

S.I. Practice Exam II

Name:

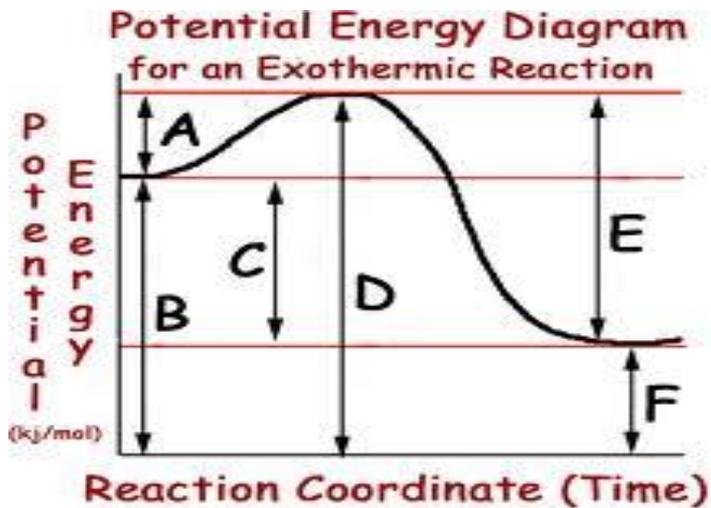
1. What is the purpose of beta oxidation in respiration?
  - a. Oxidation of glucose
  - b. Oxidation of pyruvate
  - c. Feedback regulation
  - d. Control of ATP accumulation
  - e. Oxidation of fatty acids

For **Questions 2-3**: Succinate dehydrogenase catalyzes the conversion of succinate to fumarate. The reaction is inhibited by malonic acid. Increasing the ration of succinate to malonic acid reduces the inhibitory effect of malonic acid.

2. Based on this information, which of the following is correct?
  - a. Succinate dehydrogenase is the enzyme, and fumarate is the substrate.
  - b. Succinate dehydrogenase is the enzyme, and malonic acid is the substrate.
  - c. Succinate is the substrate and Fumarate is the product.
  - d. Fumarate is the product and malonic acid is a noncompetitive inhibitor
  - e. Malonic acid is the product and fumarate is a competitive inhibitor
3. What is the purpose of using malonic acid in this experiment?
  - a. It blocks the binding of fumarate
  - b. It is a competitive inhibitor
  - c. It is able to bind to succinate
  - d. It replaces the usual enzyme
  - e. It is a noncompetitive inhibitor
4. When electrons flow along the electron transport chains of mitochondria, which of the following changes occur?
  - a. The pH of the matrix increases
  - b. ATP synthase pumps protons by active transport
  - c. The electrons gain free energy
  - d. The ETC complex proteins phosphorylate ADP to form ATP
  - e. NAD<sup>+</sup> is oxidized
5. Selective permeability of a membrane depends on
  - a. Discriminating barrier of the lipid bi-layer
  - b. Concentration gradient of molecules crossing the membrane
  - c. Specific transport proteins built into the membrane
  - d. A & C
  - e. All of the above
6. Which of the following processes includes all others?
  - a. Osmosis
  - b. Diffusion across a membrane
  - c. Facilitated diffusion
  - d. Passive transport
  - e. Transport of an ion across a membrane down its electrochemical gradient

