

# End-Semester

Started: Nov 13 at 10:01am

## Quiz Instructions

Please note by attempting all the questions, you will abide by your moral code and the honor code of the institute. There are a total of 60 Questions for 64 points. The time limit is 1 hour unless given extra time. There will no re-exam for those who missed.

Good Luck.

### Question 1

1 pts

Eukaryotic mRNA is typically processed and certain portions are removed. What are those portions called?

☐ poly-A tails

☐ caps

☒ Introns

☐ exons

### Question 2

1 pts

DNA is purified using a technique called gel- electrophoresis where typically electric charge is applied and result in band formation in the final gel form. This is because?

☐ DNA has different nucleotide compositions

- ☐ DNA is pure
- ☐ DNA has different genes
- ☒ DNA has different lengths
- ☐ DNA is from different organisms

**Question 3****1 pts**

What is bacterial transformation?

- ☐ It is the transformation of a bacterium into a pathogenic form.
- ☒ Transformation is a process in which external DNA is taken up by a cell, thereby changing morphology and physiology.
- ☐ The transformation of a bacterium occurs during replication.
- ☐ Transformation of bacteria involves changes in its chromosome.

**Question 4****1 pts**

If the sequence of the 5' to 3' strand is GTCGCATT, then the complementary sequence has which sequence?

- ☐ 3'-TTACGATG-5'
- ☐ 3'-AATGCTAC-5'
- ☒ 3'-CATCGTAA-5'
- ☐ 3'-GTAGCATT-5'

**Question 5****1 pts**

The nervous system in humans comprises of

- ☐ the autonomic and the somatic nervous systems
- ☐ the central nervous system and the somatic nervous system
- ☐ the sympathetic and the parasympathetic nervous systems
- ☒ the central nervous system and the peripheral nervous system

**Question 6****1 pts**

Carbohydrates serve various functions in different animals. Arthropods like insects, crustaceans, and others, have an outer layer, called the exoskeleton, which protects their internal body parts. This exoskeleton is made mostly of chitin. Chitin is also a major component of the cell walls of fungi, the kingdom that includes molds and mushrooms. Chitin is a polysaccharide. What is the major difference between chitin and other types of polysaccharides?

- ☐ Chitin is similar to amylase, but with sulfur linkages between the monomers.
- ☐ Chitin contains phosphate groups that give it a stiffness not found in other polysaccharides.
- ☒ Chitin is a nitrogen-containing polysaccharide, with repeating units of N-acetyl- $\beta$ -D-glucosamine, a modified sugar.
- ☐ Chitin is similar to inulin, a polysaccharide with fructose, but with additional glucose monomers.

**Question 7****1 pts**

After cleaving with the restriction enzymes, DNA molecules with the complementary sticky ends can get together by the action of another enzyme. What interactions or bonds contribute to that association.

- ☐ hydrogen bond
- ☒ phosphodiester linkages
- ☐ covalent bonds
- ☐ disulfide bond
- ☐ ionic bonds

**Question 8****1 pts**

Human DNA and a particular plasmid both have sites that are cut by the enzymes HindIII and EcoRI (Names of Enzymes). How can the scientist make recombinant DNA.

- ☐ use HindIII to cut both the plasmid and the human DNA
- ☐ use EcoRI to cut both the plasmid and the human DNA
- ☐ cut the plasmid with EcoRI and the human DNA with HindIII
- ☒ a or b
- ☐ b or c

**Question 9****1 pts**

Nucleic acids can be separated using a technique called Gel electrophoresis. This uses differences in

- ☐ relative proportions of thymine and cytosine
- ☐ relative proportions of adenine and guanine
- ☐ length (molecular weight)
- ☒ charge
- ☐ nucleotide sequence

### Question 10

1 pts

One of the following techniques helps in a significant increase in the DNA or RNA fragment

- ☒ Polymerase chain reaction
- ☐ Gel electrophoresis
- ☐ Nuclear hybridization
- ☐ Nucleic acid extraction

### Question 11

1 pts

As part of the innate immune response, how does the human body use a chemical barrier?

