

Topic 1: Biochemistry and the Molecules of Life

Viewing Guide

1. What does it mean for a compound to be organic? _____ Contains carbon _____
2. Water is (circle one) **polar** / **nonpolar** because the electrons are not evenly shared.
3. Name two properties of water: 1. _____ Cohesion _____ 2. _____ Adhesion _____
4. What is the difference between a monomer and a polymer?
Monomer is a small molecule. A polymer is long-chain molecule made of up repeated patterns of monomers.
5. Carbohydrates have a 1:2:1 ratio of the elements C:H:O. Carbohydrates are the main energy source for a cell.
6. What are the two monomers of lipids? 1. _____ Glycerol _____ 2. _____ Fatty Acid _____
7. Lipids make up the majority of the cell membrane.
8. Nucleic acid have the following elements: _____ CHOPN _____. Nucleic acids store our genetic material.
9. The functional roles of proteins include structure and enzymes.
10. What are the compounds that enter into a chemical reaction? _____ Reactants _____
11. Enzymes work as biological catalysts that speed up the chemical reactions by lowering the activation energy.
12. What environmental conditions affect enzyme activity? 1. _____ Temperature _____ 2. _____ pH _____

1. Water is a _____ molecule, which lends it to many important properties.

- a. **Polar**
- b. Nonpolar
- c. Ionic
- d. Metallic

2. Compounds like H_2O and CO_2 would be _____, while compounds like $\text{C}_6\text{H}_{12}\text{O}_6$ would be _____.
- Nonpolar; polar
 - Polar; nonpolar
 - Organic; inorganic
 - Inorganic; organic
3. A macromolecule contains the elements C, H, and O. It is a polymer of hexagonal rings, and the elements come out to a ratio of 1:2:1. Which macromolecule would this be?
- Carbohydrate
 - Lipid
 - Nucleic acid
 - Protein
4. Biological catalysts speed up reactions by
- Lowering activation energy
 - Increasing reaction temperature
 - Decreasing the amount of reactant collisions
 - All of the above

Topic 2: Cells and Cellular Organization

Viewing Guide

13. What do we call an organism that does NOT have a nucleus? _____ prokaryotes _____
14. What do we call an organism that does have a nucleus? _____ eukaryotes _____
15. What structure defines a cell, separating it from the environment? _____ cell membrane _____
16. The gel-like substance that gives shape and structure to the cell is the _____ cytoplasm _____.
17. What is one difference between plant and animal cells? Plant cells – cell wall, chloroplasts, large central vacuole. Animal cells – no cell wall, no chloroplasts, many small vacuoles

5. Which type of cell has a nucleus?
- Prokaryote
 - Eukaryote
 - Both
 - Neither

6. The structure found in ALL cells that encloses a cell from the outside is the ____.
- a. Cytosol
 - b. Cell wall
 - c. Endoplasmic reticulum
 - d. Cell membrane
7. Plants have this structure that allows them to carry out photosynthesis:
- a. Mitochondria
 - b. Golgi bodies
 - c. Chloroplasts
 - d. Chromosomes

Topic 3: Cellular Transport

Viewing Guide

18. Diffusion moves molecules from an area of ____high____ concentration to an area of ____low____ concentration.
19. True or False (circle one): After equilibrium is reached, molecules do not move anymore.
20. In an isotonic solution, there is ___equal___ solute - water concentration outside and inside a cell.
21. In a hypertonic solution, there is a (circle one) **high solute / high water** concentration outside a cell. Water moves ___out___ of the cell.
22. Facilitated diffusion needs the help of a ____protein channel____ to move large/charged molecules across a cell membrane.
23. The only type of cellular transport to go AGAINST the concentration gradient is ____active transport____.