7. When describing the cell's membrane potential, the cell interior is :
  - a. More positively charged than the exterior
  - b. More negatively charged than the exterior
  - c. Electrically neutral
  - d. Continuously reversing its electrical charge
  - e. Positively charged whenever the sodium-potassium pump is active
8. Carrier mediated transport:
  - a. Is dependent on the amount of lipids in a membrane
  - b. Is generally carried out by membrane proteins
  - c. Occurs only down concentration gradients
  - d. Is always passive
  - e. Always requires energy
9. The net diffusive flux of carbon dioxide across the membrane will be:
  - a. Predicted by the direction of its mediated transport system
  - b. Inversely proportional to its molecular radius and weight
  - c. Inversely proportional to the difference in its concentration on the two sides of the membrane.
  - d. Independent of its physical and chemical nature
  - e. Depends on the nature of the carbon dioxide used.
10. Of the following is the correct sequence of events in cellular respiration?
  - a. glycolysis → fermentation → Krebs cycle
  - b. Krebs cycle → electron transport → glycolysis
  - c. glycolysis → Krebs cycle → electron transport
  - d. Krebs cycle → glycolysis → electron transport
11. In anaerobic respiration, which of the following takes place immediately following glycolysis?
  - a. Kreb's cycle
  - b. Formation of acetyl CoA
  - c. Reduction of pyruvate by NADPH
  - d. Reduction of pyruvate by NAD<sup>+</sup>
  - e. Reduction of pyruvate by NADH
  - f. Oxidation of pyruvate by NAD<sup>+</sup>
12. Behind the cones and rods (structures of the eye) of the human eye is a structure called pigment layer whose function is to prevent light that reaches the retina to leave the eye. What would you expect to be the color of this structure?
  - a. Red
  - b. White
  - c. Blue
  - d. Green
  - e. Black
13. Which of the following processes will proceed in your cells in the absence of oxygen?
  - a. Chemiosmosis
  - b. Oxidative phosphorylation
  - c. Glycolysis
  - d. Electron transport chain
  - e. Citric acid cycle

Consider the following diagram



Answer the following for **Questions 14-17**.

14. What letter corresponds to the  $\Delta G$  of the reaction?
15. What letter represents the Activation energy of the reverse reaction?
16. Potential energy of the reactants?
17. Activation energy of the forward reaction?
18. Sublimation is the process of transition of a substance from the solid phase to the gas phase without passing through an intermediate liquid phase, thereby requiring additional energy. Which of the following correctly represents the cooling effects of dry ice (Solid carbon dioxide)?
  - a.  $+\Delta G, -\Delta H, -\Delta S$
  - b.  $+\Delta G, +\Delta H, +\Delta S$
  - c.  $-\Delta G, -\Delta H, +\Delta S$
  - d.  $+\Delta G, +\Delta H, -\Delta S$
  - e.  $-\Delta G, -\Delta H, -\Delta S$
19. Which of the following correctly corresponds to  $+\Delta G, +\Delta H, -\Delta S$ ?
  - a. Oxidation of Glucose into Pyruvate
  - b. Hydrolysis of disaccharides to monosaccharides
  - c. Dehydration of a glycerol and fatty acid to form an ester linkage
  - d. A & B
  - e. A & C
20. Ions diffuse across membranes down their
  - a. Electrical gradients
  - b. Concentration gradients
  - c. Electrochemical gradients
  - d. Chemical gradients
  - e. Osmotic gradients
21. Which process accounts for 100% of ATP produced in the intermembrane space during cellular respiration?
  - a. Oxidative phosphorylation
  - b. Substrate level phosphorylation
  - c. Chemiosmosis
  - d. All of the above
  - e. None of the above

22. Acetyl CoA is the starting molecule used in
- Glycolysis
  - Electron transport chain
  - Oxidative phosphorylation
  - Citric acid cycle
  - Fermentation
23. Which of the following sequences correctly represents the flow of electrons during photosynthesis?
- $\text{NADPH} \rightarrow \text{O}_2 \rightarrow \text{CO}_2$
  - $\text{H}_2\text{O} \rightarrow \text{NADPH} \rightarrow \text{CALVIN CYCLE}$
  - $\text{NADPH} \rightarrow \text{Chlorophyll} \rightarrow \text{Calvin cycle}$
  - $\text{H}_2\text{O} \rightarrow \text{photosystem I} \rightarrow \text{photosystem II}$
  - $\text{NADPH} \rightarrow \text{Electron transport chain} \rightarrow \text{O}_2$
24. The summary equation for cell respiration is  $\text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O}$ . From the equation, identify the reducing agent:
- Glucose
  - $\text{H}_2\text{O}$
  - $\text{CO}_2$
  - $\text{O}_2$
  - None of the above
25. What do the carriers NADH and NADPH have in common?
- They are photon carriers in respiration and photosynthesis respectively
  - They are both strong reducing agents
  - NADH accepts electrons from glucose where as NADPH accepts electrons from photosystem I
  - Both have just dropped off their electrons at the electron transport chain
  - They are both in their reduced states
26. In mechanism, photophosphorylation is most similar to
- Substrate level phosphorylation in glycolysis
  - Oxidative phosphorylation in cellular respiration
  - The Calvin cycle
  - Carbon fixation
  - Reduction of  $\text{NADP}^+$
27. Identify the molecule that can be further reduced in order to carry electrons to the electron transport chain?
- P700
  - FADH
  - $\text{P680}^+$
  - A & C
  - B & C

