The answers to the Mid Term Test are indicated below in RED. Explanations for the answers are given at the end of each answer. Remember your code will have the answers in a different order form this one.

1. The first genetic material was most likely a(n)

A. DNA polymer
B. **RNA polymer**
C. protein
D. enzyme
E. phospholipid
Refer to text book page 58.

---

2. Which of the following structures may have originated by an endosymbiotic mechanism.

A. Plasma membrane
B. Nucleus
C. Endoplasmic reticulum
D. flagella
E. **plastid**
Only mitochondria and plastids are proved to have originated as endosymbionts (they still have their own DNA and ribosomes).

---

3. What characteristics would all protobionts have had in common?

A. The ability to synthesize enzymes
B. **A surrounding membrane or membrane-like structure**
C. RNA genes
D. A nucleus
E. DNA genes
See text book page 57.

---

4. The Miller-Urey experiment was a huge breakthrough in our understanding of the origins of life. What was its major conclusion?

A. That abiotic synthesis of molecules requires oxygen (O_2).
B. That biological molecules could be formed without energy.
C. That proteins could be synthesized without ribosomes.
D. **That abiotic synthesis of organic molecules was possible.**
E. That organic molecules probably arrived on our planet via meteors.
See text book page 56.

---

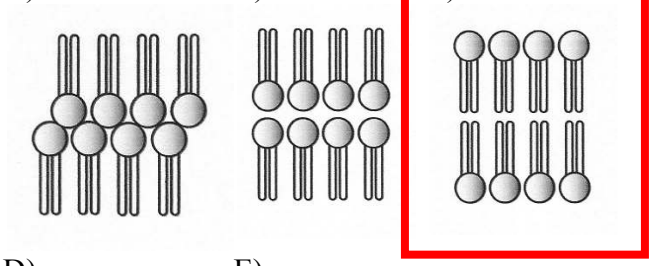
5. If the results of an experiment turn out differently from what you expected, then

A. you need to change the equipment you have used to gather the results.
B. you need to choose another type of statistical analysis.
C. you need to redo the experiment until you get the expected results.
D. you did not follow the scientific method.
E. **you should explore the possible reasons for this in the " conclusions" section of your experimental write up.**
Refer to your laboratory notes.

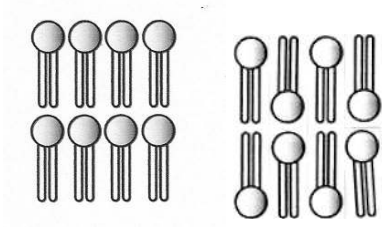
---

6. Phospholipids are built from two fatty acid chains and a phosphate group. They are found in the membranes of all cells. Which of the following diagrams most closely resembles the arrangement of phospholipids in a membrane?

A) B) C)



D) E)



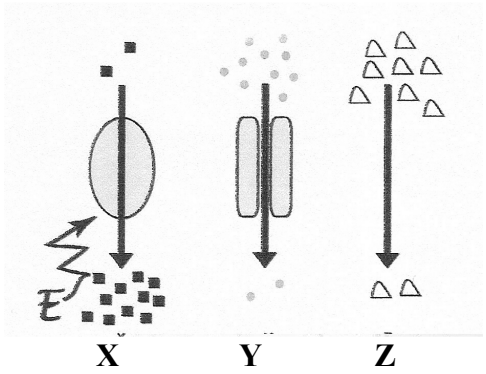
Refer to text book page 95.

7. Which of the following is **true** regarding catabolic pathways?

A. They do not depend on enzymes.
B. They consume energy to build up polymers from monomers.
C. **They release energy as they degrade polymers to monomers.**
D. They lead to the synthesis of catabolic compounds.
E. They represent endergonic reactions.
Refer to text book page 77.

