Exam

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which of the following statements regarding photosynthesis and cellular respiration is *true*? 1) _____
A) Photosynthesis occurs in mitochondria, and cellular respiration occurs in chloroplasts.
B) Photosynthesis occurs in mitochondria and in chloroplasts.
C) Photosynthesis occurs in chloroplasts, and cellular respiration occurs in mitochondria.
D) Cellular respiration occurs in mitochondria and in chloroplasts.

2) How do cells capture the energy released by cellular respiration? 2) _____
A) They store it in molecules of carbon dioxide.
B) They produce ATP.
C) They produce glucose.
D) The energy is coupled to oxygen.

3) The processes of photosynthesis and cellular respiration are complementary. During these energy conversions, some energy is 3) _____
A) destroyed when the chemical bonds of glucose are made.
B) saved in the chemical bonds of water, CO_2 and O_2.
C) used to create light.
D) lost in the form of heat.

4) Respiration _____, and cellular respiration _____. 4) _____
A) is gas exchange . . . produces ATP
B) produces glucose . . . produces oxygen
C) uses glucose . . . produces glucose
D) produces ATP . . . is gas exchange

5) Which of the following are products of cellular respiration? 5) _____
A) oxygen and carbon dioxide
B) oxygen and energy to make ATP
C) oxygen and glucose
D) energy to make ATP and carbon dioxide

6) Which of the following statements regarding cellular respiration is *false*? 6) _____
A) Cellular respiration is a single chemical reaction with just one step.
B) Cellular respiration produces water.
C) Cellular respiration releases heat.
D) Cellular respiration produces carbon dioxide.

7) The overall equation for the cellular respiration of glucose is 7) _____
A) $C_6H_{12}O_6$ + energy → 6 CO_2+ 6 H_2O + 6 O_2.
B) 5 CO_2 + 6 H_2O → $C_5H_{12}O_6$ + 6 O_2 + energy.
C) $C_6H_{12}O_6$ + 6 O_2 → 6 CO_2 + 6 H_2O + energy.
D) $C_5H_{12}O_6$ + 6 O_2 → 5 CO_2 + 6 H_2O + energy.

8) Which of the following statements about the energy yields from cellular respiration is *true*? 8) _____
A) Cellular respiration converts the kinetic energy of glucose into chemical energy.
B) Cellular respiration converts all of the energy in glucose into high–energy ATP bonds.
C) Cellular respiration is more efficient at harnessing energy from glucose than car engines are at harnessing energy from gasoline.
D) The heat produced during cellular respiration is only a tiny fraction of the chemical energy available in a glucose molecule.

9) Humans use the calories they obtain from _____ as their source of energy. 9) _____
A) minerals B) sunlight C) food D) water

10) Humans use about _____ of their daily calories to maintain brain cells and power other life–sustaining activities. 10) _____
A) 75% B) 25% C) 90% D) 50%

11) A kilocalorie is defined as 11) _____
A) the quantity of heat needed to raise the temperature of 1 kg of water by 1°C.
B) the quantity of food used to maintain normal bodily functions.
C) the quantity of glucose needed to increase the body temperature by 1°C.
D) the quantity of food consumed during a given type of exercise.

12) The label on the box of breakfast cereal lists one serving as containing "200 Calories" per serving. How many calories are actually in one serving? 12) _____
A) 20 B) 2,000,000 C) 200,000 D) 2,000

13) During cellular respiration, the energy in glucose 13) _____
A) becomes stored in molecules of ammonia.
B) is carried by electrons.
C) is released all at once.
D) is used to manufacture glucose.

14) During redox reactions, 14) _____
A) a substance that gains electrons is said to be oxidized.
B) protons from one molecule replace the electrons lost from another molecule.
C) the loss of electrons from one substance is called reduction.
D) electrons are lost from one substance and added to another substance.

15) Oxidation is the _____, and reduction is the _____. 15) _____
A) gain of oxygen . . . loss of oxygen B) loss of electrons . . . gain of electrons
C) gain of protons . . . loss of protons D) gain of electrons . . . loss of electrons

16) In biological systems, an important enzyme involved in the regulation of redox reactions is 16) _____
A) oxygen. B) dehydrogenase.
C) glucose. D) ATP.

