vegetables and converted to Vitamin A inside your body.



Guanine, a nitrogenous base found in DNA



Serine, an amino acid found in proteins

Question 1
Correct
Points out of 1.50

Which of these molecules can form hydrogen bonds with water?

Select one:

- a. Beta-carotene
- b. Guanine
- c. Serine
- d. More than one of the above ✔
- e. None of the above

Question 2
Correct
Points out of 1.50

Which of these molecules could form Van der Waals interactions with another identical molecule?

Select one:

- a. Beta-carotene
- b. Guanine
- c. Serine
- d. More than one of the above ✔
- e. None of the above

Question 3
Correct
Points out of 1.50

Which of these molecules would be least likely to cross a pure lipid bilayer (no transport proteins are involved)?

Select one:

- a. Beta-carotene
- b. Guanine
- c. Serine ✔
- d. More than one of the above
- e. None of the above

Correct

Points out of 1.50

Select one:

- a. Beta-carotene ✔
- b. Guanine
- c. Serine
- d. More than one of the above
- e. None of the above

Question 5

Correct

Points out of 1.50

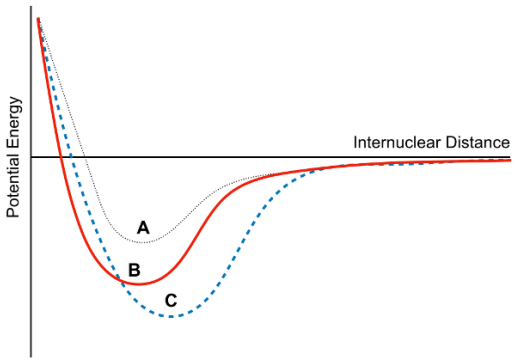
T/F: Beta-carotene contains only nonpolar covalent bonds.

Select one:

- a. True ✔
- b. False

Information

[Questions 6-9] The graph shows the potential energy changes associated with three different pairs of atoms (A, B, and C). Use these diagrams to answer questions 6-9.



Question 6

Correct

Points out of 1.50

Which curve represents the atom pair that forms a bond with the largest distance between atoms?

Select one:

- a. Curve A
- b. Curve B
- c. Curve C ✔
- d. It depends; more information needed

Question 7

Correct

Points out of 1.50

Which curve represents the atom pair that forms the weakest bond?

Select one:

- a. Curve A ✔
- b. Curve B
- c. Curve C
- d. It depends; more information needed

Correct

Points out of 1.50

represented by curve C would be an exergonic reaction.

Select one:

- a. True ✔
- b. False

Question 9

Correct

Points out of 1.50

T/F: Breaking the bond formed by atom pair A is an exergonic process.

Select one:

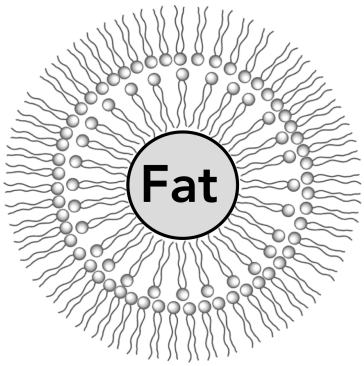
- a. True
- b. False ✔

Correct

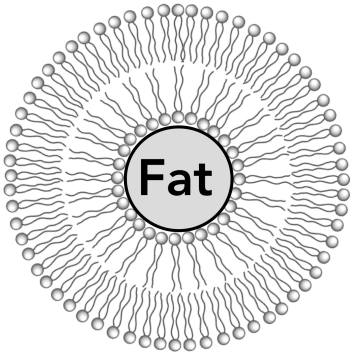
Points out of 1.50

polar head group and a nonpolar tail group, allowing them to surround fat droplets in your intestine during digestion and help make the fats soluble in the hydrophilic intestinal environment so that they can be digested. Which of the diagrams below represent the configuration of bile acids as they surround a droplet of fat in your intestine?

