

1) Life is organized in a hierarchical fashion. Which one of the following sequences illustrates that hierarchy as it *increases* in complexity?

- A) ecosystem, population, organ system, cell, community, molecule, organ, organism, tissue
- B) cell, molecule, organ system, organ, population, tissue, organism, ecosystem, community
- C) organism, organ system, tissue, population, organ, community, cell, ecosystem, molecule
- D) molecule, cell, tissue, organ, organ system, organism, population, community, ecosystem
- E) ecosystem, molecule, cell, tissue, organism, organ system, organ, community

Answer: D

2) A consumer eating a producer represents

- A) a transfer of chemical nutrients and energy.
- B) a transfer of chemical nutrients but not a transfer of energy.
- C) a transfer of energy but not a transfer of chemical nutrients.
- D) neither a transfer of chemical nutrients nor a transfer of energy.

Answer: A

3) Which of the following, if any, is *not* a common cellular activity?

- A) Cells respond to the environment.
- B) Cells develop and maintain complex organization.
- C) Cells take in and use energy.
- D) Cells regulate their internal environment.
- E) All of the choices are common cellular activities.

Answer: E

4) Your instructor asks you to look into your microscope to see a prokaryotic cell. You will be looking for a cell that

- A) has a nucleus.
- B) has a membrane.
- C) makes up most of the tissues of your body.
- D) is much larger than most cells in your body.
- E) does not use DNA to code genetic information.

Answer: B

5) Which of the following is/ are properties of life?

- A) a complex organization
- B) the ability to take in energy and use it
- C) the ability to respond to stimuli from the environment
- D) the ability to reproduce
- E) All of the choices are correct.

Answer: E

6) Which one of the following statements is *correct*?

- A) Genes are proteins that produce DNA.
- B) Each organism has its own unique DNA code.
- C) DNA relies upon five different building blocks as the alphabet of inheritance.
- D) Differences among organisms reflect different nucleotide sequences in their DNA.
- E) Each DNA molecule is a single strand of nucleotides.

Answer: D

7) Which one of the following is *false*? Living systems

- A) are composed of two or more cells.
- B) maintain a relatively consistent internal environment.
- C) respond to changes in the environment.
- D) encode their genetic information in DNA.
- E) grow and develop.

Answer: A

8) Organisms that are not prokaryotes are in the Domain

- A) Bacteria.
- B) Plantae.
- C) Eukarya.
- D) Archaea.
- E) Fungi.

Answer: C

9) Which one of the following is a kingdom within the Domain Eukarya?

- A) Viruses
- B) Monera
- C) Fungi
- D) Archaea
- E) Bacteria

Answer: C

10) Organisms belonging to the Kingdom Plantae

- A) are photosynthetic.
- B) contain cells that are surrounded by cell walls.
- C) are all unicellular.
- D) lack a nucleus.
- E) are photosynthetic and contain cells that are surrounded by cell walls.

Answer: E

11) Members of the Kingdom Fungi

- A) include the mushrooms.
- B) include the yeasts.
- C) decompose the remains of dead organisms and absorb nutrients from the leftovers.
- D) include the mushrooms and yeasts, and decompose the remains of dead organisms and absorb nutrients from the leftovers.
- E) use photosynthesis to produce their own food.

Answer: D

12) Which one of the following statements is true of the Domain Bacteria?

- A) All bacteria are "animal-like" in that they eat other organisms.
- B) All bacteria have a membrane-bound nucleus.
- C) All bacteria are multicellular organisms.
- D) All bacteria lack a nucleus.
- E) All bacteria are "animal-like" in that they eat other organisms and all bacteria have a membrane-bound nucleus.

Answer: D

13) A scientist examining a group of cells under the microscope notices the presence of nuclei within these cells. Chemical tests reveal that each cell is surrounded by a wall composed of cellulose. These cells must come from an organism that is a member of the Kingdom

- A) Monera.
- B) Protista.
- C) Plantae.
- D) Fungi.
- E) Animalia.

Answer: C

14) Evolution by natural selection relies upon

- A) heritable variation.
- B) overproduction of offspring.
- C) a struggle for existence.
- D) individual variation.
- E) All of the choices are correct.

Answer: E

15) An antibiotic kills 99.9% of a bacterial population. You would expect the next generation of bacteria

- A) to be just as susceptible to that antibiotic as was the previous generation.
- B) to be more resistant to that antibiotic.
- C) to die out due to the drastic decrease in population size.
- D) to be more contagious than the prior generation.
- E) All of the choices are correct.

Answer: B

16) Consider the following statement: "If all vertebrates have backbones, and turtles are vertebrates, then turtles have backbones." This statement is an example of

- A) a hypothesis.
- B) discovery science logic.
- C) rationalization.
- D) deductive reasoning.
- E) inductive reasoning.

Answer: D

17) A hypothesis is

- A) the same as a theory.
- B) a tentative answer to some question.
- C) an explanatory idea that is broad in scope and supported by a large body of evidence.
- D) a widely accepted idea about a phenomenon.
- E) a widely accepted theory that is broad in scope and supported by a large body of evidence.

Answer: B

18) If a light switch is moved from the "off" to the "on" position, then the light will go on. This statement

- A) is the result of deductive reasoning.
- B) is a conclusion.
- C) can be tested.
- D) can be falsified.
- E) All of the choices are correct.

Answer: E

19) The role of a control in an experiment is to

- A) provide a basis of comparison to the experimental group.
- B) prove that a hypothesis is correct.
- C) ensure repeatability.
- D) prove that a hypothesis is correct and ensure repeatability.
- E) None of the choices are correct.

Answer: A

20) To be scientifically valid, a hypothesis must be

- A) phrased as a question.
- B) based on faith.
- C) testable.
- D) falsifiable.
- E) testable and falsifiable.

Answer: E

21) A scientist performs a *controlled experiment*. This means that

- A) the experiment is repeated many times to ensure that the results are accurate.
- B) the experiment proceeds at a slow pace to guarantee that the scientist can carefully observe all reactions and process all experimental data.
- C) two experiments are conducted, one differing from the other by only a single variable.
- D) two experiments are conducted, one differing from the other by two or more variables.
- E) one experiment is performed, but the scientist controls the variables.

Answer: C

22) What is the difference between a tissue and an organ system?

- A) The tissue level of organization is more inclusive than the organ system level.
- B) Tissues are not composed of cells; organ systems are composed of cells.
- C) A tissue cannot exist unless it is a component of an organ system, whereas an organ system can exist independently of tissues.
- D) An organ system includes tissues.
- E) Tissues are not considered to be living; organ systems are considered to be living.

Answer: D

23) What feature is common to prokaryotes, fungi, and plants?

- A) a nucleus
- B) single cells
- C) at one time, membership in the kingdom Monera
- D) cell walls
- E) photosynthesis

Answer: D

24) Which one of the following is *not* a trace element in the human body?

- A) fluorine
- B) nitrogen
- C) zinc
- D) manganese
- E) iodine

Answer: B

25) The four most common elements in living organisms are

- A) C, H, O, Fe.
- B) C, H, O, Na.
- C) C, H, O, N.
- D) C, N, O, Na.
- E) Fe, N, O, Ca.

Answer: C

26) Matter

- A) is what life is composed of.
- B) occupies space.
- C) has mass.
- D) is composed of elements.
- E) All of the choices are correct.

Answer: E

27) In the equation $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$,

- A) H_2 , O_2 , and H_2O are all compounds.
- B) H_2 , O_2 , and H_2O are all elements.
- C) only H_2O is a compound.
- D) only H_2 and O_2 are compounds.
- E) H_2 , O_2 , and H_2O are all trace elements.

Answer: C

28) A compound

- A) is a pure element.
- B) is less common than a pure element.
- C) contains two or more elements in a fixed ratio.
- D) is exemplified by sodium.
- E) is a solution.

Answer: C

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

- A) The pH scale is a measure of oxygen ion concentration.
- B) A single unit change on the pH scale is equivalent to a 1% change in hydrogen ion concentration.
- C) An increase in hydrogen ion concentration means a decrease in pH scale units.
- D) Basic pH levels are less than 7.
- E) The pH of solutions inside most cells is close to 9.0.

Answer: C

30) A pharmaceutical company hires a chemist to analyze the purity of the water being used in its drug preparations. If the water is pure, the chemist would expect to find

- A) only molecules of H_2O .
- B) H_2O molecules and H^+ ions.
- C) H_2O molecules and OH^- ions.
- D) H_2O molecules, H^+ ions, and OH^- ions.
- E) only H^+ ions and OH^- ions.

Answer: D

31) Bases

- A) donate H^+ ions to solutions.
- B) accept H^+ ions from solutions.
- C) donate OH^- ions to solutions.
- D) accept OH^- ions from solutions.
- E) either accept H^+ ions from solutions or donate OH^- ions to solutions.

Answer: E

32) A solution with a pH of 7 is

- A) strongly acidic.
- B) weakly acidic.
- C) neutral.
- D) weakly basic.
- E) strongly basic.

Answer: C

33) Compared to a solution of pH 3, a solution of pH 1 is

- A) 100 times more acidic.
- B) 10 times more acidic.
- C) neutral.
- D) 10 times more basic.
- E) 100 times more basic.

Answer: A

34) Household ammonia has a pH of 12; household bleach has a pH of 13. Which of the following statements is *true*?

- A) Both of these substances are strong acids.
- B) The ammonia has 10 times as many OH^- ions as the bleach.
- C) The ammonia has 10 times as many H^+ ions as the bleach.
- D) A solution that could buffer the bleach and ammonia would remove excess OH^- ions.
- E) The ammonia has 10 times as many OH^- ions as the bleach and a solution that could buffer the bleach and ammonia would remove excess OH^- ions.

Answer: C

35) A buffer

- A) is an acid that is used to offset overly basic conditions in the body.
- B) is a base that is used to offset overly acidic conditions in the body.
- C) donates OH^- ions when conditions become too acidic and accepts OH^- ions when conditions become too basic.
- D) donates H^+ ions when conditions become too basic and accepts H^+ ions when conditions become too acidic.
- E) donates OH^- ions when conditions become too basic and accepts OH^- ions when conditions become too acidic.

Answer: D

36) Carbon is able to form an immense diversity of organic molecules because of carbon's

- A) tendency to form covalent bonds.
- B) ability to bond with up to four other atoms.
- C) capacity to form single and double bonds.
- D) ability to bond together to form extensive, branched, or unbranched "carbon skeletons."
- E) All of the choices are correct.

Answer: E

37) Hydrocarbons

- A) are inorganic compounds.
- B) are composed of carbon atoms that are attached to hydrogen skeletons.
- C) contain only carbon and hydrogen atoms.
- D) consist of atoms linked exclusively by single bonds.
- E) All of the choices are correct.

Answer: C

38) Organic compounds

- A) always contain nitrogen.
- B) are synthesized by only animal cells.
- C) always contain carbon.
- D) can only be synthesized in a laboratory.
- E) always contain oxygen.

Answer: C

39) You now know that the old cliché "oil and water don't mix" is true. Why?

- A) Oil exhibits polarity and water does not.
- B) Water exhibits polarity and oil does not.
- C) Oil is hydrophilic.
- D) Water is hydrophobic.
- E) Oil is an organic compound and water is not.

Answer: B

40) A hydroxyl group is

- A) also called a carbonyl group.
- B) characteristic of proteins.
- C) hydrophobic.
- D) characteristic of alcohols.
- E) None of the choices are correct.

Answer: D

41) Which one of the following is an amino group?

- A) —OH
- B) —NH₂
- C) —COOH
- D) —CO
- E) —CH₃

Answer: B

42) Which one of the following statements about the functional groups of organic compounds is false?

- A) Functional groups help make organic compounds hydrophilic.
- B) Many biological molecules have two or more functional groups.
- C) Functional groups participate in chemical reactions.
- D) All functional groups include a carbon atom of the organic compound's skeleton.
- E) Functional groups help make organic compounds soluble in water.

Answer: D

43) Which one of the following contains a carboxyl and an amino group?

- A) amino acids
- B) fats
- C) sugars
- D) ATP
- E) vinegar

Answer: A

44) Which list below consists of only polymers?

- A) sugars, amino acids, nucleic acids, lipids
- B) proteins, lipids, nucleic acids, amino acids
- C) proteins, lipids, nucleic acids, polysaccharides
- D) proteins, lipids, nucleotides, sugars
- E) polysaccharides, lipids, amino acids, nucleic acids

Answer: C

45) The molecular formula of most monosaccharides represents a multiple of

- A) CH₃O.
- B) CH₂O.
- C) CHO.
- D) CHO₂.
- E) CHO₃.

Answer: B

46) A molecule with the formula C₅₅H₁₁₀O₅₅ is probably a(n)

- A) oil.
- B) steroid.
- C) wax.
- D) protein.
- E) polysaccharide.

Answer: E

47) Many names for sugars end in the suffix

- A) -acid.
- B) -ose.
- C) -hyde.
- D) -ase.
- E) -ing.

Answer: B

48) Molecules that taste sweet

- A) are all carbohydrates.
- B) include at least one carbohydrate monomer.
- C) have a shape that binds tightly to sweet taste receptors.
- D) cause carbohydrates to break down into monomers that trigger the sweet taste reaction.
- E) must bind to the sweet and bitter receptors.

Answer: C

49) Which one of the following lists contains only polysaccharides?

- A) sucrose, starch, and cellulose
- B) starch, amino acids, and glycogen
- C) cellulose, starch, and glycogen
- D) nucleotides, glycogen, and cellulose
- E) fructose, cellulose, and glucose

Answer: C

50) Cellulose differs from starch in that

- A) the monomers of cellulose are held together by covalent bonds, whereas the monomers of starch are held together by hydrogen bonds.
- B) glycogen is formed by plants and cellulose by animals.
- C) most animals cannot break down cellulose, whereas starch is easily digested.
- D) starch is made of glucose monomers, whereas cellulose is made of fructose monomers.
- E) All of the choices are correct.

Answer: C

51) Foods that are high in fiber are most likely derived from

- A) plants.
- B) dairy products.
- C) meat.
- D) fish.
- E) any of these choices.