17) During cellular respiration, NADH 17) _____
A) is the final electron acceptor.
B) is chemically converted into ATP.
C) delivers its electron load to the first electron carrier molecule.
D) is reduced to form NAD^+.

18) During cellular respiration, electrons move through a series of electron carrier molecules. Which of the following statements about this process is *true*? 18) _____

A) The electrons move from carriers that have more affinity for them to carriers that have less affinity for them.
B) Molecular oxygen is eventually oxidized by the electrons to form water.
C) Molecular oxygen is reduced when it accepts electrons and forms water.
D) The electrons release large amounts of energy each time they are transferred from one carrier to another.

19) The functioning of an electron transport chain is analogous to 19) _____

A) a person climbing a flight of stairs one step at a time.
B) a canoe going over a waterfall.
C) a person leaping from the top to the bottom of a flight of stairs in one jump.
D) a Slinky toy going down a flight of stairs.

20) Which of the following options lists the stages in cellular respiration in the correct order? 20) _____

A) glycolysis, oxidative phosphorylation, and the citric acid cycle
B) glycolysis, the citric acid cycle, and oxidative phosphorylation
C) the citric acid cycle, oxidative phosphorylation, and glycolysis
D) oxidative phosphorylation, glycolysis, and the citric acid cycle

21) A drug is tested in the laboratory and is found to create holes in both mitochondrial membranes. Scientists suspect that the drug will be harmful to human cells because it will inhibit 21) _____

A) oxidative phosphorylation.
B) the citric acid cycle.
C) the citric acid cycle and oxidative phosphorylation.
D) glycolysis.

22) During which of the following phases of cellular respiration does substrate-level phosphorylation take place? 22) _____

A) glycolysis and the citric acid cycle
B) oxidative phosphorylation
C) glycolysis
D) the citric acid cycle

23) Which of the following metabolic pathways is common in aerobic and anaerobic metabolism? 23) _____

A) oxidative phosphorylation
B) electron transport chain
C) the citric acid cycle
D) glycolysis

24) As a result of glycolysis there is a net gain of _____ ATPs. 24) _____

A) 0 B) 2 C) 1 D) 36

25) How many molecules of NADH are produced during glycolysis? 25) _____

A) 8 B) 4 C) 2 D) 6

26) Which of the following is a result of glycolysis? 26) _____

A) conversion of glucose to two three-carbon compounds
B) conversion of NADH to NAD^+
C) a net loss of two ATPs per glucose molecule
D) production of CO_2

27) A culture of bacteria growing aerobically is fed glucose containing radioactive carbon and is then examined. As the bacteria metabolize the glucose, radioactivity will appear first in 27) _____
A) carbon dioxide.
B) ATP.
C) pyruvate.
D) glucose–6–phosphate.

28) The end products of glycolysis include 28) _____
A) O_2.
B) NADH.
C) acetyl CoA.
D) citric acid.

29) Pyruvate 29) _____
A) forms at the end of glycolysis.
B) is a six–carbon molecule.
C) is the molecule that starts the citric acid cycle.
D) is the end product of oxidative phosphorylation.

30) After glycolysis but before the citric acid cycle, 30) _____
A) coenzyme A is cleaved off pyruvate.
B) glucose is split, producing two molecules of pyruvate.
C) a carbon atom is added to pyruvate to make a four–carbon compound.
D) pyruvate is oxidized.

31) Which of the following statements regarding the chemical grooming of pyruvate is *false*? 31) _____
A) Each pyruvate molecule has a CO_2 added and then joins with an NADH.
B) Two molecules of pyruvate are each converted into two–carbon molecules joined to a coenzyme A molecule.
C) Two pyruvate molecules together contain less chemical energy than was found in the original glucose molecule.
D) Each pyruvate loses a carbon atom, which is released as CO_2.

32) The enzymes of the citric acid cycle are located in the 32) _____
A) cytoplasm.
B) nucleus.
C) outer mitochondrial membrane.
D) matrix and inner mitochondrial membrane.

33) The end products of the citric acid cycle include all of the following *except* 33) _____
A) pyruvate.
B) $FADH_2$.
C) ATP.
D) CO_2.

