BIO 103 – Ch. 1 Exam Study Guide - Mader 10th Ed.

1. Organisms belonging to the same _____ would be the most closely related.
A. kingdom
B. phylum
C. family
D. class
E. order

2. A university biology department wishes to hire a scientist to work on the relationships among the wolves, moose, trees and physical features on an island. If you were charged with writing the job description, you should title the position
A. population geneticist.
B. molecular biologist.
C. community ecologist.
D. organismal physiologist.
E. island zoologist

3. Which of the following terms best describes a conceptual scheme in science that is strongly supported, has not yet been found incorrect, and is based on the results of many observations?
A. a scientific model
B. an experiment
C. descriptive research
D. a scientific theory or principle
E. experimental results

4. Choose the correct order of classification from most inclusive to exclusive.
A. Domain-Kingdom-Phylum-Class-Order-Family-Genus-Species
B. Kingdom-Domain-Class-Phylum-Order-Family-Genus-Species
C. Kingdom-Domain-Class-Phylum-Order-Genus-Species-Family
D. Kingdom-Class-Phylum-Domain-Genus-Order-Family-Species

5. Which listing correctly indicates a sequence of increasing biological organization?
A. molecule, cell, organelle, atom
B. organelle, tissue, cell, molecule
C. organ, tissue, atom, molecule
D. atom, molecule, organelle, cell

6. The classification system most commonly used by biologists today contains five domains.
True False

7. Unicellular prokaryotes
A. lack a membrane bounded nucleus
B. are classified in the domains Bacteria and Archaea
C. are found in almost all habitats
D. All of the choices are correct.

8. Humans have an exaggerated impact on the ecosystem through their use of extra sources of energy and raw materials, and the production of extra wastes that must be handled.
True False

Living organisms on Earth share many common characteristics. Which statements are TRUE and which are FALSE about nearly all living things?

9. Living things are made up of cells
True False

10. Living things must obey the laws of chemistry and physics
True False

11. Living things show biological organization and other common characteristics of life
True False

12. Emergent properties can be used to distinguish living things from nonliving things
True False

13. Living things are composed only of organic elements, whereas nonliving things are made up of inorganic elements
True False

14. A hypothesis is tested by:
A. a prediction
B. experimentation
C. analysis of results
D. formulation of a theory

15. The control group in an experiment receives all the same treatments as the experimental group(s), except for the one variable being tested.
True False

16. Extinction can occur if a species is unable to adapt to a changing environment.
True False

17. Living organisms are characterized by:
A. adapting to the environment.
B. evolving over time.
C. displaying homeostatic controls.
D. all of the choices pertain to living organisms.

Living and nonliving entities share some characteristics. Which statements are TRUE and which are FALSE about both living and nonliving entities?

18. Both living and nonliving entities are organized at the cellular level
True False

19. Both living and nonliving entities exhibit homeostatic controls
True False

20. Both living and nonliving entities are composed of chemical elements
True False

21. Both living and nonliving entities adapt to the environment
True False

22. Which of the following domains contains the most primitive prokaryotes that live in extreme environments?
A. Archaea
B. Bacteria
C. Plantae
D. Fungi
E. Eukarya

23. Which of the following concepts is NOT one of the unifying theories of biology?
A. All organisms are composed of cells.
B. Life may arise through spontaneous generation.
C. Life comes only from life.
D. Organisms contain coded information that dictates their form, function, and, at times, behavior.
E. All living things have a common ancestor and are adapted to a particular way of life

24. _____ transforms solar energy into chemical energy.
A. evolution
B. metabolism
C. adaptation
D. homeostasis
E. photosynthesis

25. Which of the following does NOT represent homeostasis?
A. Sensors detect CO_2 levels in the blood and trigger an increase or decrease in the rate of breathing.
B. When body temperature drops, you shiver to generate heat; when your body heats up, you sweat and the evaporation cools you.
C. Feelings of hunger and then fullness affect the length of time and quantity of food you eat, keeping your weight near a "set point."
D. Energy is captured by plants, then transferred to consumers and decomposers, and eventually lost as heat.
E. Cells adjusting the openings on the bottom of leaves respond to differences in water stress in order to maintain moisture inside the leaf.

26. From Kansas to central Indiana to Pennsylvania, many people believe that they have water moccasins (also called "cottonmouths") in their ponds. Some assert they have seen them, although they are certainly not so foolish as to try to capture one alive. Meanwhile, the fish and game offices and the range maps in the herpetology books indicate that this poisonous snake does not breed this far north. What is the most scientific attitude to assume on this issue?
A. Observations by both the public and the fish and game officers are subjective so this is not easily resolved objectively.
B. A simple field trip to the pond locations-that resulted in the capture and confirmation of the identity of the snakes-would settle the matter.
C. Scientific books with range maps are based on field research and, therefore, determine the truth in this case.
D. Because living organisms are active, scientific theories in biology always change.

27. Studying a brick does not predict the design of a skyscraper. Intense examination of muscle tissues does not allow you to predict the design of a kangaroo or clam. The structure of chlorophyll does not dictate the unique structure of a tree. These cases demonstrate:
A. the essential properties of life.
B. the levels of organization from atom to biosphere.
C. determinism, or how all phenomena are predictable effects of causes.
D. emergent properties that are easily predicted by examining their parts.
E. emergent properties that cannot be predicted by examining their parts.

28. One classic definition of life is "a self-replicating molecular assemblage." However, clay particles (in clay soil) contain layered aluminum and iron compounds that determine the pattern of the adjacent layers of sediment. This is technically a self-replicating molecular assemblage.
A. Therefore, it is living.
B. It is not living because it cannot think.
C. It is not living because there were no molecular changes (or chemistry) involved.
D. It is not living because there is no carbon involved; otherwise, such duplication would be living.
E. It is not living because it is a simple repetitive process without the ability to evolve or respond to the environment.

29. Which of the following terms best describes the collection of scientific data through observation in the field, such as observing the behavior of birds?
A. a scientific model
B. an experiment
C. descriptive research
D. a scientific theory or principle
E. experimental results

30. Which of the following organisms is NOT ultimately dependent on the sun as a source of energy?
A. A night-blooming flower is pollinated by night-flying bats.
B. An underground earthworm avoids the sun.
C. A cave fish feeds on debris that washes down to it.
D. All of the choices ARE ultimately dependent on the sun.
E. All of the choices are NOT ultimately dependent on the sun.

31. A study is conducted to determine the average length and weight of loblolly pine tree needles in the southeast United States. Is this data obtained through observation or experimentation?
A. Observation
B. Experimentation
C. Neither observation nor experimentation
D. Both observation and experimentation

32. An environmental biologist was studying the biodiversity of a wildlife refuge. In the area, he found pine trees scattered among a variety of mixed hardwood trees. In order to identify the pine trees, he counted the number of needles per bundle and measured the average length of the needles. This is a _____ study.
A. Experimental
B. Descriptive
C. Both experimental and descriptive
D. Neither A or B

33. An earlier classification grouped organisms by whether they inhabited the air, land or sea. However, the five-kingdoms-of-life and three-domains system divided into class-order-family-genus-species as described in this chapter is superior because it
A. better represents the origin of features held in common-the unity of life in DNA, etc.
B. better reflects the origin of adaptations-the diversity of life for differing environments.
C. allows the organization of over 900,000 different species.
D. groups organisms based on similarities related to their structure and evolution.
E. All of the choices are correct.

34. A cell is to a tissue as an atom is to:
A. molecule
B. subatomic particle
C. electron
D. population

35. You are interested in the effect of increased carbon dioxide versus normal air, and also in the effect of green light versus full sunlight on the growth of corn plants in a greenhouse. Although you can set up your experiment inside a greenhouse, it is possible that there will be plant growth effects due to effects that you do not know and may never know. Which of the following are important to ensure control of unknown variables?
A. An increase in carbon dioxide does not result in a substantial decrease of other necessary gases.
B. All seedlings are from one uniform strain.
C. The intensity or brightness of the green light equals the intensity of the full sunlight.
D. All temperatures and available water remain the same.
E. All of the choices are important.

36. Tropical rainforests have many species that are found in great abundance. A study in the Brazilian rainforest found 487 tree species growing on a single hectare (2.5 acres). In the US and Canada together, there are only 700 species of trees on millions of acres. In one park in a Peruvian rainforest, scientists have identified over 1300 species of butterflies, while in all of Europe there are approximately 320 butterfly species. These findings suggest that:
A. rainforests are biologically less diverse than other ecosystems on earth.
B. the number of tree species and butterfly species are about the same throughout the ecosystems of the world.
C. rainforests are biologically more diverse than other ecosystems.
D. as many as 400 species a day are lost due to human activity.

37. Biodiversity in a particular ecosystem
A. is the total number of species in that ecosystem
B. includes the variability of the individual genes
C. impacts the function of the ecosystem in which the species live
D. All of the choices are correct.

38. Some members of Daphnia, a water flea, have a genetic mutation that causes them to prefer warmer environments. These members reproduce and pass these genetic changes to their offspring. The next generation will occupy warmer environments not previously occupied by this species. This is an example of:
A. adaptation
B. homeostasis
C. irritability
D. All of the choices are correct.

39. Some biologists study the complex interactions of animals and plants in forests or prairies. Such ecology field research often produces slightly different results for different researchers. In contrast, ecology experiments that are run indoors with one organism in a terrarium usually produce results that are repeatable. What is the most likely explanation?
A. The scientific method is only useful in laboratory settings.
B. It is not possible to establish a control group outside of a laboratory.
C. It is easier to hold all but one variable constant in a laboratory.
D. Field research is only descriptive, and descriptive research is not strictly "science."
E. Fieldwork is inductive; lab work is deductive.

Dr. James isolated *Staphylococcus aureus,* a type of bacteria, from the leg wound of a ten year old boy. He suspected these bacteria would grow better at body temperature than room temperature (72^{o}F), but thought that he should collect data to support his thinking. Dr. James introduced the same number of Staphylococcus bacteria into each of six test tubes containing the same type and amount of nutrient broth. Three test tubes were incubated at 98.6^{o}F (Group 1), while three test tubes (Group 2) sat at 72^{o}F. After 24 hours, Dr. James compared the turbidity (indicative of growth) of all six tubes and rated each on a scale of 0 - 4. 0 indicates no turbidity (no growth), while 4 indicates high turbidity (high growth). The following data was collected:

Test Tube	Temperature ^{0}F	Turbidity
Group 1: 1	**98.6**	**+ 4**
2	**98.6**	**+ 4**
3	**98.6**	**+ 3**
Group 2: 4	**72**	**0**
5	**72**	**+ 1**
6	**72**	**0**

40. After reading the scenario, write the hypothesis that was being tested in Dr. James' experiment.

41. Would you consider this to be a controlled experiment?

42. Evaluate the data presented here to reach a conclusion. Would you reject or not reject the null hypothesis.

43. The dependent (responding) variable in this experiment is:
A. the temperature
B. growth of bacteria, as indicated by the turbidity in the test tubes
C. the time that the test tubes were allowed to sit
D. amount of initial inoculum, or number of bacteria introduced into each test tube

44. The independent (experimental) variable is:
A. temperature
B. growth of bacteria
C. incubation period
D. amount of initial inoculum

45. To ensure a controlled experiment all of the following conditions (variables) should be identical in Group 1 and Group 2:
A. type of bacteria, temperature, and incubation period
B. temperature and amount of initial inoculum (bacteria used)
C. type of bacteria, incubation period, amount of bacteria used
D. degree of turbidity, incubation period, and amount of bacteria

46. Choose the hypothesis for this experiment:
A. Based on the data collected during this experiment, *S. aureus* grows better at body temperature than room temperature.
B. Based on previous experience, it is predicted that *S. aureus* will grow better at
C. body temperature than at room temperature.
D. The hypothesis is not specifically identified in the excerpt as a hypothesis. There is, therefore, no hypothesis.
E. Based on the data collected during the experiment, it is confirmed that *S. aureus* grew better at room temperature.

47. Dr. James performed another experiment. Instead of inoculating the test tubes with Staphylococcus, he used the bacterium, Streptococcus. He found that Streptococcus grew better at body temperature than at room temperature. This is a replicate of the first experiment.
A. True
B. False

48. Dr. James considers the bacteria grown at body temperature to be the control group and room temperature the experimental group. Do you agree with this reasoning?

49. A researcher reports he has conducted many experiments where a galvanometer (lie detector) was hooked up to detect a plant's responses. He reports that when a spider was released near the plant, the spider's decision to escape was picked up by the plant, "causing a reaction in the leaf." When other researchers repeated the experiment, they could not get any galvanometer responses. The researcher then concluded that plants could be put into a faint by humans.
A. This is a justified conclusion from a research design that appears to follow the scientific method.
B. The only problem with this general research plan is that it lacks a control.
C. Results must be somewhat repeatable and these results that only work for this researcher do not qualify as science.
D. The design is scientific; it just lacks a hypothesis.
E. If the researcher has actual numerical counts, this must be accepted as valid science.

50. An elementary student decides to conduct an experiment comparing the effectiveness of two commercial soaps as cleaning agents, using each in paired tests of different types of stains and colors of cloth, where the only variable is the soap used. The student will use the judgment of classmates to decide if the stains remain equal or if soap one cleans better than the other in each test run. However, the student makes no prediction of which soap is expected to perform best.
A. This lacks a hypothesis and is therefore not a scientific test.
B. This lacks any control group (no-soap treatment) and therefore will provide no meaningful results.
C. Because this is based on the subjective judgments of students, it is not objective and therefore not scientific.
D. This is a scientific procedure, although it does lack a stated hypothesis describing an anticipated outcome.
E. This experimental design has all the components and procedures of the scientific method.

51. For five years, you wake up before the alarm is set to ring each morning. This leads you to conclude that people have a built-in "alarm clock" capable of waking them up. From a science viewpoint, this conclusion
A. is science because it is based on real observations.
B. is science because it is predictive of what will happen tomorrow morning.
C. is scientifically valid because 5 years x 365 days is a large number of trials.
D. may not be valid because it generalizes about all people, and there may have been other variables that could awaken you without a built-in clock.
E. cannot be scientifically treated because it involves human behavior.

52. The manner in which a scientist intends to conduct an experiment is called:
A. inductive reasoning
B. the experimental design
C. data collection and analysis
D. the conclusion

53. There is debate as to whether religious creationism should receive ‘equal time' in the science classroom. Many firmly disagree with creationism being taught in public schools, maintaining that science does not address religious and supernatural concepts. How would you support this statement?

54. Arrange in order, the levels of ecological study from most inclusive to most exclusive:
A. biosphere, ecosystem, community, population, individual organism
B. ecosystem, biosphere, population, community, individual organism
C. individual organism, community, population, ecosystem, biosphere
D. individual organism, population, community, ecosystem, biosphere

BIO 103 – Ch. 2 Exam Study Guide - Mader 10th Ed.

1. Which of the following elements would be more reactive with other elements?
A. boron, #5
B. neon, #10
C. argon, #18
D. helium, #2

2. Which of the following would be a proposed mechanism by which stomach antacids work?
A. Antacids dilute the solution, therefore lowering the pH.
B. Antacids are bases and by definition can absorb H^+ out of a solution.
C. Antacids are bases and by definition can absorb OH^- out of a solution.
D. Antacids contain mostly water and so they neutralize the solution.

3. If you place the corner of a paper towel into a droplet of water the water moves across the paper towel. Which of the following would explain the movement of the water?
A. surface tension
B. cohesion
C. adhesion
D. both cohesion and adhesion

4. Which of the following elements is NOT one of the six most common in living organisms?
A. carbon
B. oxygen
C. iron
D. nitrogen
E. hydrogen

5. There are _____ naturally occurring elements.
A. 57
B. 108
C. 95
D. 92
E. 87

6. Which statement is NOT true about elements?
A. An element cannot be broken down into substances with different properties.
B. An element consists of atoms and molecules.
C. There is only one kind of atom in each type of element.
D. All atoms of an element contain the same number of protons.
E. Atoms of an element may contain different numbers of neutrons.

7. If the atomic number of an element is 6 and the atomic mass is 12.01, how many protons are there in the nucleus?
A. 12
B. 6
C. 24
D. 52

8. Which of the following is/are an atom, an isotope and an ion?
A. H^+
B. ^2H or deuterium
C. ^3H or tritium
D. H_2 or hydrogen gas
E. All of the choices are atoms, isotopes and ions.

Radioactive Isotope	Half-life	Energy of Particles Emitted
^{131}I ("iodine-131")	8.1 days	0.8 MeV
^{32}P ("phosphorus-32")	14.3 days	1.7 MeV
^{33}P ("phosphorus-33")	25.5 days	0.25 MeV
^{35}S ("sulfur-35")	87.5 days	0.2 MeV
^{3}H ("tritium")	12.4 years	0.02 MeV
^{14}C ("carbon-14")	5730 years	0.2 MeV

9. From the above table of radioisotopes and their properties, it is obvious that
A. the longer the half-life, the more energy emitted by the particles.
B. the longer the half-life, the less energy emitted by the particles.
C. radioisotopes of the same element must emit the same amount of energy in their emissions and decay at the same rate.
D. adjusted for time, radioisotopes emit the same amount of energy in their emissions.
E. energy and half-life are not directly related.

10. Which statement is NOT true about subatomic particles?
A. Protons are found in the nucleus.
B. Neutrons have no electrical charge.
C. Electrons contain much less mass than neutrons.
D. Electrons are found in orbitals around the nucleus.
E. All electrons in an atom contain the same amount of energy.

11. Which is NOT true about the electrical charges in chemistry?
A. Protons carry a positive charge.
B. In an atom, the number of protons and neutrons must be equal.
C. An atom is neutral when the positive and negative charges balance.
D. An ion contains one or more positive or negative charges.

12. In a water molecule,
A. the oxygen atom is more electronegative than the hydrogen atoms.
B. the oxygen atom has an overall negative charge with the hydrogen atoms having an overall positive charge.
C. unequal sharing of electrons results in a polar molecule.
D. All of the choices are correct.

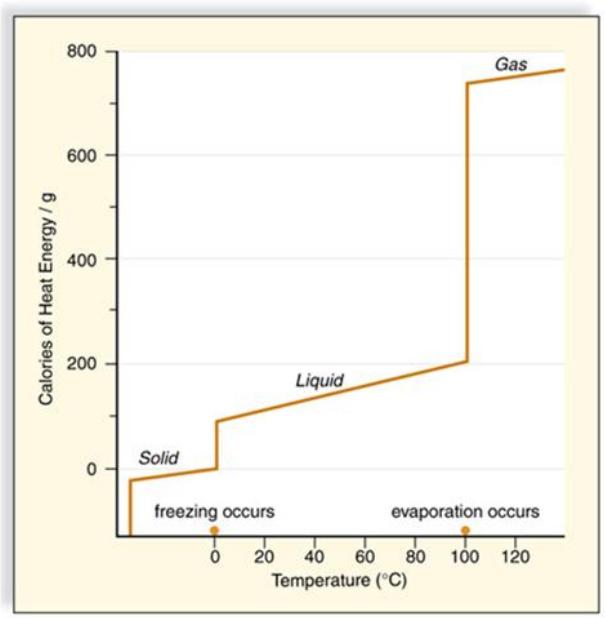
13. An atom's atomic mass is best described as the mass of
A. the protons it contains.
B. the neutrons it contains.
C. electrons in the outermost shell.
D. protons and neutrons it contains.
E. protons and electrons it contains.

