Foundations of Biology Fall Exam

1. A student tested different foods to determine which organic compounds were present. She based her results on the following information:

Test	Positive Reaction	Organic Compound Indicated		
brown paper	shiny spot	fat		
Benedict's solution	color change	sugar		
iodine solution	color change	starch		
Biuret's solution	color change	protein		

All four tests were performed on skim milk. The observations were that Benedict's solution changed color and Biuret's solution changed color. All other tests had negative results. Which organic compounds were present in skim milk? 4.1.1

- a. Sugar and protein
- b. Fat and sugar
- c. Sugar and starch
- d. Starch and protein
- 2. Enzymes are classified as which of the following biological organic compounds? 4.1.3
 - a. Carbohydrates
 - b. Lipids
 - c. Nucleic acids
 - d. Proteins
- 3. Some organelles have their own DNA that is distinct from the cell's nuclear DNA. This is true of which organelle? 1.1.1
 - a. Cell wall
 - b. Mitochondrion
 - c. Plasma membrane
 - d. Vacuole
- 4. Pollen in plants is *most similar* to which type of cell in humans? 1.1.3
 - a. Egg
 - b. Embryo
 - c. Sperm
 - d. Zygote

5. Protein synthesis occurs at which of the structures shown below? 1.1.1



- a. I
- b. II
- c. III
- d. IV
- What would happen if an animal cell were placed in a fluid containing less salt than inside the cell?
 4.2.2
 - a. The cell membrane would rupture.
 - b. The cytoplasm of the cell would expand.
 - c. Osmosis would carry fluid out of the cell.
 - d. No change would take place.
- 7. Why do cells need buffering agents? 1.2.1
 - a. To function properly in an extremely acid internal environment
 - b. To function properly in an extremely basic internal environment
 - c. To minimize the changes in pH of the internal environment
 - d. To maintain constant internal environment at a pH of 10
- 8. Consider this graph:



Which statement *best* summarizes the information in the graph? 1.2.1

- a. The cells survive best under acidic conditions.
- b. The cells survive best under basic conditions.
- c. These cells would survive better in distilled water.
- d. The survival of these cells does not affect pH.

- 9. Placing wilted lettuce in cold water will make it crisp again. Which statement *best* describes what happens to restore the lettuce to its original condition? 4.2.2
 - a. Water leaves the lettuce cells by diffusion.
 - b. Water entered the cells of the lettuce by osmosis.
 - c. Osmosis caused salts to enter the lettuce cells.
 - d. Salts in the leaf caused water to leave the cells.
- 10. Which cell process will move substances against a concentration gradient? 4.2.2
 - a. Diffusion
 - b. Facilitated diffusion
 - c. Active transport
 - d. Osmosis
- 11. Individuals who lack lactase are unable to break down the sugar lactose. Which term *best* describes lactase? 4.1.3
 - a. Enzyme
 - b. Fatty acid
 - c. Lipid
 - d. Starch
- 12. The bacteria that cause tetanus can survive in a puncture wound that has healed on the outer surface of the skin. Through what process do these bacteria acquire the energy they need to survive? 4.2.1
 - a. Aerobic respiration
 - b. Anaerobic respiration
 - c. Chemosynthesis
 - d. Photosynthesis

13. In terms of ATP production, which process results in the most stored energy? 4.2.1

- a. Aerobic respiration
- b. Anaerobic respiration
- c. Fermentation
- d. Photosynthesis
- 14. Which statement *best* distinguishes aerobic from anaerobic respiration? 4.2.1
 - a. Only aerobic respiration involved fermentation.
 - b. Only anaerobic respiration occurs in the mitochondria.
 - c. Only aerobic respiration requires oxygen.
 - d. Only anaerobic respiration produces carbon dioxide.

15. Human sperm cells must move rapidly, often against gravity, in order to reach the egg before they die. Based on this information, which organelle would be more abundant in a sperm cell than a skin cell?