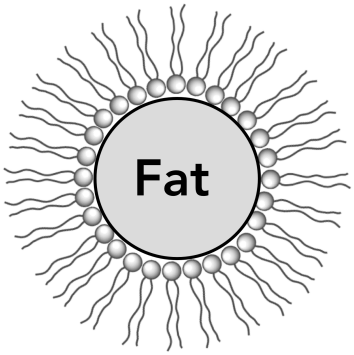
Select one:



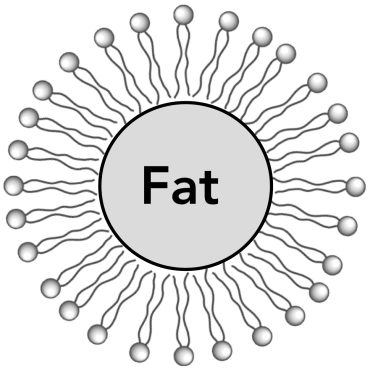
a.



b.

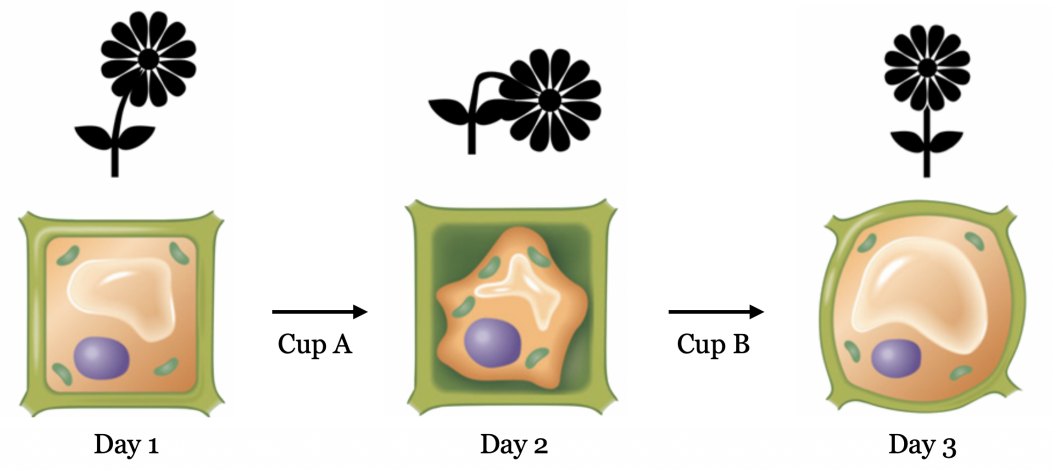


c.



d. ✔

to keep your favorite new plant alive. Looking at it one day, you notice that it's looking a little bit wilted. You take a sample of the plant's cells and look at them under a microscope, noting their shape and size (Day 1 below). You know that this plant's cell membranes are permeable to water, but not to solutes. You decide to water the plant, but being an eco-conscious person, you want to use leftover liquid in some cups that have been sitting on your desk. You have two cups, each filled with a different unknown liquid. You randomly choose one of the cups and use it to water your plant. One day later, your plant is looking shriveled up and unhealthy, and the plant's cells also look shriveled (Day 2 below). In an effort to save your plant, you pick another cup filled with unknown liquid from your desk and use it to water the plant. Thankfully, a day later your plant is healthy again, and the plant's cells look swollen (Day 3 below).



Question 11
Correct
Points out of 1.50

The observations above suggest that the liquid in cup A could have been:

Select one:

- a. A Solution that was similar in solute concentration to the cytosol of the plant cells.
- b. A very highly concentrated salt and sugar solution. ✔
- c. Pure water

Question 12
Correct
Points out of 1.50

The observations above suggest that immediately after using the liquid in cup B to water your plant, the liquid in the soil of your potted plant was _____ compared to the cytosol of your plant cells.

Select one:

- a. Hypertonic
- b. Hypotonic ✔
- c. Isotonic

Question 13
Correct
Points out of 1.50

The observations above suggest that the liquid in cup B could have been:

Select one:

- a. A Solution that was similar in solute concentration to the cytosol of the plant cells.
- b. A very highly concentrated salt and sugar solution.
- c. Pure water ✔

Correct

Points out of 1.50

and solutes. On Day 1, this plant looked similar to your original plant on Day 1. If you were to water this plant with the solution in cup A, this plant would be _____ compared to the plant shown above.