Answer: A

52) Cows can derive nutrients from cellulose because

- A) they produce the enzymes that break down cellulose.
- B) they chew their food so thoroughly that cellulose fibers are broken down.
- C) their intestinal tract contains cellulose-hydrolyzing microorganisms.
- D) they convert cellulose into starch, which is easily broken down in the intestinal tract.
- E) their intestinal tract contains termites, which can break down cellulose.

Answer: C

53) The storage form of carbohydrates in animals is _____ and in plants is _____.

- A) starch . . . glycogen
- B) glycogen . . . starch
- C) cellulose . . . glycogen
- D) glycogen . . . cellulose
- E) sucrose . . . glycogen

Answer: B

54) A triglyceride

- A) consists of three fatty acids attached to a glycerol.
- B) is hydrophobic.
- C) plays a role in energy storage.
- D) is a type of fat.
- E) All of the choices are correct.

Answer: E

55) Fatty acids with double bonds between some of their carbons are said to be

- A) unsaturated.
- B) saturated.
- C) completely hydrogenated.
- D) triglycerides.
- E) monoglycerides.

Answer: A

56) Which one of the following statements about animal cell lipids is *false*?

- A) Fats are a form of lipid that functions as energy-containing molecules.
- B) Phospholipids are important components of cell membranes.
- C) Steroids are lipids that function as signaling molecules.
- D) Many lipids function as enzymes.
- E) Cholesterol is a type of lipid used in cell membranes and as a starting material for making steroid hormones.

Answer: D

57) A phospholipid is composed of

- A) one glycerol molecule linked to three fatty acids.
- B) one fatty acid molecule linked to three glycerol molecules.
- C) one glycerol molecule linked to three phosphate groups.
- D) one fatty acid molecule linked to one glycerol molecule and two phosphate groups.
- E) one glycerol molecule linked to one phosphate group and two fatty acids.

Answer: E

58) Which one of the following substances is *not* a lipid?

- A) wax
- B) cholesterol
- C) cellulose
- D) steroids
- E) triglycerides

Answer: C

59) A major type of lipid found in cell membranes is

- A) cellulose.
- B) triglycerides.
- C) phospholipids.
- D) glycerol.
- E) waxes.

Answer: C

60) Which one of the following statements about waxes is *false*? Waxes are

- A) lipids.
- B) more hydrophobic than fats.
- C) used by some insects and plants for protection.
- D) nonpolar.
- E) used as a starting material for making steroids.

Answer: E

61) Which one of the following statements about anabolic steroids is *false*? Anabolic steroids

- A) cause a general buildup of muscle mass.
- B) often cause the body to reduce its normal output of sex hormones.
- C) chemically resemble testosterone.
- D) promote bone growth.
- E) can stimulate mood swings and violent behavior.

Answer: D

62) Which one of the following statements is *false*? Enzymes

- A) increase the rate of chemical reactions.
- B) function as chemical catalysts.
- C) regulate virtually all chemical reactions in a cell.
- D) are produced by cells.
- E) are monomers used to build proteins.

Answer: E

63) Which one of the following is *not* a type of protein?

- A) contractile proteins
- B) antibodies
- C) enzymes
- D) signal proteins
- E) All of these are types of proteins.

Answer: E

64) Proteins differ from one another because

- A) the peptide bonds linking amino acids differ from protein to protein.
- B) the sequence of amino acids in the polypeptide chain differs from protein to protein.
- C) each protein contains its own unique sequence of sugar molecules.
- D) the number of nucleotides found in each protein varies from molecule to molecule.
- E) the number of nitrogen atoms in each amino acid varies.

Answer: B

65) Glucose molecules are to starch as _____ are to proteins.

- A) oils
- B) amino acids
- C) fatty acids
- D) waxes
- E) lards

Answer: B

66) Peptide bonds

- A) are used to form amino acids.
- B) form between fatty acids.
- C) are formed by a hydrolysis reaction.
- D) link amino acids.
- E) None of the choices are correct.

Answer: D

67) Which one of the following will *not* be affected by the denaturation of a protein?

- A) the shape of the protein
- B) the function of the protein
- C) the solubility of the protein in water
- D) the number of amino acids in the protein
- E) the binding properties of the protein

Answer: D

68) Which of the following factors can result in the denaturation of a protein?

- A) heat
- B) changes in pH
- C) chemicals that destroy hydrogen bonds
- D) changes in salt concentration
- E) All of the choices can result in the denaturation of a protein.

Answer: E

69) The structure of a protein consists of a chain of amino acids assembled in a specific order.

- A) primary
- B) secondary
- C) tertiary
- D) quaternary
- E) None of the choices are correct.

Answer: A

70) Which one of the following is an example of secondary structure in a protein?

- A) a particular amino acid sequence
- B) an alpha helix
- C) a globular shape
- D) the joining of two polypeptide chains
- E) a fibrous shape

Answer: B

71) The tertiary structure of a polypeptide refers to

- A) its size.
- B) the presence of pleated sheets.
- C) the amino acids of which it is made.
- D) the overall three-dimensional structure.
- E) the number of R groups it contains.

Answer: D

72) A protein containing more than one polypeptide chain exhibits the _____ level of protein structure.

- A) primary
- B) secondary
- C) tertiary
- D) quaternary
- E) infinite

Answer: D

73) Nucleotides

- A) contain nitrogenous bases.
- B) contain sugar molecules.
- C) contain phosphate groups.
- D) can be linked together to form nucleic acids.
- E) All of the choices are correct.

Answer: E

74) DNA differs from RNA because DNA

- A) contains thymine in place of uracil.
- B) consists of a single rather than a double polynucleotide strand.
- C) contains the sugar ribose rather than the sugar deoxyribose.
- D) contains phosphate groups not found in RNA.
- E) All of the choices are correct.

Answer: A

75) Genetic information is encoded in the

- A) quaternary structure of a protein.
- B) sequence of nucleotides in DNA.
- C) degree of saturation of fatty acids.
- D) length of glycogen.
- E) linear sequence of amino acids in a polypeptide.

Answer: B

76) Which one of the following is *not* the proper pairing of a polymer and its monomer?

- A) polysaccharide and monosaccharide
- B) triglyceride and steroid
- C) nucleic acid and nucleotide
- D) protein and amino acid
- E) All of the pairs properly reflect a polymer and its corresponding monomer.

Answer: B

77) A new "wonder food" is being distributed by a rival company. The researchers in your company determine that the "wonder food" contains only carbon, oxygen, and hydrogen. At this point, your researchers can say with certainty that the food

- A) includes proteins.
- B) includes nucleic acids.
- C) could only be made of triglycerides.
- D) could only be made of carbohydrates.
- E) does not include proteins or nucleic acids.

Answer: E

78) The glucose produced by a plant is used to make the carbohydrate, proteins, fats, and nucleic acids of the plant. Which statement is *true* about the process of converting sugars into other molecules?

- A) Glucose contains all of the elements needed to produce these other molecules.
- B) Glucose contains all of the elements needed to produce the carbohydrates, but other elements must come from the soil if the plant is to produce fats, proteins, and nucleic acids.
- C) Glucose contains all of the elements needed to produce the carbohydrates and fats, but other elements must come from the soil if the plant is to produce proteins and nucleic acids.
- D) Glucose contains all of the elements needed to produce the carbohydrates and nucleic acids, but other elements must come from the soil if the plant is to produce proteins and fats.
- E) None of the substances in the other answers can be produced from glucose alone.

Answer: C

79) Structural proteins

- A) include receptor molecules.
- B) respond to environmental changes.
- C) include hemoglobin.
- D) anchor cell parts.
- E) bond to hormones.

Answer: D

80) The primary structure of a protein is

- A) an α helix or a pleated sheet.
- B) the amino acid sequence of the polypeptide chain.
- C) composed of two or more polypeptide chains.
- D) maintained by hydrogen bonds.
- E) irregular folding.

Answer: B

81) Which of these is a difference between DNA and RNA?

- A) RNA is double-stranded; DNA is single-stranded.
- B) DNA is found in the nucleus; RNA is never found in the nucleus.
- C) In DNA, adenine pairs with guanine; in RNA, adenine pairs with thymine.
- D) DNA contains thymine; RNA contains uracil.
- E) DNA consists of five different nucleotides; RNA consists of four different nucleotides.

Answer: D

82) Resolving power is the

- A) ability of an optical instrument to show two close objects as separate.
- B) size of an image.
- C) ability of an optical instrument to magnify an image.
- D) ability of an optical instrument to estimate the size of an image.
- E) distance between the lenses of a microscope.

Answer: A

83) Light microscopes

- A) can generally magnify objects about 10,000 times without blurring.
- B) typically provide more resolution than an electron microscope.
- C) work by reflecting electrons off the surface of an object being studied.
- D) use light and glass lenses to magnify an image.
- E) All of the choices are correct.

Answer: D

84) Which one of the following statements is *true* about electron microscopes?

- A) Electron beams are focused to create a magnified image of an object.
- B) Scanning electron microscopes are used to study the details of internal cell structure.
- C) Electron microscopes use glass lenses to focus and magnify the image.
- D) Transmission electron microscopes are mainly used to study cell surfaces.
- E) Specimens must be sectioned to be viewed under a scanning electron microscope.

Answer: A

85) A scientist wants to magnify a pollen grain 8,000 times and examine the ridges and pores on its surface. Which one of the following instruments would be best?

- A) a transmission electron microscope
- B) a scanning electron microscope
- C) a transmission light microscope
- D) a scanning light microscope
- E) an inverted light microscope

Answer: B

86) A scientist wants to examine living cells lining the respiratory tract to determine how the cells use tiny hairs to move dirt and mucus away from the lungs. Which one of the following instruments would be best, and why?

- A) a light microscope, because it allows observations of whole, live cells
- B) a transmission electron microscope, because it has high resolving power
- C) a transmission electron microscope, because it is capable of very high magnification
- D) a scanning electron microscope, because it can reveal structures on cell surfaces
- E) a scanning electron microscope, because it can be used to observe whole cells without slicing them

Answer: A

87) A scanning electron microscope is used to study _____, whereas a transmission electron microscope is used to study _____.

- A) live cells . . . dead cells
- B) cell surfaces . . . internal cell structures
- C) dead cells . . . live cells
- D) internal cell structures . . . cell surfaces
- E) plant tissue . . . animal tissue

Answer: B

88) The idea that all living things are composed of cells and that all cells come from other cells defines:

- A) central dogma.
- B) the laws of inheritance.
- C) organelle theory.
- D) cell theory.
- E) inheritance of acquired characteristics.

Answer: D

89) The diameter of most animal and plant cells ranges from

- A) 0.01 to 0.1 microns.
- B) 0.1 to 1.0 microns.
- C) 1.0 to 10 microns.
- D) 10 to 100 microns.
- E) 100 to 1000 microns.

Answer: D

90) As cell size increases, the

- A) volume and surface area decrease.
- B) volume increases faster than the surface area.
- C) surface area increases faster than the volume.
- D) surface area and volume increase at the same rate.
- E) None of the choices are correct.

Answer: B

91) Which one of the following cells would have the greatest surface-to-volume ratio?

- A) bacterium
- B) human red blood cell
- C) human muscle cell
- D) frog egg
- E) ostrich egg

Answer: A

92) A cell is exposed to a substance that prevents it from dividing. The cell becomes larger and larger. This situation

- A) should present no problem to the cell since it can continue to perform all other necessary functions.
- B) should present no problem to the cell because the surface area of the cell will increase as the volume of the cell increases.
- C) will eventually be problematic since the cell's ability to absorb nutrients through its outer membrane will not keep increasing as quickly as its cytoplasmic needs.
- D) should be beneficial since the cell will be able to divert the ATP normally used for cell division to other processes.
- E) None of the choices are correct.

Answer: C

93) Which one of the following is *not* found in prokaryotic cells?

- A) a membrane-bound nucleus
- B) pili
- C) a cell wall
- D) a capsule
- E) ribosomes

Answer: A

94) Which of the following structures are used by prokaryotes for attaching to surfaces?

- A) pili
- B) flagella
- C) capsules
- D) anchoring junctions
- E) both pili and capsules

Answer: E

95) The nucleoid region of a prokaryotic cell

- A) contains the cell's DNA.
- B) separates the RNA from the cytoplasm.
- C) is surrounded by a nucleoid membrane.
- D) contains the cell's nucleoli.
- E) is the site of organelle production.

Answer: A

96) Cells that lack a membrane-bound nucleus are _____ cells.

- A) plant
- B) animal
- C) prokaryotic
- D) eukaryotic
- E) fungal

Answer: C

97) You are told that the cells on a microscope slide are plant, animal, or bacterial. You look at them through a microscope and see cell walls and membrane-bound organelles. You conclude that the cells

- A) are plant cells.
- B) are animal cells.
- C) are bacteria.
- D) could be either plant or bacterial.
- E) could be plant, animal, or bacterial.

Answer: A

98) Unlike animal cells, plant cells have _____ and _____. Unlike plant cells, animal cells have _____.

- A) chloroplasts . . . cell walls . . . centrioles
- B) centrioles . . . chloroplasts . . . cell walls
- C) chloroplasts . . . cell walls . . . cell membranes
- D) chloroplasts . . . cell walls . . . a nucleus
- E) centrioles . . . cell walls . . . large central vacuoles

Answer: A

99) Which one of the following statements about cellular metabolism is *fa/se*? Cellular metabolism

- A) includes different processes that require different conditions.
- B) can occur within organelles.
- C) can involve the synthesis of steroid hormones.
- D) occurs in animal but not plant cells.
- E) often occurs on the surfaces of internal membranes.

Answer: D

100) The membranous compartmentalization of a cell

- A) divides the cell into two equal-sized halves.
- B) allows different metabolic processes to occur simultaneously.
- C) requires the presence of a cell wall.
- D) requires the presence of a large central vacuole.
- E) is common in prokaryotes and eukaryotes.