1.1.1

- a. Chloroplasts
- b. Ribosomes
- c. Nuclei
- d. Mitochondria
- 16. Which *most accurately* describes the difference in ATP production between aerobic respiration and anaerobic respiration? 4.2.1
 - a. Aerobic respiration produces more ATP than anaerobic respiration.
 - b. Anaerobic respiration produces more ATP than aerobic respiration.
 - c. Only anaerobic respiration produces measurable amounts of ATP.
 - d. Anaerobic and aerobic respiration produce the same amount of ATP.
- 17. Why is anaerobic respiration, in addition to aerobic respiration, utilized by humans during strenuous physical activity? 4.2.1
 - a. Because perspiration increases
 - b. Because blood pressure increases
 - c. Because oxygen supply is inadequate
 - d. Because the heart beats faster
- 18. A segment of a DNA strand has the following bases:

TAC GAT

What is the complementary strand of DNA? 3.1.1

- a. UAG CAU
- b. TAG CAT
- c. ATG CTA
- d. AUG CUA

19. Which process must occur before DNA information is moved out of the nucleus by mRNA? 3.1.1

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

20. Which relationship is *most similar* to the relationship below? 3.1.2 tRNA : ribosome

- a. Book : publisher
- b. Truck: factory
- c. Key: lock
- d. Baker : pie

- 21. Before a cell goes through either mitosis or meiosis, which process *must* be carried out by the DNA in the nucleus? 1.2.2
 - a. Replication
 - b. Nondisjunction
 - c. Transcription
 - d. Translation
- 22. The two molecules of DNA produced by successful replication have which characteristics? 3.1.1
 - a. They each contain identical chromosomes.
 - b. They each have different combinations of guanine, adenine, thymine, and cytosine.
 - c. They each contain one new and one old strand.
 - d. Their helixes twist in opposite directions.
- 23. Sexual reproduction provides for what to occur? 3.2.1
 - a. Cloning
 - b. Budding
 - c. Genetic stability
 - d. Genetic variation
- 24. Which term *best* describes the type of cell division in which parent cells produce daughter cells with the same number of chromosomes as the parent cells? 1.2.2
 - a. Mitosis
 - b. Meiosis
 - c. Spermatogenesis
 - d. Oogenesis
- 25. Which is responsible for most genotypic and phenotypic variation among humans? 3.2.1
 - a. Meiosis
 - b. Budding
 - c. Mitosis
 - d. Regeneration
- 26. Several mating between the same male black guinea pig and female brown guinea pig produce a total of 12 brown and 14 black guinea pigs. If black is dominant and brown is recessive, what are the genotypes of the parents? 3.2.2
 - a. BB x bb
 - b. Bb x Bb
 - c. BB x Bb
 - d. Bb x bb

- 27. Most sex-linked, recessive traits including hemophilia and color blindness appear in males. This phenomenon is *best* explained by which statement? 3.2.2
 - a. Males have an X chromosomes with dominant genes.
 - b. Most of the genes on the X and Y chromosomes of males are recessive.
 - c. In males, the recessive sex-linked genes appear only on the Y chromosomes.
 - d. In males, the Y chromosome lacks the genes needed to mask the recessive genes on the X chromosome.
- 28. Examine the tables below.

Couple	Mother's Blood Type	Father's Blood Type
Ι	AB	о
II	0	А
Ш	в	AB

Baby	Baby's Blood Type
х	AB
Y	А
Z	О

Which baby belongs to each of the couples? 3.2.2

- a. I-X, II-Y, III-Z
- b. I-Y, II-Z, III-X
- c. I-Z, II-X, III-Y
- d. I-X, II-Z, III-Y
- 29. Huntington's disease is a dominant trait. What are the chances that a child will develop Huntington's disease if one parent is heterozygous and the other is normal? 3.2.2
 - a. 0 out of 4
 - b. 1 out of 4
 - c. 2 out of 4
 - d. 3 out of 4
- 30. Some flowers show incomplete dominance. If RR = white and R'R' = red, which phenotypic ratio would be expected in the offspring of two pink flowers? 3.2.2
 - a. 4 red : 0 pink : 0 white
 - b. 0 red : 4 pink : 0 white
 - c. 3 red : 0 pink : 1 white
 - d. 1 red : 2 pink : 1 white
- 31. A couple has five children, all with blood type A. The mother's blood type is O, and the father's blood type is A. Based on this information, which describes the *most probable* genotype of the father? 3.2.2
 - a. Diploid
 - b. Haploid
 - c. Heterozygous
 - d. Homozygous

