Test: Adv Lab Tech Summer Assignment

Name: _____

Question 1 of 55

To be scientifically valid, a hypothesis must be

- **A)** reasonable.
- **B)** testable and falsifiable.
- **C)** part of a theory.
- **D)** controlled.

Question 2 of 55

Life is organized in a hierarchical fashion. Which sequence correctly lists that hierarchy from least inclusive to most inclusive?

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

Question 3 of 55

A scientist testing the affects of a chemical on apple yeild sprays an orchard with the chemical. A second orchard does not receive the chemical. In the fall, the number of apples harvested from each forest is counted. Which of the following is the independent (manipulated) variable in the experiment?

- **A)** the chemical
- **B)** the number of apples
- **C)** the first orchard
- **D)** the second orchard

Question 4 of 55

A scientist testing the affects of a chemical on apple yeild sprays an orchard with the chemical. A second orchard does not receive the chemical. In the fall, the number of apples harvested from each forest is counted.

In order for the apple tree experiment to be valid scientifically, both orchards must:

- **A)** have the same species of apple tree
- **B)** receive the same amount of water
- **C)** receive the same amount of sunlight
- **D)** all of these

Question 5 of 55

When glucose levels in the blood rise, your brain sends a signal to your pancreas. The pancreas releases insulin, which opens channels in cell membranes to allow glucose to enter the cell, lowering blood sugar levels. This is an example of what?

- **A)** Growth and development
- **B)** Evolution
- **C)** Homeostasis
- **D)** Stimulus

Question 6 of 55

Researchers set up a study to determine whether large doses of a nutritional supplement would shorten the length of time it takes to recover from a cold. Three thousand volunteers were split into two groups. For two weeks, members of group A took 3,000 mg of the supplement daily. Group B received 3,000 mg of a placebo (sugar pill). At the end of the two-week period, the researchers inserted live cold viruses directly into the noses of all the volunteers. The volunteers in both group A and group B continued to take their daily pills. All the volunteers got colds, and there was no significant difference in the length of time the colds lasted. Which was the experimental group?

- **A)** Group B
- **B)** Group C
- **C)** all 3,000 volunteers
- **D)** Group A

Question 7 of 55

The four most common elements in living organisms are

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

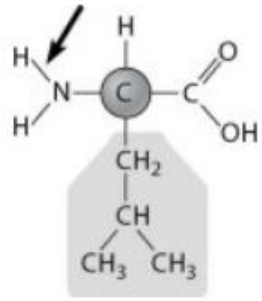
Question 8 of 55

What happens to an atom if the electrons in the outer shell are altered?

- **A)** The atom becomes radioactive.
- **B)** The atom loses a proton.
- **C)** The atom becomes a different element.
- **D)** The atom acquires different properties.

Question 9 of 55

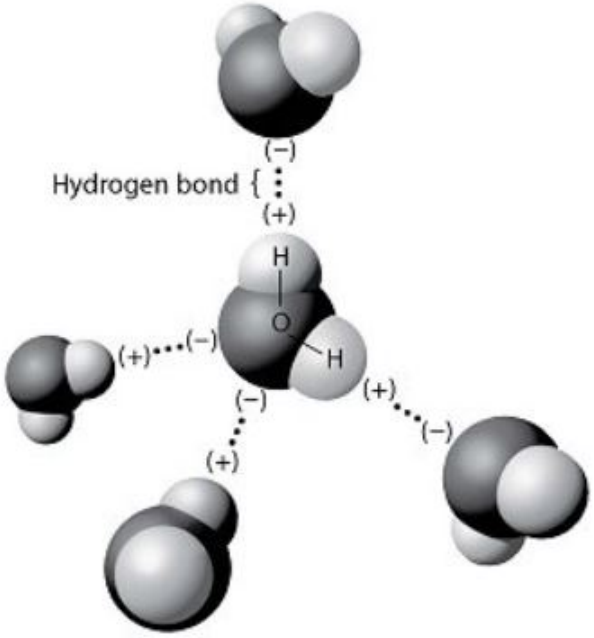
Below is the structure of leucine, an amino acid. What type of bond is the arrow pointing to?