34) The function of coenzyme A in the citric acid cycle is most like 34) _____
A) a kid jumping up and down on a trampoline.
B) throwing a baited hook into a lake and catching a fish.
C) a limousine driver dropping off a couple at the school prom.
D) a frog that turns into a prince.

35) A culture of bacteria growing aerobically is fed glucose containing radioactive carbon and is then examined. During the citric acid cycle, radioactivity would first appear in 35) _____
A) citrate.
B) NADH.
C) CoA.
D) oxaloacetic acid.

36) At the end of the citric acid cycle, most of the energy remaining from the original glucose is stored in 36) _____

A) pyruvate. B) CO_2. C) ATP. D) NADH.

37) During chemiosmosis, 37) _____

A) H^+ ions serve as the final electron acceptor.

B) energy is released as H^+ ions move freely across mitochondrial membranes.

C) a concentration gradient is generated when large numbers of H^+ ions are passively transported from the matrix of the mitochondrion to the mitochondrion's intermembrane space.

D) ATP is synthesized when H^+ ions move through a channel in ATP synthase.

38) Which of the following statements about the inner mitochondrial membrane is *false*? 38) _____

A) Electron carriers are found in the inner mitochondrial membrane.

B) The inner mitochondrial membrane plays a role in the production of pyruvate.

C) A gradient of H^+ exists across the inner mitochondrial membrane.

D) ATP synthase is found in the inner mitochondrial membrane.

39) The mitochondrial cristae are an adaptation that 39) _____

A) increases the space for more copies of the electron transport chain and ATP synthase complexes.

B) carefully encloses the DNA housed within the mitochondrial matrix.

C) helps mitochondria divide during times of greatest cellular respiration.

D) permits the expansion of mitochondria as oxygen accumulates in the mitochondrial matrix.

40) A mutant protist is found in which some mitochondria lack an inner mitochondrial membrane. Which of the following pathways would be completely disrupted in these mitochondria? 40) _____

A) glycolysis B) biosynthesis

C) oxidative phosphorylation D) alcoholic fermentation

41) If you were able to stop the process of cellular respiration after completing electron transport but prior to chemiosmosis, you would find the pH of a mitochondrion to be at its lowest 41) _____

A) in the intermembrane space. B) in the mitochondrial matrix.

C) on the outer membrane. D) on the inner membrane.

42) By–products of cellular respiration include 42) _____

A) oxygen and heat. B) $FADH_2$ and NADH.

C) carbon dioxide and water. D) NADH and ATP.

43) In the electron transport chain, the final electron acceptor is 43) _____

A) ADP. B) an oxygen atom.

C) a molecule of water. D) a molecule of carbon dioxide.

44) Rotenone is a poison commonly added to insecticides. Insects exposed to rotenone will die because 44) _____

A) they will no longer be able to produce adequate amounts of ATP.

B) they will no longer be able to perform anaerobic respiration.

C) they will no longer be able to absorb water and will become dehydrated.

D) high levels of fermentation products will build up in their bodies.

45) Cyanide differs from dinitrophenol in that 45) _____

A) cyanide is an electron transport blocker, while dinitrophenol makes the membrane of the mitochondrion leaky to H^+ ions.

B) cyanide inhibits the production of ATP by inhibiting ATP synthase, while dinitrophenol causes mitochondrial membranes to become less permeable to H^+ ions.

C) cyanide makes the membrane of mitochondria leaky to H^+ ions and prevents a concentration gradient from building up, while dinitrophenol blocks the passage of electrons through electron carriers.

D) cyanide is highly toxic to human cells, while dinitrophenol is nontoxic.

46) Which of the following statements about the energy yield of aerobic respiration is *false*? 46) _____

A) Less than 50% of the chemical energy available in glucose is converted to ATP energy.

B) Most of the ATP derived during aerobic respiration results from oxidative phosphorylation.

C) The total yield of ATP molecules per glucose molecule is about 32.

D) Oxidative phosphorylation resulting from 1 glucose molecule yields about 12 ATP molecules.

47) The energy yield from the complete aerobic breakdown of a single molecule of glucose 47) _____

A) increases as the supply of oxygen increases.

B) is less than the yield from anaerobic respiration.

C) is always 32 ATP.

D) can vary depending on whether NADH passes its electrons to NAD^+ or FAD.