- ☒ Mucus secretions trap and rinse pathogens out of the body.
- ☐ Urination carries pathogens out of the urinary tract.
- ☐ Cilia in the nasal passages and respiratory tract push mucus containing trapped pathogens out of the body.
- ☐ Low pH conditions in the stomach kill some pathogens and prevent other pathogens from growing.

**Question 12****1 pts**

What is the complement system?

- ☐ The complement system contains macrophages that phagocytize foreign pathogens.
- ☐ The complement system monitors MHC I molecules on cells and destroys any cell that displays an antigen belonging to a pathogen.
- ☒ The complement system is made up of antibodies specific to each pathogen that are synthesized when a pathogen enters the body.
- ☐ The complement system contains a group of about 20 proteins in the blood that attack pathogens in a cascading fashion to mark and destroy them.

**Question 13****1 pts**

During the transcription process, what is/are synthesized.

- ☒ mRNA only
- ☐ mRNA, tRNA, and rRNA
- ☐ mRNA and tRNA
- ☐ tRNA and protein
- ☐ mRNA, rRNA,

**Question 14****1 pts**

Humans have innate and adaptive immunity. How does the adaptive immunity work?

- ☒ A person is born with the ability to develop a specific immune response against any pathogen within minutes of being exposed to that pathogen.
- ☐ A person does not have specific immune response against a pathogen, but develops a specific response to that pathogen that is rapidly recalled later if infection by the same pathogen occurs again.
- ☐ A person is born having a specific immune responses against any pathogen that the body is exposed to.
- ☐ A person does not have any immune response against a pathogen, but develops a temporary specific response to that pathogen that is then forgotten.

**Question 15****1 pts**

In what way the innate and adaptive immunity responses differ ?

- ☒ The adaptive immune system produces a longer-lasting defense than the innate immune system.
- ☐ The innate immune system produces a more specific defense than the adaptive immune system.
- ☐ The adaptive immune system is faster-acting than the innate immune system.
- ☐ The innate immune system has a more sophisticated memory than the adaptive immune system

**Question 16****1 pts**

**skin is a great barrier for the human body to protect against infecting pathogens. But do we require more? why?**

- ☒ Pathogens could enter the body through several places that are not covered by skin that need to have a barrier to prevent infection.
- ☐ Skin does not provide a broad coverage against invasion of the body by any foreign particle, so it is not a very effective barrier.
- ☐ Skin works only against some types of bacteria. To prevent the entry of other pathogens, other physical or chemical barriers are needed.
- ☐ Skin acts only as a chemical barrier against pathogens. The body also needs physical barriers to prevent various types of infection

**Question 17****1 pts**

A person given a flu vaccine in November comes down with a severe case of influenza in January. What can you conclude about the flu vaccine?

- ☐ The flu vaccine suppressed antibodies in the person's body that were specific to a particular flu virus. Unfortunately, the flu virus that infected the person later in January was similar enough that led to the infection.
- ☐ The flu vaccine suppressed antibodies in the person's body that were specific to a particular flu virus. Unfortunately, the flu virus that infected the person later in January was different enough that led to the infection
- ☐ The flu vaccine elicited antibodies in the person's body that were specific to a particular flu virus. Unfortunately, the flu virus that infected the person later in January was similar enough that led to the infection



- ☒ The flu vaccine elicited antibodies in the person's body that were specific to a particular flu virus. Unfortunately, the flu virus that infected the person later in January was different enough that led to the infection

**Question 18****1 pts**

The fatty acids of triglycerides are classified as saturated, unsaturated, or trans fats. What is it about the structure of these compounds that distinguishes them from each other?

- ☐ Saturated and unsaturated fats have stable configurations, while trans fats are transient.
- ☒ Trans fats are a type of unsaturated fat where the hydrogens around the double bond are not in the same plane.
- ☐ Saturated fats and trans fats contain the greatest possible number of hydrogen atoms, while unsaturated fats do not.
- ☐ Trans fats are a type of saturated fat that is produced artificially by hydrogenation.