Select one:

- a. More shriveled
- b. Less shriveled ✔
- c. Similarly shriveled

Question **15**

Correct

Points out of 1.50

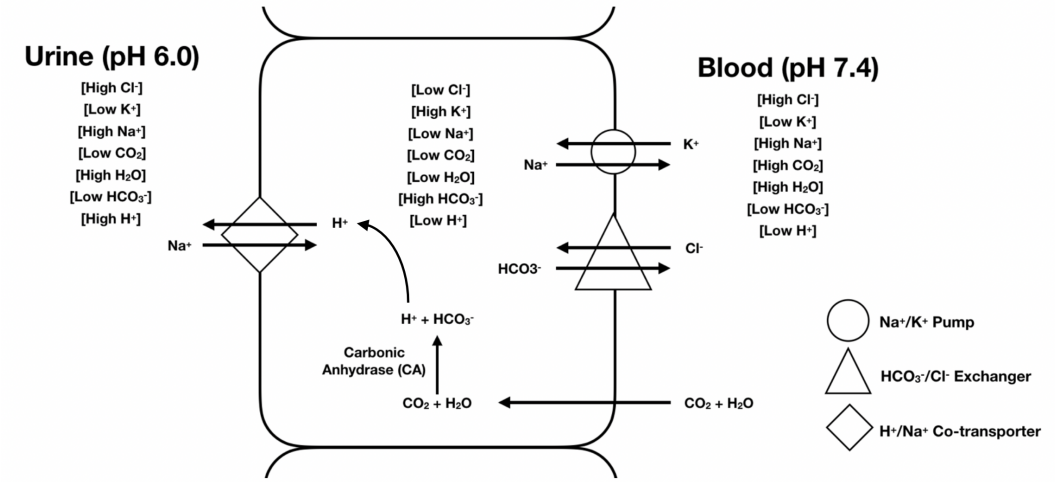
T/F: On day 3, there is no longer any water moving in or out of your plant's cells.

Select one:

- a. True
- b. False ✔

Information

[Questions 16-20] The diagram below represents a kidney cell. Kidney cells play an important role in regulating the pH of your blood. When your body produces carbon dioxide as a byproduct of cellular respiration, that carbon dioxide is carried in your blood stream to kidney cells, where it diffuses across the kidney cell membrane. Inside the kidney cell, an enzyme called carbonic anhydrase (CA) converts carbon dioxide and water to H+ and HCO3-. A series of membrane transport proteins are involved in transporting HCO3- into your blood stream, where it acts to prevent your blood from becoming too acidic. These proteins also transport H+ into your urine, where it is excreted from your body.



Question **16**

Correct

Points out of 1.50

Based on this diagram, the HCO3-/Cl- exchanger is an example of what type of transport?

Select one:

- a. Primary active transport
- b. Secondary active transport
- c. Passive transport (diffusion or facilitated diffusion) ✔
- d. No way to tell from the information given

Correct

Points out of 1.50

Select one:

- a. Primary active transport
- b. Secondary active transport ✔
- c. Passive transport (diffusion or facilitated diffusion)
- d. No way to tell from the information given

Question 18

Correct

Points out of 1.50

Based on this diagram, the movement of CO2 into the cell is an example of what type of transport?

Select one:

- a. Primary active transport
- b. Secondary active transport
- c. Passive transport (diffusion or facilitated diffusion) ✔
- d. No way to tell from the information given

Question 19

Correct

Points out of 1.50

T/F: If the Na+/K+ pump stopped working, the Na+/H+ co- transporter would eventually stop working as well.