- **A)** a nonpolar covalent bond
- **B)** a hydrogen bond
- **C)** an ionic bond
- **D)** a polar covalent bond

Question 10 of 55

The figure below shows five water molecules. The hydrogen bonds shown in this figure are each



- **A)** between two hydrogen atoms.
- **B)** between an oxygen and a hydrogen atom of the same water molecule.
- **C)** between an oxygen and a hydrogen atom of different water molecules.
- **D)** between two atoms with the same charge.

Question 11 of 55

Glycolysis is the first step of cellular respiration, in which glucose is used to generate ATP to power the cell. The major chemical reaction that takes place in glycolysis (ignoring some other reactants and products) is the conversion of glucose ($C_6H_{12}O_6$) to pyruvate ($C_3H_4O_3$) and hydrogen ions (H^+). Using this information, what is the correct equation for the glycolysis chemical reaction?

- **A)** $C_6H_{12}O_6 \rightarrow C_3H_4O_3 + H^+$
- **B)** $C_6H_{12}O_6 \rightarrow 2\ C_3H_4O_3 + 4\ H^+$
- **C)** $2\ C_6H_{12}O_6 \rightarrow C_3H_4O_3 + 2\ H^+$
- **D)** $C_6H_{12}O_6 \rightarrow 2\ C_3H_4O_3 + H^+$

Question 12 of 55

Which of the following is dependent on the ability of water molecules to form hydrogen bonds with other molecules besides water?

- **A)** the universality of water as a solvent
- **B)** the ability of certain insects to walk on the surface of water
- **C)** the evaporative cooling of skin surfaces
- **D)** the milder temperatures of coastal regions compared to inland areas

Question 13 of 55

A buffer

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

Question 14 of 55

Typically, nitrogen atoms are composed of electrons, protons, and neutrons. An isotope of nitrogen could

- **A)** be negatively charged
- **B)** be positively charged
- **C)** have more protons than the usual nitrogen atom
- **D)** have more neutrons than the usual nitrogen atom

Question 15 of 55

A(n) _____ forms when two atoms share electrons.

- **A)** covalent bond
- **B)** hydrogen bond
- **C)** ionic bond
- **D)** ion

Question 16 of 55

_____ are weak bonds that are not strong enough to hold atoms together to form molecules but are strong enough to form bonds within and around large molecules.

- **A)** Ionic bonds
- **B)** Covalent bonds
- **C)** Polar covalent bonds
- **D)** Hydrogen bonds

Question 17 of 55

Water molecules have the ability to dissolve many solutes associated with cells. Of the following choices, which property allows water to dissolve solutes?

- **A)** Polarity
- **B)** High Heat Capacity
- **C)** Non-Polarity
- **D)** Cohesive Properties

Question 18 of 55

A solution with a pH of 7 is

- **A)** neutral
- **B)** strongly acidic
- **C)** weakly basic
- **D)** weakly acidic

Question 19 of 55

A major type of lipid found in cell membranes is

- **A)** phospholipids
- **B)** saturated fats
- **C)** unsaturated fats
- **D)** glycerol

Question 20 of 55

Proteins differ from one another because

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

Question 21 of 55

How are genes used by cells to build proteins?

- **A)** The genes in RNA are transcribed into a DNA molecule, which is used to build a protein.
- **B)** The genes in DNA are translated directly into an amino acid sequence.
- **C)** The genes in RNA are transcribed directly into an amino acid sequence.
- **D)** The genes in DNA are transcribed into an RNA molecule, which is used to build a protein.