48) Which of the following processes produces the most ATP per molecule of glucose oxidized? 48) _____

A) aerobic respiration

B) All produce approximately the same amount of ATP per molecule of glucose.

C) lactic acid fermentation

D) alcoholic fermentation

49) In fermentation, _____ is _____. 49) _____

A) NADH . . . reduced

B) ethanol . . . oxidized

C) NADH . . . oxidized

D) NAD^+ . . . oxidized

50) When an organism such as a yeast lives by fermentation, it converts the pyruvate from glycolysis into a different compound, such as alcohol. Why doesn't it secrete the pyruvate directly? 50) _____

A) The conversion is needed to regenerate the molecules needed for glycolysis.

B) The conversion yields 32 ATP per pyruvate molecule.

C) The conversion yields one NADH per pyruvate molecule.

D) A buildup of pyruvate in the surrounding environment would be too toxic.

51) A child is born with a rare disease in which mitochondria are missing from skeletal muscle cells. However, the muscles still function. Physicians find that 51) _____

A) the muscles contain large amounts of carbon dioxide following even mild physical exercise.

B) the muscles contain large amounts of lactate following even mild physical exercise.

C) the muscles require extremely high levels of oxygen to function.

D) the muscle cells cannot split glucose to pyruvate.

52) Some friends are trying to make wine in their basement. They've added yeast to a sweet grape juice mixture and have allowed the yeast to grow. After several days they find that sugar levels in the grape juice have dropped, but there's no alcohol in the mixture. The most likely explanation is that 52) _____

A) the mixture needs more oxygen, because yeast need oxygen to break down sugar and get enough energy to produce alcohol.
B) the mixture needs less oxygen, because yeast only produce alcohol in the absence of oxygen.
C) the yeast used the alcohol as a carbon source.
D) the mixture needs more sugar, because yeast need a lot of energy before they can begin to produce alcohol.

53) In yeast cells, 53) _____

A) alcohol is produced during the citric acid cycle.
B) lactic acid is produced during glycolysis.
C) lactic acid is produced during anaerobic respiration.
D) alcohol is produced after glycolysis.

54) Bacteria that are unable to survive in the presence of oxygen are called 54) _____

A) facultative anaerobes.
B) obligate aerobes.
C) aerotolerant anaerobes.
D) obligate anaerobes.

55) Yeasts can produce ATP by either fermentation or oxidative phosphorylation; thus, they are 55) _____

A) facultative anaerobes.
B) strict anaerobes.
C) strict aerobes.
D) facultative aerobes.

56) When did the level of oxygen in Earth's atmosphere become high enough to sustain aerobic respiration? 56) _____

A) 3.5 billion years ago
B) 1.5 billion years ago
C) 2.7 billion years ago
D) 1.0 billion years ago

57) Which of the following statements regarding glycolysis is *false*? 57) _____

A) Glycolysis is considered to be an ancient metabolic process because it does not require oxygen.
B) Glycolysis is considered to be an ancient metabolic system because it is the most efficient metabolic pathway for ATP synthesis.
C) Glycolysis is considered to be an ancient metabolic system because it occurs universally.
D) Glycolysis is considered to be an ancient metabolic process because it is not located in a membrane–bound organelle.

58) To obtain energy from starch and glycogen, the body must begin by 58) _____

A) removing one glucose at a time with a condensation reaction.
B) converting both starch and glycogen to fatty acids.
C) hydrolyzing both starch and glycogen to glucose.
D) hydrolyzing the starch to glucose and the glycogen to amino acids.

59) When proteins are used as a source of energy for the body, the proteins 59) _____

A) are hydrolyzed to glucose and converted to acetyl CoA, which enters the citric acid cycle.
B) are converted into glucose molecules, which are fed into glycolysis.
C) are hydrolyzed to their constituent amino acids; electrons are stripped from the amino acids and passed to the electron transport chain.
D) are converted mainly into intermediates of glycolysis or the citric acid cycle.

60) When a cell uses fatty acid for aerobic respiration, it first hydrolyzes fats to 60) _____
A) fatty acids and sugars. B) glycerol and amino acids.
C) glycerol and fatty acids. D) sugars and glycerol.