For Questions 28 – 29

Given a reaction as follows

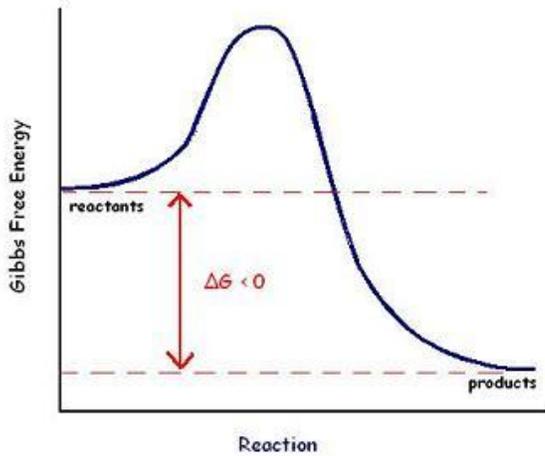


28.  $\Delta G$  of reactants 30Kcal and  $\Delta G$  of products is 143kcal. What is the  $\Delta G$  when the reaction reaches equilibrium?

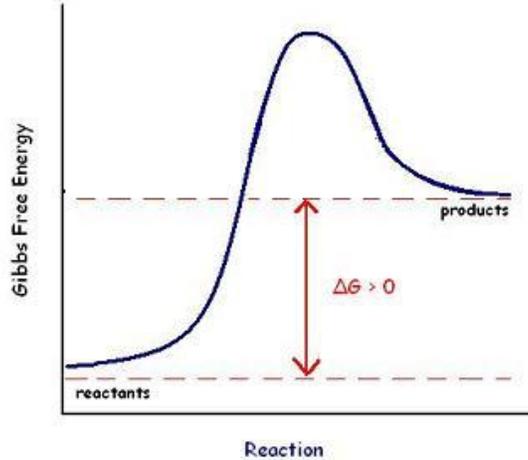
- a. +113kcal
- b. -113kcal
- c. +30kcal
- d. 0kcal
- e. 143kcal

29. Which of the following graphs below will represent the  $\Delta G$  of the overall reaction before it reaches equilibrium?

Graph 1

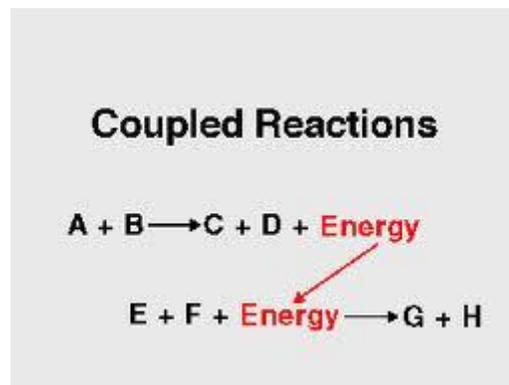


Graph 2



- a. Graph 1
- b. Graph 2
- c. None of the above

30. Consider the coupled reaction



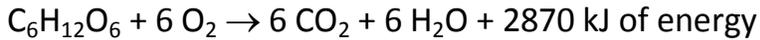
What are the products of the endergonic reaction?