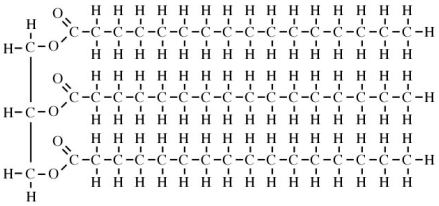
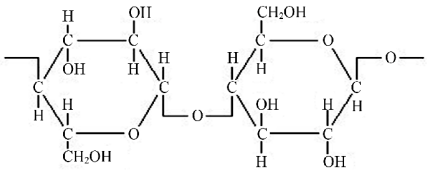
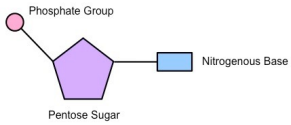
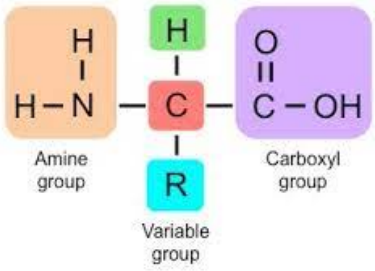
Question 22 of 55

What is the correct flow of information in gene expression?

- **A)** DNA>RNA>protein
- **B)** DNA>protein>RNA
- **C)** RNA>DNA>protein
- **D)** Protein>RNA>DNA

Question 23 of 55

Match the options below:

1. [ ]	Primary energy source for living things	A.	Nucleic Acid
2. [ ]	Contains genetic information	B.	Protein
3. [ ]		C.	Lipid
4. [ ]	 Cellulose	D.	Carbohydrate
5. [ ]			
6. [ ]			
7. [ ]	Secondary energy source in living things		
8. [ ]	Makes muscle and other structures		

Question 24 of 55

The results of a dehydration reactions can be reversed by

- **A)** hydrolysis reactions
- **B)** condensation reactions
- **C)** the addition of an amino group
- **D)** polymerization reactions

Question 25 of 55

Enzymes

- **A)** are able to heat up molecules so that they can react.
- **B)** provide CO_2 for chemical reactions.
- **C)** are biological catalysts.
- **D)** absorb excess heat so that reactions occur at low temperatures.

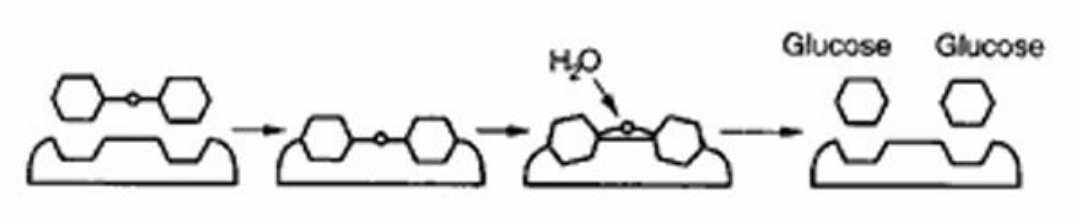
Question 26 of 55

You are studying a newly discovered species and want to analyze its genetic information. What type of molecule would you analyze?

- **A)** nucleic acid
- **B)** lipid
- **C)** protein
- **D)** carbohydrate

Question 27 of 55

Which chemical reaction is represented by the diagram below:



- **A)** dehydration synthesis of a lipid
- **B)** dehydration synthesis of a dipeptide
- **C)** hydrolysis of a disaccharide
- **D)** hydrolysis of a polypeptide

Question 28 of 55

All protein building occurs through two principal steps, which are

- **A)** Osmosis and diffusion.
- **B)** Transcription and translation.
- **C)** Mitosis and meiosis.
- **D)** Active transport and passive transport.

Question 29 of 55

An expressed gene ...

- **A)** functions as a promoter
- **B)** codes for just one amino acid
- **C)** is made of mRNA
- **D)** is transcribed into RNA

Question 30 of 55

Mendel's law of independent assortment states that

- **A)** independent sorting of genes produces polyploid plants.
- **B)** genes are sorted concurrently during gamete formation.
- **C)** chromosomes form independently of each other during mitosis.
- **D)** each pair of alleles (chromosomes) segregates independently of the other pairs of alleles during gamete formation.