**Question 19****1 pts**

- An insect population was formally distinguished by a mix of colors on their thorax and legs. Now, the population is split into two subgroups, purple-legged and orange-legged. Researchers hypothesize that the purple-legged group may be increased resistance to the Bt (*Bacillus thuringiensis*) toxin. Which idea supports this observation?

- ☐ Hybridization
- ☒ Transgenesis

- ☐ Recombination
- ☐ Natural selection

**Question 20****1 pts**

- How do phospholipids contribute to cell membrane structure?
- ☐ Phospholipids orient their tails toward the polar molecules and their heads toward the nonpolar side of the membrane, forming a bilayer.
  - ☐ Phospholipids orient their heads toward the nonpolar molecules and their tails toward the interior of the membrane, forming a bilayer.
  - ☒ Phospholipids orient their heads toward the polar molecules and tails in the interior of the membrane, forming a bilayer.
  - ☐ Phospholipids orient their tails toward the polar molecules of water solutions and their heads toward in the interior of the membrane, forming a bilayer.

**Question 21****1 pts**

Which of the following is true for a carbohydrate?

- ☐ Carbohydrates are present only on the interior surface of a membrane.
- ☐ Carbohydrates span only the interior of a membrane.
- ☐ Carbohydrates are in contact with the aqueous fluid both inside and outside the cell.
- ☒ Carbohydrates are present only on the exterior surface of a membrane.

**Question 22****1 pts**

How does the sodium-potassium pump make the interior of the cell negatively charged?

- ☒ By expelling more cations than it takes in
- ☐ By taking in and expelling an equal number of cations
- ☐ By expelling anions
- ☐ By pulling in anions

### Question 23

2 pts

Which of the following statements about glycosaminoglycans are true?

- ☒ They contain derivatives of either glucosamine or galactosamine.
- ☒ They include heparin, chondroitin sulfate, and keratan sulfate.
- ☐ They constitute 5% of the weight of proteoglycans.
- ☐ They have repeating units of four sugar groups
- ☒ They contain positively charged substituent groups.

### Question 24

1 pts

Phospholipids tend to spontaneously orient themselves into something resembling a membrane. Why?

- ☐ Phospholipids are lipophilic molecules. The polar head faces toward water, and the nonpolar fatty acid tails face toward other fatty acid tails.

- ☒ Phospholipids are amphipathic molecules. The polar head faces toward water, and the nonpolar fatty acid tails face toward other fatty acid tails.
- ☐ Phospholipids are hydrophilic molecules. The polar head faces toward water, and the nonpolar fatty acid tails face toward other fatty acid tails.
- ☐ Phospholipids are amphipathic molecules. The nonpolar head faces toward other fatty acid tails, and the polar fatty acid tails face toward water.

**Question 25****1 pts**

Which of the following statements about I-cell disease are correct?

- ☒ It arises from the absence of a mannose 6-phosphate receptor in the trans Golgi complex.
- ☐ It results from a chromosomal deletion of the genes specifying at least eight acid hydrolases ordinarily found in the lysosomes.
- ☐ It results from the inability of lysosomes to hydrolyze glycosaminoglycans and glycolipids.
- ☐ It arises from a deficiency in an enzyme that transfers mannose 6-phosphate onto a core oligosaccharide that is normally found on lysosomal enzymes.

**Question 26****3 pts**

Identify the true statement about Lectins from the given choices

- ☐ contain only a single binding site for carbohydrate.
- ☐ are glycosaminoglycans.
- ☐ mediate cell-to-cell recognition.
- ☐ recognize specific oligosaccharide patterns.

- ☐ are produced by plants and bacteria.

**Question 27****1 pts**

Over the period of many years, a beetle species that feeds on rice gradually became resistant to insecticide. Which of the following best explains this? .