- a. A + B
- b. G + H
- c. E + F
- d. C + D
- e. None of the above

31. Which of the following a characteristic of integral membrane proteins?

- a. Hydrophilicity
- b. Hydrophobic
- c. Amphipathicity
- d. Amphotericity
- e. Lipophilicity

32. Consider the following reaction, which when plotted on a graph shows an exothermic (thermodynamic) pattern. Which of the following is true?



- a. The above reaction is endergonic because it requires energy in order to proceed.
- b. Each mole of glucose has a standard free energy change of +2870KJ
- c. Oxygen is the catalyst of the reaction lowering the activation energy
- d. Glucose represents thermodynamic potentiality
- e. More than one is correct

33. Red blood cells would swell in which type of solution?

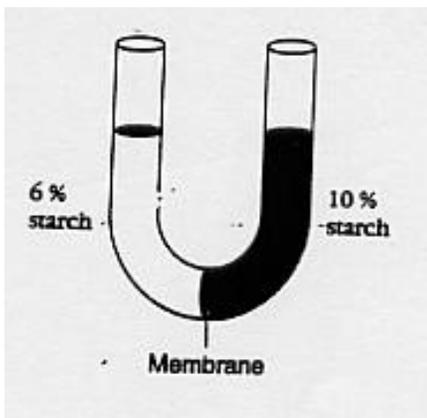
- a. Hypotonic
- b. Isotonic
- c. Hypertonic
- d. Hydrophilic
- e. Lipophilic

34. When an enzyme is activated, which of the following from the list below can influence the **activity** of that enzyme?

1. pH of surroundings   2. amount of enzyme   3. concentration of substrate   4. proteolytic activation   5. chemicals that compete with the substrates   6. co-factors and co-enzymes

- a) 1, 6, and 4
- b) 5, 2, and 4
- c) 2 and 3
- d) 5 and 1
- e) 1, 2, 3, 4, 5, and 6

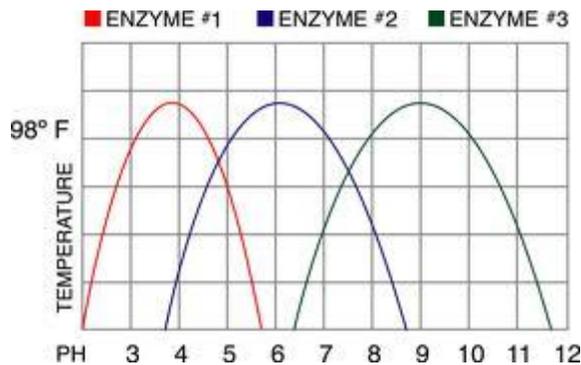
35. Given the following figure below



The U-shaped tube in the figure below is divided by a membrane that is impermeable to starch but permeable to water. Which of the following will occur?

- a. Water will move from the right to the left.
- b. Water will move from the left to the right.
- c. Starch will move from the right to the left.
- d. Starch will move from the left to the right.
- e. Nothing will happen. The membrane blocks the passage of all the molecules.

36. Inside one given bag, A, is a 50% glucose solution and inside bag B is a 20% glucose solution. Both bags are put into beakers containing 100% water.
- Bag A will gain weight.
  - Bag B will gain weight.
  - Both bags will gain weight.
  - Both bags will lose weight.
  - Both bags will remain the same
37. Voltage across a membrane is called \_\_\_\_\_, while a charge difference is called \_\_\_\_\_.
- Water potential, electric energy
  - Membrane potential, voltage.
  - Chemical gradient, electric potential
  - Osmotic potential, voltage.
  - Membrane potential, electrochemical gradient
38. The cerebral cortex of the mammalian brain sends impulses to another structure called the basal ganglia for suppression of unwanted motion and movement of the limbs. Upon receiving this stimulus through a series of metabolic steps, the basal ganglia sends a signal to the cerebral cortex that inhibits the cortex from stimulating more suppression of undesired motion. The action of the basal ganglia is known as
- Metabolic inhibition
  - Feedback inhibition
  - Competitive inhibition
  - Noncooperative inhibition
  - Reversible inhibition



Use the figure above. The enzymes of your stomach work best at extremely high concentrations of H<sup>+</sup> ions. Which curve best represents a stomach enzyme?