Question 31 of 55

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

- **A)** homologous; are inherited together
- **B)** linked; do not sort independently during meiosis
- **C)** codependent; do not sort independently during meiosis
- **D)** linked; sort independently during meiosis

Question 32 of 55

DNA replication

- **A)** uses each strand of a DNA molecule as a template for the creation of a new strand.
- **B)** occurs through the addition of nucleotides to the end of the parental DNA molecule.
- **C)** results in the formation of four new DNA strands.
- **D)** begins when two DNA molecules join together to exchange segments.

Question 33 of 55

If one strand of DNA is CGGTAC, then the complementary strand would be

- **A)** GCCTAG
- **B)** GCCATG
- **C)** GCCAUC
- **D)** TAACGT

Question 34 of 55

Which of the following enzymes catalyzes the elongation of a new DNA strand?

- **A)** reverse transcriptase
- **B)** RNA polymerase
- **C)** DNA polymerase
- **D)** DNA ligase

Question 35 of 55

Which of the following options best depicts the flow of information when a gene directs the synthesis of a cellular component?

- **A)** protein → tRNA → DNA
- **B)** DNA → tRNA → mRNA → protein
- **C)** mRNA → DNA → tRNA → protein
- **D)** DNA → mRNA → protein

Question 36 of 55

The transfer of genetic information from DNA to RNA is called

- **A)** translation
- **B)** transcription
- **C)** transubstantiation
- **D)** transition

Question 37 of 55

In the genetic code

- **A)** some codons consist of two nucleotides
- **B)** some codons specify more than one amino acid
- **C)** many amino acids are specified by more than one codon
- **D)** some amino acids are not specified by any codons

Question 38 of 55

Which of the following statements is *false*?

- **A)** During polypeptide initiation, an mRNA molecule, the first amino acid attached to its tRNA, and the two subunits of a ribosome are brought together.
- **B)** The start codon can be different depending on what kind of protein is to be translated.
- **C)** Translation consists of initiation, elongation, and termination.
- **D)** During the first step of initiation, an mRNA molecule binds to a small ribosomal subunit.

Question 39 of 55

A physical or chemical agent that changes the nucleotide sequence of DNA is called a(n)

- **A)** terminator
- **B)** prion
- **C)** mutagen
- **D)** anticodon

Question 40 of 55

What is the transcription product of the sequence GCTAGCGATGAC?

- **A)** CGAUCGCUACUG
- **B)** CGUTCGCUTCUG
- **C)** CGTUCGCUTCUG
- **D)** CAGTAGCGATCG

Question 41 of 55

Using your Codon Table, what protein sequence does the RNA sequence CUAGCUCGAUAUCUC code for?

- **A)** Leu - Ala - Arg - Tyr - Leu
- **B)** Leu - Gly - Tyr - Ala - Leu
- **C)** Val - Arg - Ala - Phe - Stop
- **D)** Asp - Ala - Arg - Ile - Leu

Question 42 of 55

Which is the correct order for the steps of respiration?

- **A)** Glycolysis, Krebs Cycle, Link Reaction, Oxidative Phosphorylation
- **B)** Glycolysis, Transition Reaction, Citric Acid Cycle, Oxidative Phosphorylation
- **C)** Gluconeogenesis, Krebs Cycle, Citric Acid Cycle, Electron Transport Chain
- **D)** Gluconeogenesis, Oxidative Phosphorylation, Krebs Cycle, Chemiosmosis

Question 43 of 55

What is the equation for cellular respiration?