- ☐ Beetles learned to avoid the spray and passed the knowledge to their offspring.
- ☐ Some beetles learned to tolerate the insecticide and passed this ability to their offspring.
- ☐ The insecticide caused the beetles to reproduce more quickly than normal.
- ☐ The insecticide mutated the beetles exposed to the biggest doses.
- ☐ Those beetles with natural resistance to the insecticide had the most offspring

**Question 28****1 pts**

Researchers testing new drugs usually give the drug to one group of people and give placebos, “sugar pills,” to another group. The group receiving the sugar pill

- ☐ is needed so that the test will be repeated enough times.
- ☐ a. constitutes the experimental group.
- ☐ is the control group.
- ☐ is a backup in case some of the people getting the drug drop out of the test.
- ☐ is the experimental variable

**Question 29****1 pts**

How do retroviruses, such as HIV, differ from other viruses?

- ☐ They can reproduce only inside of living cells.
- ☐ They are much simpler than other viruses.
- ☐ They contain nucleic acids that code for making proteins.
- ☐ They contain DNA that is used as a template to make RNA.
- ☐ They contain RNA that is used as a template to make DNA

**Question 30****1 pts**

A mule is a cross between a horse and a donkey. Why do you think a mule is not considered a “genetically modified organism”?

- ☐ because half the genes come from each parent
- ☐ because horses and donkeys are so much alike
- ☐ Actually, a mule is considered a genetically modified organism
- ☐ because a mule only inherits horse genes
- ☐ because a mule is produced naturally, not by artificial means

**Question 31****1 pts**

Archaeologists unearthed a human skull with a small dried fragment of the scalp still attached. They extracted a tiny amount of DNA from the scalp tissue. How could they obtain sufficient DNA for an analysis of the ancient man's genes?

- ☐ use a nucleic acid probe
- ☐ subject the DNA to restriction enzymes
- ☐ subject the DNA to electrophoresis
- ☒ use the polymerase chain reaction
- ☐ use reverse transcriptase

**Question 32****1 pts**

Which of the following is cited as a possible risk of genetically modified crop plants?

- ☐ GM crops actually present no risks
- ☐ creation of new pests that might be hard to control
- ☒ all of the above
- ☐ hybridization with wild relatives
- ☐ allergic reactions

**Question 33****1 pts**

The relationship between an antigen and an antibody is most like

- ☒ a recipe and a cake
- ☐ a battery and a flashlight.
- ☐ a hammer and a nail.
- ☐ a left foot and a right foot.
- ☐ a hand and a glove.

**Question 34****1 pts**

The idea behind vaccination is to induce \_\_\_\_\_ - \_\_\_\_\_ without the vaccinated individual having to get sick.

- ☒ passive immunity
- ☐ inflammation
- ☐ anaphylactic shock
- ☐ the primary immune response
- ☐ nonspecific defenses

**Question 35****1 pts**

Researchers found that when laboratory rats were already infected with a virus, they were better able to resist infection by a second completely different virus. The first infection apparently caused \_\_\_\_\_, which protected the rats from the second infection.

- ☐ passive immunity
- ☒ secretion of interferons



- ☐ cell agglutination
- ☐ production of antibodies
- ☐ increased stress

**Question 36****1 pts**

When you are immune to a disease

- ☐ B cells are stimulated to quickly engulf invaders.
- ☐ your innate defenses are strengthened.
- ☐ certain lymphocytes are able to make the proper antibodies quickly.
- ☒ antibodies against the disease are constantly circulating in your blood.
- ☐ antigens are altered so invaders can no longer attack your tissues

**Question 37****1 pts**

Which of the following best describes an action potential?

- ☒ flow of neurotransmitter chemical along a neuron
- ☐ flow of electricity along a neuron
- ☐ movement of tiny filaments of protein inside a neuron
- ☐ passage of ions through the membrane of a neuron
- ☐ change in a neuron so that the inside becomes more negatively charged

**Question 38****1 pts**

Which of the following maintains resting potential, the difference in electrical charge inside and outside a neuron membrane that enables the cell to transmit a signal?