8. Molecules naturally move from an area of _____ concentration to an area of _____ concentration.
- a. High; high
 - b. Low; low
 - c. High; low
 - d. Low; high
9. Which form of cellular transport moves AGAINST the concentration gradient?
- a. Active transport
 - b. Osmosis
 - c. Diffusion
 - d. Facilitated diffusion
10. The diffusion of water across a membrane is known as:
- a. Active transport
 - b. Osmosis
 - c. Diffusion
 - d. Facilitated diffusion
11. Water will exit the cell when placed in a(n) _____ environment.
- a. Polar
 - b. Hypotonic
 - c. Hypertonic
 - d. Isotonic

Topic 4: Cell Division

Viewing Guide

24. The longest phase of the cell cycle is (circle one) **INTERPHASE / MITOSIS**
25. The primary function of the G1 Phase is cell ____ growth ____.
26. In mitosis, the goal is to get cells that are genetically ____ identical _____. That is, we want to go $2N \rightarrow 2N$.
27. Match the following Mitosis stages to what happens:

- 1) Chromosomes move to opposite ends of cell c Prophase
- 2) Nucleus reforms, DNA loosens, last stage d Metaphase
- 3) DNA condenses; nucleus breaks down a Anaphase
- 4) Chromosomes line up in middle of cell b Telophase

28. What is the difference between plant and animal cytokinesis?

- 1) Plant – cell plate formation
- 2) Animal – cleavage furrow

29. What does meiosis do to the number of chromosomes in the daughter cells? cuts in half

30. Meiosis goes from $2N \rightarrow 1N$, or from diploid \rightarrow haploid.

31. What is crossing over?

- 1) Parts of the chromatids may exchange genes creating a new combination of alleles

12. The process of mitosis results in:

- a. Four $1N$ cells
- b. Four $2N$ cells
- c. Two $1N$ cells
- d. Two $2N$ cells

13. In mitosis, sister chromatids move towards opposite ends of the cell during which phase?

- a. Telophase
- b. Prophase
- c. Metaphase
- d. Anaphase

14. What is the difference between plant and animal mitosis?

- a. Plants use centrioles; animals use a cell wall to split the cell contents
- b. Plant cells have a cell plate; animals have a cleavage furrow
- c. Animals reduce their chromosome number; plants don't
- d. Plants do not go through telophase

15. Meiosis results in the production of

- a. 2 haploid cells
- b. 2 diploid cells
- c. 4 haploid cells
- d. 4 diploid cells

16. The failure of chromosomes to separate during meiosis is known as

- a. Nondisjunction
- b. Independent assortment
- c. Synapsis
- d. None of the above

Topic 5: Cellular Energy

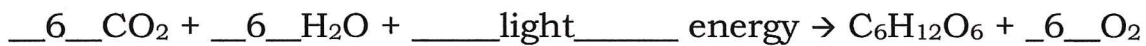
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32. What are examples of autotrophs? _____ plants, algae, bacteria _____

33. What are examples of heterotrophs? _____ animals, fungi _____

34. The most instant form of energy is known as ATP.

35. Complete the photosynthesis equation below:



36. If the photosynthesis equation is reversed, then it is the formula for cellular respiration.

37. The light dependent reactions and the light independent reactions make up photosynthesis.

38. Place a "D" if the statement refers to the light dependent reactions and an "I" if it refers to the light independent reactions.

- 1) D water is split into oxygen, protons, and electrons
- 2) I CO_2 is taken in and converted into carbohydrates
- 3) I light energy is not needed
- 4) D light energy is needed

39. What initial process splits a molecule of glucose into two 3-carbon molecules? glycolysis

40. What are the two different types of fermentation mentioned?

- 1) Alcoholic fermentation
- 2) Lactic acid fermentation

41. CO₂ is created during (circle one) **Kreb's cycle / electron transport chain.**

42. By going through glycolysis, Kreb's cycle, and the electron transport chain, a cell can make
__36__ ATP as opposed to just the two of glycolysis.

17. The formula $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ refers to

- e. Photosynthesis
- f. Fermentation
- g. Respiration
- h. Oxidation

18. Light-dependent reactions and light-independent reactions refer to

- a. Fermentation
- b. Glycolysis
- c. Respiration
- d. Photosynthesis

19. Which two are practically opposite reactions?

- a. Dark reactions and light reactions
- b. Fermentation and Kreb's cycle
- c. Photosynthesis and glycolysis
- d. Photosynthesis and respiration

