

## Biology

Name:

Teacher:

Date:

Class/Period:

---

- 1) Aisha wants to conduct an experiment to determine whether sun and shade varieties of the same plant species prefer the same wavelengths of light. She plans to measure rates of photosynthesis. Which design would be best for her experiment?
  - A. 1 plant of the sun variety tested under blue light only, and 1 plant of the shade variety tested under blue light only
  - B. 4 plants of the sun variety: 1 tested under blue light, 1 under green, 1 under red, and 1 under yellow light, and 4 plants of the shade variety: 1 tested under blue light, 1 under green, 1 under red, and 1 under yellow light
  - C. 10 plants of the sun variety tested under blue light only; and 10 plants of the shade variety tested under blue light only
  - D. 40 plants of the sun variety: 10 tested under blue light, 10 under green, 10 under red, and 10 under yellow light, and 40 plants of the shade variety: 10 tested under blue light, 10 under green, 10 under red, and 10 under yellow light
- 2) Chan wants to determine how much the mass of fungus growing on a nutrient agar plate changes over an 8 hr period. What is the most appropriate unit of measure for him to use?
  - A. Kilogram
  - B. Kilometer
  - C. Milligram
  - D. Millimeter
- 3) What is the best definition of a scientific theory?
  - A. An explanation of how and why a natural phenomenon behaves the way it does
  - B. A description of an invariable relationship that exists in nature
  - C. A speculation or guess about how nature works
  - D. An unproven fact
- 4) Carbon-14 is a radioactive isotope used to determine the age of ancient objects composed of organic matter. Carbon-12 and carbon-13 are other isotopes of carbon. The number of what subatomic particles varies among these carbon isotopes?
  - A. Electrons
  - B. Neutrons
  - C. Photons
  - D. Protons
- 5) What is the maximum number of covalent bonds that can form between a single carbon atom and 1 or more hydrogen atoms?
  - A. 1
  - B. 2
  - C. 3
  - D. 4
- 6) Megan examines a liver cell and observes an organelle with many smooth-sided channels. Which activity would identify this organelle as the Golgi apparatus?
  - A. Digestion of macromolecules and old organelles
  - B. Detoxification of poisonous molecules within the cell
  - C. Harvesting of energy from organic molecules to make ATP
  - D. Processing and packaging of cellular materials prior to export
- 7) What combines with sugar and a phosphate group to form a nucleotide?
  - A. Amino acid
  - B. Deoxyribose
  - C. Glycerol
  - D. Nitrogenous base
- 8) DNA and RNA have many structural similarities. Which structure in DNA and RNA is similar?
  - A. Purine bases
  - B. Pyrimidine bases
  - C. Type of sugar
  - D. Attached proteins
- 9) Who helped disprove the idea of spontaneous generation by demonstrating that maggots come from fly eggs and NOT from meat?
  - A. Francesco Redi
  - B. John Needham
  - C. Lazzaro Spallanzani
  - D. Louis Pasteur

10) What is the function of most epithelial tissue?

- A. Contracting under voluntary control
- B. Holding bones and muscles together
- C. Lining internal or external surfaces of the body
- D. Conducting electrochemical signals between body parts

11) Hummingbirds transfer pollen from one flower to another while feeding. What plant structure contains the pollen?

- A. Carpel
- B. Petal
- C. Sepal
- D. Stamen

12) Lions and tigers both belong to genus *Panthera*. Cheetahs belong to the genus *Acinonyx*. Scientists group these 3 types of cats together at the next taxonomic level. What is the most specific taxonomic level that lions, cheetahs, and tigers share?

- A. Class
- B. Family
- C. Kingdom
- D. Order

13) Mrs. Lewis set up a lab for her biology students using a culture of the small crustacean *Daphnia*, obtained from a pond that was 20°C. The students are to investigate the effect temperature has on *Daphnia*. The students will observe the crustacean's heartbeat under the microscope, at different temperatures, and count the number of heartbeats per sec.

What is the independent variable in this experiment?

- A. Temperature of the samples
- B. Number of heartbeats/sec
- C. Number of *Daphnia* in the cultures
- D. Type of microscope used

14) A researcher counted the number of eggs a single fruit fly laid in 24 hrs for 5 days and recorded the findings in this table.

Day	Number of eggs
1	10
2	14
3	7
4	8
5	11

What is the average number of eggs laid per day over the 5 days?

- A. 5
- B. 10
- C. 25
- D. 50

15) Which is the best example of a population?

- A. All the insects in North America
- B. All the white-tailed deer on an island
- C. All the bacteria in a person's digestive tract
- D. All the single-celled creatures in a sample of pond water

16) When a small neutral molecule becomes an ion, in which way is it better able to function?

- A. Dissolving in blood plasma
- B. Sharing electrons with other ions
- C. Combining with ions of similar charges
- D. Passing through a cell's plasma membrane

17) In aerobic respiration, glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>) combines with oxygen (O<sub>2</sub>) to yield carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O). What is the balanced chemical equation for this reaction?