---

8. Three types of movement across a plasma membrane are shown at **X**, **Y** and **Z**. (E = energy input)



The three types of movement are correctly describe as

A. active transport (**X**) : diffusion (**Y**) : facilitated diffusion (**Z**).
B. **active transport (X) : facilitated diffusion (Y) : diffusion (Z).**
C. facilitated diffusion (**X**) : active transport (**Y**) : diffusion (**Z**).
D. diffusion (**X**) : active transport (**Y**) : facilitated diffusion (**Z**).
E. facilitated diffusion (**X**) : diffusion (**Y**) : active transport (**Z**).
Active transport against a gradient requires energy : facilitated diffusion provides a chanel through which something can flow by diffusion : diffusion means crossing the membrane directly from a high concentraiton outside toa low inside or vice versa.

---

9. Noncompetitive inhibitors render an enzyme helpless by

A. filling their active sites.
B. destroying their allosteric sites.
C. denaturing their proposed substrate.
D. binding to their proposed substrate.
E. altering their shape, thereby making their active site inoperable.
See Figure 4.20

---

10. The correct sequence of steps in scientific methodology is

1. Formulate a hypothesis
2. Observe
3. Replication and forming new questions
4. Gather data and analyze results

A. 1, 2, 3, 4
B. 2, 1, 3, 4
C. 4, 3, 2, 1
D. 3, 2, 1, 4
E. **2, 1, 4, 3**
Refer to lab notes.

---

11. Our white blood cells engulf bacteria from our bloodstream by

A. **endocytosis**.
B. exocytgosis.
C. **phagocytosis.**
D. pinocytosis.
E. receptor-mediated endocytosis.
Refer to figure 5.21 ½ mark given for endocytosis.

---

12. Reactions that require a net input of energy are known as

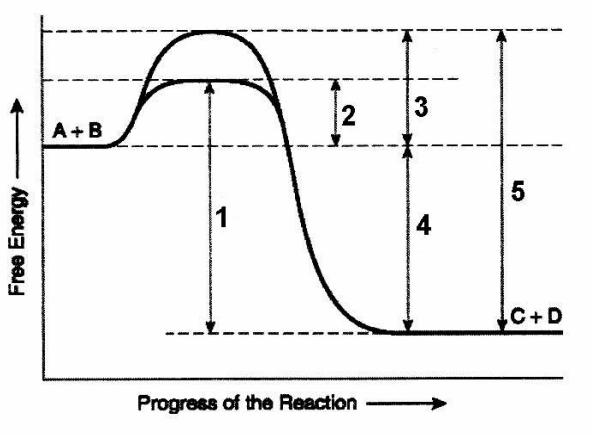
A. **endergonic.**
B. exergonic.
C. exothermic.
D. oxidative.
E. reductive.
See Figure 4.8

---

13. Which of the following statements regarding enzymes is **false**?

A. Enzymes are proteins that function as catalysts.
B. **Enzymes provide the activation energy for the reactions they catalyze.**
C. Enzymes display specificity for certain molecules which attach to them.
D. The activity of enzymes can be regulated by specific inhibitor molecules.
E. Enzymes may be used many times over for a specific reaction.
Figure 4.15

Use the following diagram to answer Questions **14, 15, 16, 17 and 18** **Refer to Section 4.4 in text book for 14, 15, 16, 17 and 18.**