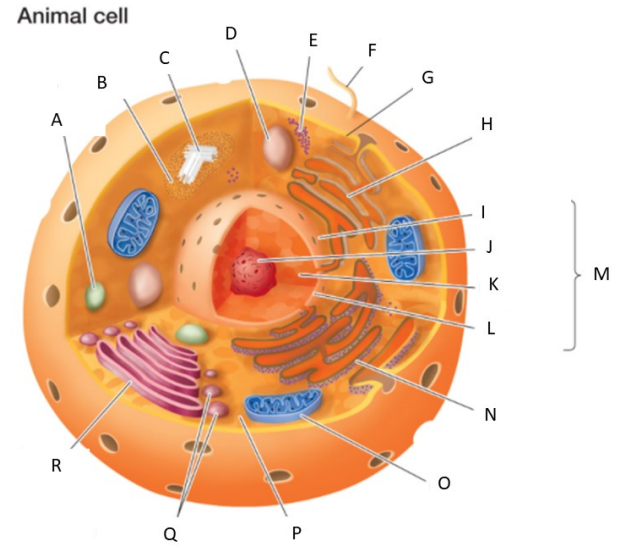
- **A)** $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 36$ ATP
- **B)** $6C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 36$ ATP
- **C)** $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 18$ ATP
- **D)** $C_{12}H_{12}O_{12} + 6O_2 \rightarrow 6CO_2 + 6H_2O + 36$ ATP

Question 44 of 55

The assembly of the protein's amino acid chain occurs in the _____ and is facilitated by _____.

- **A)** Nucleus, ribosomes
- **B)** Ribosomes, cytoplasm
- **C)** Cytoplasm, ribosomes
- **D)** Nucleus, cytoplasm

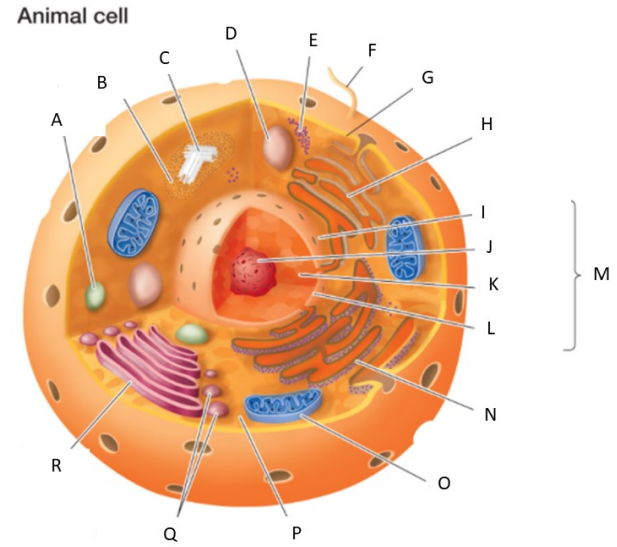
Question 45 of 55



Identify the location of transcription

- **A)** O
- **B)** M
- **C)** C
- **D)** N

Question 46 of 55



Identify an organelle that produces the most ATP during respiration.

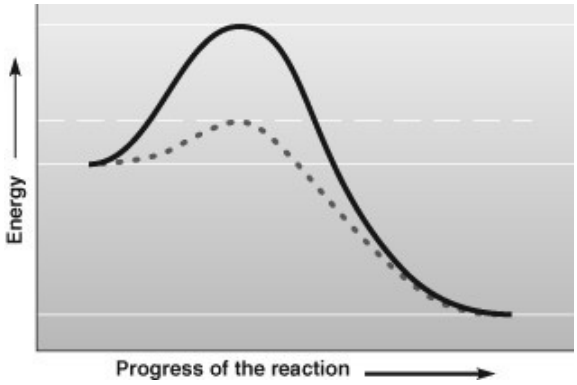
- **A)** O
- **B)** M
- **C)** H
- **D)** C

Question 47 of 55

Kinetic energy differs from chemical energy in that

- **A)** chemical energy is a particular form of kinetic energy.
- **B)** kinetic energy is the energy of a moving object, whereas chemical energy is the potential energy of molecules.
- **C)** kinetic energy is stored energy that has the potential to do work, and chemical energy is the energy of movement.
- **D)** kinetic energy can be converted into various forms of energy, whereas chemical energy can only be converted into heat.