32. The diagram below represents DNA fingerprints which are the result of gel electrophoresis done on several DNA samples found at a crime scene.



Gel Electrophoresis Results

Which suspect is linked to the crime scene by this DNA analysis? 3.3.3

- a. Suspect A
- b. Suspect B
- c. Suspect C
- d. Suspect D

33. The nucleus of a eukaryotic cell is correctly described by which structure/function pairing? 1.1.2

- a. Multi-folded inner membrane/energy production
- b. Phospholipid bilayer membrane/protein synthesis
- c. Single porous membrane/sugar storage
- d. Double membrane/DNA replication
- 34. Which group of four components are found in prokaryotic cells? 1.1.2
 - a. Ribosomes, nucleus, cilia, cell wall
 - b. Ribosomes, DNA strand, flagella, cell wall
 - c. Chloroplast, DNA strand, cilia, vacuole
 - d. Chloroplast, nucleus, flagella, vacuole

35. Which of the cells characterized in the chart below is a prokaryotic cell? 1.1.2



- a. Cell A
- b. Cell B
- c. Cell C
- d. Cell D
- 36. The structure of the digestive tube in the grasshopper and earthworm consists of many folds. The folds affect the efficiency of food absorption by which of the following functions? 1.1.3
 - a. Increasing surface area
 - b. Reducing transpiration
 - c. Increasing hormone secretion
 - d. Reducing storage of sugar
- 37. Which would *most likely* be caused by environmental conditions? 3.2.3
 - a. Lung cancer
 - b. Hemophilia
 - c. Cystic fibrosis
 - d. Sickle cell anemia
- 38. A person with swollen gums rinses his mouth with warm salt water, and the swelling decreases. Which has occurred? 4.2.2
 - a. The swollen gums have absorbed the saltwater solution.
 - b. The saltwater solution lowers the temperature of the water in the gums.
 - c. The salt in the solution has moved against the concentration gradient.
 - d. The water in the gums has moved from a high to a low concentration of water.
- 39. One of the parents of a child has phenylketonuria (PKU), which is caused by recessive alleles. The other parent does not have the PKU alleles. What is the chance that the couple will have a child with phenylketonuria? 3.2.2
 - a. 0%
 - b. 50%
 - c. 75%
 - d. 100%

40. This chart represents amino acids that are coded from different combinations of mRNA codons.

First Base	Second Base							Third Base	
	U		С		Α		G		
	UUU	Phenylalanine	UCU	Serine	UAU	Tyrosine	UGU	Cysteine	U
U	UUC	Phenylalanine	UCC	Serine	UAC	Tyrosine	UGC	Cysteine	С
	UUA	Leucine	UCA	Serine	UAA	Stop	UGA	Stop	Α
	UUG	Leucine	UCG	Serine	UAG	Stop	UGG	Tryptophan	G
	CUU	Leucine	CCU	Proline	CAU	Histidine	CGU	Arginine	U
С	CUC	Leucine	CCC	Proline	CAC	Histidine	CGC	Arginine	С
	CUA	Leucine	CCA	Proline	CAA	Glutamine	CGA	Arginine	Α
	CUG	Leucine	CCG	Proline	CAG	Glutamine	CGG	Arginine	G
	AUU	Isoleucine	ACU	Threonine	AAU	Asparagine	AGU	Serine	U
Α	AUC	Isoleucine	ACC	Threonine	AAC	Asparagine	AGC	Serine	С
	AUA	Isoleucine	ACA	Threonine	AAA	Lysine	AGA	Arginine	Α
	AUG	Methionine or start	ACG	Threonine	AAG	Lysine	AGG	Arginine	G
	GUU	Valine	GCU	Alanine	GAU	Aspartic Acid	GGU	Glycine	U
G	GUC	Valine	GCC	Alanine	GAC	Aspartic Acid	GGC	Glycine	С
	GUA	Valine	GCA	Alanine	GAA	Glutamic Acid	GGA	Glycine	Α
	GUG	Valine	GCG	Alanine	GAG	Glutamic Acid	GGG	Glycine	G