61) If you consume 1 g of each of the following, which will yield the most ATP? 61) _____
A) protein B) starch C) fat D) glucose

62) Which of the following statements regarding food is *false*? 62) _____
A) Food provides the raw materials for biosynthetic pathways that make molecules for cellular repair and growth.
B) Food provides the raw materials for biosynthetic pathways that can produce sugar by a process that is the exact opposite of glycolysis.
C) Food provides the raw materials for biosynthetic pathways that consume ATP.
D) Food provides the raw materials for biosynthetic pathways that can produce molecules that are not actually present in the original food.

63) Which of the following organisms can make organic molecules from water and carbon dioxide? 63) _____
A) crayfish B) wheat C) mushroom D) bear

64) The conversion of CO_2 and H_2O into organic compounds using energy from light is called 64) _____
A) photosynthesis. B) fermentation.
C) glycolysis. D) cellular respiration.

65) If ATP accumulates in a cell 65) _____
A) feedback inhibition speeds up cellular respiration.
B) the rate of cellular respiration does not change.
C) feedback inhibition slows down cellular respiration.
D) the cell receives a signal that there is a need for more energy.

66) What is the name given to organisms that can make their own food and thus sustain themselves without consuming organic molecules derived from other organisms? 66) _____
A) synthesizers B) chemotrophs C) autotrophs D) heterotrophs

67) Photoautotrophs 67) _____
A) make sugar by using organic raw materials.
B) include only the green plants.
C) eat other organisms that use light energy to make food molecules.
D) produce organic molecules from inorganic molecules.

68) Which of the following is an example of a photoautotroph? 68) _____
A) bacteria in our mouth
B) grizzly bears in Alaska
C) mushrooms growing on the side of a dead tree
D) cyanobacteria in freshwater and marine ecosystems

69) Autotrophs that utilize light as their energy source are 69) _____
A) heterotrophs. B) photoautotrophs.
C) chemosynthetic autotrophs. D) fungi.

70) What is the likely origin of chloroplasts? 70) _____
A) prokaryotes with photosynthetic mitochondria
B) photosynthetic prokaryotes that lived inside eukaryotic cells
C) mitochondria that had a mutation for photosynthesis
D) eukaryotes that engulfed photosynthetic fungi

71) In most green plants, chloroplasts are 71) _____
A) concentrated in a zone of leaf tissue called the mesophyll.
B) concentrated in a portion of the leaf called the stroma.
C) evenly distributed throughout the entire plant.
D) evenly distributed throughout the leaf tissue.

72) _____ cells in leaves are specialized for photosynthesis. 72) _____
A) Sclerenchyma B) Mesophyll C) Companion D) Tracheid

73) CO_2 enters and O_2 escapes from a leaf via 73) _____
A) stroma. B) grana. C) stomata. D) thylakoids.

74) In the chloroplast, sugars are made in a compartment that is filled with a thick fluid called the 74) _____
A) matrix. B) stroma. C) thylakoid. D) stomata.

75) Chloroplasts contain disklike membranous sacs arranged in stacks called 75) _____
A) cristae. B) vacuoles. C) grana. D) thylakoids.

76) Where is chlorophyll found in a plant cell? 76) _____
A) thylakoid membranes B) stroma
C) cytoplasm D) cristae

77) The oxygen released into the air as a product of photosynthesis comes from 77) _____
A) carbon dioxide. B) chlorophyll. C) glucose. D) water.

78) Which of the following molecules is both a reactant and a product of photosynthesis? 78) _____
A) glucose B) H_2O C) chlorophyll D) O_2

79) If you expose a photosynthesizing plant to water that contains both radioactive H and radioactive O, in which of the products of photosynthesis will the radioactive H and O show up? 79) _____
A) H in glucose and water; O in O_2 B) H in glucose; O in water
C) H and O both in glucose D) H in water; O in glucose

80) A redox reaction involves the transfer of 80) _____
A) an electron. B) water. C) carbon dioxide. D) oxygen.

81) Which of the following statements concerning the role of redox reactions in photosynthesis and cellular respiration is *true*? 81) _____

A) Photosynthesis involves only reductions, while respiration involves only oxidations.
B) In photosynthesis, carbon dioxide is reduced to form sugar, while in respiration, sugar is oxidized to form carbon dioxide.
C) In photosynthesis, carbon dioxide is oxidized to form sugar, while in respiration, sugar is reduced to form carbon dioxide.
D) Photosynthesis involves only oxidations, while respiration involves only reductions.