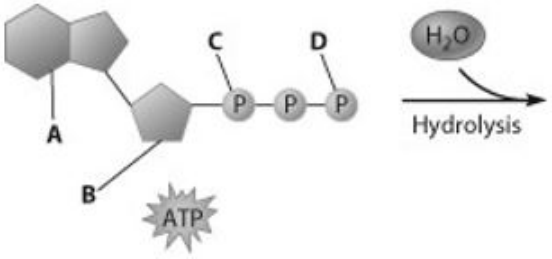
Question 48 of 55



What is true about the data in the figure?

- **A)** The dashed curved line represents a reaction that has been catalyzed by an enzyme.
- **B)** The energy of the products is higher than the energy of the reactants
- **C)** Both lines represent endergonic reactions
- **D)** The activation energy of the solid curved line is less than the dashed curved line

Question 49 of 55



Which part of the ATP molecule breaks free of the rest when an ATP molecule releases energy and forms ADP?

- **A)** Part C
- **B)** Part A
- **C)** Part B
- **D)** Part D

Question 50 of 55

How does inhibition of an enzyme-catalyzed reaction by a competitive inhibitor differ from inhibition by a noncompetitive inhibitor?

- **A)** Competitive inhibitors bind to the enzyme reversibly; noncompetitive inhibitors bind to it irreversibly.
- **B)** Competitive inhibitors change the enzyme's tertiary structure; noncompetitive inhibitors cause polypeptide subunits to dissociate.
- **C)** Competitive inhibitors interfere with the enzyme; noncompetitive inhibitors interfere with the reactants.
- **D)** Competitive inhibitors bind to the active site of the enzyme; noncompetitive inhibitors bind to a different site.

Question 51 of 55

The active site of an enzyme is

- **A)** the region of an enzyme that attaches to a substrate
- **B)** the highly changeable portion of an enzyme that adapts to fit the substrates of various reactions
- **C)** the region of a product that detaches from the enzyme
- **D)** the region of a substrate that is changed by an enzyme

Question 52 of 55

You have 6 mL of cells you need to treat with Hydrogen Peroxide (H_2O_2) such that the final concentration of H_2O_2 is 50 uM. How much of a 20 mM stock solution of H_2O_2 should you add to your cells?

Question 53 of 55

An instructor is preparing for an experiment in which she requires 225 g of phosphoric acid. The only container readily available is a 150-mL Erlenmeyer flask. She needs to know if it is large enough to contain the acid, so she checks the density (1.83 g/mL) and calculates.

What is the volume of phosphoric acid? Include units

Question 54 of 55

To make up a solution of phosphate-buffered saline (PBS), you need 15 mM Na_2HPO_4 (anhydrous) (FW:141.96 g/mol), 0.25 M NaCl (FW: 58.44 g/mol), and 2 mM KH_2PO_4 (FW: 136.09 g/mol). How many grams of each will you need to make up 750mL of PBS?

A)
B)
C)

Question 55 of 55

A novel process for obtaining magnesium from sea water involves several reactions. Write a balanced chemical equation for each step of the process.

(a) The first step is the decomposition of solid calcium carbonate from seashells to form solid calcium oxide and gaseous carbon dioxide.

(b) The second step is the formation of solid calcium hydroxide as the only product from the reaction of the solid calcium oxide with liquid water.

(c) Solid calcium hydroxide is then added to the seawater, reacting with dissolved magnesium chloride to yield solid magnesium hydroxide and aqueous calcium chloride.

(d) The solid magnesium hydroxide is added to a hydrochloric acid solution, producing dissolved magnesium chloride and liquid water.

(e) Finally, the magnesium chloride is melted and electrolyzed to yield liquid magnesium metal and diatomic chlorine gas.
