1. Which pole of a water molecule is slightly positive?

   A. The oxygen pole.

   B. Only one hydrogen pole at a time.

   C. Both hydrogen poles.

   D. None of the above.

2. Which of the following elements are constituents of proteins?

   I. Carbon
   II. Nitrogen
   III. Oxygen

   A. I only

   B. I and II only

   C. I and III only

   D. I, II and III

3. Which of the following statements about the structure of DNA is incorrect?

   A. The backbone of DNA is made up of alternating sugar and phosphate molecules.

   B. DNA is a double-stranded helix, with strands running parallel to each other.

   C. Two strands of DNA are held together by hydrogen bonds.

   D. The nitrogenous bases of DNA include adenine, thymine, cytosine, and guanine.

4. Hydrolysis of maltose results in the formation of the following:

   A. Fructose and glucose

   B. Two glucoses

   C. Galactose and fructose

   D. Sucrose and glucose

5. Which of the following is true regarding the polymer glycogen?

	Monomer is…	Shape of polymer…
A.	Alpha glucose	Branched, helical
B.	Alpha glucose	Unbranched, linear
C.	Beta glucose	Branched, helical
D.	Beta glucose	Unbranched, linear

6. Which formula correctly represents a single monosaccharide?

A. $C_6H_{11}O_8$

B. $C_{2n}H_nO_n$

C. $C_nH_{2n}O_n$

D. $C_nH_{n+2}O_n$

7. The first amino acid comprising a polypeptide chain is usually:

A. Valine

B. Alanine

C. Serine

D. Methionine

8. Which of the following is true regarding the structure of the protein hemoglobin?

I. Comprised of four polypeptide chains.
II. It is considered an unconjugated protein.
III. It has a quaternary protein structure.

A. III only

B. I and II only

C. I and III only

D. I, II and III

9. Which of the following statements about enzyme activity is false?

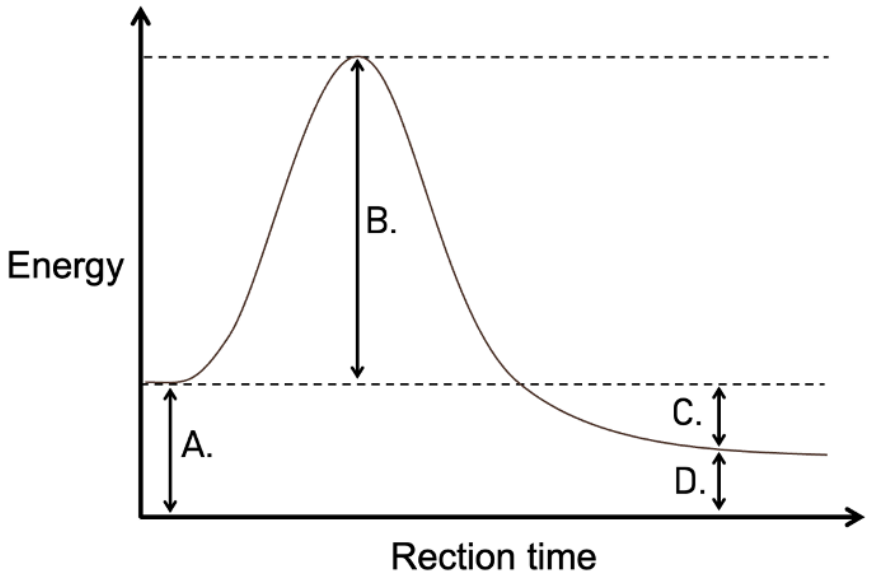
A. Enzymes increase the activation energy of reactions.

B. Enzymes can be denatured by high temperatures.

C. Enzyme activity is influenced by pH.

D. Enzymes speed up the rate of reaction without being consumed.

10. Which of the following parameters will change when an enzyme is added to the reaction mixture?



11. In the process of glycolysis, which of the following is directly oxidized?

A. Glucose

B. NAD+

C. NADH

D. Pyruvate

12. What of the following is not required for a successful polymerase chain reaction (PCR)?

A. Free nucleotides

B. DNA primer

C. RNA polymerase

D. Extracted DNA sample as the template

13. During RNA processing in eukaryotes, what is added to the 5' end of the mRNA?

A. Cap

B. Intron

C. Exon

D. Poly-A-tail

14. Which of the following explains why multiple codons can code for the same amino acid?

A. Wobble hypothesis

B. Degeneracy of the genetic code

C. Ribosomal binding sites

D. Universality of the genetic code

15. The fungal cells of Coenocytic organisms, such as Rhizopus are considered to be atypical eukaryotes that are characterized by which of the following?