Codons in mRNA

Which amino acid sequence can be coded from the DNA sequence CAG TAG CGA? 3.1.2

- a. Valine Isoleucine Glycine
- b. Valine Aspartic Acid Alanine
- c. Valine Isoleucine Alanine
- d. Valine Phenylalanine Alanine
- 41. This diagram represents samples of DNA that were cut with a restriction enzyme during DNA fingerprinting in a crime lab.



Which technique was used to produce these bands? 3.3.3

- a. Cloning
- b. Gel electrophoresis
- c. Gene splicing
- d. Genetic engineering

- 42. A scientist treats a cell with a chemical that destroys the ribosomes. As a result, which cell process will be stopped? 3.1.2
 - a. Osmosis
 - b. Photosynthesis
 - c. Protein synthesis
 - d. Respiration
- 43. Which is an example of osmosis? 4.2.2
 - a. Potassium ions moving in and out of an animal cell
 - b. Carbon dioxide moving into the leaf cells of a plant
 - c. Oxygen moving into the bloodstream from the lungs
 - d. Water moving into the root cells of a plant
- 44. This diagram shows an enzyme-substrate complex.



Which is represented by Structure X? 4.1.3

- a. Substrate
- b. Product
- c. Enzyme
- d. Complex

45. What advantage do sexually reproducing organisms have over asexually reproducing organisms? 3.2.1

- a. Genetic variation
- b. Genetic stability
- c. Increased fertilization rate
- d. Increased reproductive rate
- 46. Hitchhiker's thumb (H) is dominant to no hitchhiker's thumb (h). A woman who does not have hitchhiker's thumb marries a man who is heterozygous for hitchhiker's thumb. What is the probable genotypic ratio of their children? 3.2.2
 - a. 0% Hh : 100% hh
 - b. 50% Hh : 50% hh
 - c. 75% Hh : 25% hh
 - d. 100% Hh : 0% hh

47. This chart shows a list of messenger RNA codons.

First Base	Second Base							Third Base		
	U		С		Α		G			
	UUU	Phenylalanine	UCU	Serine	UAU	Tyrosine	UGU	Cysteine	U	
U	UUC	Phenylalanine	UCC	Serine	UAC	Tyrosine	UGC	Cysteine	С	
	UUA	Leucine	UCA	Serine	UAA	Stop	UGA	Stop	Α	
	UUG	Leucine	UCG	Serine	UAG	Stop	UGG	Tryptophan	G	
	CUU	Leucine	CCU	Proline	CAU	Histidine	CGU	Arginine	U	
С	CUC	Leucine	CCC	Proline	CAC	Histidine	CGC	Arginine	С	
	CUA	Leucine	CCA	Proline	CAA	Glutamine	CGA	Arginine	Α	
	CUG	Leucine	CCG	Proline	CAG	Glutamine	CGG	Arginine	G	
	AUU	Isoleucine	ACU	Threonine	AAU	Asparagine	AGU	Serine	U	
Α	AUC	Isoleucine	ACC	Threonine	AAC	Asparagine	AGC	Serine	С	
	AUA	Isoleucine	ACA	Threonine	AAA	Lysine	AGA	Arginine	Α	
	AUG	Methionine or start	ACG	Threonine	AAG	Lysine	AGG	Arginine	G	
	GUU	Valine	GCU	Alanine	GAU	Aspartic Acid	GGU	Glycine	U	
G	GUC	Valine	GCC	Alanine	GAC	Aspartic Acid	GGC	Glycine	С	
	GUA	Valine	GCA	Alanine	GAA	Glutamic Acid	GGA	Glycine	Α	
	GUG	Valine	GCG	Alanine	GAG	Glutamic Acid	GGG	Glycine	G	