Select one:

- a. True ✔
- b. False

Question 20

Correct

Points out of 1.50

The movement of Cl- from outside the cell to inside the cell through the HCO3-/Cl- exchanger is an example of a(n) _____ reaction

Select one:

- a. Endergonic
- b. Exergonic ✔
- c. No way to tell from the information given

Information

[Questions 21-22] If you've ever visited a high-altitude area, you may have experienced altitude sickness. Altitude sickness occurs because at higher altitudes, there is lower oxygen pressure in the atmosphere, and you therefore have to breath much faster to obtain the same amount of oxygen. When you breathe faster, you exhale CO_2 at higher rates, **lowering the amount of CO2 in your bloodstream**, resulting in a condition called "respiratory alkalosis" – this means that your blood pH becomes too basic.

Question 21

Correct

Points out of 1.50

How would you expect high altitudes to affect the movement of ions through the Cl-/HCO3- exchanger?

Select one:

- a. Speeds up
- b. Slows down ✔
- c. Unaffected

Correct

Points out of 1.50

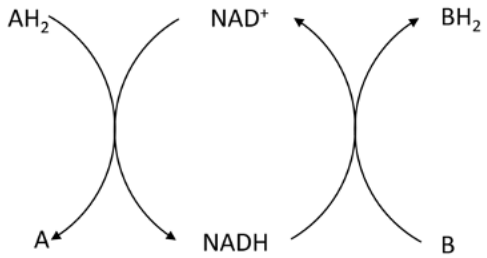
compensated for the change in altitude)?

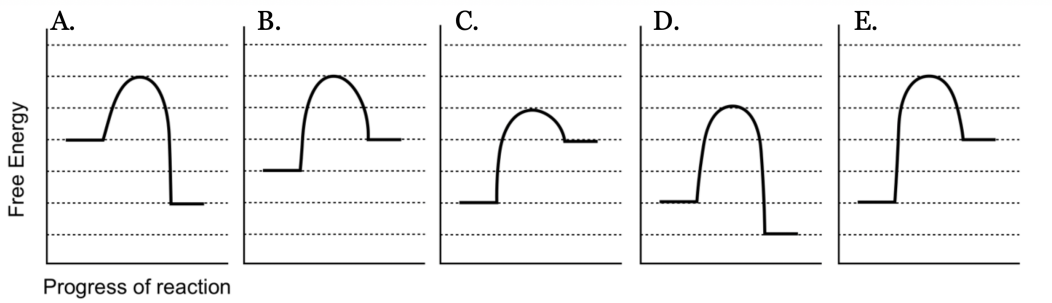
Select one:

- a. Increases ✔
- b. Decreases
- c. Does not change

Information

[Questions 23-28] The following diagram depicts a series of redox reactions. Use this diagram and the free energy diagrams below to answer the following questions. You may assume that the y-axis is the same for all of the graphs.





Question 23

Correct

Points out of 1.50

T/F: Free energy diagram B could represent the conversion of B to BH2.

Select one:

- a. True ✔
- b. False

Question 24

Correct

Points out of 1.50

T/F: Free energy diagram D could represent the conversion of NAD+ to NADH.

Select one:

- a. True
- b. False ✔

Question 25

Correct

Points out of 1.50

T/F: The reaction depicted in free energy diagram C could be coupled to the reaction depicted in free energy diagram D to produce an exergonic reaction.

Select one:

- a. True
- b. False ✔

Correct

Points out of 1.50

determine their relative reaction rates if no enzymes are involved.

Select one:

- a. True
- b. False ✔

Question 27

Correct

Points out of 1.50

T/F: The reaction depicted in free energy diagram C could represent ATP hydrolysis.

Select one:

- a. True
- b. False ✔

Question 28

Correct

Points out of 1.50

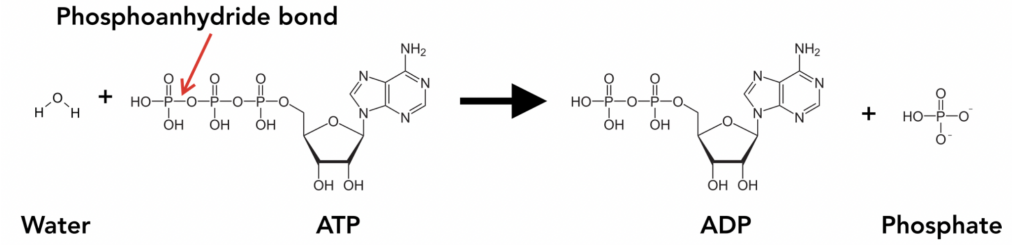
T/F: NADH is an important energy management molecule in the cell. Therefore, NADH has higher free energy than AH2 or BH2.