14. A research article indicates that researchers have used an isotope ^{3}H to trace a certain metabolic process. From the symbol that is given, we know this is a hydrogen isotope with
A. three protons.
B. three neutrons.
C. three electrons.
D. one proton and two neutrons.
E. two protons and one neutron.

15. Both ^{18}O and ^{16}O are found in nature. However, ^{16}O is the most common. Therefore,
A. these are different elements.
B. oxygen atoms can have eight or 10 neutrons.
C. ^{18}O has two additional electrons in its outer shell.
D. ^{18}O is the form of oxygen that provides living cells with life.
E. only the common form of ^{16}O can bond with hydrogen atoms to form H_2O.

16. To determine the age of fairly recent fossils and organic artifacts, it is possible to analyze the amounts of the isotopes ^{14}C and ^{14}N, because over time the ^{14}C-which originated in the atmosphere-breaks down into ^{14}N. What net change occurred for this to happen?
A. The ^{14}C lost an electron.
B. The ^{14}C gained an electron.
C. The ^{14}C lost a proton.
D. The ^{14}C gained a proton.
E. The ^{14}C gained a neutron.

17. What does this graph reveal about the heat of vaporization and the heat of fusion?



a. Calories lost when 1 g of liquid water freezes and calories required when 1 g of liquid water evaporates.

18. Which of the following statements is NOT true about electron configurations?
A. If an atom has only one shell, it is complete with two electrons.
B. If an atom has two or more shells, the octet rule applies.
C. If an atom has two or more shells, the outer shell is complete with eight electrons.
D. Atoms with more than eight electrons in the outer shell react by gaining electrons.
E. Atoms with eight electrons in the outer shell are not reactive at all.

19. An orbital is best described as
A. the electron shell closest to the nucleus.
B. the outermost electron shell of an atom.
C. the volume of space in which electrons are most often found.
D. the original energy level of electrons in photosynthesis.

20. Prior to prescription medications to control stomach acid and "heart burn" people consumed baking soda (sodium bicarbonate) to decrease their discomfort. This would indicate that sodium bicarbonate
A. effectively buffers stomach acid by releasing H^+
B. should be sold as a prescription drug
C. blocks acid production by combining with OH^-
D. neutralizes stomach acid by combining with excess H^+

21. Which statement is NOT true about ionic bonds?
A. One atom acts as an electron donor and another atom acts as an electron acceptor.
B. Electrons are completely lost or gained in ion formation.
C. An ion has the same number of electrons as a nonionic atom of the same element.
D. An ionic bond occurs between positive ions and negative ions.
E. A salt such as NaCl is formed by an ionic reaction.

22. Which statement is NOT true about covalent bonds?
A. Covalent bonds form when an electron is completely lost or gained from an atom.
B. A covalent molecule contains one or more covalent bonds.
C. A single covalent bond is drawn as a line between two atoms.
D. A pair of electrons is shared between two atoms for each covalent bond.
E. Shared electrons allow an atom to complete its outer electron shell in a covalent molecule.

23. Which statement is NOT true about polar covalent bonds?
A. Most covalent bonds are nonpolar, with electrons shared fairly equally between the atoms.
B. Polar covalent bonds are important in the characteristics of water.
C. Electrons are shared unequally in a polar covalent bond.
D. The larger atom in a polar bond attracts the electron more strongly than the smaller atom.
E. The oxygen of a water molecule is electropositive relative to the hydrogen.

24. An abandoned Indiana coal mine spoil bank contains chunks of pyrite minerals. Under constant erosion and weathering, the pyrites leech large amounts of sulfuric acid (H_2SO_4). The spoil banks are also mixed with large quantities of basic limestone and clay carbonates. What should occur over time?
A. The pH level will drop until all acid has washed out.
B. The pH level will remain at 7.0 because of constant washing with rain.
C. The pH level will remain at 7.0 because all acid will be immediately neutralized by bases.
D. The pH levels will be spotty and vary over time, first more acidic but drifting back toward 7.0.
E. Bases always dominate over acids.

Which of the following statements is/are true about the pH scale?

25. The scale indicates the relative concentrations of hydrogen and hydroxyl ions in a solution.
True False

26. The scale ranges from 1 to 15.
True False

27. pH 7 has a balanced level of H^+ and OH^-.
True False

28. Anything below pH 7 is acidic and above pH 7 is basic.
True False

29. A change of one pH unit represents a ten-fold increase or decrease in hydroxyl ion concentration.
True False

30. The blood buffer reactions described by $H_2CO_3 <----------> H^+ + HCO_3^-$ indicates that
A. scientists are uncertain which direction the equation flows.
B. the reaction can flow either direction depending on whether there is an excess of hydrogen or hydroxide ions.
C. any reaction in one direction causes an immediate reverse reaction.
D. chemicals can swing wildly from acid to basic.
E. there is really no difference in chemistry whether a molecule is formed or dissociated.

Bond	Energy (kcal/mol)	Bond	Energy (kcal/mol)
H—H	104	P—O	100
H—O	110	N—O	53
C—H	99	S—H	81
C—O	84	C=C	146
C—C	83	C=N	147
C—N	70	P=O	120
C—S	62	C=O	170
S—S	51	C≡C	195

31. From the above table, it is apparent that:
A. triple bonds are stronger than double bonds; double bonds are stronger than single bonds.
B. triple bonds are weaker than double bonds; double bonds are weaker than single bonds.
C. carbon bonds are stronger than other bonds; hydrogen bonds are always weakest.
D. carbon forms only single bonds

32. The characteristic way in which atoms of an element react is most related to the
A. number of electrons in the outermost shell.
B. number of electrons in the innermost shell.
C. number of neutrons in the nucleus.
D. size of the nucleus.

33. As a solid, water floats. This means that
A. solid water is less dense than liquid water.
B. organisms in ponds, lakes, and reservoirs can survive under the ice cover.
C. this is due to hydrogen bonding changes.
D. All of the choices are correct.

34. A coastal climate is moderated primarily by which of the following properties of water? Water
A. is the universal solvent.
B. is cohesive and adhesive.
C. resists changes of state.
D. has a high surface tension.

35. Human blood has a pH of about 7.4. This is
A. neutral.
B. very acidic.
C. slightly acidic.
D. slightly basic.

36. All of the following reflect harm due to acid deposition from rain EXCEPT
A. leaching of aluminum from the soil into lakes which results in the formation of toxic methyl mercury from mercury in the lake sediments
B. weakens trees in the forests and kills seedlings
C. increased agricultural yields
D. damage to marble and limestone monuments

37. Draw the structural formula of a single water molecule. Note the location of partial positive and negative charges. Label the covalent bonds.

38. Draw three water molecules and the hydrogen bonding that may occur between the molecules. Define hydrogen bonding and explain how and why it occurs.

39. Study the figures to determine which is liquid water and which is frozen water (ice). Explain your answer and predict if the water in Figure 2 would float or sink in the water in Figure 1.

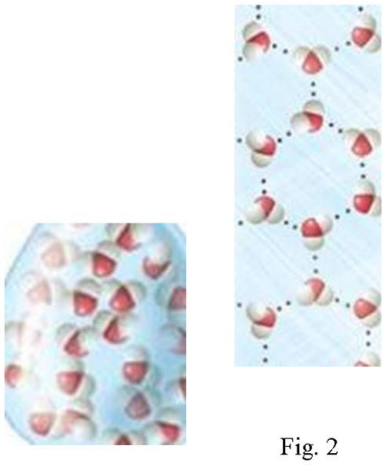


Fig. 2

40. Draw several (5 or 6) individual, unbonded water molecules. Simulate what happens when table salt (Na^+Cl^-) is added to water. Use the model you created to explain why salt is added to the roads in a 'snowy', cold climate.

41. Following nitrogen (78%) and oxygen (21%), argon is the next most common gas in the atmosphere (less than 1%). Checking the table of elements, you discover that argon is one of a family of atoms with outer shells already full of electrons. How is this related to the fact that these atoms have virtually no biological importance?

$[H^+]$ (moles per liter)		pH
0.000001	$= 1 \times 10^{-6}$	6
0.0000001	$= 1 \times 10^{-7}$	7
0.00000001	$= 1 \times 10^{-8}$	8

42.
Study the chart to determine the relationship between H^+ concentration and pH. If you were to create a herbal remedy to decrease excess stomach acid, would you create a solution with a relatively greater or lesser number of hydrogen ions.

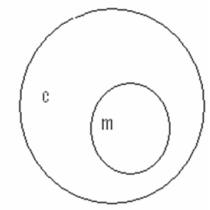
43. A solution with a pH of 7.0 has _____ times _____ H^+ than a solution of pH 10.
A. 30; more
B. 300; less
C. 10^3; more
D. 10^{-3}; less
E. none of the above

44. A solution with a pH of 6 has _____ time _____ OH^- than a solution with a pH of 10.
A. 40; more
B. 4000; less
C. 10^4; less
D. 4; less
E. 10^{-4} more

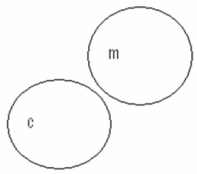
45. This system of chemicals, $H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$, act as a buffer in the blood. If hydrogen ions are added to blood which of the following reactions would occur?
A. $H^+ + HCO_3^- \longrightarrow H_2CO_3$
B. $OH^- + H_2CO_3 \longrightarrow HCO_3^- + H_2O$

46. Which of the following concept circles best depicts the relationship between molecules and compounds (c = compound and m = molecule).

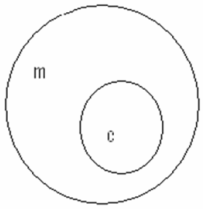
A.



B.



C.

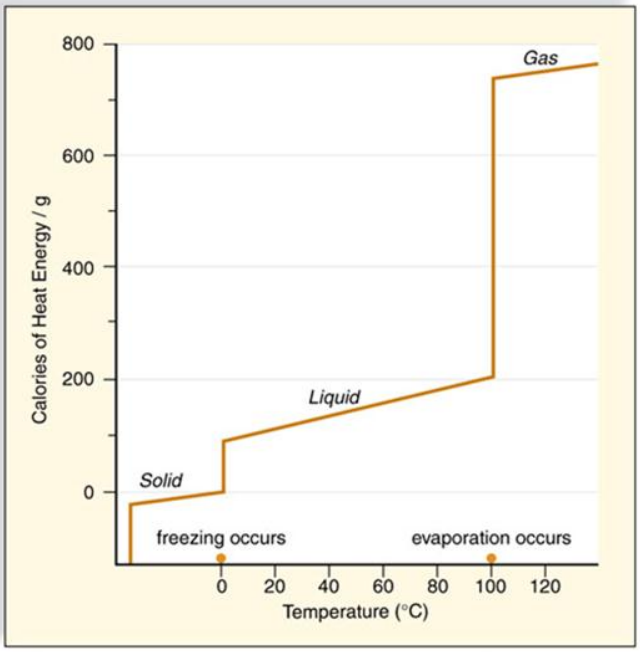


A. Option A
B. Option B
C. Option C

47. Use Bohr's model to draw a sodium (Na) atom and a chlorine (Cl) atom. Using your model, explain what happens when sodium reacts with chlorine to form table salt. Include in your explanation ion and ionic bond formation. Use your model to help you to decide whether NaCl is hydrophilic or hydrophobic.

48. Draw two hydrogen atoms using Bohr's model. Now bond them to form a molecule of hydrogen gas. Write the molecular formula. Explain what type of bond you've created and why this is a stable situation.

49. All living things are 70 - 90% water. Use this graph to explain what characteristics of water protect living organisms from rapid temperature changes.



a. Calories lost when 1 g of liquid water freezes and calories required when 1 g of liquid water evaporates.

50. The electrons are unequally shared in _____, and transferred in _____.

A. CH_4, Na^+Cl^-

B. O_2, CH_4

C. Na^+Cl^-, H_2O

D. H_2O, N_2

BIO 103 – Ch. 3 Exam Study Guide - Mader 10th Ed.

1. Saturated fatty acids and unsaturated fatty acids differ in:
A. the number of carbon-to-carbon bonds
B. the consistency at room temperature
C. the number of hydrogen atoms present
D. all of the choices are differences between saturated and unsaturated fatty acid

2. Which of the following would NOT be a molecule used for energy storage?
A. starch
B. triglyceride
C. glycogen
D. chitin

3. The lipids of the cell membrane and the lipids found in butter and vegetable oil differ in which of the following?
A. the number of fatty acids attached to the glycerol molecule
B. the glycerol molecule
C. the carbon to carbon bonds
D. lipids of the cell membrane do not have hydrophobic sections of the molecule

4. Which of the following is NOT one of the four most common elements found in living organisms?
A. hydrogen
B. oxygen
C. carbon
D. sulfur
E. nitrogen

5. Organic molecules are those that contain at least
A. carbon.
B. carbon and oxygen.
C. carbon and hydrogen.
D. carbon, oxygen, and hydrogen.

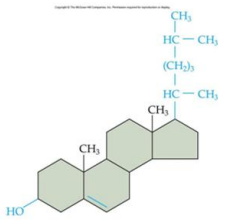
6. The differences between organic and inorganic molecules do not follow simple absolute rules. However, most organic molecules are associated with living organisms. Which of the following statements does NOT correspond to the general distinctions between these types of molecules?
A. Carbon dioxide (CO_2) lacks hydrogen atoms found in organic molecules.
B. Formaldehyde (CH_2O) is a small molecule compared to most organic molecules.
C. Salt (Na^+Cl^-) is not an organic molecule but is important to the life of many organisms.
D. Because they are in living organisms, organic carbon atoms are different from the inorganic carbon atoms forming the molecular structure of soot or a diamond.

7. A hydrocarbon is hydrophobic
A. at all times.
B. only in the living cell environment.
C. except when it has an attached ionized functional group.
D. in carbohydrates but not in lipids.

8. What term is used for molecules that have identical molecular formulas but the atoms in each molecule are arranged differently?
A. isotope
B. isomer
C. homomolecules
D. organic
E. balanced

9. What is the molecular formula of these molecules? What do these molecules differ? Are these the same molecule?

10. Identify the following molecule as a:



A. amino acid
B. hydrocarbon
C. carbohydrate
D. alcohol
E. cholesterol

11. Glucose ($C_6H_{12}O_6$) can exist as both an open-chain form and a closed-ring form. Before 1900, glucose was only thought to occur as an open chain. Now we know that over 99 percent of the time, glucose occurs in the closed-ring form. What possible difference between these forms would give chemists a clue that the open-chain form was not present?
A. Open-chain molecules can form polymers and glucose does not.
B. Only open-chain forms can undergo condensation, which does not occur with glucose.
C. An open chain presents ends with functional groups (in this case aldehyde), and glucose failed to undergo typical aldehyde reactions; a phenomenon that could be explained by having no end functional group in a ring structure.
D. Because glucose is solid at room temperature, it must have saturated hydrocarbon chains.
E. Glucose could not be "denatured" so it must be a tight chain.

12. What is the molecular formula for 5 glucose molecules?
A. $C_{30}H_{50}O_{25}$
B. $C_{30}H_{60}O_{30}$
C. $C_{30}H_{52}O_{26}$
D. $C_6H_{24}O_{12}$

13. A polysaccharide is a polymer made up of which kind of monomers?
A. simple sugars
B. amino acids
C. nucleotides
D. alternating sugar and phosphate groups
E. fatty acids and glycerol

14. A lipid is a polymer made up of which kind of monomers?
A. glucose or modified glucose molecules
B. amino acids
C. nucleotides
D. alternating sugar and phosphate groups
E. fatty acids and glycerol

15. A dehydration reaction can also be called a _____ reaction since it forms water.
A. a condensation
B. a hydrolysis
C. an isomeric
D. an energy-releasing
E. monomer formation

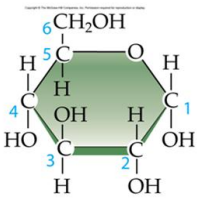
16. Which pair are both structural carbohydrate molecules?
A. starch and glycogen
B. starch and cellulose
C. glycogen and cellulose
D. cellulose and chitin
E. glycogen and chitin

17. Which carbohydrate is found in the cell walls of plants?
A. starch
B. chitin
C. cellulose
D. glycogen
E. glycerol

18. Which carbohydrate is used in the liver for energy storage?
A. starch
B. chitin
C. cellulose
D. glycogen
E. glycerol

19. Which carbohydrate is found in the exoskeleton of insects and crabs?
A. starch
B. chitin
C. cellulose
D. glycogen
E. glycerol

a.



20. Identify this molecule as a:
A. amino acid
B. hydrocarbon
C. carbohydrate
D. alcohol
E. lipid

21. If an animal needed to store energy for long-term use, but not be encumbered with the weight of extra tissue, which is the best molecule for storage?
A. fructose and glucose in the form of honey
B. high-calorie fat molecules
C. complex cellulose molecules
D. starch
E. glycogen with extensive side branches of glucose

22. A peptide bond is found in which type of biological molecule?
A. carbohydrate
B. lipid
C. nucleic acid
D. protein

23. The alpha helix and beta sheet are found at which level of protein organization?
A. primary structure
B. secondary structure
C. tertiary structure
D. quaternary structure

24. After eating eggs for breakfast, you return in the evening, dunk the dirty dishes in water, and notice the yellow streaks remain "dried on." However, after soaking awhile, the complex of various egg yolk molecules easily "washes off." What has happened?
A. Heating denatured the egg protein molecules, hydrolysis reactions then formed bonds in the dried egg, and soaking in water eventually resulted in condensation reactions where water broke these bonds.
B. Heating denatured the egg protein molecules, unorganized condensation reactions then formed bonds in the drying egg, and soaking in water eventually resulted in hydrolysis reactions where water broke these bonds.
C. The egg monomers were fused to become one polymer, which was easily dissolved by water back into monomers.
D. The presence or absence of water changes the molecules from hydrophilic to hydrophobic respectively.
E. The addition of water converted organic molecules into inorganic molecules.

25. Below freezing and above boiling, cells are unable to function as "liquid machinery." However, most organisms' cells are still limited from functioning throughout this full range of liquid temperatures. At the molecular level in different organisms, cells' ability to vary in their tolerance to temperature, etc., is most closely related to variation in
A. enzyme activity and protein denaturation.
B. ATP efficiency.
C. ability to form glucose polymers.
D. replication of nucleic acids.
E. extent of saturation of fatty acids.

26. Which of these statements is NOT true about DNA?
A. It is the genetic material of the cell.
B. It forms a double helix.
C. Adenine pairs with thymine and guanine pairs with cytosine.
D. It contains the sugar ribose.
E. The sugar and phosphate groups form the backbone of the molecule.

27. Fish sperm consists mostly of the male fish's DNA. If we tested a sample chemically, we should find relatively high amounts of
A. nitrogenous bases, sugar, and phosphate groups.
B. phospholipids and steroids.
C. amino acids and unsaturated fats.
D. triglycerides and ATP.
E. globular proteins and stored fats.

28. Which statement is true about RNA?
A. It contains adenine paired to thymine.
B. One of the bases from DNA is replaced by uracil.
C. It contains the sugar deoxyribose.
D. Its nucleotides contain twice as many phosphate groups as DNA's nucleotides.
E. It is a double-stranded molecule.