- A. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> → CO<sub>2</sub> + H<sub>2</sub>O
- B. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> + 6 O<sub>2</sub> → 6 H<sub>2</sub>O
- C. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> + O<sub>2</sub> → 6 CO<sub>2</sub> + 6 H<sub>2</sub>O
- D. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> + 6 O<sub>2</sub> → 6 CO<sub>2</sub> + 6 H<sub>2</sub>O

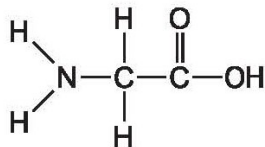
18) Naomi adds cycloheximide to cells grown in a test tube. Within minutes, she identifies short incomplete segments of proteins in the cells. On which organelle does cycloheximide act?

- A. Endoplasmic reticulum
- B. Golgi apparatus
- C. Nucleus
- D. Ribosome

19) The presence of which structure indicates that cells are NOT photosynthetic bacteria?

- A. Cell wall
- B. Chloroplast
- C. DNA
- D. Ribosome

20) This molecule is an example of which substance?



- A. Amino acid
- B. Carbohydrate
- C. Fatty acid
- D. Nucleotide

21) Bacteriophages infect bacterial cells causing them to produce more bacteriophages. The Hershey-Chase experiments used radioactively labeled bacteriophages as shown in the table.

Hershey-Chase Experiments				
	Step 1	Step 2	Step 3	Results
Experiment 1	Radioactively label bacteriophage protein with <sup>35</sup> S	Allow bacteriophages to infect bacteria cells	Separate bacteriophages from bacteria	Detect <sup>35</sup> S with bacteriophages
Experiment 2	Radioactively label bacteriophage DNA with <sup>32</sup> P	Allow bacteriophages to infect bacteria cells	Separate bacteriophages from bacteria	Detect <sup>32</sup> P inside bacteria

What was the conclusion of the Hershey-Chase experiments?

- A. DNA from the bacteriophage entered the bacteria.
- B. DNA from the bacteriophage became bacterial DNA.
- C. Protein from the bacteriophage entered the bacteria.
- D. Protein from the bacteriophage became bacterial DNA.

- 22) This chart shows the RNA sequences that code for various amino acids.

1st position	2nd position				3rd position
	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U C A G
	Phe	Ser	Tyr	Cys	
	Leu	Ser	Stop	Stop	
	Leu	Ser	Stop	Trp	
C	Leu	Pro	His	Arg	U C A G
	Leu	Pro	His	Arg	
	Leu	Pro	Gln	Arg	
	Leu	Pro	Gln	Arg	
A	Ile	Thr	Asn	Ser	U C A G
	Ile	Thr	Asn	Ser	
	Ile	Thr	Lys	Arg	
	Met	Thr	Lys	Arg	
G	Val	Ala	Asp	Gly	U C A G
	Val	Ala	Asp	Gly	
	Val	Ala	Glu	Gly	
	Val	Ala	Glu	Gly	

What is the RNA sequence for a section of protein composed of Val-Glu-Ser ?

- A. GUA-GCC-AGU  
 B. GUA-GGG-AGC  
 C. GUG-GAC-GGU  
 D. GUG-GAG-AGC
- 23) In an experiment, a scientist filled 2 open flasks, as shown in the figures, with broth and boiled the broth until it became clear. He then left the flasks open for several days.

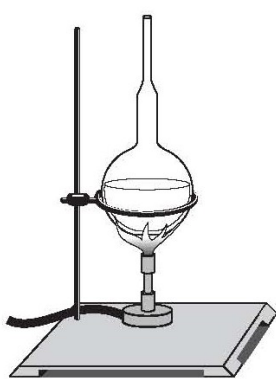


Figure A

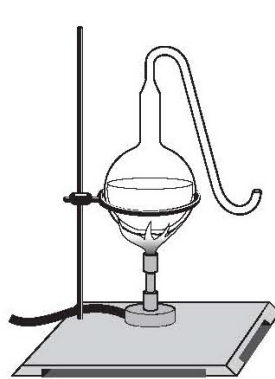


Figure B

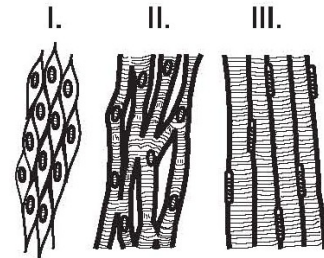
Which results showed that spontaneous generation did NOT occur?

- A. The broth in both Flasks A and B remained clear.  
 B. The broth in both Flasks A and B became cloudy.  
 C. The broth in Flask A remained clear, and the broth in Flask B became cloudy.  
 D. The broth in Flask A became cloudy, and the broth in Flask B remained clear.

- 24) What characteristic of early autotrophs gave them an advantage over early heterotrophs?

- A. They ate heterotrophs.  
 B. They produced spores.  
 C. They made their own food.  
 D. They reproduced asexually.