82) What is the source of energy that provides the boost for electrons during photosynthesis? 82) _____

A) light
B) electromagnetism
C) ATP
D) cellular respiration

83) Which of the following statements regarding photosynthesis is *false*? 83) _____

A) Photosynthesis produces O_2; respiration produces CO_2.
B) ATP is not produced during photosynthesis, but only during cellular respiration.
C) Photosynthesis consumes CO_2; respiration consumes O_2.
D) Photosynthesis is ultimately powered by light energy and respiration by the chemical energy of fuel molecules.

84) The light reactions occur in the _____, while the Calvin cycle occurs in the _____. 84) _____

A) stroma . . . thylakoid membranes
B) stroma . . . nucleus
C) thylakoid membranes . . . stroma
D) cytoplasm . . . thylakoid membrane

85) Which of the following are produced during the light reactions of photosynthesis? 85) _____

A) ADP, $NADP^+$, O_2
B) glucose, ADP, $NADP^+$
C) glucose, ADP, $NADP^+$, CO_2
D) ATP, NADPH, O_2

86) Which of the following is part of the light reaction? 86) _____

A) carbon fixation
B) regeneration of $NADP^+$
C) reduction of carbon
D) formation of waste products in the form of O_2

87) Which of the following are produced during the Calvin cycle? 87) _____

A) ATP, NADPH, O_2
B) glucose, ADP, $NADP^+$
C) ATP, NADPH, CO_2
D) glucose, ADP, $NADP^+$, CO_2

88) Carbon fixation 88) _____

A) provides the cell with a supply of NADPH molecules.
B) occurs during the light reactions.
C) occurs when carbon atoms from CO_2 are incorporated into an organic molecule.
D) supplies the cell with ATP.

89) Sunlight is a type of _____ energy. 89) _____

A) potential B) nuclear C) kinetic D) electromagnetic

90) The full range of electromagnetic energy is called the _____ spectrum. 90) _____
A) ultraviolet B) electromagnetic C) energy D) visible

91) Why are most plants green? 91) _____
A) Green helps plants blend into their environment as a sort of camouflage.
B) Chlorophyll *a* reflects green light.
C) Chlorophyll *b* primarily uses green light as the source of energy for photosynthesis.
D) Chlorophyll *a* absorbs green light.

92) Which of the following colors contributes the *least* energy to photosynthesis? 92) _____
A) blue B) red C) green D) orange

93) Of the following wavelengths of light, which would you expect to be reflected or transmitted by chlorophyll *a*? 93) _____
A) blue B) red C) green D) yellow

94) Chlorophyll *b* 94) _____
A) catalyze the incorporation of carbon atoms into RuBP.
B) is best at absorbing the energy of blue–violet and red light, just like chlorophyll *a*.
C) passes absorbed energy to chlorophyll *a*.
D) is best at absorbing the energy of green light.

95) Plant cells are protected from the harmful effects of reactive oxidative molecules by 95) _____
A) carotenoids. B) ATP. C) mitochondria. D) chlorophyll.

96) A packet of light energy is called a 96) _____
A) phaser. B) photon. C) pigment. D) quantum.

97) Which of the following statements about the absorption of photons by pigment molecules is true? 97) _____
A) The release of energy by the excited electron can be as heat, light, or fluorescence.
B) Photons raise electrons in pigments to the ground state.
C) Excitation of the electrons is a very stable state.
D) It takes several minutes for the pigment electrons to become excited.

98) Which of the following photosynthetic pigments can be found at the photosystem reaction center? 98) _____
A) chlorophyll *b* B) phycocyanin C) chlorophyll *a* D) a carotenoid

99) Which of the following is a normal process of photosynthesis that could not occur if all reaction centers were inactivated by a toxin? 99) _____
A) absorption of photons by chlorophyll *b*
B) absorption of photons by carotenoids
C) donation of excited electrons by chlorophyll *a* to a primary electron acceptor
D) donation of excited electrons by chlorophyll *b* to a primary electron acceptor

100) How do the reaction centers of photosystem I and II differ? 100) _____
A) Each preferentially absorbs slightly different wavelengths of light.
B) Chlorophyll *a* is found in photosystem I and chlorophyll *b* in photosystem II.
C) Photosystem II does not transfer electrons from photons.
D) Photosystem I functions first in the sequence of steps that make up the light reactions.