Answer: B

101) In eukaryotic cells, internal membranes

- A) greatly increase a cell's total membrane area.
- B) provide additional area where many metabolic processes occur.
- C) form membranous compartments called organelles.
- D) contain proteins essential for metabolic processes.
- E) All of the choices are correct.

Answer: E

102) Which one of the following is not a component of the endomembrane system?

- A) lysosomes
- B) Golgi apparatus
- C) smooth ER
- D) nucleus
- E) ribosomes

Answer: E

103) The nucleus of a cell

- A) is surrounded by a single layer of membrane.
- B) is contained within the nucleolus.
- C) is the region of the cell where ribosomes are degraded.
- D) contains DNA.
- E) both is contained within the nucleolus and contains DNA.

Answer: D

104) Long fibers of DNA and protein are called a

- A) chromatin.
- B) nucleolus.
- C) ribosome.
- D) lysosome.
- E) central vacuole.

Answer: A

105) During cell reproduction, chromatin fibers coil up into structures called

- A) ribosomes.
- B) lysosomes.
- C) peroxisomes.
- D) chromosomes.
- E) nucleoli.

Answer: D

106) The function of the nucleolus is

- A) to manufacture polypeptides.
- B) to help manufacture ribosomes.
- C) intracellular digestion.
- D) to store chromatin.
- E) to produce H₂O₂.

Answer: B

107) Which one of the following statements is *false*? The endomembrane system

- A) is involved in the synthesis, storage, and export of important molecules.
- B) includes the rough and smooth endoplasmic reticulum.
- C) includes the nuclear envelope.
- D) is a system of interrelated membranes that are all physically connected.
- E) divides the cell into compartments.

Answer: D

108) Chronic administration of a drug (such as a barbiturate or an antibiotic) may cause the liver to

- A) produce additional smooth endoplasmic reticulum.
- B) increase the production of enzymes that detoxify the drug in question.
- C) increase the production of enzymes that break down certain other drugs or foreign substances.
- D) increase the body's tolerance to the drug.
- E) All of the choices are correct.

Answer: E

109) The cells that produce hair contain a lot of ____ . The cells that produce the oils that coat the hair contain a lot of _____.

- A) smooth endoplasmic reticulum . . . lysosomes
- B) rough endoplasmic reticulum . . . smooth endoplasmic reticulum
- C) smooth endoplasmic reticulum . . . rough endoplasmic reticulum
- D) microbodies . . . lysosomes
- E) nuclei . . . chromatin

Answer: B

110) The two main functions of the rough endoplasmic reticulum are the production of

- A) mitochondria and proteins that are to be secreted by the cell.
- B) hydrogen peroxide and steroid hormones secreted by the cell.
- C) ribosomes and steroid hormones.
- D) membrane and proteins to be secreted by the cell.
- E) chromatin and mitochondria.

Answer: D

111) Secretory proteins are

- A) produced by ribosomes on the smooth endoplasmic reticulum.
- B) chemically modified in the nucleus.
- C) produced by the cell for internal use.
- D) released from the cell through the plasma membrane.
- E) incorporated into the mitochondrial membrane.

Answer: D

112) The Golgi apparatus

- A) is composed of stacks of membranous vesicles that are continuous with one another.
- B) stores, modifies, and packages proteins.
- C) strings together amino acids to produce proteins.
- D) forms fats from glycerols and fatty acids.
- E) is the site of carbohydrate breakdown.

Answer: B

113) Which one of the following statements is *false*? The Golgi apparatus

- A) works closely with the endoplasmic reticulum.
- B) serves as a molecular warehouse and finishing factory.
- C) decreases in size when a cell increases its protein production.
- D) modifies chemicals received from the endoplasmic reticulum.
- E) sorts molecules according to their destination.

Answer: C

114) Lysosomes

- A) help to digest worn-out or damaged organelles.
- B) recycle materials within the cell.
- C) fuse with food vacuoles to expose nutrients to lysosomal enzymes.
- D) destroy harmful bacteria engulfed by white blood cells.
- E) All of the choices are correct.

Answer: E

115) When a cell is deprived of oxygen, its lysosomes tend to burst and release their contents into the cell. As a result of this, that cell will

- A) recycle damaged organelles.
- B) produce additional ER.
- C) undergo cell division.
- D) produce replacement lysosomes.
- E) undergo self-digestion and die.

Answer: E

116) Tay-Sachs disease

- A) causes an accumulation of lipids in brain cells.
- B) involves damage to liver cells.
- C) is due to the absence of an enzyme that digests polysaccharides.
- D) prevents the breakdown of glycogen.
- E) results in an accumulation of triglycerides in the alveoli of the lungs.

Answer: A

117) The functions of the central vacuoles of plant cells include

- A) helping increase the size of cells by absorbing water.
- B) storing pigments that will help attract pollinating insects.
- C) storing waste products.
- D) storing poisons.
- E) All of the choices are correct.

Answer: E

118) Contractile vacuoles

- A) are generally found in protists that inhabit salt water.
- B) help in the excretion of excess salt.
- C) prevent cells from bursting as a result of the influx of excess water.
- D) allow organisms to avoid dehydration by absorbing water from the environment.
- E) All of the choices are correct.

Answer: C

119) A manufacturing company dumps its wastes into a nearby pond. One of the wastes is found to paralyze the contractile vacuoles of certain protists. A biologist looking at these organisms would find that these protists

- A) have lost water and shrunk.
- B) have gained water and burst.
- C) have died of malnutrition.
- D) have died because wastes have built up in the cytoplasm.
- E) are surviving but are unable to reproduce.

Answer: B

120) Which one of the following is *not* a component of the endomembrane system?

- A) lysosomes
- B) Golgi apparatus
- C) smooth ER
- D) nucleus
- E) ribosomes

Answer: E

121) Insulin is a protein that is produced by pancreatic cells and secreted into the bloodstream. Which of the following choices best describes the route of insulin from its production to its exit from the cell?

- A) rough ER, transport vesicles, Golgi apparatus, transport vesicles, cell membrane
- B) rough ER, lysosomes, transport vesicles, cell membrane
- C) rough ER, Golgi apparatus, smooth ER, cell membrane
- D) rough ER, transport vesicles, cell membrane
- E) None of the choices are correct.

Answer: A

122) The stroma is the

- A) thick fluid enclosed by the inner chloroplast membrane.
- B) watery fluid enclosed by the inner membrane of a mitochondrion.
- C) space between the inner and outer membranes of a chloroplast.
- D) space between the inner and outer membranes of a mitochondrion.
- E) fluid within the grana.

Answer: A

123) The function of chloroplasts is

- A) cellular respiration.
- B) intracellular transport of proteins.
- C) lipid synthesis.
- D) photosynthesis.
- E) intracellular digestion.

Answer: D

124) The function of mitochondria is

- A) cellular respiration.
- B) intracellular transport of proteins.
- C) lipid synthesis.
- D) photosynthesis.
- E) intracellular digestion.

Answer: A

125) The _____ of a mitochondrion is / are an adaptation that increases the surface area and enhances a mitochondrion's ability to produce ATP.

- A) stroma
- B) grana
- C) intermembrane space
- D) cristae
- E) matrix

Answer: D

126) Cyanide inhibits mitochondrial function; as a result, the rate of

- A) ATP synthesis would increase.
- B) ATP synthesis would decrease.
- C) photosynthesis would increase.
- D) lipid synthesis would increase.
- E) protein synthesis would increase.

Answer: B

127) Mitochondria differ from chloroplasts in that mitochondria

- A) convert solar energy to chemical energy, whereas chloroplasts convert one form of chemical energy to another.
- B) contain three different membrane-bound compartments, whereas chloroplasts contain two.
- C) contain membrane folds called cristae, whereas chloroplasts contain disklike vesicles in stacks called grana.
- D) are not found in plants, whereas chloroplasts are not found in animals. E) produce glucose, whereas chloroplasts break glucose down.

Answer: C

128) Microfilaments differ from microtubules in that microfilaments

- A) are larger than microtubules.
- B) are found only in plants whereas microtubules are found in plants and animal cells.
- C) are mainly composed of actin whereas microtubules are composed of tubulin.
- D) help to anchor organelles, whereas microtubules primarily function to help cells change shape and move.
- E) form the inner core of cilia and flagella whereas microtubules regulate metabolism.

Answer: C

129) Which one of the following statements about the cytoskeleton is *false*?

- A) The cytoskeleton helps to support cells.
- B) Once laid down, the elements of the cytoskeleton are fixed and remain permanently in place.
- C) The cytoskeleton is composed of three types of fibers: microfilaments, microtubules, and intermediate filaments.
- D) The cytoskeleton plays an important role in amoeboid motion.
- E) The cytoskeleton includes fibrous and globular proteins.

Answer: B

130) Cilia differ from flagella in that

- A) cilia are composed of microfilaments and flagella are composed of intermediate filaments.
- B) cilia contain nine microtubule doublets surrounding a central pair of microtubules; flagella contain only nine microtubule doublets.
- C) the protein filaments of cilia are "naked"; those of flagella are wrapped in an extension of the cell membrane.
- D) cilia are typically more numerous and shorter than flagella.
- E) cilia are anchored only in the proteins of the cell membrane; flagella are anchored in a special structure called the basal body.

Answer: D

131) A basal body is

- A) composed of nine microtubule triplets surrounding a central pair of microtubules.
- B) identical in structure to centrioles.
- C) composed of nine microtubule doublets surrounding a central pair of microtubules.
- D) identical in structure to cilia.
- E) identical in structure to flagella.

Answer: B

132) Which one of the following statements about plant cell walls is *false*?

- A) Plant cell walls consist of cellulose fibers embedded in a matrix of polysaccharides and proteins.
- B) The cell wall of one plant cell is separated from the cell wall of another by a layer of sticky polysaccharides.
- C) Plant cell walls are multilayered structures.
- D) Plant cell walls protect plant cells by forming an impermeable layer around the cell.
- E) Wood is primarily composed of plant cell walls.

Answer: D

133) Plasmodesmata

- A) penetrate plant cell walls.
- B) are one type of cell junction in plants.
- C) carry chemical messages between plant cells.
- D) carry nutrients between plant cells.
- E) All of the choices are correct.

Answer: E

134) Which one of the following would be most affected by a mutation that prevented cells from forming tight junctions?

- A) attachment of cells to the surrounding matrix
- B) direct flow of water and small molecules from one cell to another
- C) integrity of the inner lining of the digestive tract
- D) attachment of the cytoskeleton to the inside of the plasma membrane
- E) attachment of the cell wall of one plant cell to the cell wall of another

Answer: C

135) Most animal cells are

- A) surrounded by a cell wall.
- B) attached to each other via plasmodesmata.
- C) embedded in an endomembrane system.
- D) embedded in an extracellular matrix.

E) embedded in a lipid matrix.

Answer: D

136) It is essential for heart muscle cells to beat in a coordinated fashion. The cell junctions that would best facilitate this are

- A) occluding junctions.
- B) anchoring junctions.
- C) tight junctions.
- D) communicating junctions.
- E) plasmodesmata.

Answer: D

137) Skin cells are attached to the extracellular matrix by

- A) basal bodies.
- B) anchoring junctions.
- C) tight junctions.
- D) communicating junctions.
- E) plasmodesmata.

Answer: B

138) Which of the following cell structures is *not* associated with the breakdown of harmful substances or substances that are no longer needed by the cell?

- A) lysosomes
- B) mitochondria
- C) peroxisomes
- D) vacuoles
- E) All of the choices play a role in these functions.

Answer: B

139) All cells on Earth

- A) are enclosed in a membrane that maintains internal conditions different from the surroundings.
- B) have DNA as the genetic material.
- C) can interconvert forms of energy.
- D) can interconvert chemical materials.
- E) All of the choices are correct.

Answer: E

140) A child is hospitalized for a series of chronic bacterial infections and dies despite heroic efforts. At autopsy, the physicians are startled to see that the child's white blood cells are loaded with vacuoles containing intact bacteria. Which of the following explanations could account for this finding? A defect in the

- A) Golgi apparatus prevented the cells from processing and excreting the bacteria.
- B) rough endoplasmic reticulum prevented the synthesis of the antibodies (defensive proteins) that would have inactivated the bacteria.
- C) cell walls of the white blood cells permitted bacteria to enter the cells.
- D) lysosomes of the white blood cells prevented the cells from destroying engulfed bacteria.
- E) surface receptors of the white blood cells permitted bacteria to enter the cells.

Answer: D

141) A bacterial cell's DNA is found in its

- A) ribosomes.
- B) nucleus.
- C) peroxisome.
- D) nucleoid region.
- E) capsule.

Answer: D

142) Which of these is *not* a component of the endomembrane system?

- A) endoplasmic reticulum
- B) transport vesicles
- C) mitochondria
- D) nuclear envelope
- E) Golgi apparatus

Answer: C

143) Many of the enzymes that control a firefly's ability to produce light energy from chemical energy are located

- A) in membranes.
- B) in the nucleus.
- C) within chloroplasts.
- D) outside of cells.
- E) within mitochondria.

Answer: A

144) Which one of the following is *false*?

- A) Thermodynamics is the study of energy transformations that occur in a collection of matter.
- B) The collection of matter under study is called the system.
- C) A single cell or the planet Earth could be a thermodynamic system.
- D) An open system exchanges both energy and matter with its surroundings.
- E) An automobile engine is an example of a closed system.

Answer: E

145) According to _____, energy cannot be created or destroyed.

- A) Aristotle's first principle
- B) the first law of thermodynamics
- C) the second law of thermodynamics
- D) the third law of thermodynamics
- E) Einstein's law of relativity

Answer: B

146) Which of the following energy transfers is/ are possible in living systems?

- A) light energy to chemical energy
- B) chemical energy to kinetic energy
- C) potential energy to kinetic energy
- D) light energy to potential energy
- E) All of the choices are correct.

Answer: E

147) Living systems

- A) violate the first law of thermodynamics.
- B) violate the second law of thermodynamics.
- C) decrease their entropy while increasing the entropy of the universe.
- D) are examples of a closed system.
- E) None of the choices are correct.

Answer: C

148) What is the basic difference between exergonic and endergonic reactions?