29. The reactivity of an organic molecule is primarily dependent upon _____ of the molecule.
A. the carbon skeleton
B. the attached functional groups such as an hydroxyl group
C. the isomer
D. All of the choices are correct.

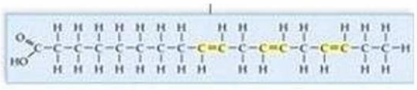


Figure A

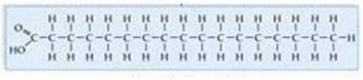


Figure B

30. Which Figure is of an unsaturated fat?
A. Figure A
B. Figure B

31. A saturated fat is
A. solid at room temperature.
B. has fatty acids with no double bonds between the carbon atoms.
C. is of animal origin.
D. All of the choices are correct.

32. A polypeptice has an amino acid sequence of: alanine-leucine-tryptophane-glycien-valine-alanine
This chain of amino acids is further organized into a helix that in-turn, folds in and around itself to form a globular structure. The primary structure of this polypeptide is:
A. globular
B. pleated-sheet
C. alpha helix
D. alanine-leucine-tryptophane-glycien-valine-alanine

33. How many molecules of water are used to degrade this polypeptide, using hydrolysis reactions, into its constituent amino acids? alanine-leucine-tryptophane-glycine-valine-alanine
A. six
B. five
C. one
D. seven

34. A strand of DNA has the following base sequence (genetic code): ATTGCGAATGGCA. Construct the complementary strand of DNA.

35. Construct a portion of cell membrane using the typical phospholipid symbol. Indicate the location of the cytoplasm and outside of the cell. Explain how the chemical characteristics of phospholipids molecules dictate membrane structure and cause it to be fluid in nature.

36. Cold climate plants such as flax, hemp, pumpkin, and canola are high in polyunsaturated fats. Why are these plants high in polyunsaturated fats rather than saturated fats?

37. Chitin and cellulose are molecules that do not spontaneously break down but can be digested by bacteria and some other microorganisms. Since carbon is not among the most common elements in the earth's crust, what would happen if all of the chitin-digesting and cellulose-digesting organisms on the earth were destroyed?

38. Do disaccharide isomers exist? If so, describe how they are formed.

39. Choose the Figure that depicts polymer synthesis.

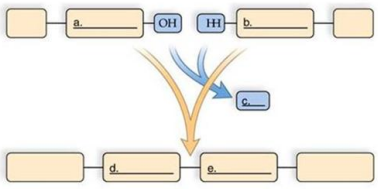


Figure 1

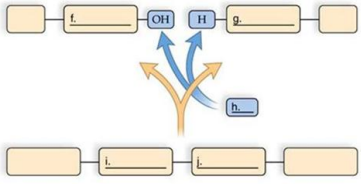


Figure 2

A. Figure 1
B. Figure 2

40. If a segment of DNA has 20% adenine in its base composition, what percent thymine is there?
A. 20%
B. 80%
C. 60%
D. 30%

41. If a certain segment of DNA has 30% adenine in it base composition, what percentage guanine is there?

42. Carbon can form covalent bonds with as many as four other atoms.
True False

43. Waxes consist of a glycerol bonded to three long-chain fatty acids.
True False

44. ATP is a protein that supplies energy to the cell.
True False

45. Starch is a protein that serves in energy storage in plant cells.
True False

46. Migratory birds store energy as glycogen which is lighter than fat.
True False

BIO 103 - Ch. 4 Exam Study Guide - Mader 10th Ed.

1. Which of the following organelles is found within a cell that is both eukaryotic and autotrophic?
A. lysosomes
B. ribosomes
C. rough endoplasmic reticulum
D. chloroplast

2. After being formed by the ribosomes located on the endoplasmic reticulum, what is the next organelle to which a protein could be transported?
A. mitochondria
B. smooth endoplasmic reticulum
C. Golgi apparatus
D. nucleus

3. Which of the following help direct the movement of materials or organelles throughout the cell?
A. rough endoplasmic reticulum
B. cytoskeleton
C. smooth endoplasmic reticulum
D. all of the choices are true

4. Which is NOT true about the cell theory?
A. Its various parts were described by Schleiden, Schwann, and Virchow.
B. It states that all organisms are composed of cells.
C. It states that all cells come from preexisting cells.
D. It states that bacteria and other small organisms can arise spontaneously.
E. It is accepted today by biologists as applying to virtually all forms of life.

5. As they flow over rotten logs as a fluid sheet, slime molds appear to lack any partitioning into cell units; however, slime molds do become cellular when they change form to produce spores. The surface of some parasitic flatworms and some insect tissues are a "syncytium" or layer of living material that contains many nuclei and cell organelles but lacks partitioning by cell membranes. These tissues consume food and produce wastes. In light of the cell theory that "all living things are composed of cells," then
A. these tissues are not living because they are not cellular.
B. these tissues are obviously a bridge between nonliving and primitive living cells.
C. the general concept of life-is-cellular still holds because these organisms are cellular at specific stages in their life cycle, but this shows that cell membrane partitions can be abandoned.
D. this proves that a "vital force" beyond cell chemistry can give life to substances.
E. All of the choices are true.

6. Which of the following gives rise to both lysosomes and vesicles?
A. rough endoplasmic reticulum
B. mitochondria
C. Golgi apparatus
D. ribosomes

7. A high-powered microscope that produces an image from scattered secondary electrons is the
A. immunofluorescence microscope.
B. bright-field light microscope.
C. transmission electron microscope (TEM).
D. scanning electron microscope (SEM).
E. confocal microscope.

8. A microscope that uses antibodies that glow to reveal the location of a protein in a cell is the
A. immunofluorescence microscope.
B. bright-field light microscope.
C. transmission electron microscope (TEM).
D. scanning electron microscope (SEM).
E. confocal microscope.

9. A microscope used to observe living cells and organelles by contrasting the phase differences so that some regions appear brighter is the
A. immunofluorescence microscope.
B. phase contrast light microscope.
C. transmission electron microscope (TEM).
D. scanning electron microscope (SEM).
E. confocal microscope.

10. Which statement is NOT true about bacteria?
A. Bacteria contain membrane bound organelles.
B. Some are photosynthetic.
C. Some are motile due to flagella.
D. All bacteria are prokaryotes.
E. Bacteria have a cell wall that contains peptidoglycan.

11. Which statement is NOT true about bacterial anatomy?
A. The cell wall is located outside of the plasma membrane.
B. The glycocalyx sheath is located inside the cell wall.
C. There may be small rings of accessory DNA called plasmids.
D. Bacteria may have fimbriae that help attach the bacteria to other structures.

12. An amino sugar called N-acetylmuramic acid is an important building block of the cell wall of some bacteria. Penicillin prevents this amino sugar from being incorporated into the bacterial cell wall. Therefore,
A. penicillin affects bacteria but not eukaryotes because eukaryotic cell walls are different.
B. bacterial cells that had already formed their cell walls would be unaffected.
C. penicillin would stop the growth of active colonies of susceptible bacteria.
D. All of the choices are correct.

13. Most bacteria live in a solution that is hypotonic relative to the cytoplasm of the bacteria. The cell wall of a bacterium is a peptidoglycan polymer that is tightly cross-linked. This would therefore function to
A. regulate the flow of most molecules into and out of the bacterial cell.
B. provide a rigid wall that prevents the cell from swelling.
C. provide a rigid wall that prevents the cell from shrinking.
D. confirm a close relationship to plant cells that have a similar structure and live in hypotonic solutions.
E. make all bacteria fairly uniform in metabolic chemistry.

14. Which is NOT true of eukaryotic cells?
A. A true nucleus contains the chromosomes.
B. Eukaryotic cells contain membrane-bounded compartments.
C. They contain ribosomes that are smaller than those of prokaryotic cells.
D. They all contain mitochondria.
E. They contain many organelles in the cytoplasm.

15. Cells that do NOT produce cell walls are:
A. animal cells.
B. plant cells.
C. fungal cells.
D. prokaryotic cells.

16. Which of the following is NOT offered as evidence in support of the endosymbiotic theory, the belief that a eukaryotic cell has evolved as a "committee" of prokaryotic cells?
A. Mitochondria and chloroplasts are similar in size and structure to some species of bacteria.
B. The ribosomes of chloroplasts and mitochondria are similar to bacteria.
C. Mitochondria and chloroplasts can actively break away from eukaryotic cells and live on their own.
D. Mitochondria and chloroplasts have their own DNA coding separate from the eukaryotic nucleus.
E. All of the choices offer support of the endosymbiotic theory.

17. Which is a true statement about ribosomes?
A. Ribosomes contain DNA and protein.
B. Ribosomes are active in carbohydrate synthesis.
C. Ribosomal subunits leave the nucleus after being formed by the nucleolus.
D. Polyribosomes are the subunits of ribosomes.
E. Ribosomes are only found associated with the endoplasmic reticulum in prokaryotic cells.

18. Chloroplasts are to _____ as _____ are to aerobic respiration.
A. stroma, cristae
B. photosynthesis, mitochondria
C. thylakoid membranes, matrix
D. protein synthesis, lysosomes

19. _____ are to ribosomes as lipids are to _____.
A. carbohydrates; rough endoplasmic reticulum
B. nucleoli; lysosomes
C. sugars; peroxisomes
D. proteins; smooth endoplasmic reticulum

20. Without a cytoskeleton, eukaryotic cells would NOT
A. synthesize protein.
B. have an efficient way to transport materials from one organelle to another.
C. have an efficient means of metabolism.
D. communicate with adjacent cells.

21. Mitochondria have an inner membrane system called thylakoid membranes.
True False

22. All cells have a cell wall that regulates the passage of molecules into and out of the cell.
True False

23. Mitochondria are thought to be derived from aerobic bacteria that became part of the eukaryotic cell through endosymbiosis.
True False

24. Mitochondria and chloroplasts are able to reproduce independently from the division of the cell.
True False

25. Which of these is NOT part of the endomembrane system of the cell?
A. mitochondria
B. endoplasmic reticulum
C. lysosomes
D. Golgi complex

26. Membrane-bounded vesicles that contain enzymes for oxidizing small organic molecules with the formation of hydrogen peroxide are
A. vacuoles.
B. vesicles.
C. glyoxisomes.
D. lysosomes.
E. peroxisomes.

27. Which is NOT a characteristic of mitochondria?
A. A mitochondrion has two membranes.
B. Mitochondria are the site of cellular respiration.
C. Mitochondria are found in prokaryotic and eukaryotic cells.
D. Mitochondria contain DNA and ribosomes.
E. The inner space of the mitochondrion contains a fluid matrix.

28. Which cytoskeletal element is NOT correctly associated with its characteristic?
A. Cilia are small extensions of membrane-surrounded microtubules.
B. Microtubules are made up of a globular protein called tubulin.
C. Centrioles are found in the microtubule organizing centers of plants.
D. Flagella have a 9 + 2 pattern of microtubule structure.
E. Basal bodies are located at the base of cilia and flagella.

29. The cells that line our respiratory tract, and one-celled paramecia both have these short hair-like projections.
A. flagella
B. microfilaments
C. centrioles
D. cilia
E. pili

30. According to the endosymbiotic theory, mitochondria and chloroplasts evolved from aerobic and photosynthetic bacteria that were engulfed and 'took up' residence in a host prokaryotic cell. Use your knowledge of how plant and animal cells differ to answer the following questions:
A. Did the ancestral plant cell engulf both types of bacteria ? Cite evidence to justify your answer.
B. Did the ancestral animal cell engulf both types of bacteria? What evidence can you cite to justify your answer. Cite evidence to justify your answer.
C. If the answer to either A or B is yes, then which type of bacteria would have been engulged first? Cite evidence to justify your answer.

31. The springtail is a very common small insect that lives in rotten logs, rich soil, and other humid places. Its cuticle is water repelling (hydrophobic) except for a strange organ, the collophore, on its ventral side. Because it lacks the excretory organs of other insects, the springtail has this organ in contact with the water (it is responsible for ion balance and secretion of wastes). If we examined the cell structure of this collophore, we would expect to find a high number of
A. nuclei.
B. ribosomes.
C. Golgi bodies.
D. lysosomes.
E. centrioles.

32. Each time the water in a cell freezes slowly, long sharp crystals spear through the membrane structures of the cell. However, in the frozen state, virtually no chemical reactions occur. The most likely explanation for the bad taste of meat that has "freezer burn" from repeated freezing is the destruction of
A. the Golgi bodies and their vesicles.
B. lysosomes and resultant autodigestion.
C. rough endoplasmic reticulum causing the release of ribosomes.
D. ribosomes causing them to break into subunits.
E. the nuclear membrane causing mixing of nucleoplasm and cytoplasm.

33. Which of the following gives rise to both lysosomes and vesicles?
A. rough endoplasmic reticula
B. mitochondria
C. Golgi apparati
D. ribosomes

34. All cells have these two characteristics:
A. contain DNA in the nucleus and have a plasma membrane
B. produce a cell wall outside of the plasma membrane
C. contain mitochondria and chloroplasts
D. have a plasma membrane and ribosomes in the cytoplasm

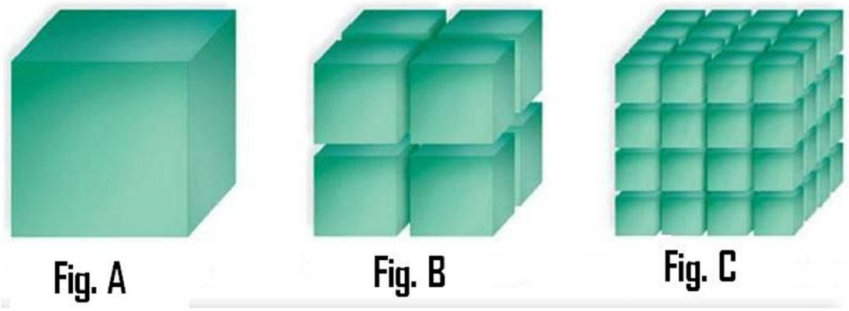
35. Cell biologists have introduced radioactively labeled carbohydrates, fats and amino acids to living cells, allowed time for cell metabolism, and then disrupted the cells in a blender and separated out the various cell organelles from the cytoplasm. They found the radioactive molecules could soon be detected as part of various cellular compounds, although the visible cell structures appeared unchanged. This leads us to conclude that
A. these "food" molecules are used only for energy.
B. most cell components are constantly being broken down and rebuilt.
C. radioactivity was transferred from the introduced molecules to the resident stable molecules.
D. molecules diffuse at random through the cytoplasm and into cell organelles.
E. radioactivity has an unusual role in metabolism of living cells.

36. You are a scientist who wants to produce large amounts of the protein insulin that is used to facilitate the entry of glucose into cells. You know that insulin genes may be introduced into bacteria by way of a plasmid vector. These bacteria may then be used as ‘micro-manufacturers' of insulin. Your laboratory technicians explore various methods of producing the desired bacteria, but you are not sure how many and which of the bacterial cells have been transfected (have the plasmid with the insulin gene). Propose a way to determine which bacterial cells have been transfected with the engineered plasmid and are able to produce insulin.

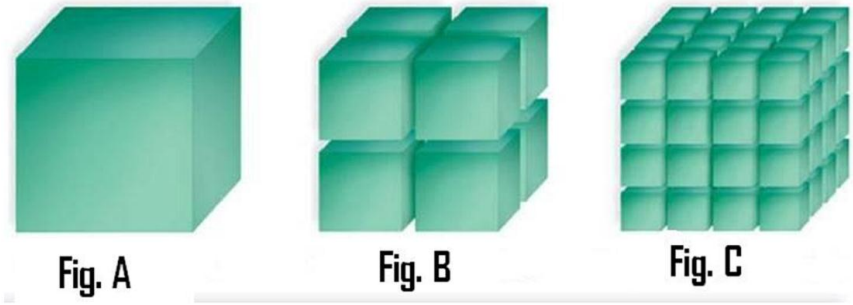
37. From your knowledge of the size and density of cell components and the process of centrifugation, predict the order (from first to last) that the nucleus and organelles will be extracted?
A. ribosomes-mitochondria and chloroplasts-nucleus-soluble cytoplasm
B. nucleus-mitochondria and chloroplasts-ribosomes-soluble cytoplasm
C. nucleus-mitochondria and chloroplasts-soluble cytoplasm-ribosomes
D. mitochondria and chloroplasts-nucleus-soluble cytoplasm-ribosomes
E. soluble cytoplasm-ribosomes-mitochondria and chloroplasts-nucleus

38. What organelle would be found in increased quantities in the liver cells of a person who abuses alcohol and/or other drugs on a regular basis?

39. If you were to design a structure that would have the greatest potential to interact with the environment through surface area contact, would you design a structure similar to Figure A, B or C? Explain your answer.



Use Figures A, B and C to answer Questions 40 - 44. Figure A is an 8-cm. cube. Figure B is eight, 4-cm cubes. Figure C is sixty-four, 2-cm cubes.



40. What Figure has the greatest volume (height x width x length x number of cubes)?
A. Figure A
B. Figure B
C. Figure C
D. None of the above

41. What figure has the greatest surface area (height x width x number of sides x number of cubes)?
A. Figure A
B. Figure B
C. Figure C
D. None of the above

42. What figure has the greatest surface area : volume ratio?
A. Figure A
B. Figure B
C. Figure C
D. None of the above

43. If the figures represented cells, what size cell has the greatest potential to bring nutrients in and rid itself of waste.
A. The cell in Figure A, one 4-cm cube.
B. The individual cells in Figure B.
C. The individual cells in Figure C.
D. All cells have the same potential

44. As a cell increases in size, the:
A. surface area increases as the volume decreases.
B. surface area, volume and surface area volume ratio increases.
C. surface area and volume increase, but the surface area: volume ratio decreases.
D. surface area and volume decreases the surface area: volume ratio increases.

45. Why is a large surface area: volume ratio needed for cells to function properly?
A. Adequate surface area (plasma membrane) is needed to furnish nutrients to and expel wastes from the volume (cytoplasm).
B. Smaller volumes reduce and larger surface areas reduce the cell's ability to bring nutrients in and get rid of waste.
C. A smaller surface area allows the cell to increase its metabolic activity by bringing in even more nutrients than larger surface areas.
D. The surface area and volume increase at the rate to ensure cell growth and reproduction.

46. The plant cell's central vacuole
A. provides the plant cell with support.
B. stores nutrients and cellular waste products.
C. is a reservoir for water.
D. All of the choices are correct.

47. Of the following, which is NOT associated with the mitochondria?
A. ATP production
B. cristae
C. stroma
D. matrix

BIO 103 - Ch. 5 Exam Study Guide – Mader 10th Ed.

1. A major chemical that regulates the fluidity of animal cell membranes by stiffening the membrane at higher temperatures and preventing the membrane from freezing at lower temperature is:
A. cholesterol.
B. lipid in nature.
C. a steroid.
D. All of the choices are correct.

2. Proteins in a membrane are:
A. peripheral if they are on the inside surface held in place by the cytoskeleton.
B. integral if they are embedded in the membrane and protrude from both surfaces of the bilayer
C. integral if they protrude from only one surface of the bilayer.
D. All of the choices are correct.

3. Which of the following protein functions is not correctly associated with its correct integral protein?
A. carrier proteins-facilitate passage of molecules through the membrane
B. enzymatic proteins-catalyze a specific reaction
C. channel proteins-block the activity of carrier proteins
D. cell recognition proteins-recognize pathogens

4. Active transport
A. requires an input of ATP.
B. is involved in diffusion.
C. occurs in osmosis and facilitated transport.
D. All of the choices are correct.