101) Clusters of light-gathering pigments in a photosystem 101) _____
A) are found in the roots of plants. B) pass energy to the reaction center.
C) break down H_2O. D) absorb electrons.

102) In a photosystem, clusters of chlorophyll *a*, chlorophyll *b*, and carotenoid pigments function most like 102) _____
A) a spring. B) an antenna.
C) a windmill. D) a propeller on a motorboat.

103) The energy that excites P680 and P700 is supplied by 103) _____
A) NADPH.
B) ATP.
C) photons.
D) electrons passing down the electron transport chain.

104) The electron transport chains of the light reactions 104) _____
A) provide energy for the citric acid cycle.
B) are located in the stroma.
C) shuttle electrons along in a series of redox reactions.
D) are found on the plasma membrane of mesophyll cells.

105) As a result of the cascade of electrons down the electron transport chains of the light reactions, 105) _____
A) NADPH is reduced to $NADP^+$. B) $NADP^+$ is oxidized to NADPH.
C) NADPH is oxidized to $NADP^+$. D) $NADP^+$ is reduced to NADPH.

106) The electrons lost from the reaction center of photosystem I are replaced by electrons from 106) _____
A) H_2O.
B) the top of the electron transport chain.
C) CO_2.
D) the bottom of the electron transport chain.

107) The electrons lost from the reaction center of photosystem II are replaced by electrons from 107) _____
A) CO_2. B) photosystem I. C) H_2O. D) ATP.

108) Photosystem II 108) _____
A) does not have a reaction center. B) passes electrons to photosystem I.
C) releases CO_2 as a by-product. D) has P700 at its reaction center.

109) Photophosphorylation during photosynthesis differs from oxidative phosphorylation during cellular respiration in that 109) _____
A) energy is stored in the form of a proton concentration difference.
B) it involves an electron transport chain.
C) the final electron acceptor is $NADP^+$ and not oxygen.
D) regeneration of ATP is driven by a flow of protons through an ATP synthase.

110) In photophosphorylation, energy from electron flow is used to transport _____ from the _____ to the thylakoid compartment, generating a concentration gradient of _____. 110) _____

A) H^+ . . . stroma . . . H^+
B) H^+ . . . stroma . . . ATP
C) electrons . . . grana . . . H^+
D) H^+ . . . grana . . . electrons

111) The chloroplast ATP synthase 111) _____

A) is found in the stroma.
B) helps transport H^+ against the concentration gradient.
C) is a nucleic acid complex.
D) couples the flow of H^+ to the phosphorylation of ADP.

112) In photosynthesis, the chemiosmotic production of ATP 112) _____

A) requires oxygen.
B) is done by the Calvin cycle.
C) is analogous to the production of ATP in mitochondria.
D) is a result of the oxidation of glucose.

113) Mitochondria transfer _____ energy from _____ to ATP; chloroplasts transform _____ energy into the chemical energy of ATP. 113) _____

A) chemical . . . food . . . light
B) food . . . light . . . nuclear
C) food . . . light . . . chemical
D) light . . . food . . . kinetic

114) Photosynthetic organisms derive their carbon from 114) _____

A) carbon monoxide.
B) hydrocarbons.
C) methane.
D) carbon dioxide.

115) ATP and NADPH 115) _____

A) are used in the electron transport chain to pump H^+ into the thylakoid space.
B) provide energy to Photosystem I and Photosystem II.
C) power sugar synthesis during the Calvin cycle.
D) are products of the Calvin cycle.

116) To produce one glucose, the Calvin cycle needs to be run through _____ time(s). 116) _____

A) four
B) two
C) eight
D) six

117) The Calvin cycle constructs _____, an energy-rich molecule that a plant cell can then use to make glucose or other organic molecules. 117) _____

A) carbon dioxide
B) G3P
C) NADH
D) ATP

118) The addition of oxygen instead of carbon dioxide to RuBP results in 118) _____

A) cellular respiration.
B) photophosphorylation.
C) aerobic respiration.
D) photorespiration.