- A) Exergonic reactions involve ionic bonds; endergonic reactions involve covalent bonds.
- B) Exergonic reactions involve the breaking of bonds; endergonic reactions involve the formation of bonds.
- C) Exergonic reactions involve the formation of bonds; endergonic reactions involve the breaking of bonds.
- D) Exergonic reactions release energy; endergonic reactions absorb it.
- E) In exergonic reactions, the reactants have less chemical energy than the products; in endergonic reactions, the opposite is true.

Answer: D

149) Which one of the following statements concerning energy is *false*?

- A) Fireflies are able to take potential energy in the form of food and convert that energy into kinetic energy in the form of heat and light.
- B) A gasoline engine converts chemical energy into kinetic energy.
- C) Living systems convert heat energy into chemical energy to reduce entropy.
- D) Energy transformations in cells are accompanied by the release of heat energy.
- E) During photosynthesis, plants convert kinetic energy into chemical energy.

Answer: C

150) The transfer of a phosphate group to a molecule or compound is called

- A) carboxylation.
- B) ionization.
- C) phosphorylation.
- D) hydrogen bonding.
- E) hydrogenation.

Answer: C

151) Anything that prevents ATP formation will most likely

- A) result in cell death.
- B) force the cell to rely on lipids for energy.
- C) result in the conversion of kinetic energy to potential energy.
- D) force the cell to rely on ADP for energy.
- E) have no effect on the cell.

Answer: A

152) When a cell uses chemical energy to perform work, it couples a(n) _____ reaction with a(n) _____ reaction.

- A) exergonic . . . endergonic
- B) endergonic . . . exergonic
- C) exergonic . . . spontaneous
- D) spontaneous . . . exergonic
- E) endergonic . . . spontaneous

Answer: A

153) ATP can be used as the cell's energy currency because

- A) endergonic reactions can be fueled by coupling them with the formation of ATP from ADP.
- B) ATP is the most energy-rich small molecule in the cell.
- C) endergonic reactions can be fueled by coupling them with the hydrolysis of high-energy phosphate bonds in ATP.
- D) the regeneration of ATP from ADP can be fueled by coupling it with endergonic reactions.
- E) None of the choices are correct.

Answer: C

154) Most of a cell's enzymes are

- A) lipids.
- B) proteins.
- C) amino acids.
- D) nucleic acids.
- E) carbohydrates.

Answer: B

155) When an enzyme catalyzes a reaction,

- A) it lowers the activation energy of the reaction.
- B) it raises the activation energy of the reaction.
- C) it becomes a product.
- D) it acts as a reactant.
- E) None of the choices are correct.

Answer: A

156) Which one of the following is *false*?

- A) An enzyme's function depends on its three-dimensional shape.
- B) Enzymes are very specific for certain substrates.
- C) Enzymes are used up in chemical reactions.
- D) Enzymes emerge unchanged from the reactions they catalyze.
- E) An enzyme binds to its substrate at the enzyme's active site.

Answer: C

157) The creation of offspring carrying genetic information from just a single parent is called

- A) asexual reproduction.
- B) sexual reproduction.
- C) a life cycle.
- D) regeneration.
- E) None of the choices are correct.

Answer: A

158) Which one of the following is a difference between sexual and asexual reproduction?

- A) Cell division only occurs after sexual reproduction.
- B) Only offspring from asexual reproduction inherit traits from two parents.
- C) Sexual reproduction typically includes the development of unfertilized eggs.
- D) Sexual reproduction is more likely to increase genetic variation than is asexual reproduction.
- E) Only asexual reproduction results from the union of a sperm and an egg.

Answer: D

159) Strictly speaking, the phrase "like begets like" refers to

- A) all forms of reproduction.
- B) sexual reproduction only.
- C) asexual reproduction only.
- D) production of gametes from a premeiotic cell.
- E) None of the choices are correct.

Answer: C

161) With the exception of identical twins, siblings who have the same two biological parents are likely to look similar, but not identical, to each other because they have

- A) identical chromosomes but not identical genes.
- B) identical genes but different chromosomes.
- C) the same combination of traits but different genes.
- D) only a 20% chance of sharing the same combination of genes.
- E) a similar but not identical combination of genes.

Answer: E

162) Virchow's simple and profound principle, stated formally in 1858, was that

- A) animals must always reproduce.
- B) photosynthesis is the center of all life.
- C) animals must develop.
- D) every cell from a cell.
- E) all life evolves.

Answer: D

163) Which one of the following is *false*? Cell division

- A) can reproduce an entire organism.
- B) is necessary for development to occur.
- C) ensures the continuity of life from generation to generation.
- D) is the basis of both sexual and asexual reproduction.
- E) is common in eukaryotes but rare in prokaryotes.

Answer: E

164) Which one of the following is *false*?

- A) Prokaryotic chromosomes are more complex than those of eukaryotes.
- B) Most prokaryotes reproduce by binary fission.
- C) Prokaryotic cells are generally smaller and simpler than eukaryotic cells.
- D) In prokaryotes, most genes are carried on a circular DNA molecule.
- E) Daughter prokaryotic chromosomes are separated by some sort of active movement away from each other and the growth of new plasma membrane between them.

Answer: A

165) Sister chromatids are

- A) found right after a cell divides.
- B) tightly linked together at a centromere.
- C) formed when chromatids separate during cell division.
- D) made only of DNA.
- E) unique to prokaryotes.

Answer: B

166) Compared to prokaryotic chromosomes, *eukaryotic* chromosomes

- A) are simpler.
- B) are circular in structure.
- C) include fewer proteins.
- D) are copied immediately after cell division.
- E) are housed in a membrane-enclosed nucleus.

Answer: E

167) Prior to mitosis, each chromosome of a eukaryotic cell consists of a pair of identical structures called

- A) chromatin.
- B) sister chromosomes.
- C) DNA transcripts.
- D) nucleoli.
- E) sister chromatids.

Answer: E

168) Which of the following help maintain the structure of chromosomes and control the activity of genes?

- A) the nuclear membrane
- B) proteins
- C) centromeres
- D) ribosomes
- E) lipids

Answer: B

169) Eukaryotic cells spend most of their cell cycle in which phase?

- A) interphase
- B) prophase
- C) metaphase
- D) anaphase
- E) telophase

Answer: A

170) The process by which the cytoplasm of a eukaryotic cell divides to produce two cells is called

- A) mitosis.
- B) cytokinesis.
- C) binary fission.
- D) telophase.
- E) spindle formation.

Answer: B

171) If the S phase was eliminated from the cell cycle, the daughter cells would

- A) have half the genetic material found in the parental cell.
- B) be genetically identical.
- C) be genetically identical to the parental cell.
- D) synthesize the missing genetic material on their own.
- E) None of the choices are correct.

Answer: A

172) Which of the following occurs during interphase?

- A) a reduction in the size of the nuclear membrane
- B) duplication of the chromosomes
- C) cytokinesis
- D) cell growth and duplication of the chromosomes
- E) None of the choices are correct.

Answer: D

173) Looking into your microscope, you spot an unusual cell. Instead of the typical rounded cell shape, the cell has a very narrow middle separating two bulging ends. It sort of looks like the number 8! Then you realize, this is a cell

- A) undergoing cytokinesis.
- B) in the S phase of interphase.
- C) in the G1 phase of interphase.
- D) in the G2 phase of interphase.
- E) that is about to undergo mitosis.

Answer: A

174) The phase of mitosis during which the nuclear envelope fragments and the nucleoli disappear is called

- A) interphase.
- B) prophase.
- C) metaphase.
- D) anaphase.
- E) telophase.

Answer: B

175) During which phase of mitosis do the chromosomes line up on a plane located equidistant from the two spindle poles?

- A) interphase
- B) prophase
- C) metaphase
- D) anaphase
- E) telophase

Answer: C

176) Which one of the following does *not* occur during mitotic anaphase?

- A) The centromeres of each chromosome divide.
- B) Sister chromatids separate.
- C) The chromatid DNA replicates.
- D) Daughter chromosomes begin to move toward opposite poles of the cell.
- E) All of the choices occur during mitotic anaphase.

Answer: C

177) During which phase of mitosis does the nuclear envelope re-form and the nucleoli reappear?

- A) anaphase
- B) metaphase
- C) prophase
- D) interphase
- E) telophase

Answer: E

178) Which of the following is a feature of plant cell division that distinguishes it from animal cell division?

- A) A cell plate forms.
- B) A cleavage furrow forms.
- C) Cytokinesis does not occur.
- D) Four new cells (rather than two) are produced per mitotic division.
- E) The nucleolus disappears and then reappears.

Answer: A

179) Which of the following is likely to account for the difference between plant and animal cell cytokinesis?

- A) Plant cells lack the microfilaments required for forming a cleavage furrow.
- B) Animal cells lack chloroplasts.
- C) Plant cell division must maintain the integrity of the cell wall.
- D) Plant cells have two sets of chromosomes; animal cells have one set of chromosomes.
- E) Plant and animal cells do not have a common ancestor.

Answer: C

180) Which of the following must occur for a plant or animal to grow and develop normally?

- A) The organism must receive a supply of the appropriate hormones from its parents.
- B) It must be able to control the timing and rate of cell division in different parts of its body.
- C) Sufficient light must be available to stimulate cell division.
- D) Sufficient oxygen must be available to stimulate cell division.
- E) None of the choices are correct.

Answer: B

181) When animal cells are grown in a petri dish, they typically stop dividing once they have formed a single, unbroken layer on the bottom of the dish. This arrest of division is an example of

- A) cancer.
- B) cell constraint.
- C) density-dependent inhibition.
- D) cell division repression.
- E) growth factor desensitization.

Answer: C

182) Which of the following is probably the main factor responsible for the phenomenon of density-dependent inhibition?

- A) a local accumulation of growth-inhibiting factors
- B) a shortage of growth factors
- C) cells' innate "sense" of knowing when the organ of which they are a part has no need for additional cells
- D) a local deficiency of nutrients
- E) None of the choices are correct.

Answer: B

183) As a patch of scraped skin heals, the cells fill in the injured area but do not grow beyond that. This is an example of

- A) density-independent inhibition.
- B) density-dependent inhibition.
- C) anchorage independence.
- D) growth factor inhibition.
- E) anchorage-dependent inhibition.

Answer: B

184) Mature human nerve cells and muscle cells

- A) remain undifferentiated unless an injury occurs.
- B) become cancerous more easily than other cell types.
- C) continue to divide throughout their lifetime.
- D) are permanently in a state of nondivision.
- E) cease dividing after a predetermined number of cell generations.

Answer: D

185) The cell-cycle control system

- A) receives messages from outside of the cell that influence cell division.
- B) triggers and controls major events in the cell cycle.
- C) is influenced by growth factors that bind to cell receptors.
- D) includes three key checkpoints to complete a cell cycle.
- E) All of the choices are correct.

Answer: E

186) You are asked to culture an unidentified sample of animal tissue. You notice that the cells seem not to exhibit density-dependent inhibition. Which of the following choices would be the most likely source for this tissue sample?

- A) a scar
- B) a cancer
- C) the skin
- D) the fetal liver
- E) the sperm-producing tissue of the testis

Answer: B

187) A benign tumor differs from a malignant tumor in that a benign tumor

- A) is cancerous.
- B) spreads from the original site.
- C) does not metastasize.
- D) never causes health problems.
- E) can only arise in the brain, whereas a malignant tumor can arise anywhere in the body.

Answer: C

188) You are the director of research for a drug company. A list of candidate drugs is brought to you. Which of the following shows the greatest promise as a cancer chemotherapy agent? A drug that

- A) causes cells to divide at a right angle from their usual orientation.
- B) interferes with cellular respiration.
- C) prevents sister chromatids from separating at anaphase.
- D) prevents crossing over.
- E) prevents tetrad formation.

Answer: C

189) Two chromosomes in a nucleus that carry loci for the same traits in the same positions on the chromosome but specify different versions of some traits constitute a pair of

- A) homologous chromosomes.
- B) heterologous chromosomes.
- C) complementary chromosomes.
- D) polyploid chromosomes.
- E) None of the choices are correct.

Answer: A

190) Which one of the following statements is *false*?

- A) A typical body cell is called a somatic cell.
- B) Gametes are haploid cells.
- C) Somatic cells are diploid.
- D) Gametes are made by mitosis.
- E) A zygote is a fertilized egg.

Answer: D

191) Which of the following statements is *false*?

- A) Meiosis only occurs in the ovaries and testes.
- B) All sexual life cycles involve an alternation of diploid and haploid stages.
- C) Mitosis produces daughter cells with half the number of chromosomes as the parent cell.
- D) A normal human zygote has 46 chromosomes.
- E) A haploid cell has half the chromosomes of a diploid cell.

Answer: C

192) During which stage of meiosis do synapsis and the formation of tetrads occur?

- A) interphase I
- B) prophase I
- C) interphase II
- D) prophase II
- E) None of the choices are correct.

Answer: B

193) Which of the following is a difference between mitosis and meiosis?

- A) In meiosis four daughter cells are produced, whereas in mitosis two daughter cells are produced.
- B) Cells produced by mitosis are diploid; cells produced by meiosis are haploid.
- C) In mitosis cytokinesis occurs once, whereas in meiosis cytokinesis occurs twice.
- D) Mitosis but not meiosis occurs in somatic cells.
- E) All of the choices are correct.

Answer: E

194) Which of the following does *not* enhance genetic diversity?

- A) random fertilization
- B) independent orientation of chromosomes at metaphase I
- C) mitosis of somatic cells
- D) crossing over during prophase I of meiosis
- E) All of the choices enhance genetic diversity.

Answer: C

195) Independent orientation of chromosomes at metaphase I results in an increase in the number of

- A) gametes.
- B) homologous chromosomes.
- C) possible combinations of characteristics.
- D) sex chromosomes.
- E) points of crossing over.

Answer: C

196) Karyotyping

- A) shows chromosomes as they appear in metaphase of meiosis II.
- B) can reveal alterations in chromosome number.
- C) examines points of crossing over.
- D) reveals the results of independent orientation of chromosomes during meiosis I.
- E) reveals the presence of cancerous genes.