A. They have separate, individual cells with distinct membranes.

B. They have a continuous cytoplasm with multiple nuclei and no compartmentalization.

C. They contain mitochondria and chloroplasts.

D. They are multicellular but lack any cellular differentiation.

16. Which of the following components was not included in the original Miller-Urey experimental setup?

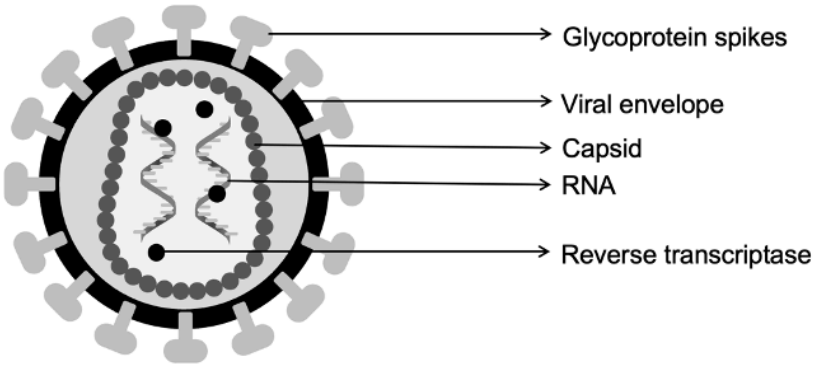
A. Methane (CH_4)

B. Ammonia (NH_3)

C. Oxygen (O_2)

D. Water vapor (H_2O)

17. Below is a diagram of a pathogen.



Which of the following diseases is caused by the pathogen in the diagram above.