Select one:

- a. True
- b. False ✔

Information

[Questions 29-34] The following diagram shows the ATP hydrolysis reaction. During ATP hydrolysis, the phosphoanhydride bond shown is broken, resulting in the production of ADP and inorganic phosphate.



You have two hypotheses about this reaction:

(1) The hydrolysis of ATP has a positive ΔG^0

(2) The hydrolysis of ATP has a negative ΔG^0

To try and distinguish between your hypotheses, you make some observations about this reaction. For questions 29-32, determine whether each observation is consistent with hypothesis 1 only, hypothesis 2 only, or both hypothesis 1 and hypothesis 2.

Question 29

Correct

Points out of 1.50

Observation 1: The hydrolysis of ATP can occur in a cell even when it is not coupled to any other reaction.

Select one:

- a. This observation is consistent with hypothesis 1 only.
- b. This observation is consistent with hypothesis 2 only.
- c. This observation is consistent with both hypothesis 1 and hypothesis 2. ✔

Correct

Points out of 1.50

Select one:

- a. This observation is consistent with hypothesis 1 only.
- b. This observation is consistent with hypothesis 2 only.
- c. This observation is consistent with both hypothesis 1 and hypothesis 2. ✔

Question 31

Correct

Points out of 1.50

Observation 3: Over the course of the reaction, standard entropy (ΔS0) decreases.

Select one:

- a. This observation is consistent with hypothesis 1 only.
- b. This observation is consistent with hypothesis 2 only.
- c. This observation is consistent with both hypothesis 1 and hypothesis 2. ✔

Question 32

Correct

Points out of 1.50

Observation 4: The hydrolysis of ATP occurs very quickly in a cell.

Select one:

- a. This observation is consistent with hypothesis 1 only.
- b. This observation is consistent with hypothesis 2 only.
- c. This observation is consistent with both hypothesis 1 and hypothesis 2. ✔

Question 33

Correct

Points out of 1.50

Which of the above observations allows you to distinguish between your two hypotheses?

Select one:

- a. Observation 1
- b. Observation 2
- c. Observation 3
- d. Observation 4
- e. None of these ✔

Question 34

Correct

Points out of 1.50

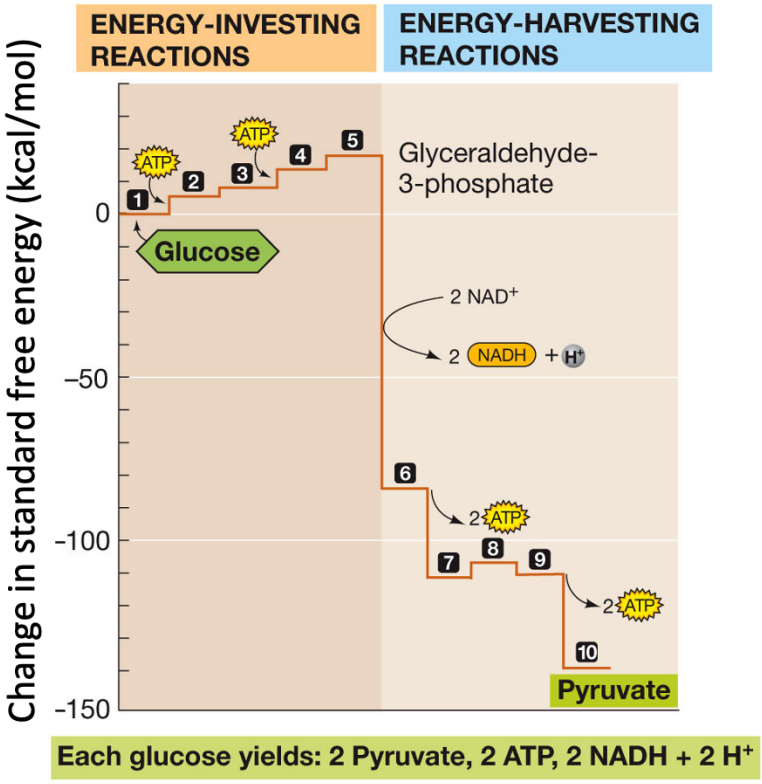
You eventually determine that ATP has a negative ΔG0 value. Specifically, in a cell, the ΔG of ATP hydrolysis is -7.3 kcal/mol. Refer to the diagram of glycolysis found on the next page of your exam. Given what you know about ATP, what could be the ΔG of converting intermediate 9 to intermediate 10 during glycolysis?