119) Photorespiration 119) _____

A) may be an evolutionary relic from when atmospheric O_2 levels were low.
B) is of benefit to the plant since it breaks down rubisco.
C) produces glucose.
D) is attributable to high CO_2 levels.

120) What is the main adaptive advantage of the C_4 and CAM photosynthesis strategies over the C_3 strategy? 120) _____

A) They make it possible for the plant to use the Calvin cycle at night.
B) They allow the plant to fix carbon more efficiently in dim or cool conditions.
C) They help the plant conserve water and synthesize glucose efficiently under hot, dry conditions.
D) They allow the plant to fix carbon more efficiently under conditions of low atmospheric CO_2.

121) The ultimate source of all the food we eat and the oxygen we breathe is 121) _____

A) photosynthesis.
B) cellular respiration.
C) glycolysis.
D) anaerobic metabolism.

122) Plants use sugars as 122) _____

A) a starting material for the Calvin cycle.
B) a fuel for photosynthesis.
C) a fuel for cellular respiration and a starting material for making other organic molecules.
D) a source of electrons for chemiosmosis.

123) Plant cells 123) _____

A) lack mitochondria and chloroplasts.
B) have mitochondria and chloroplasts.
C) lack mitochondria but have chloroplasts.
D) have mitochondria but do not have chloroplasts.

124) Global warming due to the greenhouse effect may be 124) _____

A) made worse by photosynthesis, which adds carbon dioxide to the atmosphere.
B) moderated by photosynthesis, which removes carbon dioxide from the atmosphere.
C) reduced by the burning of fossil fuels, which removes oxygen from the atmosphere.
D) of little concern, since it is part of the normal cycle for the planet.

125) Which of the following statements about the greenhouse effect is *true*? 125) _____

A) The greenhouse effect will decrease the average temperature of the planet.
B) The greenhouse effect has no direct relationship with the Industrial Revolution of the 1800s.
C) The greenhouse effect is exacerbated by the use of fossil fuels.
D) The greenhouse effect is reduced by deforestation.

126) It has been argued that cutting old-growth forests and replacing them with plantations of young trees would help to alleviate the threat of global greenhouse warming. What important fact does this argument ignore? 126) _____

A) Young trees fix carbon at a lower rate per unit mass than old trees.
B) Most of the biomass of the cut trees would be added to the atmosphere as CO_2 within a few years.
C) Most of the young trees would die within a few years.
D) Forests play too minor a role in global CO_2 dynamics, which are affected far more by marine algae.

127) Ozone 127) _____

A) formation is promoted by CFCs.
B) protects Earth from UV radiation.
C) is a source of oxygen for cellular respiration.
D) is broken down by carbon dioxide.

128) Ozone consists of _____ oxygen atom(s). 128) _____

A) three B) one C) two D) four

129) Which of the following has been a major source of ozone destruction over the past 50 years? 129) _____

A) chlorofluorocarbons B) carbon dioxide
C) ethylene glycol D) chemiosmosis

1) C
2) B
3) D
4) A
5) D
6) A
7) C
8) C
9) C
10) A
11) A
12) C
13) B
14) D
15) B
16) B
17) C
18) C
19) D
20) B
21) C
22) A
23) D
24) B
25) C
26) A
27) D
28) B
29) A
30) D
31) A
32) D
33) A
34) C
35) A
36) D
37) D
38) B
39) A
40) C
41) A
42) C
43) B
44) A
45) A
46) D
47) D
48) A
49) C
50) A

51) B
52) B
53) D
54) D
55) A
56) C
57) B
58) C
59) D
60) C
61) C
62) B
63) B
64) A
65) C
66) C
67) D
68) D
69) B
70) B
71) A
72) B
73) C
74) B
75) C
76) A
77) D
78) B
79) A
80) A
81) B
82) A
83) B
84) C
85) D
86) D
87) B
88) C
89) D
90) B
91) B
92) C
93) C
94) C
95) A
96) B
97) A
98) C
99) C
100) A

101) B
102) B
103) C
104) C
105) D
106) D
107) C
108) B
109) C
110) A
111) D
112) C
113) A
114) D
115) C
116) D
117) B
118) D
119) A
120) C
121) A
122) C
123) B
124) B
125) C
126) B
127) B
128) A
129) A