- 25) These figures represent what type of tissue?



- A. Adipose  
 B. Epithelial  
 C. Muscle  
 D. Nervous

- 26) In addition to the reproductive system, which body system is most directly essential to the production of gametes and offspring?

- A. Circulatory  
 B. Endocrine  
 C. Immune  
 D. Nervous

- 27) In North America, prairies and deciduous forests have growing seasons of similar length and temperature. Which major factor determines whether a region develops into a prairie or a deciduous forest?

- A. Amount of rain  
 B. Amount of sunlight  
 C. Nutrient content of the soil  
 D. Type of animal populations

- 28) What is the correct sequence of events during photosynthesis?

- A. Light absorption, photolysis, electron transport chain, Calvin cycle, chemiosmosis  
 B. Photolysis, light absorption, chemiosmosis, Calvin cycle, electron transport chain  
 C. Chemiosmosis, light absorption, electron transport chain, Calvin cycle, photolysis  
 D. Light absorption, electron transport chain, photolysis, chemiosmosis, Calvin cycle

29) Mrs. Lewis set up a lab for her biology students using a culture of the small crustacean *Daphnia*, obtained from a pond that was 20°C. The students are to investigate the effect temperature has on *Daphnia*. The students will observe the crustacean's heartbeat under the microscope, at different temperatures, and count the number of heartbeats per sec.

If the experiment is designed correctly, what will the students choose for the experimental treatment?

- A. Placing 5 identical cultures of *Daphnia* at 20°C
- B. Placing each of 5 identical cultures of *Daphnia* at a different temperature
- C. Placing 5 cultures, each with a different type of crustacean, at 20°C
- D. Placing 5 cultures, each with a different type of crustacean, at a different temperature

30) After learning about viruses in Biology class, Sam decides to have his cat vaccinated against feline leukemia virus. According to cell theory, are viruses, such as feline leukemia, considered living things?

- A. Yes, because they can reproduce.
- B. Yes, because they are composed of cells.
- C. No, because they cannot adapt to their environment.
- D. No, because they are not composed of cells.

31) What is the primary factor that determines the polarity of a bond between atoms?

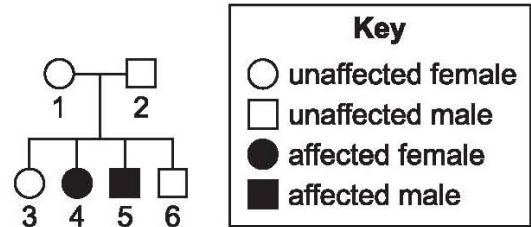
- A. The total number of electrons involved in the bond
- B. The total number of protons and neutrons in both atoms
- C. The difference in the relative attraction of electrons to each atom
- D. The difference in the relative attraction of protons to each atom

32) A scientist adds an antibody specific to the actin protein to a prepared culture of macrophages. The macrophages exhibit active movement before, but not after, treatment. What is the most accurate conclusion about the function of actin?

- A. Actin depolymerizes microtubular arrays.
- B. Actin plays a role in the function of pseudopodia.
- C. Actin disrupts cellular activities in the cytoskeleton.
- D. Actin guides the movement of chromosomes in macrophages.

33) Alkaptonuria is a genetic disorder of protein metabolism.

The disorder is determined by 2 alleles at 1 locus.



What is the genotype for Individual 1 in the diagram?

- A. AA or Aa
- B. AA
- C. Aa
- D. aa

34) John Needham performed an experiment testing spontaneous generation. He boiled chicken broth, placed it in a sterile flask, and then sealed the flask. After a few days, Needham observed microorganisms in the flask. Based on current understanding, how was his experiment flawed?

- A. Boiling activated dormant microorganisms present in the broth.
- B. Boiling the broth did not kill all microorganisms present.
- C. Microorganisms entered the broth from the flask itself after the flask was sealed.
- D. After Needham boiled the broth, microorganisms entered from the air.

35) A hospital patient had a serious bacterial infection that required treatment with strong antibiotics. The patient recovered from the infection, but experienced side effects, including oral fungal infections and digestive problems. What is the most probable reason for the side effects?

- A. The patient experienced an allergic reaction to the antibiotics.
- B. The patient had not fully recovered from the infection.
- C. The antibiotics killed both harmful and beneficial bacteria.
- D. The antibiotics encouraged an overgrowth of beneficial bacteria.

## Answer Key

- 1) D
- 2) C
- 3) A
- 4) B
- 5) D
- 6) D
- 7) D
- 8) A
- 9) A
- 10) C
- 11) D
- 12) B
- 13) A
- 14) B
- 15) B
- 16) A
- 17) D
- 18) D
- 19) B
- 20) A
- 21) A
- 22) D
- 23) D
- 24) C
- 25) C
- 26) B
- 27) A
- 28) D
- 29) B
- 30) D
- 31) C
- 32) B
- 33) C
- 34) D
- 35) C