5. The newly discovered membrane channel protein that accounts for why water can cross a membrane more quickly than expected is:
A. ATP synthetase
B. Aquaporin
C. The sodium-potassium pump
D. Integrin

6. Which of the following is true with respect to plant cell walls?
A. They contain n-acetylglutamic acid.
B. They all have secondary cell walls to some extent.
C. There is a greater amount of cellulose in secondary cell walls than in primary cell walls.
D. Lignin is found in primary cell walls of plants.

7. In a phospholipid bilayer, the
A. phosphate groups are hydrophobic.
B. fatty acid tails are ionized.
C. fatty acid tails are hydrophilic.
D. proteins are located only between the two layers.
E. phosphate heads are oriented toward the exterior of the cell or toward the cytoplasm.

8. Which statement is true about the plasma membrane?
A. The proteins make up the matrix of the membrane.
B. The model can be likened to a sandwich where phospholipids are like the bread and proteins are like the filling.
C. The fluid nature of the membrane is regulated by flip-flopping of the phospholipids from one side of the membrane to the other.
D. Movement of proteins and phospholipids can occur sideways within the plane of the membrane.

9. Which statement is NOT true about the proteins in the plasma membrane?
A. Proteins may be attached to the inner surface of the plasma membrane.
B. The hydrophobic portion of a protein is embedded within the membrane.
C. Some peripheral proteins are connected to cytoskeletal filaments.
D. Integral proteins are responsible for membrane functions.
E. Glycoproteins contain carbohydrate chains that are oriented toward the inner surface of the membrane.

10. Which phrase does NOT describe one of the functions of proteins of the plasma membrane?
A. forming a channel through the membrane
B. initiating the replication of the genetic material
C. binding to a substance to carry it through the membrane
D. acting as a receptor for substances external to the cell
E. increasing the rate of a chemical reaction

11. Red blood cells come in many "blood types" including type A, type B, type AB, type O [lacking proteins A and B], Rh positive, and Rh negative [lacking Rh^+] and many others. If blood is transfused, the recipient detects any new or "foreign" proteins. These blood type proteins are
A. in the plasma where they have been secreted by the red blood cells.
B. inside the red blood cell cytoplasm.
C. on the outer surface of the red blood cell membrane.
D. evenly distributed throughout the cell contents and plasma.
E. in the red blood cell nucleus.

12. Whether a molecule can cross the plasma membrane depends upon
A. the size of the molecule.
B. the shape of the molecule.
C. the chemical properties of the molecule.
D. the charge of the molecule.
E. All of the choices are correct.

13. If a cell is placed in a hypotonic solution, which will occur?
A. Salts will move into the cell from the surrounding solution.
B. Water will move into the cell from the surrounding solution.
C. Salts will move out of the cell into the surrounding solution.
D. Water will move out of the cell into the surrounding solution.
E. None of the choices will occur.

14. Which is the best definition of osmosis?
A. The movement of molecules from an area of their higher concentration to an area of their lower concentration.
B. The movement of water across a semi permeable membrane from an area of higher water concentration to an area of lower water concentration.
C. The movement of molecules from an area of their lower concentration to an area of their higher concentration.
D. The movement of water across a semi permeable membrane from an area of lower water concentration to an area of higher water concentration.
E. The movement of a substance against its concentration gradient through the release of energy from ATP.

15. Having similar _____ would allow tissues and organs to be transplanted easily.
A. cell recognition proteins
B. major histocompatibility complex proteins
C. carbohydrate chains in the cell membrane
D. all of the choices are involved in tissue transplantation

16. The current theory of the structure of the plasma membrane is best described by the ____ model.
A. sandwich
B. fluid-mosaic
C. unit membrane
D. electrochemical
E. unipermeable

17. Freshwater protozoans react to a/an _____ environment by removing water through _____.
A. hypertonic, turgor pressure
B. hypotonic, turgor pressure
C. isotonic, a contractile vacuole
D. hypertonic, a contractile vacuole
E. hypotonic, a contractile vacuole

18. Which of the following is NOT associated with animal cells?
A. an extracellular matrix
B. plasmodesmata
C. gap junctions
D. adhesion junctions (desmosomes)
E. tight junctions

19. The major functions of the plasma membrane do NOT include
A. separation of the fluid environments inside and outside the cell.
B. regulation of molecules and ions that pass into and out of the cell.
C. recognition and communication between different cells and tissues.
D. maintaining connections between adjacent cells.
E. production of proteins used in construction of the cell wall.

20. Some parasites and disease agents regularly change their identity before our immune system can build up substantial antibodies. How could cells change their chemical identity on a regular basis?
A. Rapid evolution produces mutations.
B. A new phospholipid bilayer is generated to replace the old layer.
C. Because the membrane is "set," the cell must reproduce and then the cell with the old membrane must die.
D. Cells eliminate all surface proteins and present only a naked lipid bilayer.
E. Different glycolipids and glycoproteins are produced internally and moved into the plasma membrane.

21. Plants show turgor pressure when
A. cells are losing water from their water vacuoles.
B. cells contain water vacuoles that are full of water.
C. water is being used up in photosynthesis.
D. water is being evaporated from the leaves.

22. Which is the best definition of active transport?
A. movement of molecules from an area of their higher concentration to an area of their lower concentration
B. movement of water across a semi permeable membrane from an area of higher water concentration to an area of lower water concentration
C. movement of molecules from an area of their lower concentration to an area of their higher concentration
D. movement of water across a semi permeable membrane from an area of lower water concentration to an area of higher water concentration
E. movement of a substance against its concentration through the release of energy from ATP

23. Sugars and amino acids are carried into the cell by means of
A. facilitated transport.
B. diffusion
C. endocytosis.
D. exocytosis.

24. The process by which cholesterol is transported into the cell by binding of LDL to its receptor and the internalization of the receptor-LDL complex is
A. facilitated transport.
B. active transport.
C. cotransport.
D. endocytosis.
E. exocytosis.

25. Design an experiment that illustrates how any one of these factors (temperature, pressure, molecule size) may affect the rate of diffusion.

26. A 10% glucose solution is placed in the thistle tube. The thistle tube is placed in a beaker that contains a 5% glucose solution. The solution in the thistle tube is _____ to the solution in the beaker.

A. Hypertonic
B. Hypotonic
C. Isotonic
D. None of the above

27. A 10% glucose solution is placed in the thistle tube. The thistle tube is placed in a beaker that contains a 5% glucose solution. Where is the highest concentration of water found?

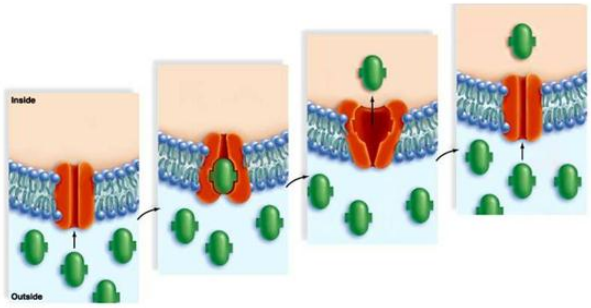
A. In the 10% solution
B. In the 5% solution
C. The concentration of water is the same in both solutions.
D. None of the above

28. A 10% glucose solution is placed in the thistle tube. The thistle tube is placed in a beaker that contains a 5% glucose solution. There is a differentially permeable membrane across the broad end of the tube, which is permeable to water but not to the sugar glucose. What will occur over time to water? To the solute?

29. A 10% glucose solution is placed in the thistle tube. The thistle tube is placed in a beaker that contains a 5% glucose solution. There is a differentially permeable membrane across the broad end of the tube, which is permeable to water but not to the sugar glucose. As diffusion occurs:

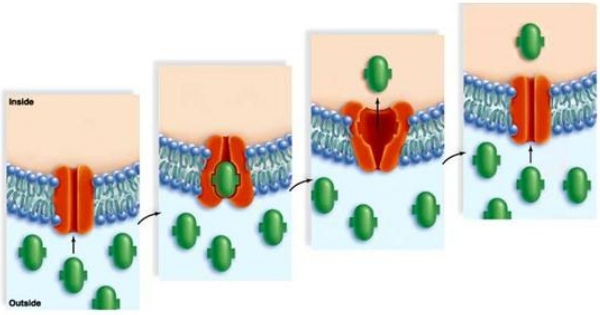
A. the 10% solution will become more concentrated and the 5% solution will become less concentrated
B. both solutions will become more concentrated.
C. the 10% solution will become less concentrated and the 5% solution will become more concentrated.
D. both solutions will become less concentrated.

30. Study the series of pictures at right to identify the process as:

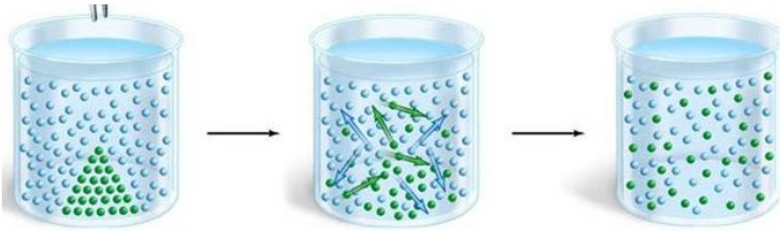


A. facilitated transport
B. active transport
C. passive transport
D. osmosis

31. Study the series of pictures to identify the process through which materials are being transported across the membrane. Explain how you arrived at your answer.



32. A crystal of green dye is added to a beaker of water. The dye and the water undergo diffusion. After studying the series of beakers from the left to the right, define diffusion and state the ultimate outcome of diffusion?



33. Before boarding an airplane on a commercial flight, the traveler must show personal identification and a ticket to airport security. The traveler must then remove his shoes and place any carry-on items on the belt of an x-ray machine before walking through the checkpoint. How is the passage of molecules through a membrane similar to travelers passing through airport security?

34. Why do membranes self-assemble into their characteristic phospholipids bilayer?

35. Why does this model of a phospholipids bilayer in Fig. 1 not ‘work'?

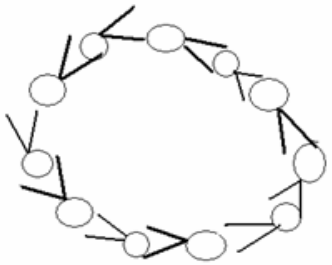


Fig. 1

36. Why does this model of a phospholipids bilyer in Fig. 2 not ‘work'?

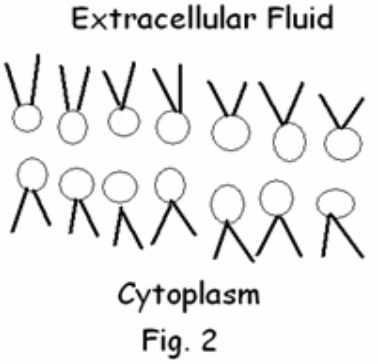
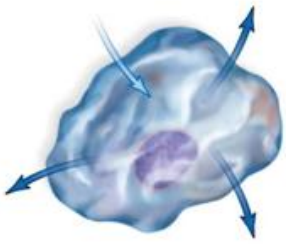


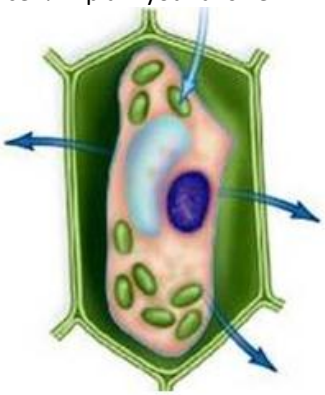
Fig. 2

37. In the cell pictured at the right, there is no net movement of water. The amount leaving the cell and entering the cell is the same. In what type of environment is this cell found?



A. hypertonic
B. hypotonic
C. isotonic
D. none of the above

38. Is this cell an animal or plant cell? In what type of environment is this cell found? Is there a net movement of water into or out of the cell? Explain your answer.



39. Eukaryotic cells are substantially larger than bacterial cells and average over 20 times more volume-per-surface-area than bacterial cells. How can the eukaryotic cell membrane provide this higher rate of exchange of materials?
A. Plasma membrane folds increase the surface area.
B. Carrier proteins speed the rate at which a solute crosses the plasma membrane in the direction of decreasing concentration.
C. Mitochondria are concentrated near membranes to provide energy for active transport of molecules or ions.
D. Large molecules are engulfed by vesicle formation.
E. All of the choices are correct.

40. In speculating upon the origin of early cells and the cell membrane, which of the following statements is/are NOT plausible?
A. Due to similarities in basic structure, the endoplasmic reticulum, Golgi body, vesicles, and other "cytomembranes" may have arisen as invaginations of the cell membrane.
B. As long as a phospholipid-production mechanism is present, these molecules would naturally arrange themselves in two layers with the hydrophobic tails on the inside away from water.
C. It would be nearly impossible to have a cell without a cell membrane.
D. All of the choices are plausible.
E. None of the choices are plausible.

41. All life forms currently have a basic cell membrane so we presume that the earliest forms of life had this "fence" isolating the internal organization from the external chaos. It is likely that the primordial environment was acidic. In such a case, the cell membrane would have to include
A. a sodium (Na^+) pump.
B. a proton (H^+) pump.
C. mitochondria underneath in order to provide energy for active transport.
D. an acid-proof cell wall.
E. a totally nonpermeable membrane.

42. If a living plant were moved from a freshwater aquarium to a saltwater aquarium, which of the following would occur?
A. Nothing. The plant would be fine in either aquarium.
B. The plant's cells would take on ions.
C. The plant's cells would take on water and will lyse.
D. The plant's cells would lose water and plasmolysis would occur.

43. Which of the following is the reason plants wilt on a hot summer day?
A. to protect the leaves from full exposure to the sun
B. an increase in turgor pressure
C. heat weakens the plant cell walls
D. loss of water resulting in a decrease in turgor pressure.

44. Why is the plasma membrane necessary for the life of a cell?

45. Receptor-mediated endocytosis involves the use of specific proteins in the cell membrane.
True False

46. Fluidity of a membrane increases as the percentage of unsaturated fatty acids in the phospholipids goes up.
True False

47. In the cells that line the lumen of the small intestine, gap junctions keep materials from the digestive tract from slipping between the cells and entering the tissues.
True False

48. In the sodium-potassium pump, sodium is transported out of the cell and potassium is transported into the cell as ATP is broken by a membrane protein.
True False

49. The process by which a white blood cell or an amoeba engulfs bacteria is called phagocytosis.
True False

50. An extracellular matrix helps some cells to adhere to neighboring cells.
True False

BIO 103 - Ch. 6 Exam Study Guide – Mader 10th Ed.

1. All of the biochemical pathways in a cell constitute
A. coupling reactions.
B. free energy.
C. endergonic reactions only.
D. exergonic reactions only.
E. metabolism.

2. Which organelles contain functioning ATP synthetase complexes in their membranes?
A. Golgi complexes and lysosomes.
B. Mitochondria and chloroplasts.
C. Endoplasmic reticulum and vesicles.
D. Vacuoles and vesicles.
E. Mitochondria and endoplasmic reticulum.

3. The activity of an enzyme might be increased by all of the following except _____?
A. increase in substrate concentration.
B. a vitamin.
C. 2-4 degree increase in temperature.
D. lead.

4. Which form of energy is NOT correctly associated with the related example?
A. kinetic energy: fat molecules
B. kinetic energy: movement of muscles
C. chemical energy: glucose
D. potential energy: water held behind a dam
E. potential energy: ATP

5. Which best describes the first law of thermodynamics?
A. Energy is changed from one form to another with a loss of usable energy.
B. Energy is not created nor destroyed, but it can change from one energy form to another.
C. Energy can be created from matter or used to produce matter.
D. Some useful energy is lost as heat whenever an energy transfer occurs.
E. Energy transfers are always 100% efficient in changing energy from one useful form to another.

6. Which best describes the second law of thermodynamics?
A. Energy is not created nor destroyed, but it can change into matter.
B. Energy is not created nor destroyed, but it can change from one energy form to another.
C. Energy can be created from matter or used to produce matter.
D. Some useful energy is lost as heat whenever an energy transfer occurs.
E. Energy transfers are always 100% efficient in changing energy from one useful form to another.

7. A living organism represents stored energy in the form of chemical compounds. When an organism dies, what happens to this stored energy?
A. All chemicals immediately lose their high-energy bonds.
B. All molecules immediately degrade into basic elements.
C. All energy immediately leaves, and that is one manifestation that the organism is dead.
D. The chemical compounds in cells lose their organization over time because there is no longer an input of energy to maintain the organized state.
E. The chemical compounds remain exactly intact and ready to start up again unless digested by a consumer or decay organism.

8. Endergonic reactions:
A. release energy.
B. have a negative ΔG and occur spontaneously.
C. can only occur if there is an input of energy.
D. have products with less free energy than the reactants.
E. All of the choices are correct.

9. Which of these statements is NOT a consequence of the second law of thermodynamics?
A. While the total amount of energy is unchanged, the energy lost as heat is no longer useful to the cell in doing work.
B. Reactions that occur spontaneously are those that increase the amount of useful energy in a system.
C. The amount of disorder in the universe is always increasing.
D. To maintain organization of a cell, a continual input of energy is required.

10. Coupling occurs when the energy released by an exergonic reaction is:
A. used to drive another exergonic reaction.
B. used to drive an endergonic reaction.
C. lost as nonusable heat to the environment.
D. used to decrease the entropy of the universe.
E. All of the choices are correct.

11. The subunits from which ATP is made are:
A. ADP and phosphate.
B. FAD and NAD^+.
C. FAD and NADPH.
D. ADP and FAD.
E. ADP and NAD^+.

12. ATP is considered to be
A. an enzyme used widely in all kinds of cells.
B. a coenzyme used to inhibit or activate different enzymes.
C. a molecule that carries a great deal of chemical energy in a chemical bond.
D. the precursor of a high-energy membrane-bounded protein.

13. ATP is considered a high-energy compound because under cellular conditions, 7.3 kcal per mole of energy is released when a bond is broken between:
A. the base adenine and the sugar ribose.
B. the adenosine and the phosphate groups.
C. the base adenine and the phosphate groups.
D. the adenosine diphosphate and the third phosphate.
E. All of the bonds release energy as ATP is completely broken down.

14. Which statement describes the currently accepted theory of how an enzyme and its substrate fit together?
A. As the product is released, the enzyme breaks down.
B. The enzyme is like a key that fits into the substrate, which is like a lock.
C. The active site is permanently changed by its interaction with the substrate.
D. As the substrate binds to the enzyme, the shape of the active site changes to accommodate the reaction.

15. Which statement is NOT true about the effects of various conditions on the activity of an enzyme?
A. Higher temperatures generally increase the activity of an enzyme up to a point.
B. Above a certain range of temperatures, the protein of an enzyme is denatured.
C. A change in pH can cause an enzyme to be inactivated.
D. An enzyme's activity is generally reduced by an increase in substrate concentration.
E. When sufficient substrate is available, the active site will nearly always be occupied.

16. What establishes the electrochemical gradient across a membrane to provide energy for ATP production?
A. The chloroplast's electron transport system provides the ions.
B. Hydrogen ions naturally collect on the outside of the organelle membrane.
C. Hydrogen ions are pumped across the membrane by carrier proteins of the electron transport chain.
D. All of the choices establish the electrochemical gradient.