Select one:

- a. +16.0 kcal/mol
- b. +14.0 kcal/mol
- c. -14.0 kcal/mol
- d. -16.0 kcal/mol ✔

following questions.

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 686 \text{ kcal/mol free energy}$$



Question 35
Correct
Points out of 1.50

T/F: Glycolysis is an example of a catabolic pathway. Over the course of glycolysis, entropy decreases.

Select one:
- a. True
- b. False ✔

Question 36
Correct
Points out of 1.50

T/F: Glycolysis is an example of a catabolic pathway. Over the course of glycolysis, heat is released.

Select one:
- a. True ✔
- b. False

Question 37
Correct
Points out of 1.50

T/F: The conversion of intermediate 7 to intermediate 8 is not coupled to ATP hydrolysis. Therefore, the ΔG of this reaction is most likely negative under cellular conditions.

Select one:
- a. True ✔
- b. False

Correct

Points out of 1.50

Select one:

- a. True ✔
- b. False

Question 39

Correct

Points out of 1.50

T/F: The ΔG for the reaction that converts intermediate 4 to intermediate 5 during glycolysis will become more negative as the concentration of intermediate 5 increases in a cell.

Select one:

- a. True
- b. False ✔

Question 40

Correct

Points out of 1.50

T/F: Reduction of glyceraldehyde-3-phosphate is coupled to the oxidation of NAD+.

Select one:

- a. True
- b. False ✔

Question 41

Correct

Points out of 1.50

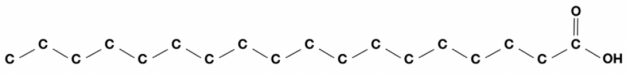
Athletes eat large meals containing carbohydrate and fat when they are in training but their body weight (mass) remains nearly constant. Which of the following statements correctly describes what happens to most of the mass consumed?

Select one:

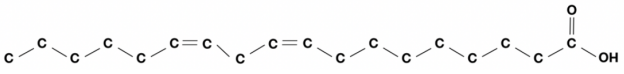
- a. It is converted to energy.
- b. It is released as carbon dioxide and water. ✔
- c. It is converted into adenosine triphosphate (ATP).

make up cell membranes of bacteria. Additionally, a molecule called hopene is shown. This molecule is very bulky, and wedges into bacterial membranes to have an effect on membrane fluidity similar to the effect that cholesterol has on animal membranes.