Answer: B

197) Which one of the following is *false*?

- A) Trisomy 21 usually leads to Down syndrome.
- B) A human embryo with an abnormal number of chromosomes is usually spontaneously aborted.
- C) Down syndrome is the most common serious birth defect in the United States.
- D) People with Down syndrome usually have a life span much shorter than normal.
- E) Women with Down syndrome cannot reproduce.

Answer: E

198) Nondisjunction occurs when

- A) a portion of a chromosome breaks off and is lost.
- B) chromosomes replicate too many times.
- C) two chromosomes fuse into one.
- D) members of a chromosome pair fail to separate.
- E) an entire pair of chromosomes is lost during meiosis I.

Answer: D

199) Which one of the following is *false*?

- A) Nondisjunction in meiosis can affect autosomes and sex chromosomes.
- B) In mammals, extra copies of the Y chromosome are typically inactivated.
- C) The absence of a Y chromosome results in "femaleness."
- D) In general, a single Y chromosome is enough to produce "maleness."
- E) Women with a single X chromosome have Turner syndrome and are sterile.

Answer: B

200) If a chromosome fragment breaks off and then reattaches to the original chromosome but in the reverse direction, the resulting chromosomal abnormality is called a(n)

- A) deletion.
- B) inversion.
- C) translocation.
- D) nondisjunction.
- E) reciprocal translocation.

Answer: B

201) Cancer is not usually inherited because

- A) the chromosomal changes in cancer are usually confined to somatic cells.
- B) people with cancer usually die before reproducing.
- C) cancer typically causes disruptions of meiosis.
- D) the causes of cancer are not usually genetic.
- E) the cancerous cells usually interfere with the ability to produce gametes.

Answer: A

202) The genetic material is duplicated during

- A) the mitotic phase.
- B) G1.
- C) the S phase.
- D) G2.
- E) mitosis.

Answer: C

203) Asexual reproduction requires _____ individual(s).

- A) 0
- B) 1
- C) 2
- D) 3
- E) 4

Answer: B

204) Both mitosis and meiosis are preceded by

- A) prometaphase.
- B) interphase.
- C) prophase.
- D) telophase.
- E) anaphase.

Answer: B

205) Which one of the following is *false*?

- A) The offspring of two different varieties are called hybrids.
- B) Hybridization is also called a cross.
- C) The parental plants of a cross are the P generation.
- D) The hybrid offspring of a cross are the P1 generation.
- E) The hybrid offspring of an F1 cross are the F2 generation.

Answer: D

206) A monohybrid cross is

- A) the second generation of a self-fertilized plant.
- B) a breeding experiment in which the parental varieties have only one trait in common.
- C) a breeding experiment in which the parental varieties differ in only one trait.
- D) a triploid plant that results from breeding two very different plants.
- E) None of the choices are correct.

Answer: C

207) Research since Mendel's time has established that the law of the segregation of genes during gamete formation

- A) applies to all forms of life.
- B) applies to all sexually reproducing organisms.
- C) applies to all asexually reproducing organisms.
- D) applies only to unicellular organisms.
- E) is invalid.

Answer: B

208) Which one of the following is *false*?

- A) The genetic makeup of an organism constitutes its genotype.
- B) An organism with two different alleles for a single trait is said to be heterozygous.
- C) Alleles are alternate forms of a gene.
- D) An allele that is fully expressed is referred to as recessive.
- E) The expressed physical traits of an organism are called its phenotype.

Answer: D

209) Alleles of a gene are found at _____ chromosomes.

- A) the same locus on homologous mitochondrial
- B) the same locus on heterologous
- C) different loci on homologous
- D) different loci on heterologous
- E) the same locus on homologous

Answer: E

210) Mendel's law of independent assortment states that

- A) chromosomes sort independently of each other during mitosis and meiosis.
- B) genes sort independently of each other in animals but not in plants.
- C) independent sorting of genes produces polyploid plants under some circumstances.
- D) each pair of alleles segregates independently of the other pairs of alleles during gamete formation.
- E) None of the choices are correct.

Answer: D

211) A carrier of a genetic disorder who does not show symptoms is most likely to be _____ to transmit it to offspring.

- A) heterozygous for the trait and able
- B) heterozygous for the trait and unable
- C) homozygous for the trait and able
- D) homozygous for the trait and unable
- E) None of the choices are correct.

Answer: A

212) Many genetic disorders of humans are caused by

- A) multiple alleles.
- B) recessive alleles.
- C) drinking during pregnancy.
- D) a mutation that occurs in the egg, sperm, or zygote that gives rise to the affected individual.
- E) None of the choices are correct.

Answer: B

213) The vast majority of people afflicted with recessive disorders are born to parents who were

- A) both affected by the disease.
- B) not affected at all by the disease.
- C) slightly affected by the disease, showing some but not all of the symptoms.
- D) subjected to some environmental toxin that caused the disease in their children.
- E) None of the choices are correct.

Answer: B

214) Which of the following best explains why dominant alleles that cause lethal disorders are less common than recessive alleles that cause lethal disorders?

- A) Lethal disorders caused by dominant alleles are usually more severe than lethal disorders caused by recessive alleles.
- B) Unlike lethal disorders caused by recessive alleles, lethal disorders caused by dominant alleles usually cause death of the embryo.
- C) Most individuals carrying a lethal dominant allele have the disorder and die before they reproduce, whereas individuals carrying a lethal recessive allele are more likely to be healthy and reproduce.
- D) The presence of a lethal dominant allele causes sterility.
- E) Many lethal recessive alleles cause enhanced disease resistance when they are present in the heterozygous state, and carriers of these alleles have more children, on average, than other people.

Answer: C

215) Which one of the following is *false*?

- A) Genetic testing before birth requires the collection of fetal cells.
- B) Carrier testing helps determine if a person carries a potentially harmful disorder.
- C) Most children with recessive disorders are born to healthy parents.
- D) Newborn screening can catch inherited disorders right after birth.
- E) Most human genetic diseases are treatable if caught early.

Answer: E

216) For most sexually reproducing organisms, Mendel's laws

- A) cannot strictly account for most patterns of inheritance.
- B) explain the reasons why certain genes are dominant.
- C) help us understand the global geographic patterns of genetic disease.
- D) indicate if a particular genotype will cause a certain phenotype.
- E) None of the choices are correct.

Answer: A

217) The expression of both alleles for a trait in a heterozygous individual illustrates

- A) incomplete dominance.
- B) codominance.
- C) pleiotropy.
- D) polygenic inheritance.
- E) blending inheritance.

Answer: B

218) A person with AB blood illustrates the principle of

- A) incomplete dominance.
- B) codominance.
- C) pleiotropy.
- D) polygenic inheritance.
- E) blending inheritance.

Answer: B

219) Individual features of all organisms are the result of

- A) genetics.
- B) the environment.
- C) genetics and cytoplasmic determinants.
- D) the environment and individual needs.
- E) genetics and the environment.

Answer: E

220) Genetic testing can reveal

- A) if a person will develop a disease.
- B) when a certain disease will strike.
- C) a person's chances of developing a disease.
- D) All of the choices are correct.
- E) None of the choices are correct.

Answer: C

221) The *chromosome theory of inheritance* states that

- A) chromosomes that exhibit mutations are the source of genetic variation.
- B) the behavior of chromosomes during meiosis and fertilization accounts for patterns of inheritance.
- C) the behavior of chromosomes during mitosis accounts for inheritance patterns.
- D) humans have 46 chromosomes.
- E) None of the choices are correct.

Answer: B

222) Genes located close together on the same chromosomes are referred to as _____ genes and generally _____.

- A) associated . . . sort independently during meiosis
- B) linked . . . sort independently during meiosis
- C) homologous . . . are inherited together
- D) linked . . . do not sort independently during meiosis
- E) codependent . . . do not sort independently during meiosis

Answer: D

223) Linked genes generally

- A) follow the laws of independent assortment.
- B) do not follow the laws of independent assortment.
- C) show incomplete dominance.
- D) reflect a pattern of codominance.
- E) show pleiotropy.

Answer: B

224) Crossing over _____ genes into assortments of _____ not found in the parents.

- A) recombines unlinked . . . genes
- B) recombines linked . . . alleles
- C) combines unlinked . . . alleles
- D) combines linked . . . genes
- E) recombines unlinked . . . chromosomes

Answer: B

225) The mechanism that "breaks" the linkage between linked genes is

- A) incomplete dominance.
- B) pleiotropy.
- C) codominance.
- D) independent assortment.
- E) crossing-over.

Answer: E

226) What is the normal complement of sex chromosomes in a human male?

- A) two X chromosomes
- B) two Y chromosomes
- C) two X chromosomes and one Y chromosome
- D) one X chromosome and one Y chromosome
- E) one Y chromosome

Answer: D

227) How many sex chromosomes are in a human gamete?

- A) one
- B) two
- C) three
- D) four
- E) five

Answer: A

228) How is sex determined in most ants and bees? Sex is determined by the

- A) X-Y system.
- B) Z-W system.
- C) number of chromosomes.
- D) size of the sex chromosome.
- E) X-O system.

Answer: C

229) What is meant by the statement that "male bees are fatherless"?

- A) Male bees don't play a role in the rearing of bee young.
- B) Male bees are produced by budding.
- C) Male bees develop from fertilized eggs.
- D) Male bees develop from unfertilized eggs.
- E) The queen bee's mate dies before the male eggs hatch.

Answer: D

230) Any gene located on a sex chromosome

- A) is called a recessive gene.
- B) is called a sex-linked gene.
- C) is called a dominant allele.
- D) will exhibit pleiotropy.
- E) will exhibit codominance.

Answer: B

231) Recessive X-linked traits are more likely to be expressed in a male fruit fly than a female fruit fly because

- A) males are haploid.
- B) the male's SRY gene doubles the chances that sex-linked genes are expressed.
- C) the male's phenotype results entirely from his single X-linked gene.
- D) More than one of the choices are correct.
- E) None of the choices are correct.

Answer: C

232) Which of the following is/ are recessive sex-linked human conditions?

- A) red-green color blindness
- B) muscular dystrophy
- C) hemophilia
- D) All of the choices are correct.
- E) None of the choices are correct.

Answer: D

233) Why are sex-linked conditions more common in men than in women?

- A) Men acquire two copies of the defective gene during fertilization.
- B) Men need to inherit only one copy of the recessive allele for the condition to be fully expressed.
- C) Women simply do not develop the disease regardless of their genetic composition.
- D) The sex chromosomes are more active in men than in women.
- E) None of the choices are correct.

Answer: B

234) Mendel conducted his most memorable experiments on

- A) peas.
- B) roses.
- C) guinea pigs.
- D) fruit flies.
- E) clones.

Answer: A

235) All the offspring of a cross between a red-flowered plant and a white-flowered plant have pink flowers. This means that the allele for red flowers is to the allele for white flowers.

- A) dominant
- B) codominant
- C) pleiotropic
- D) incompletely dominant
- E) recessive

Answer: D

236) Which one of the following statements is *false*?

- A) A virus is generally considered to be alive because it is cellular and can reproduce on its own.
- B) The host cell provides most of the tools and raw materials for viral multiplication.
- C) Once a person is infected with the herpesvirus, the virus remains permanently latent in the body.
- D) Viruses can enter a host cell when the protein molecules on the outside of the virus fit into receptor molecules on the outside of the cell.
- E) Herpesviruses and the virus that causes AIDS can remain latent inside our cells for long periods of time.

Answer: A

237) Which of the following people conducted experiments that demonstrated that DNA is the genetic material of bacteriophages?

- A) Watson and Crick
- B) Hershey and Chase
- C) Franklin
- D) Griffith
- E) Pauling

Answer: B

238) When a T2 bacteriophage infects an *E. coli* cell, what part of the phage enters the bacterial cytoplasm?

- A) the whole phage
- B) only the RNA
- C) only the DNA
- D) the protein "headpiece" and its enclosed nucleic acid
- E) the tail fibers

Answer: C

239) The way that genetic material of a bacteriophage enters a bacterium is most like the way that

- A) a drug is injected with a hypodermic needle.
- B) a person swallows a pill.
- C) skin lotion is rubbed onto the hands.
- D) sugar dissolves in water.
- E) water soaks into a sponge.

Answer: A

240) DNA replication

- A) occurs by the addition of nucleotides to the end of the DNA molecule.
- B) results in the formation of four new DNA strands.
- C) produces two daughter DNA molecules that are complementary to each other.
- D) uses each strand of a DNA molecule as a template for the creation of a new strand.
- E) begins when two DNA molecules join together to exchange segments.

Answer: D

241) If one strand of DNA is CGGTAC, the corresponding strand would be

- A) GCCTAG.
- B) CGGTAC.
- C) GCCAUC.
- D) TAACGT.
- E) GCCATG.

Answer: E

242) The copying mechanism of DNA is most like

- A) using a photographic negative to make a positive image.
- B) mixing flour, sugar, and water to make bread dough.
- C) joining together links to make a chain.
- D) carving a figure out of wood.
- E) threading beads onto a string.

Answer: A

243) Multiple origins of replication on the DNA molecules of eukaryotic cells serve to

- A) remove errors in DNA replication.
- B) create multiple copies of the DNA molecule at the same time.
- C) shorten the time necessary for DNA replication.
- D) reduce the number of "bubbles" that occur in the DNA molecule during replication.
- E) assure the correct orientation of the two strands in the newly growing double helix.

Answer: C

244) Why does a DNA strand grow only in the 5' to 3' direction?

- A) because DNA polymerases can only add nucleotides to the 3' end of the growing molecule
- B) because DNA polymerases can only add nucleotides to the 5' end of the growing molecule
- C) because mRNA can only read a DNA molecule in the 5' to 3' direction
- D) None of the choices are correct.

Answer: A

245) The "one gene-one polypeptide" theory states that

- A) the synthesis of each gene is catalyzed by one specific enzyme.
- B) the synthesis of each enzyme is catalyzed by one specific gene.
- C) the function of an individual gene is to dictate the production of a specific polypeptide.
- D) each polypeptide catalyzes a specific reaction.
- E) None of the choices are correct.