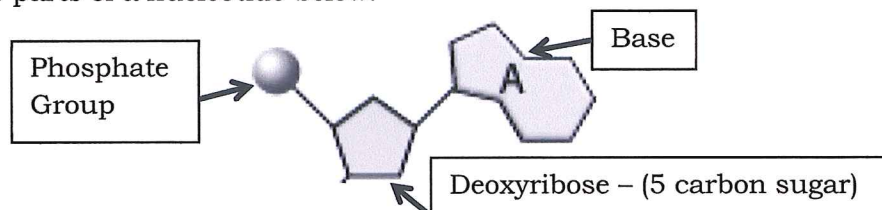
20. The most ATP is generated during

- a. Kreb's cycle and electron transport chain
- b. Light-dependent and light-independent reactions
- c. Glycolysis and fermentation
- d. Light-dependent reactions and fermentation

Topic 6: DNA and its processes

Viewing Guide

43. Label the three parts of a nucleotide below.



44. DNA has 2 strands and the bases A denine, T hymine, C ytosine, and G uanine.

45. What happens during replication? An exact copy of the DNA is made

46. RNA has 1 strand and the base U racil instead of thymine.

47. What are the functions of:

- 1) mRNA – copy instructions from DNA
- 2) rRNA – helps with protein synthesis
- 3) tRNA – transfers amino acids to the ribosome to create the proteins

48. What happens during transcription? A small section of DNA (a gene) is copied to make mRNA

49. What happens during translation? Instructions from the mRNA are used to make the protein

50. What does AUG code for? start

51. What do UGA, UAA, and UAG code for? stop

52. What is the **biology** definition of a mutation? Mistakes or changes in the DNA that are heritable (able to be passed down to the next generation)

53. What happens during a substitution point mutation? A base is substituted with the wrong base.

54. What happens during a deletion chromosomal mutation? Part of the chromosome is deleted.

21. Making an mRNA strand based on DNA is called

- a. Transcription
- b. Translation
- c. Transformation
- d. Replication

22. A group of 3 nucleotides read by a ribosome is referred to as a(n)

- a. Transfer RNA molecule
- b. Codon
- c. Enzyme
- d. Isomer

23. AATTGC → ATTGC would be what type of mutation?

- a. Deletion
- b. Translocation
- c. Substitution
- d. Insertion

24. What are the rules for base-pairs?

- a. A with G
- b. A with T
- c. A with C
- d. G with U

Topic 7: Genetics

Viewing Guide

55. What is the difference between self-pollination and cross-pollination? Self-pollination – pollen from one plant fertilizes the egg cells of the same plant, cross pollination – pollen from one plant fertilizes the egg cells from a different plant

56. The offspring of the parental (P) generation are called the __F1__ generation.

57. __f__ dominant allele a. organism with two different alleles for the same trait

58. __e__ recessive allele b. genetic make up

59. __b__ genotype c. physical appearance

60. __c__ phenotype d. organism that has two identical alleles for a trait

61. __d__ homozygous e. allele that can be masked

62. __a__ heterozygous f. allele that can mask the other alleles

63. Complete the Punnett Square to show the possible genotypes of parent pea plants Yy and yy.

	Y	y
y	Yy	yy
y	Yy	yy

__50__% Yy

__50__% yy

64. __c__ incomplete dominance a. both alleles can be seen (speckled chicken feathers)
65. __a__ codominance b. genes have more than 2 possible alleles (blood types)
66. __b__ multiple alleles c. intermediate phenotype (pink flowers)
67. __d__ polygenic traits d. a trait controlled by 2 or more genes (skin color)

25. The allele that can be masked is called

- a. Homozygous
- b. Codominant
- c. Recessive
- d. Heterozygous

26. The genotype AA or bb would be referred to as _____, while Aa or Bb would be _____.

- a. Recessive; dominant
- b. Dominant; recessive
- c. Heterozygous; homozygous
- d. Homozygous; heterozygous

27. The physical appearance of an organism that results from its genetic makeup is known as its?

- a. Genotype
- b. Phenotype
- c. Mitochondrial effect
- d. Allele

28. When setting up a Punnett Square, what information goes on the outside?

- a. The offspring alleles
- b. The parent alleles
- c. The diploid chromosomes
- d. Somatic cells

Topic 8: Evolution

Viewing Guide

68. The process of change over time is _____ evolution _____.

69. Who studied organisms in the Galapagos Islands and developed the Theory of Evolution by

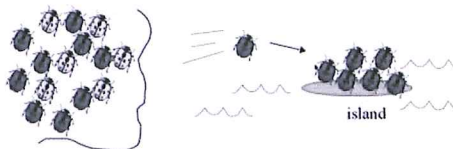
Natural Selection? _____ Charles Darwin _____

70. An advantageous trait is also known as a ___ adaptation ___.

71. An organism with an advantageous trait will be more likely to _____ survive _____ and reproduce passing on traits to the next generation.