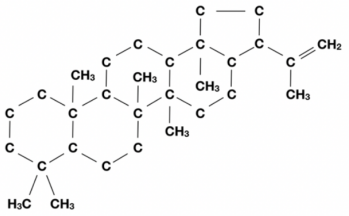
Stearic Acid



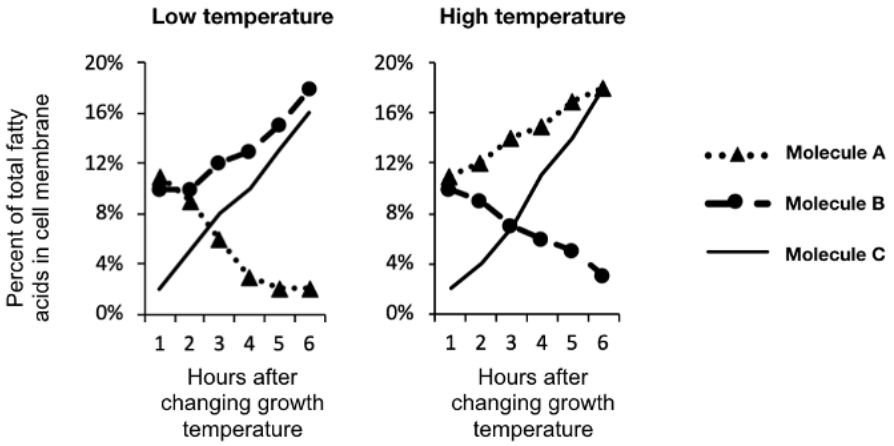
Linoleic Acid



Hopene



To determine the impact of temperature on bacterial membrane composition, you decide to perform an experiment. First, you grow bacteria at 37°C (this is their standard growth temperature) in the presence of all of these compounds. After one hour, you move the bacteria to different temperatures. At various time points after changing the temperature, you collect the bacteria and determine the composition of each compound in their membranes. Your results are shown below. Use this data to answer the following questions.



Question **42**

Correct

Points out of 1.50

Which molecule on the graphs may be hopene?

Select one:

- a. Molecule A
- b. Molecule B
- c. Molecule C ✔

Question **43**

Correct

Points out of 1.50

Which molecule on the graphs may be stearic acid?

Select one:

- a. Molecule A ✔
- b. Molecule B
- c. Molecule C

Correct

Points out of 1.50

Select one:

- a. Molecule A
- b. Molecule B ✔
- c. Molecule C

Question 45

Correct

Points out of 1.50

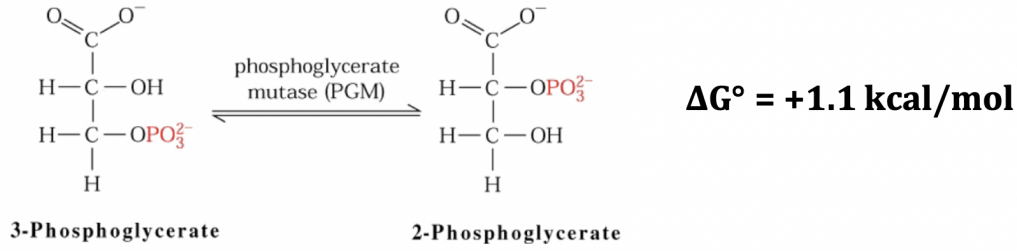
You anticipate that as global climate change increases the temperature of the Earth over time, these bacteria will adapt to the increasing temperature by changing their membrane composition. Which molecule(s) do you expect to increase in abundance over time as bacteria adapt?

Select one:

- a. Stearic acid
- b. Linoleic acid
- c. Hopene
- d. More than one of the above ✔

Information

[Questions 46-49] In glycolysis, 3-phosphoglycerate is converted into 2-phosphoglycerate through the reaction shown below. This reaction is catalyzed by the enzyme phosphoglycerate mutase (PGM). Determine whether each statement below is true or false.



$\Delta G° = +1.1$ kcal/mol

Question 46

Correct

Points out of 1.50

T/F: The forward reaction can only proceed in a cell if it is coupled to an exergonic reaction.

Select one:

- a. True
- b. False ✔

Question 47

Correct

Points out of 1.50

T/F: When the cell is actively producing ATP through cellular respiration, this reaction will be at equilibrium.

Select one:

- a. True
- b. False ✔

Question 48

Correct

Points out of 1.50

T/F: PGM will continue catalyzing this reaction after it has reached equilibrium.

Select one:

- a. True ✔
- b. False

Correct

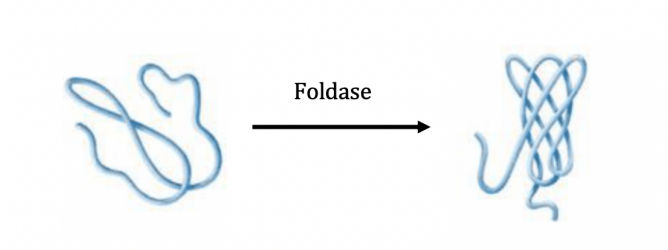
Points out of 1.50

Select one:

- a. True ✔
- b. False

Information

[Questions 50-56] The following diagram shows the folding of a protein. After proteins are synthesized in a cell, they need to be folded into specific highly organized structures in order to perform their functions. This folding process involves the making and breaking of different types of bonds and intramolecular interactions. To assist in protein folding, the cell uses enzymes called "foldases". Based on this information and the diagram, answer the following questions.