- ☐ opening of sodium and potassium channels in the membrane
- ☐ charges that pull sodium and potassium through the membrane
- ☐ the myelin sheath, which prevents ions from entering or leaving
- ☐ the mutual repulsion of sodium and potassium ions
- ☒ transport and leakage of sodium and potassium into and out of the cell

**Question 39****1 pts**

A doctor injects a patient with what the doctor thinks is an isotonic saline solution. The patient dies, and an autopsy reveals that many red blood cells had burst. Was the solution the doctor injected really isotonic?

- ☒ No, the solution was hypertonic.
- ☐ No, the solution was hypotonic.
- ☐ Yes, the solution was isotonic
- ☐ No, the solution was either hypotonic or hypertonic.

**Question 40****1 pts**

### A neuron's myelin sheath

- ☐ enables the neuron to form the proper connections with other neurons.
- ☐ covers the neuron cell body
- ☒ protects the neuron from damage.
- ☐ makes action potentials travel faster.
- ☐ secretes neurotransmitter into the synaptic cleft.

### Question 41

**1 pts**

Identify the true statement about glycosaminoglycans.

- ☒ They constitute 5% of the weight of proteoglycans.
- ☐ They contain positively charged substituent groups.
- ☐ ) They have repeating units of four sugar groups
- ☐ They include heparin, chondroitin sulfate, and keratan sulfate.

### Question 42

**1 pts**

Only one of the following statements about the diffusion of lipids and proteins in membranes is NOT true. Identify the same?

- ☐ Lipids diffuse across and in the plane of the membrane at equal rates
- ☐ In general, lipids show a faster lateral diffusion than do proteins.
- ☐ Many membrane proteins can diffuse rapidly in the plane of the membrane.

- ☐ Membrane proteins do not diffuse across membranes at measurable rates.

**Question 43****1 pts**

A man was admitted to the hospital suffering from abnormally low body temperature, loss of appetite, and extreme thirst. A brain scan showed a tumor located in the

- ☐ pons.
- ☒ hypothalamus.
- ☐ right cerebral hemisphere.
- ☐ cerebellum.
- ☐ corpus callosum.

**Question 44****1 pts**

Which of the following animals is least cephalized?

- ☐ ant
- ☒ clam
- ☐ human being
- ☐ fish
- ☐ flatworm

**Question 45****1 pts**

A drug that causes potassium to leak out of a neuron, increasing the positive charge on the outside, would

- ☐ act as a stimulant.
- ☐ speed up action potentials travelling the length of the cell.
- ☐ cause the cell to release its neurotransmitter.
- ☐ make it easier to trigger action potentials in the neuron.
- ☒ inhibit transmission of action potentials by the neuron.

**Question 46****1 pts**

What is the difference between a neuron and a nerve?

- ☐ Neurons are made of white matter, nerves of gray matter.
- ☐ Neurons are found only in vertebrates.
- ☐ Nerves are found only in the central nervous system.
- ☒ A neuron is one cell, a nerve consists of parts of many cells.
- ☐ One is sensory in function, the other motor.

**Question 47****1 pts**

Which of the following maintains resting potential, the difference in electrical charge inside and outside a neuron membrane that enables the cell to transmit a signal?

- ☐ transport and leakage of sodium and potassium into and out of the cell
- ☐ the mutual repulsion of sodium and potassium ions
- ☐ opening of sodium and potassium channels in the membrane
- ☐ charges that pull sodium and potassium through the membrane
- ☐ the myelin sheath, which prevents ions from entering or leaving

**Question 48****1 pts**

What characteristic of the genetic code points to a common ancestry for all organisms?

- ☒ The code contains 64 codons.
- ☐ The code is degenerate
- ☐ The code contains stop codons
- ☐ The genetic code is almost universal.