17. Which statement is NOT true about enzyme inhibition?
A. In competitive inhibition, the inhibitor binds to the active site of the enzyme.
B. In noncompetitive inhibition, the inhibitor binds to the allosteric site of the substrate.
C. In irreversible inhibition, a poison binds to the enzyme so that it can never work again.
D. Most inhibitors act in a reversible fashion.
E. All of the statements are true.

18. A coenzyme is
A. an ionic cofactor that interacts with an enzyme to allow it to work.
B. a protein cofactor that interacts with an enzyme to allow it to work.
C. a nonprotein organic cofactor that interacts with an enzyme to allow it to work.
D. an ionic cofactor that interacts with an enzyme to inhibit it.
E. a protein cofactor that interacts with an enzyme to inhibit it.

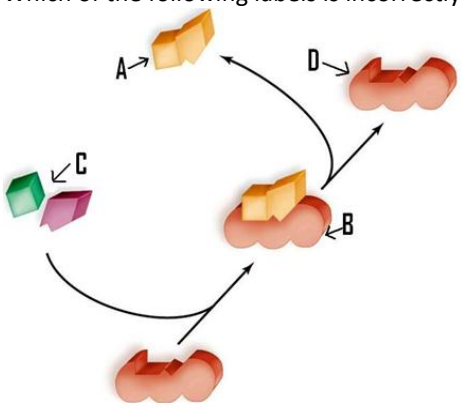
19. Which of the following is NOT a form of potential energy?
A. food
B. water in a dam
C. a muscle contracting
D. All of the choices are not potential energy.

20. Energy coupling of endergonic and exergonic reactions within cells
A. permits biological reactions to proceed at temperatures consistent with life.
B. uses heat released by one reaction to fuel the other reaction.
C. utilizes ATP to carry energy between the exergonic and endergonic reactions.
D. All of the choices are correct.

21. Of the following, which process will not denature a protein?
A. heating to temperatures above 100 C
B. addition of strong acids or strong bases
C. phosphorylation
D. addition of distilled water

22. In the electron transport systems of chloroplasts and mitrochondria,
A. the system consists of a series of membrane bound carriers that transfer electrons from one carrier to another.
B. high energy electrons enter the system and low energy electrons exit the system.
C. energy release occurs when the electron transfers from one carrier to another.
D. All of the choices are correct.

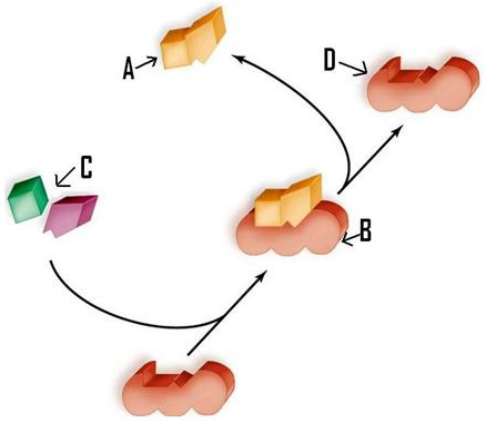
23. Which of the following labels is incorrectly identified.



A. A refers to the products.
B. B refers to the substrate-enzyme complex.
C. C refers to the reactants.
D. D refers to the product.

24. In living substances, the hydrolysis of ATP to ADP and P is virtually the sole supply of energy. However, ATP does not release this energy spontaneously but only in cell machinery where some work is being carried out. If ATP underwent hydrolysis spontaneously at a fast rate without enzymes, would life as we know it be possible?

25. Analyze this figure to categorize the chemical reaction as a synthesis reaction or a degradation reaction. Cite evidence to support your answer.



26. An automobile engine is about 20 - 30% efficient in converting chemical energy to mechanical energy. Cells are about 39% efficient if the transformation of glucose to ATP. The rest of the energy is lost as heat. This is illustrative of the:
A. First Law of Thermodynamics.
B. Second Law of Thermodynamics.
C. Third Law of Thermodynamics.
D. The Cell Theory.

27. In living substances, the hydrolysis of ATP to ADP and P is virtually the sole supply of energy. However, ATP does not release this energy spontaneously but only in cell machinery where some work is being carried out. In such cases, special enzymes (ATPases) are necessary for the hydrolysis of ATP. How does the universality of ATP and the diversity of enzyme systems relate to the unity and diversity of life through evolution?

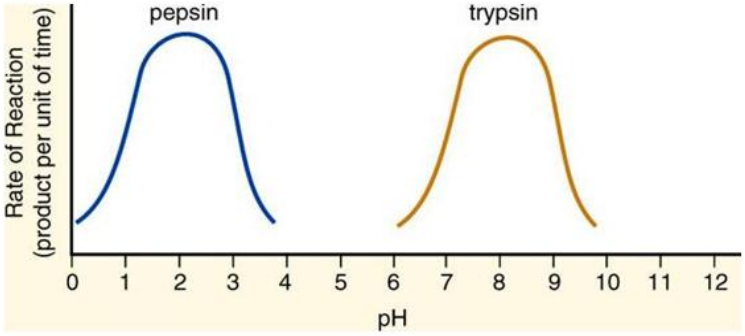
28. Explain how, at a glance, it appears that life must violate the laws of thermodynamics. Provide a brief explanation on how life does NOT violate these rules.

29. Which of the following is consistent with the laws of physics governing energy?
A. When a liter of gasoline is burned in a car engine, 100% of its energy goes into moving the car along the road.
B. You eat a "quarter-pounder" hamburger and assemble exactly a quarter-pound of additional body weight on your body.
C. Eventually sunlight that is absorbed on the earth returns to space as dispersed heat.
D. A calorie of sunlight becomes a calorie of plant tissue that, eaten by you, becomes a calorie of heat lost in muscle "power."
E. Chemical bonds are a case of converting energy to matter; breaking the bonds converts matter to energy.

30. While science is not yet able to describe the phenomenon of "thinking" in physical terms, we can be certain that it is a process involving the metabolism of brain cells. With positron emission tomography (PET scan) it is possible to inject short-lived isotopes and image the regions of the brain that have the most active metabolism during various mental activities. For different mental functions, different regions and amounts of nerve cells become active. However,
A. the cellular energy expended in "thinking" must be less than the chemical bond energy supplied in food to these brain cells.
B. "thought" cannot be linked to cell processes because energy is not related to matter.
C. since thoughts can occur over and over, the requirement for a continual input of energy to prevent entropy does not apply to this cell activity.
D. "thinking" is beyond the scope of science to study.

31. Astrophysicists explain that eventually the sun will swell to become a red giant, engulf the earth and "burn out" with all forms of energy dispersing in a final "heat death." Compared with conditions today, the entropy of the universe then will
A. have increased greatly.
B. have decreased greatly.
C. remain the same because energy cannot be created or destroyed.

32. What does this graph reveal about the rate of reaction of the two different enzymes? What are the implications of this finding?



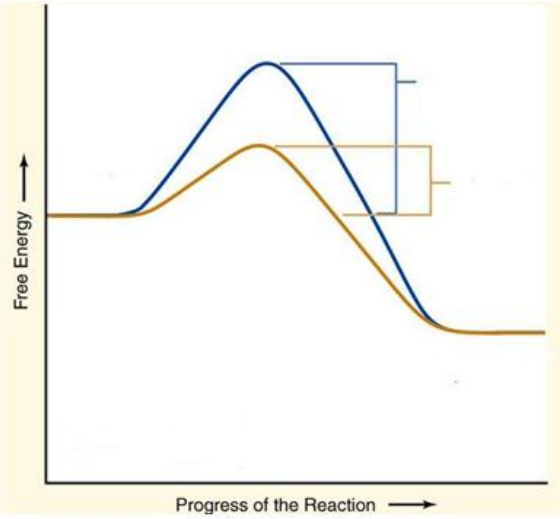
33. While eating a container of yogurt, you have to leave, so you store the yogurt in the refrigerator. A day later you return and find the surface of the yogurt is no longer smooth but has broken into several liquified products. You correctly guess that enzymes from your saliva, via the spoon, have continued digesting the yogurt in your absence. What will happen over time?
A. The reaction will soon stop because the amount of saliva is small, and you would have to add more saliva to continue the degradation.
B. The reaction will continue, since the enzyme is not consumed by the reaction.
C. The reaction will continue until half is digested and then stop because the reaction between substrate and product will be balanced.
D. Absolutely no degradation of the yogurt will occur naturally unless in the presence of this enzyme.

34. If there are twelve different intermediate products produced in the stages for production of a molecule in a cell, we can expect that there
A. is one enzyme that carries this process through to the end product.
B. is one enzyme for degradation and another enzyme for synthesis.
C. may not be any enzymes involved if this is a natural cell product.
D. must be twelve different raw materials combined in the cell by one enzyme.
E. are about twelve enzymes, at least one responsible for each step in the metabolic pathway.

35. Lactose is milk sugar, and humans produce substantial lactase enzyme to digest it when we are infants. However, we soon lose some or even all of our lactase after childhood. In such cases, undigested lactose passes to the lower intestine where bacteria break it down into lactic acid and CO_2, causing painful gas bloating. This problem could be avoided by

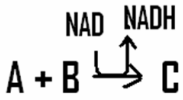
A. avoiding all dairy products containing lactose.
B. taking lactase enzyme tablets when consuming lactose products.
C. taking any enzyme tablets when consuming dairy products.
D. consuming lactose in tablet form.
E. Both taking lactase enzyme and avoiding all dairy products would be correct.

36. Analyze the graph at the right. Label the following.



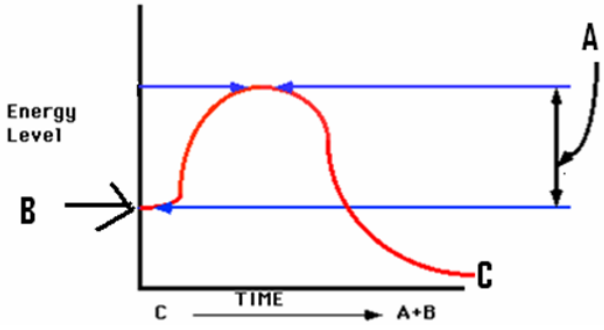
A. The energy of activation of the reaction with an enzyme.
B. The energy of activation of the reaction without an enzyme.
C. The energy of the reactants.
D. The energy of the products.

37. In this reaction, the reactant (s) are _____ and the coenzyme NAD is _____.



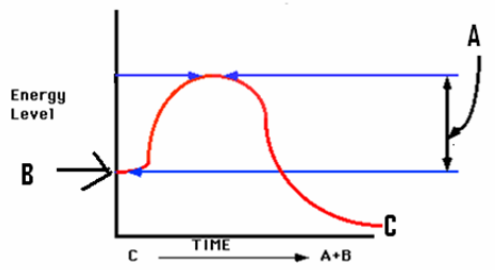
A. reduced; oxidized
B. oxidized; oxidized
C. reduced; reduced
D. oxidized; reduced

38. Study the figure at right. What does the letter A depict?



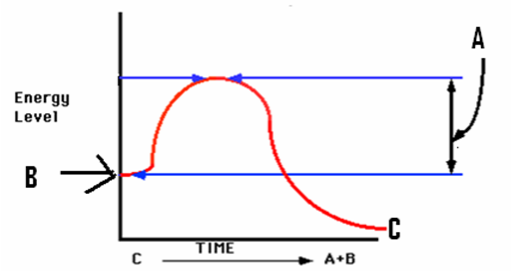
A. Energy of the reactant
B. Energy of the products
C. Energy of activation
D. Substrate concentration

39. Study the graph at right. The letter 'B ' depicts the _____, while 'C' depicts _____.



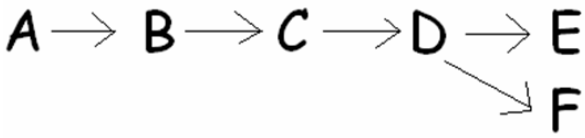
A. Energy of Activation; Energy of products
B. Energy of products; Energy of Activation
C. Energy of reactants; Energy of products
D. Reactant concentration; Activation Energy

40. If the reaction graphed at right is coupled with D → E, then D → E is:



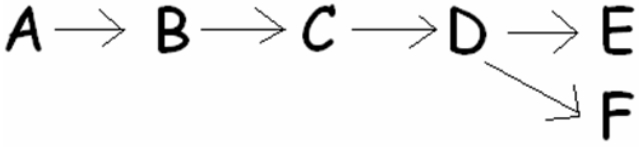
A. exergonic
B. endergonic
C. spontaneous
D. none of the above

41. The metabolic pathway at right involves how many possible chemical reactions?



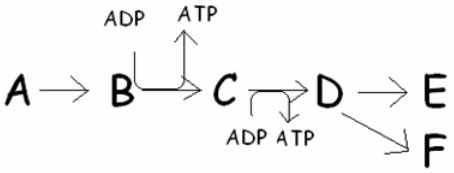
A. five
B. six
C. one
D. three

42. _____ represents the first reactant of this metabolic pathway and _____ reperesents the endproduct (s) of the pathway?



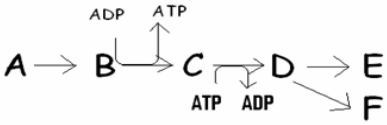
A. A; E
B. B; E and F
C. A; E and F
D. A and B; D and E

43. In this pathway, B → C is coupled with ADP → ATP. Categorize the reactions as endergonic or exergonic.

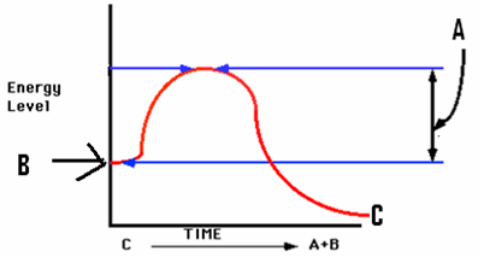


A. B →C is endergonic and ADP →ATP is exergonic.
B. ADP →ATP is endergonic and B →C is exergonic.
C. Both B →C and ADP →ATP are endergonic.
D. Both B →C and ADP →ATP are exergonic.

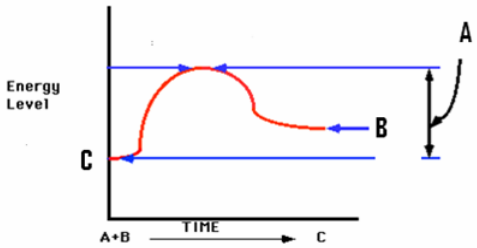
44. Identify the graph that depicts the reaction C → D.



A.



B.



45.

Reaction	Standard free-energy change (kcal/mol)
$6CO_2 + 6H_2O$ —> Sugar + $6O_2$	+686
sugar + $6O_2$ —> $6CO_2 + 6H_2O$	-686
ATP + H_2O —> ADP + P	-7.3
Maltose + $6H_2O$ —> 2 Glucose	-4.0

From the above table of free energy exchange, it is obvious that
A. photosynthesis and cellular respiration have essentially the same amount of free energy generated or released.
B. free energy is released in all of these reactions except photosynthesis.
C. where the free energy is negative, formation of the products is more likely.
D. All of the choices are true.
E. None of the choices are true.

46. If a change in pH alters an allosteric site where an inhibitor binds, but doesn't change the active site for the intended substrate, it would be possible for an enzymatically controlled reaction to occur as normal.
True False

47. In order to roll a rock down a hillside, you must first push it up out of the hole in which it rests. Pushing the rock is analogous to the energy of activation of a chemical reaction.
True False

48. Feedback inhibition is the process that turns off an early enzyme in a metabolic pathway as the result of inhibitory actions of a product of the pathway.
True False

49. The energy for ATP synthesis in chemiosmotic phosphorylation comes from the movement of hydrogen ions across a membrane down a concentration gradient.
True False

50. An enzyme is a globular protein that inhibits the formation of chemical bonds within the enzyme's substrate(s).
True False

BIO 103 – Ch. 9 Exam Study Guide - Mader 10th Ed.

1. Which of the following is NOT true concerning mitosis?
A. Plant cells lack centrioles while animal cells do not.
B. Both plant and animal cells undergo cytokinesis.
C. Mitosis allows growth and increase in size in both plants and animals.
D. Animal cells form a cell plate during cytokinesis while plant cells do not.

2. Cancer cells require many nutrients, which are supplied by blood vessels. The growth of new blood vessels to cancerous tissue is called:
A. angiogenesis
B. metastasis
C. carcinogenesis
D. apotosis

3. Apoptosis
A. is programmed cell death.
B. is a process that acts to decrease the number of somatic cells.
C. frees the fingers and toes of the human embryo from their 'webbed' structure to independent structures
D. All of the choices are correct.

4. The region that contains the genetic information in a bacterial cell is called the
A. nucleus.
B. nucleoid.
C. nucleolus.
D. nucleosome.
E. nucleoprotein.

5. Virtually all specialized cells of multicellular organisms
A. develop through mutation from less specialized cells of the organism.
B. contain more genetic material than less specialized cells of the same organism.
C. contain less genetic material than less specialized cells of the same organism.
D. have the same amount of DNA and the same number of chromosomes as all other cells of the organism.

6. If a parent cell has 48 chromosomes, how many chromosomes will each daughter cell have after mitosis and cytokinesis occurs?
A. 24 chromosomes
B. 48 chromosomes
C. 12 chromosomes
D. 96 chromosomes

7. Interphase:
A. occupies the majority of the cell cycle
B. includes G1, S and G2 stages
C. results in an increase in cell size
D. all of the above
E. A and B only

8. Eukaryotic chromosomes
A. consist of both DNA and protein.
B. may occur as chromatin.
C. contain histones responsible for packaging DNA to fit into a small space.
D. All of the choices are correct.

The enzymes that bring about apoptosis are:

9. called caspases.
True False

10. are ordinarily held in check by inhibitors.
True False

11. can be unleashed by internal or external signals.
True False

12. are only present in the cell immediately before apoptosis begins.
True False

13. Generally, animals build an organism using the diploid number of chromosomes. However, insects in the order of ants, wasps and bees can use a haploid-diploid system where adults of one sex are formed with a haploid number of chromosomes. This would mean that
A. a single set of chromosomes is sufficient to code for a functional individual.
B. a female could determine the sex of the offspring by fertilizing or not fertilizing an egg.
C. the males and females are not equally "related" to their mothers considering the proportion of genes held in common.
D. All of the choices are true.
E. this system in no way differs from regular diploid organisms.

14. What is the result of a cell not meeting the criteria to pass the G_1 checkpoint?
A. The cell cycle halts.
B. The cell may enter the G_0 stage
C. The cell may undergo apoptosis.
D. All of the above.
E. A and B only.

15. Which is NOT true about the chromosomes of a multicellular organism?
A. They are made up of DNA and protein.
B. Each chromosome is replicated into two chromatids during the S phase of interphase.
C. Each chromosome separates into two daughter chromosomes by binary fission.
D. All cells contain chromosomes that carry the same genetic information.

16. The function of mitosis is:
A. growth of the organism and tissue repair.
B. to ensure that each new cell receives a complete set of genetic information.
C. asexual reproduction in some species.
D. All of the choices are correct.