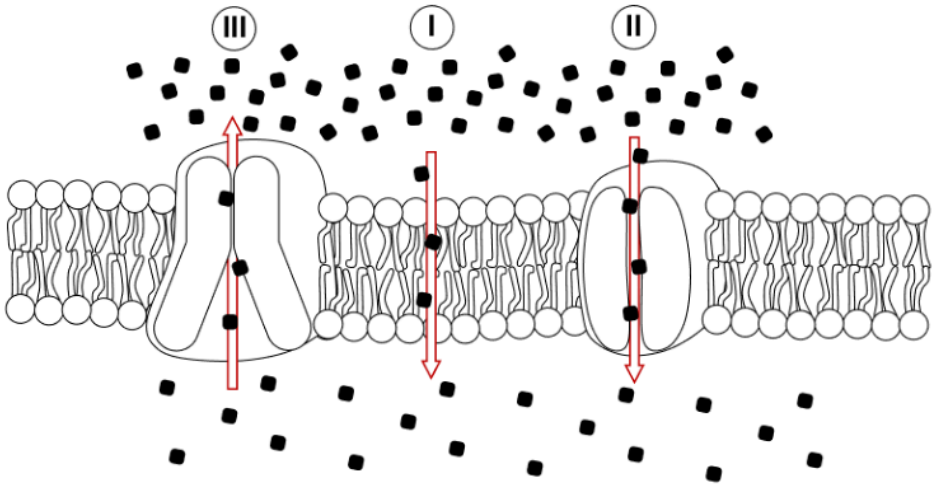
A. COVID-19

B. HIV/AIDS

C. Ascariasis

D. Tuberculosis

18. Which of the following modes of membrane transport requires chemical energy in the form of ATP?



A. II only

B. III only

C. I and II only

D. II and III only

19. Which of the following is true about a G-protein coupled receptor (GPCR)?

A. The alpha subunit can dissociate and bind to an effector molecule.

B. Insulin is a ligand that can bind to a GPCR.

C. It is an example of an intracellular receptor.

D. None of the above.

20. How does methylation of histone tails affect the accessibility of DNA?

A. It relaxes the chromatin to make DNA more accessible.

B. It compacts the chromatin to make DNA less accessible.

C. Histone methylation has no effect on chromatin.

D. It can have different effects depending on the location.

21. Which type of RNA is involved in translating genetic information into proteins?

I. mRNA
II. tRNA
III. rRNA

A. I only

B. II only

C. I and II only

D. I, II and III

22. What is true about this human Karyogram?

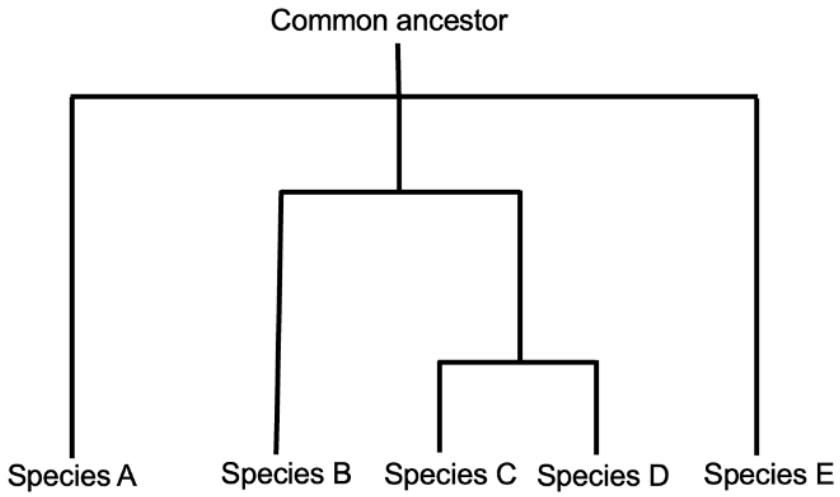
A. It is haploid and has 44 autosomes.

B. It is haploid and has 46 autosomes.

C. It is diploid and has 44 autosomes.

D. It is diploid and has 46 autosomes.

23. Which of the following groups is not a monophyletic group?



A. Species B, C and D

B. Species A add E

C. Species C and D

D. Species A, B, C, D, and E

24. Which of the following increases the rate of transpiration?

I. Increased temperature
II. Increased wind
III. Increased humidity

A. I only

B. I and II only

C. I and III only

D. I, II and III

25. What is the primary effect of the Bohr shift in the context of hemoglobin?

A. It increases the affinity of hemoglobin for oxygen in tissues.

B. It decreases the affinity of hemoglobin for oxygen in the lungs.

C. It increases the release of oxygen from hemoglobin in tissues.

D. It decreases the release of oxygen from hemoglobin in the lungs.

26. After surgery and prolonged bed rest, an 82-year-old gets a blood clot in a vein in their leg. What pathway will this clot take to reach the pulmonary artery?

A. Leg vein → Vena cava → Left atrium → Left ventricle → Pulmonary artery

B. Leg vein → Pulmonary vein → Left atrium → Left ventricle → Pulmonary artery

C. Leg vein → Vena cava → Left ventricle → Aorta → Pulmonary aorta

D. Leg vein → Vena cava → Right atrium → Right ventricle → Pulmonary artery

27. Which of the following does not occur during muscle contraction?

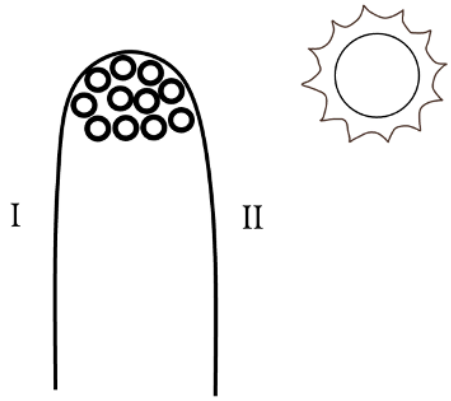
A. The sarcomere shortens during muscle contraction.

B. The dark band decreases in size and the light band remains the same.

C. The thick and thin filaments do not change in length.

D. During the power stroke, actin filaments slide over myosin filaments.

28. In this stem, which side would auxin be distributed to and which side will elongate?



	Side distributed to	Side to elongate
A.	I	I
B.	I	II
C.	II	I
D.	II	II

29. Which of the following is not a characteristic of autonomic nervous system:

A. It controls involuntary actions like digestion and heart rate.

B. It is divided into sympathetic and parasympathetic branches.

C. It directly controls voluntary muscle movements in the limbs.

D. It uses both neurotransmitters and hormones and transmit signals.

30. Which cell in spermatogenesis undergoes meiosis II?

A. Spermatogonium

B. Primary spermatocyte

C. Secondary spermatocyte

D. Spermatid

31. A test cross was carried out between two plants for the height trait. The tall allele is dominant over the short allele. Knowing that some of the offspring displayed the recessive trait, what can be concluded about the genotypes of the parents?