Answer: C

246) Which one of the following sequences best describes the flow of information when a gene directs the synthesis of a cellular component?

- A) RNA → DNA → RNA → protein
- B) DNA → RNA → protein
- C) protein → RNA → DNA
- D) DNA → amino acid → RNA → protein
- E) DNA → tRNA → mRNA → protein

Answer: B

247) The transfer of genetic information from DNA to RNA is called

- A) translation.
- B) transcription.
- C) initiation.
- D) elongation.
- E) promotion.

Answer: B

248) Experiments have demonstrated that the "words" of the genetic code (the units that specify amino acids) are

- A) single nucleotides.
- B) two-nucleotide sequences.
- C) three-nucleotide sequences.
- D) nucleotide sequences of various lengths.
- E) enzymes.

Answer: C

249) The directions for each amino acid in a polypeptide are indicated by a codon that consists of _____ nucleotide(s) in an RNA molecule.

- A) 5
- B) 4
- C) 3
- D) 2
- E) 1

Answer: C

250) We would expect that a 15-nucleotide sequence will direct the production of a polypeptide that consists of

- A) 2 amino acids.
- B) 3 amino acids.
- C) 5 amino acids.
- D) 7 amino acids.
- E) 15 amino acids.

Answer: C

251) A base substitution mutation in a gene sometimes does not result in a different protein. Which of the following factors could account for this?

- A) the mutation affects only the sequence of the protein's amino acids, so the protein stays the same
- B) the rarity of such mutations
- C) a correcting mechanism that is part of the mRNA molecule
- D) the fact that such mutations are usually accompanied by a complementary deletion
- E) some amino acids are produced from more than one codon

Answer: E

252) Which of the following enzymes catalyzes the linking together of RNA nucleotides to form RNA?

- A) RNA polymerase
- B) RNA ligase
- C) a ribozyme
- D) reverse transcriptase
- E) tRNA

Answer: A

253) The signal that marks the end of a gene and causes transcription to stop is

- A) RNA polymerase.
- B) RNA ligase.
- C) a terminator.
- D) reverse transcriptase.
- E) methionine.

Answer: C

254) Where do transcription and translation occur in prokaryotic cells?

- A) on the plasma membrane
- B) in the nucleus
- C) in the cytoplasm
- D) in chromatophores
- E) in the cell wall

Answer: C

255) Which one of the following does *not* happen to eukaryotic RNA?

- A) Introns are added to the RNA.
- B) Exons are spliced together.
- C) A small cap of extra nucleotides is added to one end of the RNA.
- D) A long tail of extra nucleotides is added to the other end of the RNA.
- E) The completed RNA molecule is exported out of the nucleus.

Answer: A

256) Translation consists of which of the following?

- A) the conversion of genetic information from the language of nucleic acids to the language of proteins
- B) the conversion of genetic information from DNA nucleotides into RNA nucleotides
- C) the addition of nucleotides to a DNA template
- D) the conversion of genetic information from the language of proteins to the language of enzymes
- E) DNA replication

Answer: A

257) Which one of the following is *not* a function of tRNA?

- A) joining to only one specific type of amino acid
- B) recognizing the appropriate codons in mRNA
- C) transferring nucleotides to rRNA
- D) helping to translate codons into amino acids
- E) All of the choices are functions of tRNA.

Answer: C

258) Which of the following is / are required for translation to occur?

- A) sources of energy, including ATP
- B) ribosomes
- C) tRNA
- D) various enzymes and protein "factors"
- E) All of the choices are required for translation to occur.

Answer: E

259) Which one of the following statements about ribosomes is *false*?

- A) A ribosome consists of two subunits.
- B) Subunits of RNA are made of proteins and ribosomal RNA.
- C) The ribosomes of prokaryotes and eukaryotes are the same in structure and function.
- D) Each ribosome has two binding sites for tRNA.
- E) Ribosomes coordinate the functioning of mRNA and tRNA.

Answer: C

260) Which one of the following best describes the sequence of events of translation?

- A) codon recognition – translocation – peptide bond formation – termination
- B) peptide bond formation – codon recognition – translocation – termination
- C) codon recognition – peptide bond formation – translocation – termination
- D) codon recognition – peptide bond formation – termination – translocation
- E) peptide bond formation – translocation – codon recognition – termination

Answer: C

261) Which one of the following is *false*?

- A) Polypeptides form proteins that determine the appearance and function of the cell and organism.
- B) Eukaryotic mRNA is processed in several ways before export out of the nucleus.
- C) The codons in a gene specify the amino acid sequence of a polypeptide.
- D) Transcription occurs in the cytoplasm of eukaryotic cells.
- E) Ribosomes function as factories that coordinate the functioning of mRNA and tRNA.

Answer: D

262) Any change in the nucleotide sequence of DNA is called

- A) a mutation.
- B) an advantage.
- C) a codon.
- D) a translation.
- E) an anticodon.

Answer: A

263) A physical or chemical agent that changes the nucleotide sequence of DNA is called

- A) a reverse transcriptase.
- B) a terminator.
- C) a transposon.
- D) a mutagen.
- E) an anticodon.

Answer: D

264) Which of the following features would characterize a lytic cycle of a viral infection?

- A) The cycle typically ends when the host bacterium divides.
- B) The cycle typically leads to the lysis of the host cell.
- C) The viral DNA is inserted into a bacterial chromosome.
- D) The virus reproduces outside of the host cell.
- E) The viral genes typically remain inactive once they are inside the host cell.

Answer: B

265) Which one of the following statements is *false*?

- A) Some prophage genes can cause the transformation of a nonpathogenic bacterium into a form that causes human disease.
- B) Sometimes an environmental signal can trigger a switchover from the lysogenic to the lytic cycle.
- C) The lysogenic cycle always occurs inside of host cells.
- D) The lysogenic cycle typically results in the rapid lysis of all infected cells.
- E) During a lysogenic cycle, viral DNA replication typically occurs without destroying the host cell.

Answer: D

266) The envelope of a flu virus

- A) helps the virus enter the cell.
- B) is coded for by viral genes.
- C) helps the virus insert its DNA into the host cell genome.
- D) changes rapidly, thereby helping the virus evade an immune system response.
- E) accounts for viral resistance to antibiotics.

Answer: A

267) Which one of the following statements about herpesviruses is *false*? Herpesviruses

- A) reproduce inside the host cell's mitochondria.
- B) acquire their envelopes from the host cell nuclear membrane.
- C) are DNA viruses.
- D) may remain latent for long periods of time while inside the host cell nucleus.
- E) may cause cold sores to appear during times of physical or emotional stress.

Answer: A

268) Which one of the following statements about plant viruses is *false*?

- A) Once in a plant, a virus can spread from cell to cell through plasmodesmata.
- B) The genetic material in most plant viruses is RNA.
- C) Many plant viruses are rod-shaped with a spiral arrangement of proteins surrounding the nucleic acid.
- D) To infect a plant, a virus must first get past the plant's epidermis.
- E) There are many successful ways to rid infected plants of a virus.

Answer: E

269) What kind of virus is HIV (the AIDS virus)?

- A) a herpes virus
- B) a paramyxovirus
- C) a retrovirus
- D) a complex virus
- E) a provirus

Answer: C

270) Transformation

- A) is the direct transfer of DNA from one bacterium to another.
- B) occurs when a bacterium acquires DNA from the surrounding environment.
- C) is the result of crossing over.
- D) occurs when a phage transfers bacterial DNA from one bacterium to another.
- E) requires DNA polymerase.

Answer: B

271) Transduction

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- D) occurs when a phage transfers bacterial DNA from one bacterium to another.
- E) requires DNA polymerase.

Answer: D

272) Which of the following mechanisms increases genetic diversity in bacteria?

- A) conjugation
- B) transduction
- C) transformation
- D) All of the choices increase genetic diversity.
- E) None of the choices increase genetic diversity.

Answer: D

273) In many bacteria, genes that confer resistance to antibiotics are carried on

- A) factors.
- B) R plasmids.
- C) dissimilation plasmids.
- D) transposons.
- E) exons.

Answer: B

274) Which of the following human activities has contributed to an increase in the number of bacteria having R plasmids?

- A) nitrogen fixation by genetically engineered plants
- B) widespread use of childhood vaccination in developing countries
- C) heavy use of antibiotics in medicine
- D) heavy use of antibiotics in agriculture
- E) heavy use of antibiotics in medicine and in agriculture

Answer: E

275) One type of virus that infects bacteria is called a(n)

- A) phage.
- B) mage.
- C) rhinovirus.
- D) filovirus.
- E) Ebola.

Answer: A

276) Which of these is always *true* with regard to a DNA double helix?

- A) The amount of adenine is equal to the amount of uracil, and the amount of guanine is equal to the amount of cytosine.
- B) The amount of adenine is equal to the amount of thymine, and the amount of guanine is equal to the amount of uracil.
- C) The amount of adenine is equal to the amount of guanine, and the amount of thymine is equal to the amount of cytosine.
- D) The amount of adenine is equal to the amount of cytosine, and the amount of guanine is equal to the amount of thymine.
- E) The amount of adenine is equal to the amount of thymine, and the amount of guanine is equal to the amount of cytosine.

Answer: E

277) What enzyme catalyzes the elongation of a new DNA strand?

- A) helicase
- B) primase
- C) ligase
- D) single-stranded binding protein
- E) DNA polymerase

Answer: E

278) What enzyme catalyzes the unwinding of a DNA double helix?

- A) helicase
- B) primase
- C) ligase
- D) single-stranded binding protein
- E) DNA polymerase

Answer: A

279) Viral DNA incorporated into host cell DNA is known as a(n)

- A) capsid.
- B) prophage.
- C) envelope.
- D) phage.
- E) genome.

Answer: B

280) A protein shell enclosing a viral genome is known as a(n)

- A) capsule.
- B) envelope.
- C) phage.
- D) capsid.
- E) prophage.

Answer: D

281) Which of the following are problems created by cloning?

- A) Cloning endangered species may de-emphasize the need to preserve critical natural habitats.
- B) Cloning does not increase genetic diversity in the cloned species.
- C) Cloned animals are less healthy than animals created by natural methods.
- D) All of the choices are problems created by cloning.
- E) None of the choices are problems created by cloning.

Answer: D

282) The ability to use the nucleus from an adult somatic cell to create all of the cell types in a new organism demonstrates that development depends upon

- A) the control of gene expression.
- B) the timing of mitosis and meiosis.
- C) the timing of meiosis and cell migrations.
- D) the deposition of materials in the extracellular matrix.
- E) the position of cells within an embryo.

Answer: A

283) The term *gene expression* refers to the

- A) fact that each individual of a species has a unique set of genes.
- B) fact that individuals of the same species have different phenotypes.
- C) process by which genetic information flows from genes to proteins.
- D) fact that certain genes are visible as dark stripes on a chromosome.
- E) flow of information from parent to offspring.

Answer: C

284) A single cell, the zygote, can develop into an entirely new organism with many different specialized cells. Which one of the following statements about this process is *false*?

- A) Additional genetic information for the formation of specialized cells is passed on to the developing embryo via the placenta.
- B) The descendant cells specialize by a process known as cellular differentiation.
- C) The zygote contains all of the genetic information required for the development of many different cell types.
- D) Not all of the genes in the zygote are expressed in all of its descendant cells.

Answer: A

285) The basis of cellular differentiation is

- A) the operon.
- B) cellular specialization.
- C) selective gene expression.
- D) cloning.
- E) mutation.

Answer: C

286) Most differentiated cells retain

- A) only a tiny fraction of their original set of genes.
- B) only a tiny fraction of their original set of genes but can regenerate lost genes as needed.
- C) a complete set of their genes but lose the ability to express most of those genes.
- D) a complete set of their genes and retain the ability to express those genes under certain circumstances.
- E) None of the choices are correct.

Answer: D

287) Which of the following processes occurs when a salamander regenerates a lost limb?

- A) Oncogenes that cause accelerated cell division are turned on.
- B) Certain cells in the limb dedifferentiate, divide, and then redifferentiate to form a new limb.
- C) A new salamander develops from the lost limb.
- D) The homeotic genes of the regenerating cells turn off.
- E) None of the choices are correct.

Answer: B

288) Why can some plants be cloned from a single cell?

- A) Plant cells do not differentiate even when mature, so any cell can grow into an entire plant.
- B) Plant cells can dedifferentiate and give rise to all of the specialized cells required to produce an entire plant.
- C) Plant cells are able to retrieve genes lost to the environment during development.
- D) Plant cells can produce genes to replace those lost during development.
- E) None of the choices are correct.

Answer: B

289) The tortoiseshell pattern on a cat

- A) usually occurs in males.
- B) is the result of a homozygous recessive condition.
- C) results from X chromosome inactivation.
- D) is a result of alleles on the Y chromosome.
- E) None of the choices are correct.

Answer: C

290) Both prokaryotic and eukaryotic cells use which of the following to turn certain genes on or off?

- A) DNA ligase
- B) RNA transcriptase
- C) intron segments
- D) regulatory proteins
- E) nucleosome packing

Answer: D

291) Enhancers are

- A) adjacent to the gene that they regulate.
- B) required to turn on gene expression when transcription factors are in short supply.
- C) the site on DNA to which activators bind.
- D) required to facilitate the binding of DNA polymerases.
- E) the products of transcription factors.

Answer: C

292) Silencers are sites in DNA that

- A) bind RNA promoters to promote the start of transcription.
- B) bind enhancers to promote the start of transcription.
- C) bind repressor proteins to inhibit the start of transcription.
- D) bind activators to inhibit the start of transcription.
- E) release mRNA.

Answer: C

293) The coding regions of a gene (the portions that are expressed as polypeptide sequences) are called

- A) introns.
- B) exons.
- C) redundant coding sections.
- D) proto-oncogenes.
- E) nucleosomes.

Answer: B

294) Which of the following permits a single gene to code for more than one polypeptide?