17. In the life cycle of animals, _____ have the haploid number of chromosomes.
A. all body cells
B. sperm and egg cells
C. muscle and nerve cells
D. skin and blood cells

18. Which statement is NOT true about eukaryotic chromosomes?
A. There is only one chromosome of each type in each body cell.
B. Chromosomes contain both DNA and associated histones.
C. Chromosomes condense from chromatin at the start of mitosis.
D. Chromosomes disperse back into chromatin at the end of mitosis.
E. Chromosomes are not located within the nuclear envelope during mitosis.

19. What codes for proteins that promote the normal cell cycle and prevents apoptosis?
A. Tumor suppressor genes
B. Oncogenes
C. Caspases
D. proto-oncogenes

20. The diploid (2n) number of chromosomes for humans is
A. 23.
B. 24.
C. 44.
D. 46.
E. 48.

21. The haploid (n) number of chromosomes for humans is
A. 23.
B. 24.
C. 44.
D. 46.
E. 48.

22. Which statement is NOT true about mitosis?
A. Mitosis is a process that duplicates and divides the nuclear contents only.
B. Mitosis produces two daughter cells that contain the same number of chromosomes as the parent cell.
C. Mitosis produces two daughter cells that contain the same kinds of chromosomes as the parent cell.
D. Mitosis uses a diploid (2n) parent cell to form daughter cells containing a haploid number(n) of chromosomes.
E. Mitosis is involved in development of a fertilized egg into a multicellular organism.

23. Which represents the correct sequence of stages in the cell cycle?
A. G_1, G_2, S, M
B. G_1, G_2, M, S
C. G_1, M, G_2, S
D. G_1, S, G_2, M

24. Below the skin are "stem cells" that divide, with some cells continuing the stem cell line and others being pushed toward the surface to flatten and die and be sloughed off. In the bone marrow other stem cells produce erythrocytes that lose their nucleus and function for a few months in the bloodstream before they too die. Such "dead end" cells that reproduce no further
A. leave the cell cycle in a G_0 phase, which immediately follows telophase.
B. leave the cell cycle in a G_3 phase, which immediately follows G_2.
C. halt in the midst of the S phase.
D. continually cycle but simply fail to go through cytokinesis.
E. reverse from G_2 to G_1.

25. What factors are evaluated before a cell is allowed to proceed through the G_1 checkpoint?
A. growth signals
B. availability of nutrients
C. the integrity of cellular DNA
D. all of the above
E. A and C, but not B

26. The critical checkpoints that control the cell cycle are at the:
A. M to G_1 stage and G_2 to M stage.
B. S to G_2 stage and G_2 to M stage.
C. G_1 to S stage and G_2 to M stage.
D. M to G_1 stage and S to G_2 stage.

27. During which stage of the cell cycle is cell growth and replication of organelles most significant?
A. M phase
B. G_1 phase
C. G_2 phase
D. S phase
E. G_0 phase

28. Which stage is most associated with a cell that is unable to divide again, such as a muscle or nerve cell?
A. M phase
B. G_1 phase
C. G_2 phase
D. S phase
E. G_0 phase

29. Which sequence of stages in mitosis is correct?
A. prophase, anaphase, prometaphase, metaphase, telophase
B. prophase, telophase, anaphase, prometaphase, metaphase
C. prophase, prometaphase, metaphase, anaphase, telophase
D. telophase, anaphase, prophase, prometaphase, metaphase
E. anaphase, prometaphase, metaphase, prophase, telophase

30. In some organisms, mitosis occurs without cytokinesis. This results in:
A. cell death
B. a multinucleated cell
C. cells arrested in the G_0 phase
D. cells with no nucleus
E. uncontrolled cell division

31. What occurs in anaphase?
A. Centrioles move to opposite poles.
B. Chromosomes move to opposite poles.
C. Chromosomes line up along the equator of the dividing cell.
D. The nuclear envelope disappears.
E. The nuclear envelope is constructed.

32. Which does NOT occur in telophase?
A. Cytokinesis is under way.
B. The nuclear envelope is being reconstructed.
C. The centromeres split apart.
D. Chromosomes de-condense into chromatin.
E. The nucleolus reforms.

33. Cytokinesis in plant cells differs from this process in animal cells because
A. the plant endoplasmic reticulum forms a cell plate.
B. microtubules are laid down in a plywood-like cell plate pattern.
C. the Golgi apparatus produces vesicles that migrate along microtubules and fuse to become a cell plate.
D. the inner plasma membrane divides by cytokinesis as in animal cells and then secretes a cellulose cell wall.
E. asters coalesce to form a fibrous plate that reinforces with cellulose.

34. Binary fission in bacteria differs from mitosis because
A. the chromosome copies attach to the plasma membrane and are pulled apart by cell growth.
B. the chromosome is a simple DNA strand without complex proteins and no spindle forms.
C. there is no nuclear membrane to break down and rebuild.
D. All of the choices are correct.
E. A and B only.

35. Oncogenes are all of the following EXCEPT:
A. mutated proto-oncogenes
B. cancer causing genes
C. genes that stimulate uncontrolled cell divisions
D. tumor suppressor genes

36. Which of the following is NOT true about cancer cells?
A. They never fully differentiate.
B. They exhibit contact inhibition.
C. They exhibit uncontrolled growth.
D. They exhibit disorganized growth.
E. They may undergo metastasis.

37. Which is NOT correctly associated with cancer?
A. Angiogenesis forms new blood vessels and brings nutrients and oxygen to the tumor.
B. The disorganized mass of cells is encapsulated and does not invade adjacent tissue.
C. Metastasis establishes new tumors distant from the site of the primary tumor.
D. Cells have receptors to adhere to basement membranes, then secrete proteinase enzymes to invade underlying tissues.

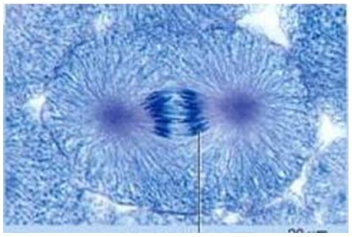
38. Angiogenesis:
A. is the growth of blood vessels into the tumor
B. is directed by additional mutations in tumor cells
C. bring nutrients and oxygen to a tumor
D. all of the above
E. A and C only

39. Although cancer may originate in many regions of the body, many patients die from cancerous growth in the lungs, lymph glands, or liver. This is most readily explained as
A. spreading of cancer by angiogenesis.
B. metastasis occurring more commonly in organs that have a filter effect.
C. proteinase enzymes making cancer particularly damaging to these tissues.
D. growth anywhere but in these organs is called benign.
E. due to these organs simply being more susceptible to cancer.

40. Apoptosis refers to cell death and
A. is always biologically detrimental to an organism.
B. is merely the accumulation of genetic errors.
C. is any failure of the genetic machinery to work properly.
D. is a failure in the translation or transcription mechanism.
E. can be programmed and is essential to normal development.

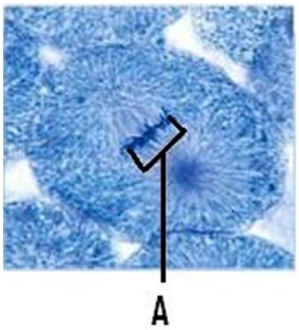
41. The purpose of therapeutic cloning is:
A. to produce an individual to the donor of the nucleus
B. to produce specialized tissue cells
C. to stimulate cells that have been arrested in the S phase
D. none of the above

42. What phase of mitosis is pictured at right?



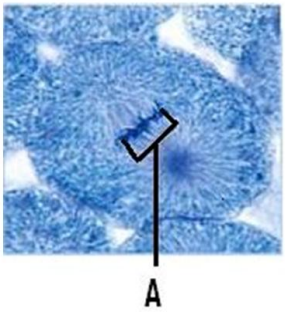
A. prophase
B. prometaphase
C. metaphase
D. anaphase
E. telophase

43. What is (are) the structures designated by the letter ‘A'.



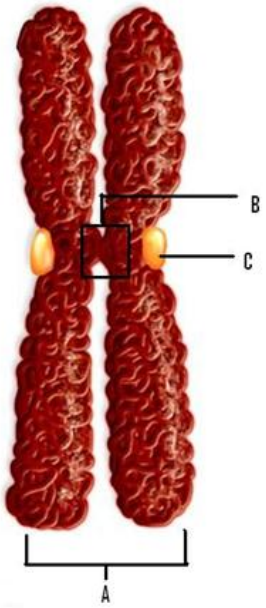
A. spindle fibers
B. centrioles
C. chromosomes
D. kinetochore microtubules

44. What phase of mitosis is pictured at right?



A. prophase
B. prometaphase
C. metaphase
D. anaphase
E. telophase

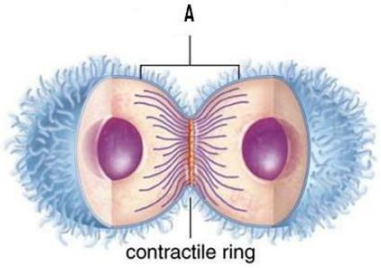
45. Name the labeled structures in the figure and answer the following questions.



A. _____
B. _____
C. _____
D. When the structures labeled A separate, what are they called?
E. What is the function of the structure labeled C?

46. Generally, complex organisms *do* require more genes to control their synthesis and organization than do primitive organisms. However, the numbers of chromosomes vary from ants with 2, molds with 8-14, humans with 46, potatoes with 100 and the crayfish with 200! Some birds and insects have chromosomes that dwindle in size into obscurity, so it is not possible to establish a diploid number.
A. there must be no relationship between amount of genetic information and complexity of the organism.
B. the number of genes per chromosome may vary among organisms, preventing a simple relationship between chromosome number and complexity.
C. birds and insects probably cannot follow the same mitotic laws as other organisms.
D. All of the choices are correct.

47. Answer the following questions concerning the figure to the right.



A. Name the structure labeled A.
B. What process is occurring in the figure?
C. Is this an animals or plant cell? Explain

48. The event that signals the start of anaphase is
A. division of the centromeres to separate sister chromatids.
B. migration of the centrioles to opposite poles of the nuclear space.
C. a cleavage furrow starts to form.
D. asters disappear.

49. Cloning can only be carried out using adult stem cells.
True False

50. Contact inhibition stops normal cells from dividing when they come in contact with neighboring cells, but this is not functional in cancer cells.
True False

51. Generally, brain and nerve cells are not able to regenerate after injury because they have left the cell cycle and are unable to return.
True False

52. Viruses and chemical exposure can cause mutations in proto-oncogenes which can lead to cancer.
True False

53. Organisms produced as a result of mitosis exhibit a great deal of genetic variation.
True False

BIO 103 - Ch. 10 Exam Study Guide – Mader 10th Ed.

1. Which of the following steps would NOT lead to variation of genetic material?
A. crossing over of homologous chromosomes
B. crossing over of sister chromatids
C. the random alignment of the chromosomes during metaphase I
D. the combination of sperm and egg genes.

2. Which of the following is NOT a difference between anaphase I and anaphase II?
A. At the end of anaphase I, each chromosome is composed of two chromatids and at the end of anaphase II, sister chromatids have separated, becoming daughter chromosomes
B. Anaphase I occurs in a haploid cell while anaphase II occurs in a diploid cell.
C. Sister chromatids separate during anaphase II while homologous chromosomes separate during anaphase I.
D. The cell undergoing anaphase II is genetically different from what it contained while undergoing anaphase I.

3. It could be said that males are able to provide gametes with more genetic diversity than females for reproduction. One main reason would be:
A. Males provide more genes in sperm than females provide in eggs.
B. Crossing over occurs more often in the formation of sperm than in eggs.
C. Spermatogenesis in males results in four functional sperm while oogenesis in females results in only one egg and three structures that contain genetic information that is lost when they disintegrate.
D. Sperm that contain a recombination of genes are usually more successful in fertilizing an egg.

4. The cell formed through fertilization of an egg by a sperm is called a/an
A. gamete.
B. sperm cell.
C. zygote.
D. egg cell.
E. ovum.

5. If a sperm cell contains 8 chromosomes, it comes from an animal that has _____ chromosomes.
A. 4
B. 8
C. 12
D. 16
E. 24

6. If gametes had the same number of chromosomes as body cells, and an organism had 12 chromosomes in its body cells, how many chromosomes would it have after three generations? How does this illustrate the necessity of meiosis for gamete formation?

7. Another name for a tetrad is a/an
A. homologue.
B. bivalent.
C. öocyte.
D. gamete.
E. polar body.

8. If a cell contains 12 chromosomes at the end of meiosis I, how many chromosomes will the daughter cells contain at the end of meiosis II?
A. 3
B. 6
C. 12
D. 24

9. During which stage of meiosis does crossing-over occur?
A. prophase I of meiosis I
B. anaphase I of meiosis II
C. telophase I of meiosis I
D. prophase II of meiosis II
E. anaphase II of meiosis I

10. Homologous chromosomes are similar in all of these characteristics EXCEPT:
A. similar in size.
B. carry the same alleles for all traits.
C. carry genes for the same traits.
D. similar in shape and location of the centromere.

11. What is the importance of crossing-over?
A. It provides extra genetic material for the daughter cells.
B. It increases the likelihood that daughter cells contain different genetic material.
C. It produces the proteins that are associated with DNA in chromosomes.
D. It increases chromosome condensation.
E. It separates the homologous chromosomes.

12. The overall function of meiosis includes all of the following EXCEPT
A. gamete production.
B. reduction of chromosome number (from 2N to N).
C. providing genetic variation in sexually reproducing organisms.
D. growth of the overall individual.

13. Sources of genetic variation in a sexually reproducing population include(s) which of the following?
A. crossing over in Prophase I of meiosis
B. independent assortment in Metaphase I of meiosis
C. fertilization
D. All of the choices are sources of genetic variation.
E. A and C only

14. To what does the term *chiasma* refer?
A. the process of fertilization
B. the life cycle of a fungus
C. the process of crossing-over
D. a structure that holds together homologues during crossing-over
E. the period between meiosis I and meiosis II

15. During which stage of meiosis are the bivalents arranged along the equator?
A. prophase I
B. metaphase II
C. anaphase II
D. prophase II
E. metaphase I

16. At which stage of meiosis is each chromosome composed of a single chromatid?
A. prophase I
B. metaphase II
C. anaphase II
D. prophase II
E. metaphase I

17. During which stage of meiosis does homologue separation occur?
A. prophase I
B. anaphase I
C. telophase I
D. prophase II
E. anaphase II

18. Which statement is NOT true about homologues in meiosis I?
A. Homologous chromosomes pair to form a tetrad.
B. Homologous chromosomes separate and go to different daughter cells.
C. Each homologue's centromere splits to form two chromosomes.
D. Homologues exchange genetic material between non-sister chromatids.
E. Homologues interact with the spindle as if they were one chromosome.

19. In the genus *Lacerta* are species of lizards that are female and do not mate. They undergo "endomitosis" where one extra chromosome replication results in a tetraploid cell before meiosis begins. Normal female 2n offspring result without fertilization. What change(s) from regular meiosis (in preparation for fertilization) would be required to produce this system?
A. The haploid cell products of meiosis II fuse.
B. Meiosis stops after meiosis I and does not proceed to meiosis II.
C. Cytokinesis does not follow "endomitosis" that results in a tetraploid cell.
D. During anaphase II, the sister centromeres fail to separate and daughter cells will not form.
E. During anaphase II, the daughter chromosomes are non-disjunctive and are all pulled to one daughter cell.

20. Interkinesis is different from interphase in which way?
A. Interkinesis occurs after a cell finishes a nuclear division.
B. Interkinesis is the stage that precedes a prophase stage.
C. Interphase involves DNA replication and interkinesis does not.
D. Interkinesis can be variable in length.

21. Which does NOT occur in meiosis?
A. two daughter cells at completion
B. four daughter cells at completion
C. two nuclear divisions
D. formation of bivalents

22. Meiosis occurs during all of the following EXCEPT
A. gametogenesis.
B. oogenesis.
C. pangenesis.
D. spermatogenesis.

23. The polar body is
A. another name for an egg cell.
B. a precursor cell that becomes an egg cell.
C. a nonfunctional cell rudiment formed at the same time as an egg cell.
D. the cell produced when fertilization occurs.

24. Why do polar bodies form?
A. They nurse the egg as it leaves the follicle.
B. This is extra chromosomal material representing the X chromosome in each female cell.
C. They orient the sperm toward the egg.
D. They allow a reduction in chromosomes while preserving all the food for one egg.
E. They orient the egg for penetration by the sperm.

25. Which of the following is/are true about sexual reproduction?
A. At the cellular level is the opposite of reproduction since it involves two cells fusing to become one.
B. It requires the development of organs such as the uterus, which are of no immediate survival advantage to the individual but are advantageous to the species.
C. It regularly produces a wider array of adaptations to the external environment in a shorter period of time.
D. It regularly produces a wider array of adaptations to the internal environment (disease agents, parasites) in a shorter period of time.
E. All of the choices are true.

26. Species X reproduces asexually by fission and species Y reproduces sexually. Consider that all other relevant characteristics are similar between these species. When the environment gradually changes, then
A. species X and Y will have an equal chance of surviving.
B. species Y should have a better chance of surviving than species X.
C. species X should have a better chance of surviving than species Y.
D. neither species should have an advantage in surviving since organisms often become extinct when the environment changes.

27. Before the time of Gregor Mendel and genetics, sexual reproduction was thought to produce a blending or equal mixing of the parents' traits. Today we know that
A. offspring will be identical to one another and demonstrate traits exactly halfway between the parents' traits.
B. offspring can vary from receiving over 99% of one parent's genes to receiving over 99% of the other parent's genes.
C. offspring inherit essentially 50% of their genes from each parent, but two sibling offspring may share with each other from zero to 23 chromosomes in common from each parent, and further variation may occur due to crossing-over.
D. offspring inherit copies of the same 23 pair of chromosomes from each of their parents but the rate of crossing-over makes them very dissimilar.
E. there is one chance in 23 of getting identical sets of chromosomes from one parent, times two because there are two parents; therefore, two siblings out of every 46 are really identical except for crossing-over.

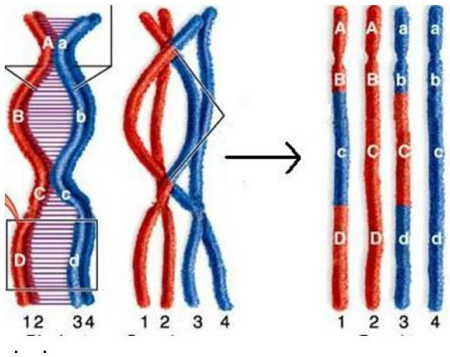
28. There is a species of desert lizard where only females are known to exist-there are no males known. It is nevertheless necessary for two females to court and for one to assume the posture of a male to stimulate the female to produce eggs. No fertilization can occur, and the eggs develop into female lizards. What is the probable evolutionary mechanism for this occurring?
A. The species is probably going extinct.
B. The desert is relatively uniform and there is little advantage to maintaining variation, but the animal has not been able to completely evolve away from its heritage of sexual reproduction.
C. This switch in mating behavior is the direct physical reflection of crossing-over.
D. This is probably an asexual organism attempting to mimic sexual reproduction.

29. In human females, when is meiosis II completed?
A. at ovulation
B. immediately after the sperm penetration of the secondary oocyte
C. immediately after the sperm penetrates the primary oocyte
D. None of the choices are correct.