- Curve 1
- Curve 2
- Curve 3
- More information is needed
- None of the above

40. Most cells cannot harness heat to perform work because
- Heat is not a form of energy
  - Cells do not have much heat; they are relatively cool
  - Temperature is usually uniform throughout a cell
  - Heat can never be used to do work
  - Heat denatures enzymes
41. If an enzyme is added to a solution where its substrate and product are in equilibrium, what would occur?
- Additional product would be formed
  - Additional substrate would be formed
  - The reaction would change from endergonic to exergonic
  - The free energy of the system would change
  - Nothing; the reaction would stay at equilibrium
42. Consider the following phrases that demonstrate the formation of ATP by ATP synthase. Reorganize and place them in chronological order.
- Turning of the rod activates catalytic sites in the knob that produce ATP
  - H<sup>+</sup> ions flowing down their concentration gradient enter a half channel in a stator
  - Each H<sup>+</sup> ion makes a complete turn before leaving the rotor and passing through a second channel into the mitochondrial matrix
  - H<sup>+</sup> ions enter binding sites within the rotor, causing the rotor to spin within the membrane
  - Spinning of the rotor causes an internal rod to spin as well. This rod extends like a stalk into the knob below it which is held stationary by part of the stator.
- i, v, iv, ii, iii
  - iv, iii, i, v, ii
  - ii, iii, iv, v, i
  - ii, iv, iii, v, i
  - v, ii, iv, iii, i
43. During oxidative phosphorylation, which of the following has the lowest pH?
- Electron transport chain
  - Mitochondrial matrix
  - Thylakoid space
  - Intermembrane space
  - Inner membrane space
44. The quantum of the electromagnetic interaction and the basic unit of light and all other forms of electromagnetic radiation best describes a
- Proton
  - H<sup>+</sup> ion
  - Photon
  - Electron
  - Ions stimulated by light energy
45. Which of the following is the light NOT used by plants to drive photosynthesis?
- Red light
  - Blue light
  - Green Light
  - Violet
  - A & B only

46. Which of the following does not occur in the Calvin cycle?
- Carbon fixation
  - Oxidation of NADPH
  - Release of oxygen
  - Regeneration of the CO<sub>2</sub> acceptor
  - Consumption of ATP
47. At what stages of cellular respiration is carbon dioxide released?
- Glycolysis and oxidative phosphorylation
  - Reduction of pyruvic acid by NADH and formation of acetyl CoA
  - The citric acid cycle and fermentation
  - More than one is correct
  - None of the above
48. Which of the following metabolic poisons will interfere with Glycolysis?
- Rotenone and Antimycin; electron transport inhibitors
  - Carbony cyanide p-rifluoromethoxyle; Mimics 3D structure of glucose and cannot be metabolized by the cell.
  - Malonate; Succinate (citric acid cycle) dehydrogenase inhibitor
  - Oligomycin; inhibitor of oxidative phosphorylation and electron thief from NADH and FADH<sub>2</sub>
  - 2,4-Dinitrophenol; inhibits the oxidation of pyruvate and thus the formation of acetyl CoA
49. Which of the following are not embedded in the lipid bilayer?
- Transmembrane proteins
  - Integral proteins
  - Peripheral proteins
  - Integrins
  - Glycoproteins
50. An inorganic trace element present in the active sites of the enzyme acetylcholinesterase functions as a(n):
- Competitive inhibitor of the enzyme
  - Noncompetitive inhibitor of the enzyme
  - Allosteric activator of the enzyme
  - Coenzyme derived of vitamins
  - Cofactor necessary for enzyme activity
51. Which of the following factors would tend to increase membrane fluidity?
- A greater proportion of unsaturated phospholipids
  - A greater proportion of saturated phospholipids
  - A lower temperature
  - A relatively high protein content in the membrane
  - A greater proportion of relatively large glycolipids compared with lipids having smaller molecular masses.