Question **50**

Correct

Points out of 1.50

Entropy decreases over the course of this reaction.

Select one:

- a. True ✔
- b. False

Question **51**

Correct

Points out of 1.50

As this reaction proceeds, a small amount of energy will be released as heat.

Select one:

- a. True ✔
- b. False

Question **52**

Correct

Points out of 1.50

Foldase provides the energy required to make this reaction proceed in the direction shown by the arrow.

Select one:

- a. True
- b. False ✔

Question **53**

Correct

Points out of 1.50

Foldase is used up in this reaction.

Select one:

- a. True
- b. False ✔

Question **54**

Correct

Points out of 1.50

Because this process uses an enzyme, we know that this process is endergonic.

Select one:

- a. True
- b. False ✔

Correct

Points out of 1.50

Select one:

a. True

b. False ✔

Question 56

Correct

Points out of 1.50

Because the protein folding reaction proceeds in the presence of a specific enzyme and no other components, we can conclude that:

Select one:

a. The reaction would not proceed in the absence of the enzyme

b. The reaction would proceed in the absence of the enzyme but at a slower rate ✔

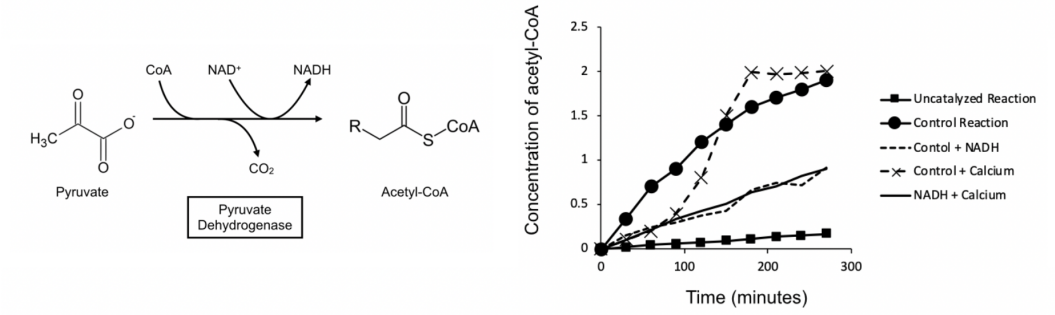
c. The reverse reaction (protein unfolding) would not proceed in the presence of the enzyme

d. The reaction in the presence of the enzyme will not proceed any faster if the temperature is raised a few degrees

Information

[Questions 57-60] The reaction below depicts the conversion of pyruvate to acetyl-CoA that occurs after glycolysis. This reaction is catalyzed by an enzyme called pyruvate dehydrogenase. To measure enzyme activity under different conditions, you set up a control and three experiments where you add different potential activators or inhibitors of pyruvate dehydrogenase to the reaction, and you measure the amount of acetyl-CoA produced over time in each experiment. Use this information to answer the following questions.

Uncatalyzed reaction: Pyruvate + CoA + NAD^+
Control reaction: Pyruvate Dehydrogenase + Pyruvate + CoA + NAD^+



Question 57

Correct

Points out of 1.50

T/F: NADH is an activator of pyruvate dehydrogenase activity.

Select one:

a. True

b. False ✔

Question 58

Correct

Points out of 1.50

T/F: T/F: The addition of calcium and NADH together increases pyruvate dehydrogenase activity.

Select one:

a. True

b. False ✔

Correct

Points out of 1.50

pyruvate dehydrogenase activity.

Select one:

- a. True ✔
- b. False

Question **60**

Correct

Points out of 1.50

When NADH is added to the reaction, more carbon dioxide will be produced.

Select one:

- a. True
- b. False ✔