14. Which of the following terms best describes the reaction?

A. endergonic
B. **exergonic**
C. anabolic
D. allosteric
E. nonspontaneous

---

15. Which of the following represents the ΔG of the reaction?

A. 1
B. 2
C. 3
D. **4**
E. 5

---

16. Which of the following would be the same in an enzyme-catalyzed or uncatalyzed reaction?

A. 1
B. 2
C. 3
D. **4**
E. 5

---

17. Which of the following represents the activation energy required for the enzyme-catalyzed reaction?

A. 1
B. **2**
C. 3
D. 4
E. 5

---

18. Which of the following represents the activation energy required for a noncatalyzed reaction?

A. 1
B. 2
C. **3**
D. 4
E. 5

---

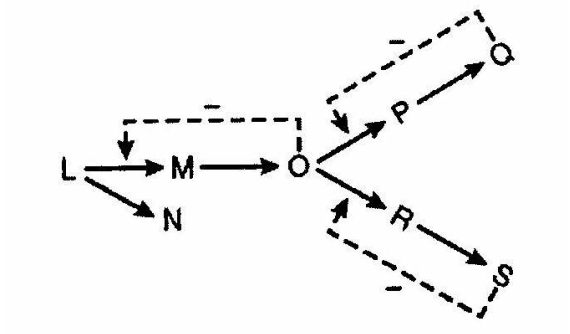
19. You bite into a spinach leaf. Which of the following is **true**?

A. **You are getting 50% of the protein in the leaf in the form of Rubisco.**
B. The major pigment you are ingesting is a carotenoid.
C. The water in the leaf is a product of the light-dependent reactions.
D. Any usable energy in the leaf is in the form of AMP.
E. The spinach which was grown locally is most likely a CAM plant.

See text book page 151

---

20. In the following branched metabolic pathway, a dotted arrow with a minus sign symbolizes inhibition of a metabolic step by an end product.

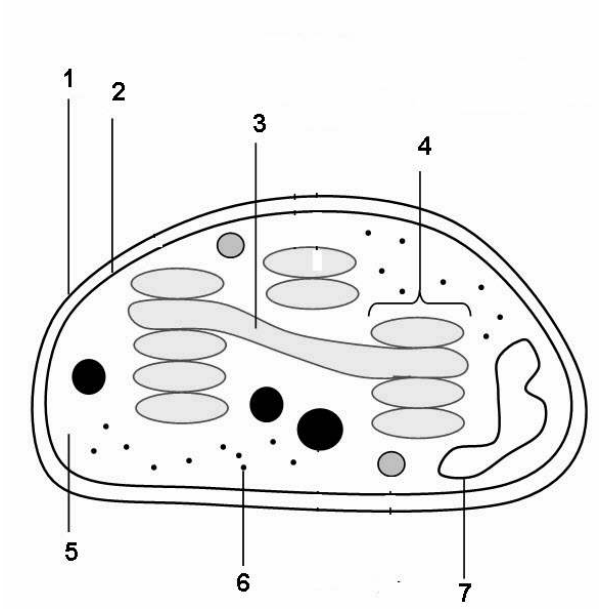


Which reaction would prevail if both **Q** and **S** were present in the cell in high concentrations?

A. L → M
B. M → O
C. **L → N**
D. O → P
E. R → S

Ok so if Q and S are present in high concentrations they will turn off the enzymes that convert O to P and R. Now O will accumulate and turn off the conversion of L to M so only L to N can proceed. (Allosteric inhibition, negative feedback).

Use the following diagram to answer **Questions 21, 22 and 23**



21. What number(s) on the diagram represents the location in the organelle where the two Photosystems would be located?

A. 1and 2
B. 2
C. **4**
D. 5 and 6
E. 7

Embedded in thylakoid membrane, stacked up to allow more area for more enzymes.

---

22. What is the name given to the region labeled 5?

A. **Stroma**
B. Matrix
C. Thylakoid
D. Cytosol
E. Nucleoid

This is the term we used for the "cytoplasm" of the chloroplast.

---

23. Which region of the organelle accumulates a high concentration of H^+ ions for chemiosmosis?

A. 5
B. **3**
C. Between 1 and 2
D. 7
E. 6

Lumen of the thylakioids.

---

24. How many glucose molecules are produced from the incorporation of **3** CO_2 molecules in the Calvin cycle?

A. **0**
B. 1
C. 2
D. 6
E. 10

Rubisco must fix a total of 6 carbons for the creation of one glucose molecule (6 carbon sugar).