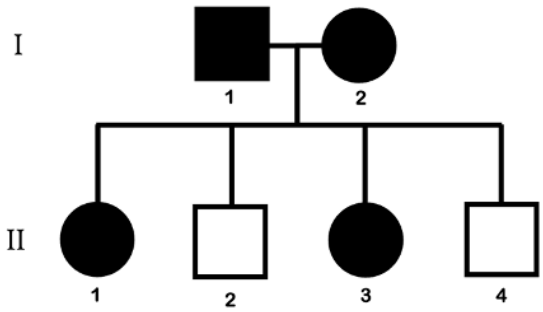
A. One is tt, and the other is tt

B. One is Tt and the other Tt

C. One is Tt and the other tt

D. One is TT and the other tt

32. Assuming that this a pedigree chart for an autosomal trait, what is the genotype for individual II-3?



A. AA

B. Aa

C. aa

D. Aa or AA

33. In the context of human blood, which of the following is an example of a negative feedback mechanism?

A. Increased production of insulin when blood glucose levels are high.

B. Increase production of red blood cells when oxygen levels are low.

C. The release of adrenaline during stress.

D. Increased oxytocin production during labor.

34. The efferent arteriole exiting the glomerulus has a smaller diameter than the afferent arteriole entering it. This anatomical arrangement:

A. Increases water movement into Bowman's capsule by osmosis.

B. Facilitates water reabsorption from the proximal convoluted tubule.

C. Increases pressure in the glomerulus for ultrafiltration.

D. Reduces the risk of capillary damage by high pressure.

35. Which of the following is/are true regarding homologous structures?

I. They indicate common ancestry between species.
II. They may perform different functions in different species.
III. They result from convergent evolution due to similar environmental pressures.

A. I only

B. I and II only

C. II and III only

D. I, II and III

36. Which process would a facultative anaerobe most likely prioritize when oxygen levels are high?

A. Glycolysis followed by lactic acid fermentation.

B. Glycolysis followed by the Krebs cycle and oxidative phosphorylation.

C. Alcohol fermentation.

D. Anaerobic respiration using nitrate as a terminal electron acceptor.

37. Which of the following is true regarding Saprotrophs and detritivores respectively?

	Saprotrophs	**Detritivores**
A.	Are heterotrophic	Are autotrophic
B.	Digest internally	Digest externally
C.	Secrete enzymes onto dead matter	Ingest, then digest dead matter
D.	Consume dead plant material	Consume dead animal material

38. Which of the following is a true statement about ecological pyramids?

A. Energy is transferred efficiently at each trophic level.

B. Biomass decreases as you move up trophic levels.

C. Producers are typically at the top of the pyramid.

D. The number of individuals increases as you move up trophic levels.

39. The recessive allele *a* for a certain trait occurs with frequency of 0.7 in a population of squirrels that follows the Hardy-Weinberg equilibrium. What is the frequency of individuals that are homozygous dominant for this trait?

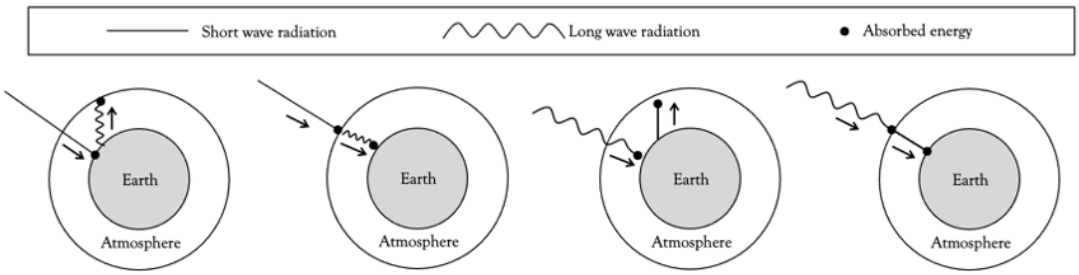
A. 0.09

B. 0.3

C. 0.47

D. 0.7

40. Which diagram best represents how atmospheric greenhouse gases trap heat energy?



A. B. C. D.