**Question 49****1 pts**

The body produces antibodies complementary to foreign antigens. The process by which the body comes up with the correct antibodies to a given disease is most like

- ☐ ordering the lunch special at a restaurant without looking at the menu.

- ☐ going to a shoe store and trying on shoes until you find a pair that fits.
- ☐ going to a tailor and having a suit made to fit you.
- ☐ picking out a video that you haven't seen yet.
- ☐ selecting a lottery prize winner by means of a random drawing

**Question 50****1 pts**

A patient has been diagnosed as suffering from an immunodeficiency disease. Their doctor suspected the patient might be immunodeficient because

- ☐ Patient seemed to be immune to her own "self" molecules.
- ☐ Patient strongly rejected an organ transplant.
- ☐ Patient's blood showed high levels of numerous antibodies.
- ☐ Patient suffered from repeated, prolonged infections
- ☐ Patient suffered from numerous allergies.

**Question 51****1 pts**

The characteristic/s of B lymphocytes are

- ☐ attack cells that have been infected by viruses.
- ☐ multiply and make antibodies that circulate in blood and lymph.
- ☐ engulf and destroy bacteria and viruses.
- ☒ All the statements are true
- ☐ are responsible for cell-mediated immunity.

**Question 52****1 pts**

An antigen is

- ☐ a protein molecule that helps defend the body against disease.
- ☐ an invading virus or bacterium.
- ☐ a body cell attacked by an invading microorganism
- ☐ a type of white blood cell.
- ☒ a foreign molecule that evokes an immune response.

**Question 53****2 pts**

Innate immunity is a mammal's first line of defense against invaders. It is nonspecific, resisting any invader

Natural killer cell

[ Choose ]



Interferons

[ Choose ]



Mucus

[ Choose ]



Histamines

[ Choose ]





[ Choose ]



[ Choose ]

**Question 54****1 pts**

Identify the kind of interactions that are typically involved in binding a drug to the binding site of a protein.

- ☐ predominantly ionic bonds
- ☒ a combination of all the interactions stated
- ☐ predominantly hydrogen bonds
- ☐ predominantly van der Waals interactions

**Question 55****1 pts**

Which of the following statements best describes an induced fit?

- ☒ the process by which binding of a drug to a binding site alters the shape of the binding site
- ☐ the process by which a binding site alters shape such that it is ready to accept a drug
- ☐ the process by which a binding site alters the shape of the drug into the binding conformation before binding
- ☐ the process by which a drug adopts the correct binding conformation before entering a binding site

**Question 56****1 pts**

Which of the following is one of the rules in Lipinski's rule of five?

- ☐ No more than 10 hydrogen bond donor groups
- ☒ calculated logP value less than +5
- ☐ No more than five hydrogen bond acceptor groups
- ☐ A molecular weight equal to 500

**Question 57****1 pts**

Which of the following statements about high throughput screening is false?

- ☐ It is process that happens inside living cells
- ☐ It is an automated process
- ☒ . It can be carried out on large numbers of compounds in a short time
- ☐ It is carried out on a small scale

**Question 58****1 pts**

In recombinant DNA experiments, \_\_\_\_ is used to cut pieces of DNA, and \_\_\_\_ joins these segments to form recombinant DNA.

- ☐ plasmid . . . DNA ligase
- ☐ a transposon . . . a restriction enzyme

- ☒ a restriction enzyme . . . DNA ligase
- ☐ DNA ligase . . . a restriction enzyme
- ☐ a transposon . . . a plasmid

**Question 59****1 pts**

Which of the following has been produced by genetically modified microorganisms?

- ☒ human insulin
- ☐ human growth hormone
- ☐ all the statements given
- ☐ growth factor for burn treatment
- ☐ cancer drugs

**Question 60****1 pts**

At which site glycosylation of protein takes place

- ☐ Golgi Complex
- ☒ Both ER and Golgi
- ☐ Nucleolus
- ☐ Endoplasmic Reticulum
- ☐ Ribosomes

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