---

25. Where is the electron transport chain found in plant cells?

A. **thylakoid membranes of chloroplasts**
B. stroma of chloroplasts
C. outer membrane of mitochondria
D. matrix of mitochondria
E. cytoplasm

---

26. Carbon fixation involves the addition of carbon dioxide to

A. G3P.
B. Rubisco.
C. **RuBP.**
D. NADPH.
E. citric acid.

Fig. 7.14

---

27. The stomata of CAM plants are generally open under which of the following conditions?

A. **all night.**
B. during the day.
C. during photosynthesis.
D. only when transpiration rates are high.
E. whenever they need CO_2.

Figure 7.20b

---

28. You have just discovered a new flower species that has a unique photosynthetic pigment. The leaves of this plant appear to be reddish-yellow. What wavelengths of visible light are **not** being absorbed by this pigment?

A. **red and yellow**
B. blue and violet
C. green and yellow
D. blue, green and red
E. All wavelengths of light are absorbed by this pigment.

The colours we see represent the wavelengths of light not being absorbed.

29. Why are C4 plants able to photosynthesize with no apparent photorespiration?

A. They do not participate in the Calvin Bensen cycle.
B. **They use PEP carboxylase to initially fix CO_2.**
C. They are adapted to cold, wet climates.
D. They conserve water more efficiently.
E. They exclude oxygen from their tissues.
Text book Fig. 7.19

---

30. The Calvin-Benson cycle is sometimes called the light-independent or dark reactions. This is misleading since the Calvin-Benson cycle will stop operating after a plant is placed in the dark. Why?

A. Rubisco is rapidly degraded in the dark.
B. NAD^+ generated by the light reactions is needed to activate G3P.
C. In the dark oxygen builds up in the chloroplast and inhibits Rubisco activity.
D. **The Calvin-Benson cycle requires a constant supply of ATP generated by the light reactions.**
E. The Calvin-Benson cycle never stops operating and does not need anything from the light reactions.
Figure 7.2

---

31. Which of the following statements is a **correct** distinction between autotrophs and heterotrophs?

A. Only heterotrophs require chemical compounds from the environment.
B. Cellular respiration is unique to heterotrophs.
C. Only heterotrophs have mitochondria.
D. **Autotrophs, but not heterotrophs, can nourish themselves beginning with CO_2 and other nutrients that are inorganic.**
E. Only heterotrophs require oxygen.

---

32. In addition to ATP, what are the end products of glycolysis?

A. CO_2 and H_2O
B. CO_2 and pyruvate
C. **NADH and pyruvate**
D. CO_2 and NADH
E. H_2O, $FADH_2$, and citrate
Fig. 6.9

---

33. Which of the following statements is **false**? In cellular respiration

A. one molecule of glucose can produce about 32 ATPs.
B. **oxygen unites directly with glucose to form carbon dioxide.**
C. a series of energy-requiring reactions is coupled to a series of energy-releasing reactions.
D. NADH and $FADH_2$ allow H^+ to be pumped across the inner mitochondrial membrane.
E. the electron transfer system occurs on the inner mitochondrial membrane.
Refer to Chapter 6
Note Answer A states about 32 ATP as we said in lecture this value varies, I mentioned I would not ask questions that asked you to confirm this number. Here we only mean one molecule of glucose makes " a lot of ATP"

---

34. Alcoholic fermentation

A. requires the presence of oxygen.
B. results in the complete breakdown of glucose into CO_2 and H_2O.
C. occurs inside the mitochondrion.
D. **recycles the NAD^+ needed for glycolysis.**
E. releases oxygen as a byproduct.
Fig. 6.23

---

35. One turn of the Krebs Cycle produces

A. **3 NADH, 1 $FADH_2$, 1 ATP**
B. 1 NADH, 1 $FADH_2$, 3 ATP
C. 1 NADH, 3 $FADH_2$, 3 ATP
D. 3 NADH, 1 $FADH_2$, 38 ATP
E. 3 NADH, 1 $FADH_2$, 2 ATP
See Fig. 6.14