30. Where in the human male does spermatogenesis occur?
A. ovaries
B. prostate gland
C. epididymus
D. testes

31. Which is NOT true about daughter cells of mitosis or meiosis?
A. In meiosis, daughter cells are haploid.
B. In meiosis, there are four daughter cells.
C. In mitosis, there are two daughter cells.
D. In mitosis, the daughter cells are genetically identical.
E. In meiosis, the daughter cells are genetically identical.

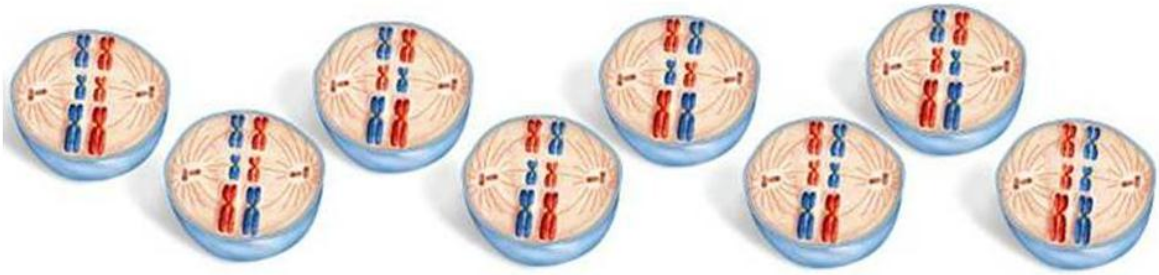
32. Study the diagram to answer the following questions.



A. What process is occurring in this diagram?
B. What structures, represented by (ABCD) and (abcd), are participating in this process?
C. How has this changed the structures?

33. All of the following are true concerning Down Syndrome EXCEPT
A. it is caused by autosomal trisomy 21
B. in 23% of cases, the sperm contributes the extra chromosome
C. it is the most common trisomy in humans
D. chances of a woman having a child with Down Syndrome decreases with her age

34. Study the diagram below. This is one cell with three homologous pairs of chromosomes pictured in eight different patterns.
A. What is this diagram illustrating?
B. How many daughter nuclei will result from these cells?
C. How many different combinations of chromosomes are there?



Characterize the following statements about changes in chromosome number and structure as True or False.

35. The correct number of chromosomes in a species is known as aneuploidy
True False

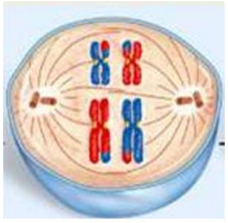
36. A change in the chromosome number resulting from nondisjunction is called euploidy.
True False

37. Monosomy occurs when an individual has only one of a particular type of chromosome.
True False

38. Primary nondisjunction occurs during meiosis II when the sister chromatids fail to separate and both daughter chromosomes go in the same gamete.
True False

39. Sex chromosome aneuploids are better tolerated and have a better chance of producing survivors.
True False

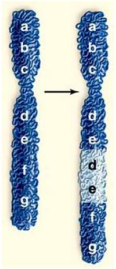
40. Study the figure to answer the following questions.



A. Is this cell going through mitosis or meiosis?
B. Explain your answer.
C. Identify the stage.

41. Some plants are tetraploid (4n). How might such a plant arise?

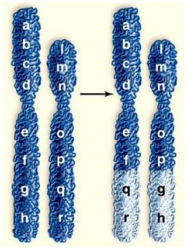
42. The picture at right depicts which of the following changes in chromosome structure.



A. deletion
B. duplication
C. translocation
D. aneuploidy

43. Extra copies of sex chromosomes are more easily tolerated in humans than extra copies of autosomes.
True False

44. The picture at right depicts which of the following changes in chromosome structure.

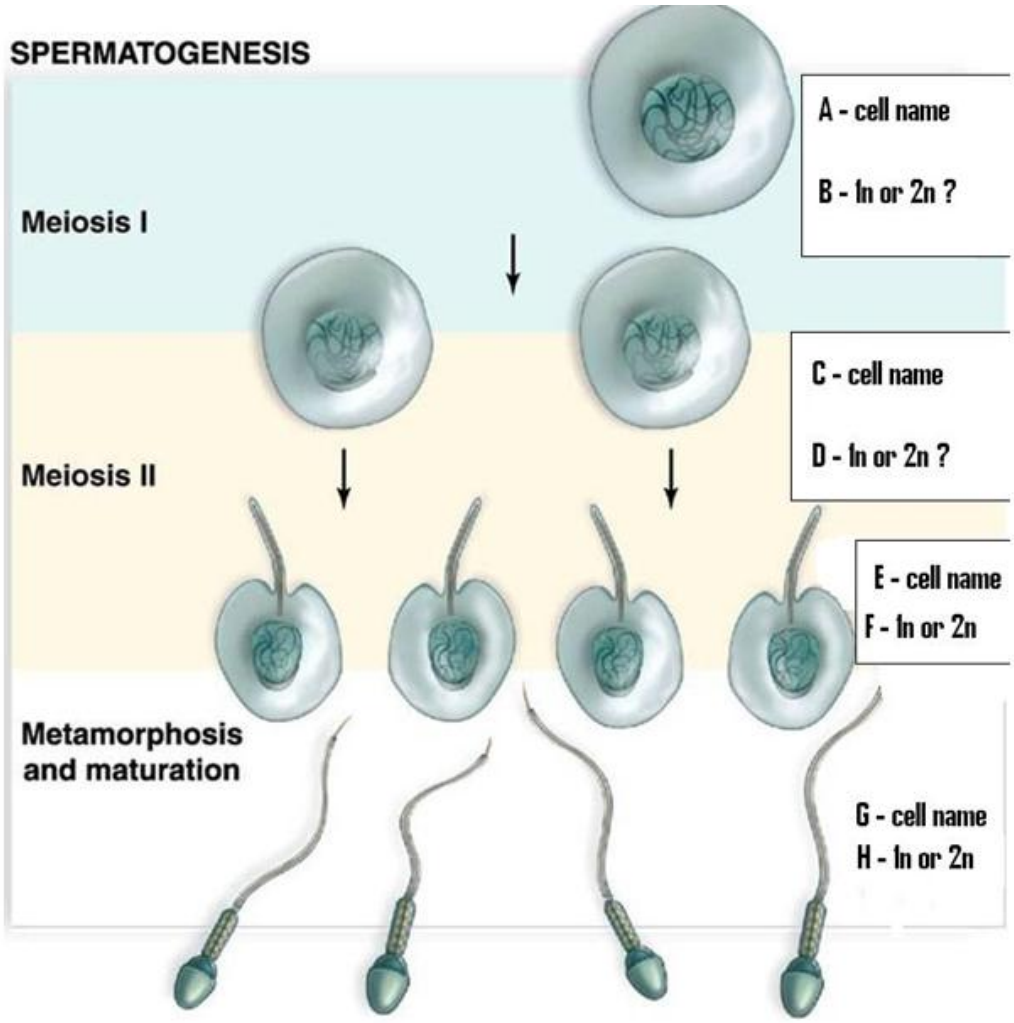


A. deletion
B. duplication
C. translocation
D. aneuploidy

45. At a cellular level, sexual reproduction involves the fusion of two cells into one. Some biologists have proposed early conditions (such as life in a pool that is drying up) that could have promoted primitive cells trying to engulf members of their own species but they succeeded in only fusing together. That means that the real evolutionary question may be the following: How could these early cells reduce the chromosome number by half? Consider the stages in mitotic division. Which processes in both nuclear replication and division, and cytokinesis, would need to be turned on or turned off in order to move from mitosis to meiosis?

46. Study the figure depicting the process of spermatogenesis. Name the labeled cells and tell whether they are haploid or diploid. In what part of meiosis is the number of chromosomes reduced by half?

A -
B -
C -
D -
E -
F -
G -
H -



47. Some animals are hermaphrodites that possess both male and female organs in the same organisms, and in some cases this allows for self-fertilization. Other animals can undergo parthenogenesis, where a female lays unfertilized eggs that develop into females. Since these systems can produce offspring that gain all their heredity from one parent, what is the chromosomal difference between an animal that is a hermaphrodite and one that uses parthenogenesis?

48. Sexual reproduction brings about genetic variation within a species. Why is genetic variation so important to the survival of a species? Support your answer with an example.

49. Oogenesis always involves an equal division of cell contents in the formation of an egg and polar bodies.
True False

50. A lattice holds the members of a bivalent together in such a way that the RNA of the non-sister chromatids is aligned.
True False

51. It is estimated that an average of two or three cross-overs occur per human chromosome.
True False

52. Aneuploidy is a change in the number of chromosomes resulting from nondisjunction during meiosis.
True False

53. Only one of the four daughter cells becomes a functional gamete in spermatogenesis.
True False

54. Jacobs Syndrome, XYY, results from nondisjunction during spermatogenesis.
True False

BIO 103 - Ch. 11 Exam Study Guide – Mader 10th Ed.

1. The location on a chromosome where a particular gene is located is known as the:
A. allele
B. dihybrid
C. locus
D. diploid
E. autosome

2. Which of the following is NOT a trait that is the result of, or is affected by, the interaction of more than one gene?
A. human skin color
B. cleft palate
C. height
D. sickle cell anemia

3. Which of the following crosses would always result in offspring that only display the dominant phenotype?
A. TT x tt
B. Tt x Tt
C. TT x TT
D. Tt x tt
E. both A and C

4. What aspect of Mendel's background gave him the necessary tools to discover the laws of inheritance?
A. He was a monk.
B. He was a teacher.
C. He lived in Austria.
D. He had studied mathematics and probability.
E. He corresponded with Charles Darwin.

5. What is the blending theory of inheritance?
A. Mendel's theory of how the traits of parents are passed to offspring through the gametes
B. Darwin's theory of how traits are passed from all parts of the parent's body into the gamete to be transmitted to the offspring
C. the modern theory of how genetic information is passed from parents to offspring
D. an old theory that said that offspring show traits intermediate between those of the parents

6. Which characteristic of pea plants were important in their selection as Mendel's research organism?
A. Peas are easy to cultivate.
B. Pea plants have a short generation time.
C. Pea plants are self-pollinating but can be cross-fertilized easily.
D. Many true-breeding varieties were available.
E. All of the above were important characteristics in Mendel's selection.

7. In a classic Mendelian monohybrid cross between a homozygous dominant parent and a homozygous recessive parent, which generation is always completely heterozygous?
A. F_1 generation
B. F_2 generation
C. F_3 generation
D. P generation

8. If a pea plant shows a recessive phenotype,
A. the genotype may be TT or Tt.
B. the genotype may be Tt or tt.
C. the genotype can only be TT.
D. the genotype can only be tt.
E. the genotype may be TT, Tt, or tt.

9. Women with X-linked disorders always pass the genes for the disorder to _____, while men with X-linked disorders always pass the genes for the disorder to _____.
A. only their daughters; only their daughters
B. both their daughters and sons; only their sons
C. both their daughters and sons; only their daughters
D. both their daughters and sons; their daughters and sons

10. Generally, it is not possible to determine whether nondisjunction failed to occur in oogenesis or spermatogenesis. However, it is possible to assert that _____ resulted in nondisjunction in _____.
A. XXY; oogenesis
B. XYY; spermatogenesis
C. XXX; oogenesis
D. XXY; spermatogenesis
E. XO; oogenesis

11. The F_2 offspring of a classic Mendelian monohybrid cross between homozygous dominant and homozygous recessive parents would produce the genotype(s)
A. AA and Aa.
B. Aa and aa.
C. AA, Aa, and aa.
D. AA only.
E. Aa only.

12. The offspring of a monohybrid testcross would have what possible genotype(s)?
A. AA and Aa.
B. Aa and aa.
C. AA, Aa, and aa.
D. AA only.
E. aa only.

13. What are alleles?
A. genes for different traits, such as hair color or eye color
B. alternative forms of a gene for a single trait, such as blue eyes or brown eyes
C. the locations of genes on a chromosome
D. recessive forms of a kind of characteristic carried by genes
E. dominant forms of a kind of characteristic carried by genes

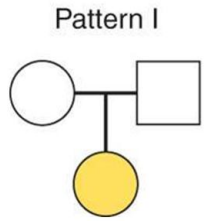
14. If an individual with a dominant phenotype is crossed with an individual with a recessive phenotype, 4 of their 9 offspring show the recessive phenotype. What is the genotype of the first parent?
A. AA
B. Aa
C. aa
D. The answer cannot be determined from this information.

15. Which is NOT true according to Mendel's law of segregation?
A. Each individual contains two factors for each trait.
B. One factor must be dominant and one factor recessive in each individual.
C. Factors separate from each other during gamete formation.
D. Each gamete contains one copy of each factor.
E. Fertilization restores the presence of two factors.

16. Some plants fail to produce chlorophyll, and this trait appears to be recessive. Many plants also self-pollinate. If we locate a pea plant that is heterozygous for this trait, self-pollinate it and harvest seeds, what are the likely phenotypes of these seeds when they germinate?
A. All will be green with chlorophyll since that is the dominant trait.
B. All will be white and lack chlorophyll since this is self-pollinated.
C. About one-half will be green and one-half white since that is the distribution of the genes in the parents.
D. About one-fourth will be white and three-fourths green since it is similar to a monohybrid cross between heterozygotes.
E. About one-fourth will be green and three-fourths white since it is similar to a monohybrid cross between heterozygotes.

17. The most common lethal genetic disease among Caucasians is
A. neurofibromatosis.
B. Tay-Sachs disease.
C. phenylketonuria.
D. albinism.
E. cystic fibrosis.

18. The pedigree chart depicts the inheritance pattern of ____. Circles depict females and squares to depict males. Colored shape represent affected individuals (expressing a trait) and uncolored shapes are unaffected (do not express a trait).



A. an autosomal recessive characteristic with both parents being heterozygous
B. an autosomal dominant characteristic with both parents being homozygous dominant
C. an autosomal recessive characteristic with both parents being homozygous recessive
D. none of the above

19. Create a pedigree chart that depicts an inheritance pattern of an autosomal dominant characteristic. Use circles to depict females and squares to depict males. Colored shape represent affected individuals (expressing a trait) and uncolored shapes are unaffected (do not express a trait).

20. A range of genotypes and phenotypes occur in polygenic inheritance. Draw a graph that depicts this pattern of continuous variation in polygenic inheritance.

21. Where does independent assortment occur in meiosis (what stage)? Where is the law of segregation evident in meiosis? What is the result of independent assortment and segregation? Explain your answer.

22. If the parents are AO and BO genotypes for the ABO blood group, their children could include which of the following genotypes?
A. AO and BO only
B. AO, BO, and AB only
C. AA, BB, and AB only
D. AO, BO, and OO only
E. AO, BO, AB, and OO only

23. Haiti is settled by peoples of both African and European ancestry. A young couple, both with mixed ancestry, marry and have several children. The children vary widely in the amount of skin melanin production, with one child being lighter than both parent, and one being darker. The simple explanation for this is
A. epistasis.
B. multiple alleles are available for the one chromosomal locus that governs skin color.
C. the environment affected the phenotype that developed.
D. polygenic inheritance.
E. gene linkage.

24. Lethal genes (genes that result in the failure to develop a vital organ or metabolic pathway) are nearly always recessive. Animal breeders who discover a unique trait and selectively breed to increase the occurrence of that trait often encounter a noticeable increase in lethal genes. Why?
A. The lethal recessive gene may be incompletely dominant.
B. Spreading the gene among offspring of both sexes will increase the likelihood it will be sex-linked and expressed.
C. The selective-mating of closely related individuals, or inbreeding, increases chances that two recessive genes will "meet" in offspring.
D. "Pleiotropy" - the gene that is being selected for this trait may have the second effect of being lethal.
E. "Epistasis" - selection for the desired trait may result in "uncovering" the lethal gene.

25. Unattached earlobes (EE or Ee) are described in the textbook as dominant over attached earlobes (ee). A couple both have unattached earlobes. Both notice that one of their parents on both sides has attached earlobes (ee). Therefore, they correctly assume that they are carriers for attached earlobes (Ee). The couple proceeds to have four children.
A. They can be certain that three will be heterozygous and one homozygous recessive.
B. If the first three are heterozygous, the fourth must be homozygous recessive.
C. The children must repeat the grandparents' genotype (Ee).
D. All children must have unattached earlobes since both parents possess the dominant gene for it.
E. Two heterozygous, one homozygous recessive and one homozygous dominant is a likely outcome, but all heterozygous, or two, three or all four homozygous are also possible.

26. In 1940, two researchers named Weiner and Landsteiner discovered that about 85 percent of the human population sampled possessed a blood cell protein that had been previously detected in Rhesus monkeys. This blood type was labeled Rh positive, and Rh^+ was found to be dominant over the absence of the blood factor (Rh). Under normal Mendelian inheritance, which of the following statements is FALSE?
A. Two Rh^+ parents could have an Rh^- child.
B. Two Rh^- parents could have an Rh^+ child.
C. An Rh^- child would require that both parents be carriers of at least one Rh^- gene.
D. It is possible with just one pair of parents to have children where some siblings are Rh^- and some are Rh^+.
E. All of the choices are false.

27. Since each child of two heterozygous parents has a 1/2 chance of receiving a recessive trait from each parent,
A. if the first child is phenotypically recessive, then the next child must be phenotypically dominant.
B. if the first child is phenotypically recessive, then the next child has a 3/4 chance of being phenotypically recessive.
C. if the first child is phenotypically recessive, then the next child has a 1/2 chance of being phenotypically recessive.
D. no matter what the first child's phenotype, the next child will have a 1/4 chance of being phenotypically recessive.

28. The ability to roll the edges of the tongue upward in a U-shape has been considered to be an inherited ability. The standard assumption is that tongue-rolling is a dominant allele at a single gene locus. Which of the following would cast doubt on this assumption?
A. A teacher reports that after testing her class on the ability to roll their tongue, with very little effort the non-tongue-rollers can learn to also roll their tongues.
B. A student who can roll his tongue has a mother and father, both of whom cannot.
C. A student who cannot roll his tongue has a mother and father, both of whom can.
D. Both A and B are situations that would cast doubt on this assumption.

29. If the probability of event A is 3/4 and the probability of event B is 1/4, then the probability of both A and B occurring at the same time is
A. 3/4.
B. 1/4.
C. 1 or absolute certainty.
D. 1/2.
E. 3/16.

30. The water buttercup produces thin leaves underwater, but those same tissues will produce broad leaves above the water. Individuals in the 1800's (when hunger and childhood diseases were common) averaged slightly over five feet tall, but their offspring in the 1900's were substantially taller on the average. This reflects the influence of
A. polygenic inheritance.
B. epistasis.
C. gene linkage.
D. genotype having no relationship to phenotype.
E. environmental factors on gene expression

31. Computer simulations are sometimes used to demonstrate the outcome of monohybrid fruit fly crosses, where a student can run generation after generation of fruit flies with 100 offspring produced each generation, half male and half female, and a 3-to-1 phenotype ratio (or 75 to 25) in the F_1 generation. Compared with real genetics results,
A. rarely would exactly 100 fly offspring be produced or survive.
B. an exact balance between males and females would be rare.
C. a precise 3-to-1 ratio would be uncommon.
D. All of the choices are true.

32. In what kind of classic Mendelian cross would you expect to find a ratio of 9:3:3:1 among the F_2 offspring?
A. monohybrid cross
B. dihybrid cross
C. testcross
D. None of the choices is correct.