72. What are different types of isolating mechanisms? Geographic isolation, temporal isolation, behavioral isolation

73. What concept does this diagram illustrate? _____ Founder effect _____



74. Evidence for evolution:

- 1) The ___fossil___ record shows us that organisms have changed gradually over time.
- 2) ___Biogeography___ describes the distribution of life forms over geographical areas.
- 3) ___Homologous___ structures are structures inherited and shared by related species.
- 4) ___Analogous___ structures are body parts that share a common function, but not a structure.
- 5) ___Vestigial___ structures are inherited from ancestors, but have lost much or all of their original function.
- 6) ___Embryology___ describes similar patterns of embryological development between different organisms.
- 7) The ___Genetic___ code is nearly identical in almost all organisms.

29. Remains of organisms that are preserved and can show evolutionary relationships area known as

- a. Disruptive selection
- b. Fossils
- c. Missing links
- d. Stabilization

30. The arm bones of a cat, a bat, and a human would be an example of

- a. Coevolutionary structures
- b. Vestigial structures
- c. Analogous structures
- d. Homologous structures

31. A variation that allows an organism to better survive in its environment is known as a(n)?

- a. Variation
- b. Reductive trait
- c. Adaptation
- d. Gradualism

32. The theory of evolution is driven by the process of

- a. Natural selection
- b. Artificial selection
- c. Stabilizing selection
- d. Disruptive selection

33. Fish produce thousands of eggs every year. What part of Darwin's theory would this be?

- a. Overproduction
- b. Competition
- c. Survival
- d. Variation

34. An earthquake divides two pieces of land. What type of isolation would this be?

- a. Genetic isolation
- b. Behavioral isolation
- c. Temporal isolation
- d. Geographic isolation

Topic 9: Ecology

Viewing Guide

75. Write down the levels of ecological organization from smallest to largest:

Individual < population < community < ecosystem < biosphere

76. What is the difference between abiotic and biotic factors? abiotic – nonliving, biotic – living

77. ___Autotrophs___ make their own food, while ___heterotrophs___ eat other organisms for food.

78. When you move up an energy pyramid, the amount of available energy goes:

(circle one) up / down.

79. What is the difference between a food web and a food chain? Food webs show all the feeding relationships/interactions in a specific environment. A food chain shows the specific flow of energy from one living thing to another.

80. Explain the following organism interactions:

- 1) Competition – compete for the same resource
- 2) Predation – (+/-) a predator kills and eats prey
- 3) Symbiosis – relationship in which two organisms live closely together
 - i. Parasitism (+/-) – a parasite relies on a host for nourishment
 - ii. Mutualism (+/+) – two or more species benefit
 - iii. Commensalism (+/0) – one species benefits while the other is unaffected

81. An endemic species is found in its original location, while a non-native species lives outside of its original distribution range.

82. An endangered species is more likely to become extinct than a threatened species.

83. What is succession? A series of predictable and orderly changes within an ecosystem over time.

35. Where would a producer be found on a food chain?

- a. The top
- b. The bottom
- c. The middle
- d. They would not be found on one

36. With an energy pyramid, how does the energy change as you go up the pyramid?

- a. It decreases by 90% each level.
- b. It decreases by different amounts each level.
- c. It increased by 90% each level.
- d. It increased by different amounts each level.

37. Which of the following would NOT be an abiotic factor?

- a. Amount of sunlight
- b. Soil bacteria
- c. Wind
- d. Temperature

38. A fox chases, attacks, and kills a rabbit. What type of relationship would this be?

- a. Competition
- b. Predation
- c. Symbiosis
- d. Parasitism

39. A species that belongs to an ecosystem is called _____, while a species that does not belong to an ecosystem is called _____.

- a. Threatened; endangered
- b. Endangered; endemic
- c. Endemic; non-native
- d. Non-native; endemic

40. A forest burns down after a lightning storm. The slow, gradual process of replacing the forest with different types of plants would be called:

- a. Evolution
- b. Succession
- c. Development
- d. A tragedy