- A) retention of different introns in the final version of the different mRNA strands
- B) alternative RNA splicing
- C) protein degradation
- D) genetic differentiation
- E) addition of different types of caps and tails to the final version of the mRNA strands

Answer: B

295) RNA splicing involves the

- A) addition of a nucleotide "cap" to the molecule.
- B) addition of a nucleotide "tail" to the molecule.
- C) removal of introns from the molecule.
- D) removal of exons from the molecule.
- E) addition of introns to the molecule.

Answer: C

296) Cloning to produce embryonic stem cells is called

- A) regenerative cloning.
- B) transplantational cloning.
- C) reproductive cloning.
- D) therapeutic cloning.
- E) dedifferentiation.

Answer: D

297) Which of the following are possible uses of reproductive cloning?

- A) the production of genetically identical animals for experimentation
- B) the production of potentially valuable drugs
- C) the production of organs in pigs for transplant into humans
- D) the improvement of the quality of farm animals
- E) All of the choices are correct.

Answer: E

298) Which of the following best expresses the degree of success that has been attained in the cloning of humans?

- A) No attempts have been made to clone humans.
- B) A human cloned zygote has been formed, but it never divided.
- C) A six-celled cloned human embryo is the oldest produced to date.
- D) A cloned human embryo developed to the blastocyst stage.
- E) A cloned human being, implanted in a woman, developed up to the sixth month and died.

Answer: D

299) Which one of the following is false?

- A) Embryonic stem cells can be induced to differentiate.
- B) Embryonic stem cells can give rise to all the different specialized cells in the body.
- C) Adult but not embryonic stem cells can be grown in laboratory culture.
- D) Adult stem cells are present in adult tissues.
- E) Adult stem cells are part way along the road to differentiation.

Answer: C

300) Animal development is directed by

- A) cell receptors that detect transcription factors.
- B) the availability of certain "key" nutrients as cells divide.
- C) signal-transduction pathways.
- D) cell-to-cell signaling.
- E) cell-to-cell signaling and signal-transduction pathways.

Answer: E

301) The way that a signal outside a cell triggers changes in the transcription and translation inside the cell is by the process of

- A) post-translational editing.
- B) signal-transduction pathways.
- C) protein activation.
- D) protein breakdown.
- E) X chromosome inactivation.

Answer: B

302) A gene that can cause cancer when present in a single copy in a cell is called a(n)

- A) oncogene.
- B) enhancer gene.
- C) silencer gene.
- D) carcinogen.
- E) proto-oncogene.

Answer: A

303) The carcinogen known to cause the most cases of cancer is

- A) plutonium.
- B) ultraviolet light.
- C) alcohol.
- D) salt.
- E) tobacco.

Answer: E

304) Which one of the following statements is *false*?

- A) Factors that alter DNA and make cells cancerous are called carcinogens.
- B) Mutagens are usually not carcinogens.
- C) X-rays and ultraviolet radiation are two of the most potent carcinogens.
- D) Eating 20-30 grams of plant fiber daily and reducing the intake of animal fat can reduce your risk of developing colon cancer.
- E) Broccoli and cauliflower are thought to be especially rich in substances that help prevent cancer.

Answer: B

305) To initiate a signal-transduction pathway, a signal binds to a receptor protein usually located in the

- A) cytosol.
- B) nucleus.
- C) plasma membrane.
- D) ER.
- E) cytoplasm.

Answer: C

306) Which of these is *not* a carcinogen?

- A) testosterone
- B) cigarette smoke
- C) UV light
- D) fat
- E) All of the above are carcinogens.

Answer: E

307) When plasmids are used to produce a desired protein

- A) the plasmids are inserted into the bacterial chromosome.
- B) the plasmids multiply and produce the protein outside of the bacterium.
- C) the bacterial chromosome is genetically engineered and the plasmid is used to help the bacterium replicate.
- D) the desired gene is inserted into the plasmid and the plasmid is returned to the bacterium by transformation.
- E) the bacterial genome and plasmid are inserted into the genome of the cell containing the desired gene (perhaps the cell of a plant or animal).

Answer: D

308) The production of multiple identical copies of gene-sized pieces of DNA defines

- A) gene cloning.
- B) plasmid transformation.
- C) clonal selection.
- D) tissue culturing.
- E) plasmolysis.

Answer: A

309) Restriction enzymes

- A) edit proteins.
- B) cut DNA at specific sites.
- C) stop transcription.
- D) bind together strands of DNA.
- E) bind RNA fragments together.

Answer: B

310) "Sticky ends" are

- A) produced by the action of DNA ligase.
- B) produced by PCR.
- C) always long sequences of a single nucleotide.
- D) used by mRNA to attach to ribosomes.
- E) DNA fragments with single-stranded ends.

Answer: E

311) DNA ligase binds

- A) exons together.
- B) polymerase to the promotor.
- C) nucleotides together.
- D) introns together.
- E) All of the choices are correct.

Answer: C

312) The feature of "sticky ends" that makes them especially useful in DNA recombination is their ability to

- A) bind to DNA and thereby activate transcription.
- B) bind to ribosomes and thereby activate translation.
- C) form hydrogen-bonded base pairs with complementary single-stranded stretches of DNA.
- D) allow plasmids to attach to the main bacterial chromosome.
- E) insert a segment of RNA into a bacterial chromosome.

Answer: C

313) In the process of human gene cloning using recombinant plasmids, the bacterial plasmid

- A) functions as a vector.
- B) is the source of the gene to be cloned.
- C) is cultured inside the human cell which contains the gene to be cloned.
- D) is used to insert the human gene into the bacterial chromosome.
- E) None of the choices are correct.

Answer: A

314) The approach to gene cloning which uses a mixture of fragments from the entire genome of an organism is called a(n) _____ approach.

- A) "HIV"
- B) "shotgun"
- C) "Ti"
- D) "A K-47"
- E) "V-protein"

Answer: B

315) A collection of DNA fragments that is obtained from the genome of one organism, inserted by recombinant DNA techniques into the genome of a host organism (one fragment per host genome), and maintained there is called a

- A) DNA collection.
- B) genomic library.
- C) DNA file.
- D) gene bank.
- E) vector battery.

Answer: B

316) Genomic libraries can be constructed using bacterial plasmids or what other vector?

- A) ribosomes
- B) tRNA
- C) human chromosomes
- D) phages
- E) None of the choices are correct.

Answer: D

317) Retroviruses such as HIV use _____ to convert information stored in their RNA to information stored in DNA.

- A) DNA ligase
- B) reverse transcriptase
- C) a restriction enzyme
- D) a terminator enzyme
- E) RNA polymerase

Answer: B

318) Recombinant bacteria most often used to mass-produce genes are

- A) *Pseudomonas aeruginosa*.
- B) *Agrobacterium tumefaciens*.
- C) *E. coli*.
- D) *Rhizobium*.
- E) *Saccharomyces cerevisiae*.

Answer: C

319) A vaccine works by

- A) inhibiting bacterial replication.
- B) stimulating the immune system.
- C) inhibiting viral replication.
- D) preventing the translation of mRNA.
- E) stimulating the secretion of insulin.

Answer: B

320) A nucleic acid probe is

- A) a virus that transfers DNA to a recipient cell.
- B) a piece of radioactively labeled DNA that is used to locate a specific gene.
- C) an enzyme that locates a specific restriction site on RNA.
- D) a promoter site that is associated with a specific set of genes.
- E) a plasmid that recognizes a specific DNA sequence.

Answer: B

321) Which of the following is easiest to alter using DNA technology?

- A) somatic cells of triploid organisms
- B) somatic cells in human body organs
- C) germ cells
- D) zygotes
- E) germ cells and zygotes

Answer: E

322) Genetically modifying _____ cells may directly affect future generations.

- A) intestinal
- B) basal
- C) somatic
- D) germ
- E) somatic and germ

Answer: D

323) The polymerase chain reaction relies upon unusual, heat-resistant _____ that were isolated from bacteria living in hot springs.

- A) plasmids
- B) phages
- C) mRNA
- D) restriction enzymes
- E) DNA polymerase molecules

Answer: E

324) Which of the following areas of research will benefit from the human genome project?

- A) understanding human evolution
- B) understanding human embryonic development
- C) improving the diagnosis, treatment, and prevention of heart disease, cancer, and other common ailments.
- D) All of the choices are correct.
- E) None of the choices are correct.

Answer: D

325) Approximately what percentage of human DNA is noncoding?

- A) 99.9%
- B) 37%
- C) 49%
- D) 79%
- E) 97%

Answer: E

326) Segments of eukaryotic DNA that can move or be copied from one site to another in the genome are called

- A) exons.
- B) plasmids.
- C) transposons.
- D) introns.
- E) vectors.

Answer: C

327) Which one of the following statements is *false*?

- A) The genomes of about 150 species have been completely or almost completely sequenced.
- B) The first multicellular organism to have its genome sequenced was a nematode.
- C) The first eukaryotic organism to have its genome sequenced was yeast.
- D) Most of the genomes that have been sequenced to date are eukaryotes.
- E) The genome of a mouse has been sequenced.

Answer: D

328) Which one of the following statements is *false*?

- A) Recent comparisons of the genomes of diverse organisms strongly support the theory that bacteria, archaea, and eukarya are the three fundamental domains of life.
- B) Whole sets of genes and their interactions are studied in the field of genomics.
- C) Full sets of proteins encoded by genomes are studied in the field of proteomics.
- D) The number of proteins in humans is fewer than the number of human genes.
- E) When comparing the genomes of different species, genes that are more similar in sequence suggest the species are more closely related.

Answer: D

329) Which of the following best defines the term *transgenic animal*?

- A) an animal that is the first of its kind to bear a particular allele
- B) an animal in which a genetic defect has been corrected using recombinant DNA therapy
- C) an animal containing a gene from a third "parent," which may even be another species
- D) an animal containing genes from both its parents
- E) an animal containing genes from three or more species

Answer: C

330) Which one of the following statements is *false*?

- A) Transgenic animals have been engineered to be pharmaceutical factories.
- B) Golden rice is a transgenic plant that has been engineered to produce grains containing beta-carotene.
- C) The majority of American soybean and cotton crops are genetically modified.
- D) Genetic modification of plants increases the amount of tillage and use of chemical insecticides.
- E) GM plants have received genes that make the plants more resistant to pests and herbicides.

Answer: D

331) The eighteenth-century French naturalist Lamarck argued for which of the following ideas?

- A) Life evolves toward perfection, with chaotic and watery early forms giving way to ever more organized and noble forms.
- B) The history of life has consisted of a series of divine creations punctuated by geologic catastrophes.
- C) Species are immutable, but individuals can by their own efforts approach more closely to their species' ideal form. Thus, by reaching for higher leaves, a giraffe can lengthen its neck and become a more perfect giraffe.
- D) Species evolve, and the characteristics an individual develops as a result of using or not using its native capacities can be passed to its young.
- E) Each environment spontaneously produces the species that are fitted to it.

Answer: D

332) Which one of the following people developed a theory of evolution identical to Darwin's?

- A) Lyell
- B) Wallace
- C) Buffon
- D) Lamarck
- E) Huxley

Answer: B

333) The unifying theme of biology is

- A) taxonomy.
- B) genetics.
- C) ecology.
- D) evolution.
- E) None of the choices are correct.

Answer: D

334) Which one of the following is *false*? Natural selection

- A) is more of an editing process than a creative mechanism.
- B) is contingent upon time and place.
- C) results from an organism's needs.
- D) and evolutionary change can occur in a short time.
- E) can be seen to be working in organisms alive today.

Answer: C

335) Which of the following constitutes a basic, modern definition of a sexually reproducing species?

- A) a group of individuals living in the same place at the same time
- B) a group of individuals who resemble each other, on average, more than they resemble anything else
- C) a group of populations whose members can interbreed and produce fertile offspring
- D) a group of individuals who interbreed
- E) the smallest unit that can engage in microevolution

Answer: C

336) A population is

- A) applicable only to animals that reproduce asexually.
- B) the smallest unit that can evolve.
- C) a group of individuals of different species living in the same place at the same time.
- D) a collection of communities.
- E) All of the choices are correct.

Answer: B

337) The modern evolutionary synthesis

- A) was first formed in the 1940s.
- B) focuses on populations as the units of evolution.
- C) includes the central role of natural selection.
- D) incorporates population genetics and ideas from paleontology, taxonomy, and biogeography.
- E) All of the choices are correct.

Answer: E

338) Which of the following are polyploid plants?

- A) oats
- B) potatoes
- C) bananas
- D) coffee beans
- E) All of the choices are polyploid plants.

Answer: E

339) Which one of the following is *false*?

- A) Plant biologists estimate that 25-50% of all plant species are polyploids.
- B) Most polyploid plants form by hybridization.
- C) Bread wheat is the ancestral diploid wheat plant.
- D) Plant geneticists use chemicals to induce meiotic and mitotic errors to try to create new hybrid plants with special qualities.
- E) Bread wheat grown widely today is the result of several hybridization events.

Answer: C

340) Which of the following has been shown to greatly reduce the transmission of HIV from mother to newborn?

- A) high amounts of folic acid in the diet of the mother
- B) intensive treatment with AZT
- C) encouraging mothers to breast-feed their newborns
- D) encouraging mothers to exercise regularly when pregnant
- E) restricting the intake of red meat in the diets of pregnant women

Answer: B

341) Studies to test whether cost-saving treatments were effective in reducing the transmission of HIV from mother to child found that treatment

- A) with AZT during the final four weeks of pregnancy lowered HIV transmission by 50%.
- B) with lymphocytes from the blood of infected women reduced the rate of HIV transmission.
- C) with lower doses of AZT actually increased the rate of HIV transmission versus no AZT at all.
- D) with lower dosages of AZT were more effective than treatment with higher doses.
- E) when a woman was nursing was more effective than treatment before she gave birth.

Answer: A

342) Which of the following is one of the body's innate defenses against infection?

- A) several nonspecific antibodies
- B) several nonspecific amino acid toxins
- C) barriers such as dead skin cells and mucus
- D) increased production of certain hormones and changes in microcirculation
- E) None of the choices are correct.