---

36. Cellular respiration harvests the most chemical energy from which of the following?

A. substrate-level phosphorylation
B. **chemiosmotic phosphorylation**
C. converting oxygen to ATP
D. transferring electrons from organic molecules to pyruvate
E. generating carbon dioxide and oxygen in the electron transport chain
See Figure 6.19

---

37. What kind of metabolic poison would most directly interfere with glycolysis?

A. An agent that reacts with oxygen and depletes its concentration in the cell.
B. An agent that binds to pyruvate and inactivates it.
C. **An agent that closely mimics the structure of glucose but is not metabolized.**
D. An agent that reacts with NADH and oxidizes it ot NAD^+.
E. An agent that blocks the passage of electrons along the electron transport chain.
Ok so oxygen is not needed; pyruvate is the final product; anything that makes NAD+ is positive; ETC is not part of glycolysis; so only answer is C.

---

38. You are writing this test while breathing in oxygen and breathing out carbon dioxide. What two processes are the sources of the carbon dioxide?

A. glycolysis and pyruvate oxidation
B. glycolysis and oxidative phosphorylation
C. **pyruvate oxidation and the Krebs Cycle**
D. Krebs cycle and oxidative phosphorylation
E. Calvin-Benson Cycle and Krebs Cycle
See Figure 6.13

---

39. In glycolysis, for each molecule of glucose oxidized to pyruvate

A. 2 molecules of ATP are used and 2 molecules of ATP are produced.
B. **2 molecules of ATP are used and 4 molecules of ATP are produced.**
C. 4 molecules of ATP are used and 2 molecules of ATP are produced.
D. 2 molecules of ATP are used and 6 molecules of ATP are produced.
E. no molecules of ATP are used and 2 molecules of ATP are produced.
I only asked for the numbers in and out, not the net. So if we are talking accounting we are talking Gross vs Net.

---

40. All of the following are functions of the citric acid cycle **except**

A. production of ATP.
B. production of NADH.
C. production of $FADH_2$.
D. release of CO_2.
E. **adding electrons and protons to oxygen, forming water.**
See Figure 6.14

---

41. Glucose is the **only** sugar produced from photosynthesis.

A. TRUE
B. **FALSE**
This is false as a three carbon sugar G3P is produced and the plant can make numerous sugars from this, of which glucose would be one

---

42. The ΔG of the reaction ADP → ATP is positive.

A. **TRUE**
B. FALSE
Energy must be invested so it is true.

---

43. Enzymes generally operate on a variety of substrates.

A. TRUE
B. **FALSE**
Enzymes generally operate on specific substrates that is why they can regulate metabolism.

---

44. Pinocytosis is a form of vesicle based active transport that exports material out of the cell.

A. TRUE
B. **FALSE**
False it imports material into the cell.

---

45. Cholesterol insertion into a membrane increases fluidity.

A. **TRUE**
B. FALSE
True it can do this.

---

46. Molecular oxygen (O_2) is breathed in and expired as carbon dioxide (CO_2).

A. TRUE
B. **FALSE**
Molecular oxygen is breathed in and expired as water.

---

47. The excited electron ejected from oxidized P700 is replaced by an electron obtained by splitting of a water molecule and adding the electron directly to P700.

A. TRUE
B. **FALSE**
False see Figure 7.13

---

48. During pyruvate oxidation, one molecule of ATP is produced.

A. TRUE
B. **FALSE**
False no ATP is made at this step. NADH is made.

---

49. The Krebs Cycle occurs in the matrix of the mitochondria.

A. **TRUE**
B. FALSE
Yep.

---

50. The light compensation point refers to the amount of light intensity where the rate of photosynthesis is greater than the rate of respiration in a plant.

A. TRUE
B. **FALSE**
False this is the point where they are equal.