33. If a woman is a carrier for the color-blind recessive allele and her husband is normal, what are their chances that a son will be color-blind?
A. None since the father is normal.
B. 50% since the mother is the only carrier.
C. 100% because the mother has the gene.
D. 25% because the mother is a hybrid.
E. None since he will also be just a carrier.

34. In pea plants, the gene for round seed (R) is dominant, and wrinkled seeds (r) are recessive. The endosperm of the pea is also either starchy, a dominant gene (S), or waxy (s). What can be said of a fully heterozygous, dihybrid cross?
A. It is impossible to secure offspring that are homozygous for both dominant genes.
B. It is impossible to secure offspring that are homozygous for both recessive genes.
C. It is impossible to secure offspring that are homozygous for one dominant gene such as round seed and homozygous recessive for the other recessive waxy gene.
D. All of these choices are impossible combinations in a dihybrid cross.
E. All of these choices are possible combinations in a dihybrid cross.

35. A testcross involves an individual exhibiting the dominant phenotype but an unknown genotype being crossed with an individual that has a(n) _____ genotype.
A. homozygous dominant
B. heterozygous dominant
C. homozygous recessive
D. any of the choices

36. If individuals exhibiting a dominant phenotype are crossed and produce only offspring with the dominant phenotype, what would be the logical genotype of the parents?
A. both are homozygous recessive
B. one is heterozygous and one is homozygous dominant
C. both are homozygous dominant
D. both are heterozygous
E. both B and C

37. In the use of a Punnett square for genetic results of crossing individuals
A. all different kinds of sperm are lined up either horizontally or vertically.
B. all different kinds of eggs are lined up either horizontally or vertically.
C. the results show the offspring's expected genotypes.
D. All of the choices are correct
E. A and B only.

38. If a human who is a tongue roller (T) and has unattached ear lobes (E) marries a person who cannot roll their tongue and has attached earlobes, could they produce an offspring that was also a non-tongue roller with attached earlobes? What would be the genotype of the first parent? the second parent?
A. yes; TtEe; ttee
B. yes; TtEE; ttEe
C. no; TTEE; ttee
D. unable to determine from the information given

39. The particulate theory of inheritance
A. preceded Mendel's research by a century.
B. was proposed by Mendel.
C. is based on particles or hereditary units we now call genes.
D. All of the choices are correct.
E. B and C only

40. As many as 60 % of people in malaria-infected regions of Africa have the sickle-cell allele, but only about 10% of the U.S. population of African ancestry carries the allele. Malaria remains a major disease in central Africa but has not been a serious problem in the U.S. for many generations. What is/are the reason(s) for the difference in the percentages and what is a reasonable statement about future percentages?
A. The presence of malaria in Africa maintains the advantage of the heterozygous sickle-cell trait, and the prevalence of malaria will likely continue to preserve the 60% rate.
B. The U. S. percentage may have always been somewhat lower due to immigration from nonmalaria regions, but changes in sites and rates of immigration could occur.
C. Lack of widespread malaria in the United States would have made both homozygous and heterozygous carriers of sickle-cell undergo several generations of negative selection, and we should expect this to continue unless innovative therapies give all individuals an equal chance of surviving and reproducing.
D. All of the choices are reasonable.

41. An individual with blood type A marries an individual with blood type B.
A. What blood types could their offspring exhibit?
B. Provide the possible genotypes of parents and offspring produced.
C. What pattern of inheritance is this?

42. Which is associated with the inability to produce factor VIII in the blood?
A. Williams syndrome
B. trisomy 21
C. color-blindness
D. Hemophilia A
E. Duchenne muscular dystrophy

43. When crossing a true-breeding red snapdragon flower with a true-breeding white flower of the same species, we secure all pink offspring. This would seem to support the pre-Mendel view that inheritance is a blending of parental traits. However, Mendel and conventional wisdom agree that "blending" of parental traits is not correct and that particles of inheritance are actually involved because
A. in the case of incomplete dominance, only radioactive isotope tracers can follow the actual hereditary particles
B. under blending theory, over many generations only the average (or pink flowers) would remain; there would be no way to get back to pure red and white
C. it is possible to cross the pink F-1 generation and secure a predictable proportion of pure red and white flowers again, which is not accounted for under the blending theory
D. there is no way to directly prove incomplete dominance is not a case of blending, but we can be sure of genes because of the other cases of dominance, etc., where genes are the only logical explanation.
E. B and C are true

44. Black and brown guinea pigs are bred. Assuming their color is determined by one gene, and that there is a dominant and a recessive allele, how would you determine which allele is dominant? How could you determine the genotypes of the parents? Explain.

45. What is the blending theory of inheritance? How did Mendel disprove this theory?

46. Cystic fibrosis and Niemann-Pick Disease are common autosomal dominant disorders.
True False

47. In a case of incomplete dominance, the phenotypic ratio of the F_2 generation is the same as the genotypic ratio.
True False

48. Each gamete carries one factor, now called an allele, for each inherited trait.
True False

49. If an individual is heterozygous for a particular trait, the gametes that individual produces will contain 3/4 dominant and 1/4 recessive alleles.
True False

50. Polygenic traits such as height or weight are often influenced by the environment of the organism.
True False

BIO 103 - Ch. 12 Exam Study Guide – Mader 10th Ed.

Present experimental evidence related to Griffith's experiment and the identification of the cell's genetic material.
When experimenting with *Streptococcus pneumoniae* in the 1920's, Griffith noticed that some colonies were shiny and smooth and some were rough in appearance. He called the shiny colonies, the 'S strain' and the rough colonies, the 'R' strain. When Griffith injected mice with the S strain, which he discovered were encapsulated, they died. When he injected them with the R strain, they did not die. In trying to determine what factor was responsible for the S strain's virulence, Griffith heat-killed the S bacteria to destroy the capsule. When he injected mice with the normally fatal S strain bacteria that had been heat-killed, they did not die. However, if the heat-killed S strain bacteria were mixed with harmless live R strain bacteria of the same species and injected, the mice did die. Surprisingly, living S strain bacteria were recovered from the bodies of the mice. Griffith concluded that some substance from the dead S strain bacteria passed to the R strain bacteria, imparting virulence and the ability to form a capsule. Avery and others continued the search for the substance that "transformed" the R strain into the S strain.
Hypothesis I: Genetic material or "transforming substance" is protein.
Hypothesis II: Genetic material or "transforming substance" is RNA.
Hypothesis III: Genetic material or "transforming substance" is DNA.

1. An experiment was performed that demonstrated that the addition of protein-degrading enzyme did not prevent transformation. This finding:
A. Supports Hypothesis I
B. Supports Hypothesis II
C. Supports Hypothesis III
D. Rejects Hypothesis I only.
E. Rejects Hypothesis II only.
F. Rejects Hypothesis III only.
G. Does not support any of these hypotheses.

2. An experiment was performed in which DNAase enzyme digestion prevented transformation. This finding:
A. Supports Hypothesis I
B. Supports Hypothesis II
C. Supports Hypothesis III
D. Reject Hypothesis I only.
E. Reject Hypothesis II only.
F. Reject Hypothesis III only.
G. Does not support any of these hypotheses.

3. In an experiment, neither heat-killed R strain nor heat-killed S strain can kill the mice. This finding:
A. Supports Hypothesis I
B. Supports Hypothesis II
C. Supports Hypothesis III
D. Reject Hypothesis I only.
E. Reject Hypothesis II only.
F. Reject Hypothesis III only.
G. Does not support or provide information to reject any of these hypotheses.

4. An experiment was performed that demonstrated that RNAase fails to prevent transformation of the strain R to S strain. This finding
A. Supports Hypothesis I
B. Supports Hypothesis II
C. Supports Hypothesis III
D. Reject Hypothesis I only.
E. Reject Hypothesis II only.
F. Reject Hypothesis III only.
G. Does not support or provide information to reject any of these hypotheses.

5. An experiment was performed that demonstrated that DNA extracted from the S strain bacteria transformed R strain bacteria. This finding:
A. Supports Hypothesis I
B. Supports Hypothesis II
C. Supports Hypothesis III
D. Rejects Hypothesis I only.
E. Rejects Hypothesis II only.
F. Rejects Hypothesis III only.
G. Does not support any of these hypotheses.

6. Which of the following statements is NOT true about the debate over the nature of genetic material?
A. Many scientists believed that DNA was not the genetic material because, with only four types of nucleotides, DNA did not have enough variability to store information.
B. Scientists focused on carbohydrate and protein in their studies of possible genetic material since they knew that genes were on chromosomes and that chromosomes were made of carbohydrate and protein.
C. Many scientists thought that proteins had a greater capacity for storing information because proteins contain 20 amino acids that could be sequenced differently.
D. Some scientist thought that RNA was likely to be the genetic material.

7. Transformation of bacteria was shown to occur when _____ bacteria were injected into mice and the mice _____.
A. live S strain; died
B. live R strain; didn't die
C. live S and R strain; died
D. live R strain and dead S strain; died
E. live S strain and dead R strain; didn't die

8. DNA was shown to be the transforming substance when only the _____ enzymes could inhibit transformation.
A. proteinase
B. RNAase
C. DNAase
D. lipase

9. If a DNA sample contains 13% adenine, what percentage of the sample contains cytosine?
A. 13%
B. 37%
C. 26%
D. 74%

10. One of Chargaff's rules states that
A. A + G = T + C.
B. A = C, T = G.
C. A = G, T = C.
D. A + T = G + C.

11. The X-ray diffraction photography of Rosalind Franklin and Maurice Wilkins was critical evidence in the study of DNA,
A. indicating that DNA has a double helix structure.
B. showing equal numbers of purines and pyrimidines.
C. showing the bases of DNA were held together by hydrogen bonds.
D. revealing the structure of the deoxyribose sugar.
E. of the location of each adenine, guanine, cytosine, and thymine.

12. In the Watson and Crick model of DNA, the "steps" of the ladder are composed of
A. sugars.
B. a purine and a pyrimidine.
C. two purines.
D. two pyrimidines.
E. a sugar and a phosphate molecule.

13. Before Watson and Crick described DNA structure, Linus Pauling proposed a possible model with three strands of support running down the middle and the bases extending out the sides. How did Pauling's model differ from Watson and Crick's?
A. He missed the number of support strands which was two rather than three.
B. The support strands ran along the outside rather than down the center.
C. The bases were paired in the middle rather than sticking out the sides.
D. All of the choices describe how Pauling's model was different than Watson and Crick's model.

14. Scientists have created genetically modified organisms (GMOs) by isolating and then transferring the jellyfish gene for green fluorescent protein into pigs, bacteria, plants and mice. The result was bioluminescent organisms! These experiments demonstrate that:
A. jellyfish genes may be transferred into other aquatic ectotherms, but not mammals
B. genes have no difficulty crossing the species barrier
C. animal genes will not function if transferred into animals
D. genes can only be transferred to other organisms within the same species

15. Which of the following statements about DNA replication is NOT correct?
A. Unwinding of the DNA molecule occurs as hydrogen bonds break.
B. Replication occurs as each base is paired with another exactly like it.
C. The process is known as semiconservative replication because one old strand is conserved in the new molecule.
D. The enzyme that catalyzes DNA replication is DNA polymerase.
E. Complementary base pairs are held together with hydrogen bonds.

16. Nucleotides contain all of the following except:
A. a phosphate group
B. a 5 - carbon sugar
C. a nitrogen base
D. histones
E. A and C

17. According to Watson and Crick's model, DNA consists of two strands of nucleotides that are antiparallel. What does this mean? What evidence supports the antiparallel nature of the strands?

18. During DNA replication, this enzyme _____, catalyzes the elongation of new DNA by adding, to the 3' end of the previous nucleotide, new nucleotides that are complementary to a DNA template.
A. helicase
B. DNA polymerase
C. DNA ligase
D. ATP synthase

19. Which statement is NOT true about DNA replication?
A. It proceeds in a 5'-to-3' direction only.
B. One strand of new DNA is replicated faster than the other strand at the replication fork.
C. DNA can only replicate at one point on a chromosome at one time.
D. It occurs more rapidly in bacteria than in eukaryotes.
E. Replication can only begin at a special origin of replication.

20. Which statement is NOT true about DNA replication in prokaryotes?
A. Replication begins at a single origin of replication.
B. Replication is bidirectional from the origin(s).
C. Replication occurs at about 1 million base pairs per minute.
D. Since bacterial cells replicate so rapidly, a second round of replication may begin before the first has been completed.
E. There are many bacterial chromosomes, with replication occurring in each at the same time.

21. Which statement is NOT true about DNA replication in eukaryotes?
A. Replication of the entire genome takes about ten minutes.
B. A replication fork occurs at each growing point of the replicating chromosome(s).
C. Eukaryotes have many different chromosomes, with replication occurring in each at the same time.
D. Replication occurs at the rate of about 500-5000 base pairs per minute.
E. Multiple sites of replication are present on each chromosome.

22. Some chemotherapeutic drugs combat cancer by using
A. healthy cell templates to correct the resultant daughter cell DNA sequences that are cancerous.
B. analogs of one of the four nucleotides to prevent replication.
C. analogs of one of the four nucleotides to prevent unzipping of the DNA.
D. DNA polymerase to promote continuous or premature replication.
E. DNA repair enzymes to correct the genetic fault that causes cancer.

23. Before the DNA repair enzyme complex has completed its function, approximately how many base-pairs are still improperly matched?
A. 1 in 10,000
B. 1 in 100,000
C. 1 in 1,000,000
D. 1 in 10,000,000
E. 1 in a billion

24. After the DNA repair enzymes complex has completed its function, approximately how many base-pairs are still improperly matched?
A. 1 in 10,000
B. 1 in 100,000
C. 1 in 1,000,000
D. 1 in 100,000,000
E. 1 in a billion

25. Which is NOT true about the genetic code?
A. Most amino acids have only one codon.
B. It is composed of a triplet code of three bases per codon.
C. It produces 64 different possibilities of base sequences.
D. It was cracked through the use of a cell-free system of enzymes.
E. It contains start and stop codons as instructions.

26. The correct sequence of events in translation is:
A. initiation, termination, elongation.
B. elongation, termination, initiation.
C. termination, elongation, initiation.
D. elongation, initiation, termination.
E. initiation, elongation, termination.

27. An unknown chemical is analyzed and found to contain the bases thymine and guanine. This chemical is most likely
A. tRNA.
B. mRNA.
C. DNA.
D. rRNA.

28. Codons:
A. are triplets coding for a single amino acid.
B. are the alphabet of the genetic language.
C. each have only one meaning.
D. All of the choices are correct.
E. A and B are true.

29. The first codon to be deciphered was _____, which codes for _____.
A. AAA, proline
B. GGG, alanine
C. UUU, phenylalanine
D. TTT, arginine
E. CCC, glycine

30. Transcription of a part of a DNA molecule with a nucleotide sequence of A-A-A-C-A-A-C-T-T results in a mRNA molecule with the complementary sequence of
A. G-G-G-A-G-A-A-C-C.
B. U-U-U-G-U-U-G-A-A.
C. T-T-T-G-A-A-G-C-C.
D. C-C-C-A-C-C-T-C-C.
E. none of the choices are correct.

31. If one strand of DNA has the base sequence AAGCAA, the complementary strand has which of the following sequences?
A. UUCGUU
B. TTCGTT
C. AAGCAA
D. UTCGTU
E. TTCGTG

32. Transcription is initiated when:
A. initiation factors assemble ribosomal subunits, mRNA, and initiator tRNA.
B. RNA polymerase comes to a stop sequence.
C. RNA polymerase binds to a region of DNA called the promoter.
D. new nucleotides are added to an existing strand of nucleotides

33. For translation to take place, which of the following would NOT be required to be present?
A. DNA.
B. mRNA.
C. tRNA-amino acid complex.
D. rRNA.
E. ribosome.

34. Which of the following processes does NOT take place during translation?
A. Growth of a polypeptide chain.
B. Attachment of a ribosome to mRNA.
C. Binding of two tRNA molecules per ribosome.
D. Liberation of polypeptide from the ribosome.
E. Production of mRNA.

35. What is the function of the ‘cap" during the processing of mRNA?
A. The cap is placed at the 5' end to tell the ribosome where to attach when translation begins.
B. The cap is placed at the 3' end to facilitate the transport of mRNA into the nucleus.
C. The cap is placed at the 5' end to inhibit mRNA degradation by proteolytic enzymes.
D. All of the above statements describe functions of the ‘cap' during mRNA processing.

36. During the elongation of a polypeptide chain, _____ occurs when the mRNA moves to the next site on the ribosome to read the next codon.
A. translocation
B. transcription
C. translation
D. transference

37. Which of the following would be transcribed into mRNA?
A. a noncoding gene
B. a protein-coding gene
C. a promoter
D. a ribozyme

38. A (an) _____ is a group of three bases on tRNA that is complementary to a specific mRNA codon.
A. codon.
B. anticodon.
C. poly-A tail
D. cap

39. Which of the following statements concerning ribosomes are true?
A. Several ribosomes are often attached to and translating the same mRNA.
B. Ribosomes join amino acids to form a polypeptide.
C. Ribosomes have a binding site for mRNA and three binding sites for tRNA molecules.
D. No protein synthesis within a cell would occur without ribosomes.
E. All of the above statements are true.

40. A eukaryotic chromosome contains a single linear DNA molecule and protein. In fact, over 50% of the chromosome is protein. Although there are several different types of protein, the majority of chromosomal protein is histones. What have scientists discovered about histones that suggest they have important functions in the cell?

41. A sample of Chargaff's data on the DNA base composition in various species is provided. Discuss several conclusions that may be drawn from this data?

Chargaff's DNA Database Composition in Various Species (%)

Species	A	T	G	C
Homo sapiens (human)	31.0	31.5	19.1	18.4
Drosophila melanogaster (fruit fly)	27.3	27.6	22.5	22.5
Zea mays (corn)	25.6	25.3	24.5	24.6
Neurospora crassa (fungus)	23.0	23.3	27.1	26.6
Escherichia coli (bacterium)	24.6	24.3	25.5	25.6
Bacillus subtilis (bacterium)	28.4	29.0	21.0	21.6

42. While many body cells only replicate 40 to 60 times, cells that produce some white blood cells may replicate many more times. It is, therefore, crucial that proofreading and repair occur so that the transfer of biological information is accurate. On the other hand, absolute accuracy in replication of biological information would cancel out mutations that are the raw material of evolution. Why is accuracy in transcription and translation less critical than accuracy in gene replication?

43. The next generation of a bacterium contains half the original DNA strands of the "parent." Explain why the cells in your body do not all contain one-half or one-fourth the original strands of DNA from your parents.

44. Transposons are thought to be a driving force in the evolution of living things. What are transposons and how might they be involved in evolution?

45. A unit of a chromosome that consists of DNA wound around a core of eight histone proteins is a transposon.
True False

46. Ribozymes are RNA molecules that function as enzymes, catalyzing reactions during RNA splicing.
True False

47. Growth at two replication forks arising from a single origin of replication produce a "bubble" as daughter DNA molecules form.
True False

48. During the replication of DNA, DNA polymerase has to synthesize the daughter strand in the 5' to 3 ‘direction because DNA polymerase can only join nucleotides to the 3' end of the growing new strand.
True False

49. Telomerase is an enzyme that unwinds DNA during DNA replication.
Helicase unwinds DNA during DNA replication.
True False

50. The poly-A tail is a modified guanine nucleotide that tells a ribosome where to attach when translation begins.
True False