Codons in mRNA

A strand of DNA with the sequence AAC AAG CCC undergoes a mutation, and the first A is changed to a C. How will this mutation affect the amino acid sequence? 3.1.3

- a. One amino acid will change.
- b. Two amino acids will change.
- c. All of the amino acids will change.
- d. The amino acids will remain the same.

48. Which is a use of genetically engineered bacteria? 3.3.3

- a. Identifying the remains of an unknown person
- b. Developing a DNA fingerprint for blood left at a crime scene
- c. Making human insulin for diabetics
- d. Producing corn that is resistant to herbicides
- **49**. In humans, glucose is kept in balance in the bloodstream by insulin. Which concept does this *best* illustrate? 1.2.1
 - a. Adaptation
 - b. Homeostasis
 - c. Metabolism
 - d. Organization
- 50. In which ways are photosynthesis and cellular respiration different? 4.2.1
 - a. Cellular respiration stores ATP, while photosynthesis releases ATP.
 - b. Cellular respiration produces oxygen, while photosynthesis uses oxygen.
 - c. Photosynthesis releases energy, while cellular respiration stores energy.
 - d. Photosynthesis uses carbon dioxide, while cellular respiration produces carbon dioxide.



51. This diagram shows a pedigree for a recessive genetic disorder.



What is the genotype of individual 6? 3.2.2

- a. $X^H X^H$
- b. $X^H X^h$
- c. X^HY
- d. X^hY

52. Which is the most likely function of a group of cells that contains a high number of chloroplasts? 4.2.1

- a. Respiration
- b. Transpiration
- c. Fermentation
- d. Photosynthesis
- 53. What process best explains how a nerve cell and a muscle cell can both develop from the same fertilized egg? 1.1.3
 - a. Differentiation
 - b. Natural selection
 - c. Selective breeding
 - d. Genetic engineering

- 54. During strenuous exercise, body temperature increases. The body responds to the increase in temperature by sweating, which helps to reduce the body temperature. Which is demonstrated in this situation? 1.2.1
 - a. Excretion
 - b. Metabolism
 - c. Homeostasis
 - d. Synthesis
- 55. A strand of DNA has these bases:

AGC CAT GTA TAC

What is the complementary DNA strand? 3.1.1

- a. ACG GAT CTA TAG
- b. TCG GTA CAT ATG
- c. TGC CTA GAT ATC
- d. UCG CUA CAU AUG
- 56. This diagram shows a plant cell. Which structure is found in a plant cell but is absent in an animal cell? 1.1.1



- a. 1
- b. 2
- c. 3
- d. 4

- **57**. A freshwater plant is placed in a container of saltwater. What will *most likely* happen to the cells of the plant? 4.2.2
 - a. They will swell because water will move into them.
 - b. They will swell because salt will move into them.
 - c. They will shrink because water will move out of them.
 - d. They will shrink because salt will move out of them.
- 58. During which phase of the cell cycle is the cell growing and preparing for cellular division? 1.2.2
 - a. Cytokinesis
 - b. Anaphase
 - c. Prophase
 - d. Interphase
- 59. This diagram shows the DNA fingerprints of a baby and four couples.



A hospital wants to identify the parents of a baby. Based on the DNA fingerprints, which couple is *most likely* the parents of the baby? 3.3.3

- a. Couple W
- b. Couple Z
- c. Couple Y
- d. Couple X

60. What is the result when a single cell reproduces by mitosis? 1.2.2

- a. Two cells with genetic material identical to the parent cell
- b. Two cells with half the genetic material of the parent cell
- c. Four cells with half the genetic material of the parent cell
- d. Four cells with genetic material identical to the parent cell