Answer: C

343) Which of the following wander through the interstitial fluid eating whatever bacteria and virus-infected cells they encounter and recognize?

- A) erythrocytes
- B) megakaryocytes
- C) leukocytes
- D) macrophages
- E) interferons

Answer: D

344) Which of the following, produced by virus-infected cells, diffuses to neighboring cells to help them fight a viral infection?

- A) lysozyme
- B) interferon
- C) histamine
- D) antigen
- E) interleukin-2

Answer: B

345) Natural killer cells

- A) are phagocytes that attack and kill pathogenic microorganisms.
- B) attack virus-infected cells by releasing chemicals that promote apoptosis.
- C) are phagocytes that attack virus-infected cells.
- D) tag pathogenic microorganisms with antibodies.
- E) phagocytize microorganisms that have been tagged with antibodies.

Answer: B

346) Certain complement proteins:

- A) enhance the effects of antibiotics by reproducing antibiotics inside cells and releasing them to neighboring cells.
- B) help trigger the inflammatory response.
- C) trigger the production of lysozyme by monocytes.
- D) are released by natural killer cells to attack cancer and virus-infected cells.
- E) None of the choices are correct.

Answer: B

347) A researcher detects interferon in a laboratory rat and concludes that

- A) the rat has, or recently had, a viral infection.
- B) cancerous cells are present in the rat.
- C) the rat's diet is deficient in calcium.
- D) the complement system is activated by exposure to bacteria.
- E) None of the choices are correct.

Answer: A

348) Which of the following mobilizes our nonspecific defense system?

- A) active immunity
- B) inflammation
- C) passive immunity
- D) cell-mediated immunity
- E) mobilization of erythrocytes to the affected site

Answer: B

349) When you cut yourself, the damaged cells immediately release which of the following chemical alarm signals?

- A) interferon
- B) complement
- C) histamine
- D) antihistamine
- E) anti-interferon

Answer: C

350) Which of the following is not an immediate function of histamine?

- A) causing local blood vessels to dilate
- B) causing local blood vessels to become leakier
- C) increasing blood flow to the area
- D) increasing systemic blood pressure
- E) causing local swelling of the tissue

Answer: D

351) The major result of the inflammatory response is to

- A) initiate the production of antibodies.
- B) disinfect and clean damaged tissues.
- C) initiate cell-mediated immune responses.
- D) initiate humoral-mediated immune responses.
- E) initiate the production of killer cells.

Answer: B

352) Why do diseases involving widespread infection usually result in a fever?

- A) because the rapid multiplication of the invading microorganisms results in extra heat production
- B) because the inflammatory and immune responses result in extra heat production
- C) because the microorganisms trick the brain's temperature control center into creating a hot environment that favors their growth
- D) because the brain's temperature control center responds to systemic inflammation by creating a hot environment unfavorable to microorganisms
- E) None of the choices are correct.

Answer: D

353) The human lymphatic system consists of all of the following structures except the

- A) thymus.
- B) tonsils.
- C) spleen.
- D) pancreas.
- E) appendix.

Answer: D

354) The two main functions of the lymphatic system are

- A) coagulating blood and fighting infections.
- B) producing hormones that regulate the immune system and coagulating blood.
- C) producing hormones that regulate the immune system and fighting infections.
- D) returning tissue fluid to the circulatory system and coagulating blood.
- E) returning tissue fluid to the circulatory system and fighting infections.

Answer: E

355) One kind of vaccine consists of a solution containing

- A) antibodies.
- B) horse erythrocytes.
- C) B cells.
- D) a harmless variant strain of a disease-causing microbe.
- E) antibiotics.

Answer: D

356) Antibodies are

- A) amino acids.
- B) lipids.
- C) carbohydrates.
- D) proteins.
- E) nucleic acids.

Answer: D

357) The transfer of antibodies from breast milk to an infant is an example of _____ immunity.

- A) nonspecific
- B) passive
- C) humoral
- D) active
- E) cell-mediated

Answer: B

358) Passive immunity depends on

- A) a person's own immune system to produce antibodies.
- B) antibodies made by another organism.
- C) antibody-producing cells from another organism.
- D) antigens from a person's own body.
- E) None of the choices are correct.

Answer: B

359) Which one of the following diseases has not yet been widely prevented by vaccinations?

- A) AIDS
- B) polio
- C) mumps
- D) measles
- E) All of the choices have been widely prevented by vaccinations.

Answer: A

360) Which of the following cell types is specifically responsible for humoral immunity?

- A) C lymphocytes
- B) B cells
- C) neutrophils
- D) natural killer cells
- E) macrophages

Answer: B

361) Which of the following cell types is specifically responsible for cell-mediated immunity?

- A) T cells
- B) B cells
- C) leukocytes
- D) natural killer cells
- E) lymphocytes

Answer: A

362) The immune system is capable of mounting specific responses to particular microorganisms because

- A) lymphocytes are able to change their antigen specificity as required to fight infection.
- B) stem cells determine which type of B and T cells to make.
- C) the body contains an enormous diversity of lymphocytes, each with a specific kind of antigen receptor.
- D) stem cells make different antigen receptors depending on the invading microorganism.
- E) stem cells are able to change their antigen specificity as required to fight infection.

Answer: C

363) Which one of the following statements about humoral immunity is *f a l s e*? Humoral immunity

- A) primarily defends against bacteria and viruses.
- B) can be passively transferred by injecting plasma from an immune individual into a nonimmune individual.
- C) plays a major role in protecting the body from cancerous cells.
- D) relies upon blood and lymph to transport antibodies.
- E) involves B and T cells.

Answer: C

364) A substance that can elicit an immune response is called a(n)

- A) complement.
- B) interferon.
- C) histamine.
- D) antibody.
- E) antigen.

Answer: E

365) Which one of the following statements is *f a l s e* ?

- A) An antibody usually recognizes and binds to an antigenic determinant.
- B) An antigen usually has several different determinants.
- C) A single antigen may stimulate the immune system to make several distinct antibodies to it.
- D) Most antigens are proteins or large polysaccharides on the surfaces of viruses or foreign cells.
- E) Each antibody has only one antigen binding site.

Answer: E

366) What is the primary immune response?

- A) the production of primary-type antibody in the first day of exposure to a microorganism
- B) the immune response elicited by the primary antigen of a disease-causing microorganism
- C) the immune response elicited by the primary antibody of a disease-causing microorganism
- D) the immune response elicited by the first exposure of lymphocytes to a particular antigen
- E) the immune response elicited by the first exposure of memory cells to a particular antigen

Answer: D

367) Which of the following cell types initiates a secondary immune response?

- A) immature leukocytes
- B) natural killer cells
- C) memory cells
- D) effector cells
- E) plasma cells

Answer: C

368) The secondary immune response occurs when memory cells bind to

- A) particular hormones.
- B) particular antibodies.
- C) antigens.
- D) plasma cells.
- E) particular clones.

Answer: C

369) Which of the following is not a way in which the secondary immune response differs from the primary immune response?

- A) The secondary response begins faster.
- B) The secondary response produces higher levels of antibodies.
- C) The secondary response lasts longer.
- D) The secondary response allows new antigens to be recognized faster.
- E) The secondary response only occurs after a primary response for the same antigen.

Answer: D

370) When a B cell first interacts with its particular antigen, the B cell

- A) dies, killing the antigen.
- B) engulfs the antigen and destroys it.
- C) grows, divides, and differentiates further.
- D) sticks to other cells with attached antigens to form a large clot.
- E) converts the antigen to a nonharmful form.

Answer: C

371) Which of the following choices best describes the life history of a plasma cell?

- A) It is generated by multiplication of a B cell in response to an antigen and lives several months.
- B) It is generated by multiplication of a B cell in response to an antigen and lives several days.
- C) It is present before an antigen appears and multiplies in response to it.
- D) It is produced during a primary immune response, persists, and multiplies in response to a reappearance of the antigen.
- E) It is generated from bone marrow stem cells in response to an antigen and lives about a week.

Answer: B

372) Which of the following statements about antibodies is false?

- A) Antibody molecules are constructed from four polypeptide chains.
- B) Antibodies recognize and bind to particular antigens.
- C) Antibodies assist in destroying particular antigenic particles.
- D) All of the polypeptide chains of an antibody molecule have both a V region and a C region.
- E) The antibodies of mammals can be divided into two major classes.

Answer: E

373) Which of the following is not an effector mechanism?

- A) neutralization of antigenic particles
- B) agglutination of antigenic particles
- C) phagocytosis of antigenic particles
- D) precipitation of dissolved antigens
- E) activation of complement proteins

Answer: C

374) All effector mechanisms involve

- A) a specific recognition and attack phase followed by a nonspecific destruction phase.
- B) a nonspecific recognition and attack phase followed by a specific destruction phase.
- C) a destruction phase followed by a recognition phase.
- D) an agglutination phase followed by a precipitation phase.
- E) an agglutination phase followed by a neutralization phase.

Answer: A

375) All effector mechanisms of the immune system involve a specific recognition and attack phase followed by

- A) a short phase of antibody release.
- B) a nonspecific destruction phase.
- C) a short phase of nonspecific antibody release.
- D) a phase of specific killer cell activation.
- E) a resting phase.

Answer: B

376) Monoclonal antibodies are produced

- A) by cells that are formed when a B cell is fused to a tumor cell.
- B) when a female is pregnant.
- C) when an animal is infected by a single type of pathogen.
- D) by cells that are formed when a B cell is fused to a T cell.
- E) by cancerous tumors.

Answer: A

377) Which one of the following statements is false? Monoclonal antibodies

- A) are used in some home pregnancy tests.
- B) are used to bind toxins to tumor cells.
- C) can be used to identify bacteria that cause sexually transmitted disease.
- D) come from T lymphocytes raised in cell cultures.
- E) specific for a single antigenic determinant can be produced in large amounts.

Answer: D

378) The basic function of T cells is to identify and destroy invaders in our

- A) blood or lymph.
- B) interstitial fluid.
- C) cells.
- D) immune system.
- E) brain.

Answer: C

379) When an antigen-presenting cell interacts successfully with a helper T cell, it secretes a signal molecule that assists in the activation of the helper T cell. This signal molecule is

- A) interferon.
- B) complement.
- C) an antibody.
- D) interleukin-1.
- E) perforin.

Answer: D

380) Which of the following is not an effect of interleukin-2?

- A) to stimulate helper T cells
- B) to stimulate cytotoxic T cells
- C) to stimulate antigen-presenting cells
- D) to stimulate B cells
- E) The choices are all effects of interleukin-1, not interleukin-2.

Answer: C

381) Which one of the following statements about AIDS is false?

- A) AIDS results from infection by the human immunodeficiency virus.
- B) There is no available cure or vaccine for AIDS.
- C) AIDS patients often suffer from opportunistic infections.
- D) Using condoms during sex prevents the spread of the virus that causes AIDS.
- E) It may take 10 years or more for full-blown AIDS to develop after initial infection.

Answer: D

382) Which one of the following statements about HIV is false?

- A) The genome of HIV consists of RNA.
- B) HIV attacks helper T cells.
- C) New HIV are produced inside helper T cells.
- D) HIV is transmitted by body fluids transporting infected cells.
- E) Some antibiotics have proven effective in combating the spread of AIDS.

Answer: E

383) Which of the following types of cells does HIV preferentially infect?

- A) cytotoxic T cells
- B) natural killer cells
- C) helper T cells
- D) plasma cells
- E) memory cells

Answer: C

384) Which of the following substances does a cytotoxic T cell secrete to destroy a target cell?

- A) interferon
- B) complement
- C) antibodies
- D) interleukin-2
- E) perforin

Answer: E

385) _____ can destroy cancerous cells.

- A) Macrophages
- B) Plasma cells
- C) Monocytes
- D) B cells
- E) Cytotoxic T cells

Answer: E

386) _____ genes are responsible for coding for self-proteins.

- A) STR
- B) MHC
- C) RFLP
- D) PCR
- E) SCID

Answer: B

387) Which of the following diseases is not thought to be an autoimmune disease?

- A) cancer of the bone marrow
- B) insulin-dependent diabetes mellitus
- C) rheumatoid arthritis
- D) systemic lupus erythematosus
- E) multiple sclerosis

Answer: A

388) Which type of immune response is always disadvantageous to a person?

- A) cell-mediated
- B) inflammatory
- C) humoral-mediated
- D) autoimmune
- E) All immune responses are advantageous.

Answer: D

389) Which of the following statements best explains why people with Hodgkin's disease often show signs of immunodeficiency?

- A) The Hodgkin's disease virus infects and destroys B cells.
- B) Hodgkin's disease involves the deposition of immune complexes in the kidneys.
- C) Hodgkin's disease affects lymphocytes which can suppress the immune system.
- D) Hodgkin's disease consists of a cancerous proliferation of one kind of lymphocyte.
- E) Hodgkin's disease occurs when an immune response elicited by streptococcal bacteria kills normal heart cells as well.

Answer: C

390) Which of the following compounds are mast cells specialized to secrete?

- A) interferon
- B) complement
- C) allergens
- D) histamine
- E) perforin

Answer: D

391) Anaphylactic shock is an example of an

- A) autoimmune disease.
- B) immunodeficiency disease.
- C) allergic response.
- D) acquired immunodeficiency disease.
- E) acquired autoimmune disease.

Answer: C

392) Which of these play a role in cell-mediated immunity?

- A) B cells
- B) plasma cells
- C) cytotoxic T cells
- D) antibodies
- E) memory cells

Answer: C

393) Antibodies are secreted by

- A) plasma cells.
- B) antigen-presenting cells.
- C) macrophages.
- D) T cells.
- E) memory cells.

Answer: A

394) What type of cell acts as an intermediary between humoral and cell-mediated immunity?

- A) plasma cell
- B) cytotoxic T cell
- C) B cell
- D) helper T cell
- E) macrophage

Answer: D

395) What enzyme enables an HIV virus to make DNA from an RNA template?

- A) reverse transcriptase
- B) DNA polymerase
- C) DNA ligase
- D) restriction enzyme
- E) RNA polymerase

Answer: A