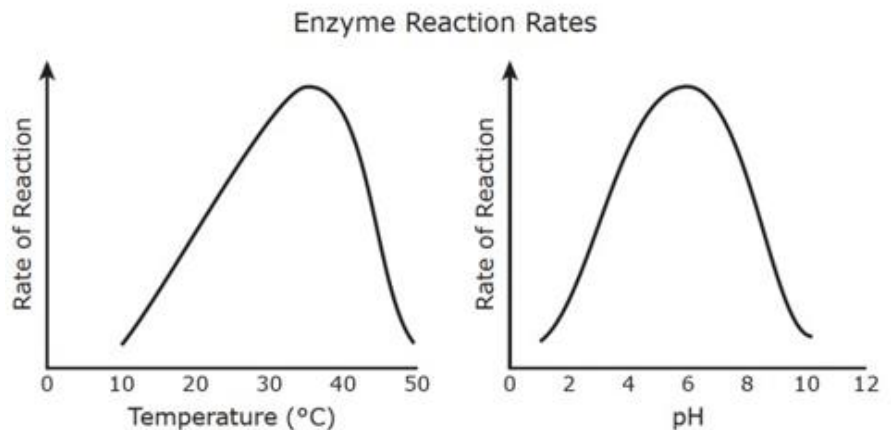


2018 Fall Semester Exam Review - KEY

1. Antibodies are composed primarily of **amino acids**. In which class of biomolecules would antibodies belong? (Circle one) Carbohydrates Lipids **Proteins** Nucleic Acids
2. What is the main function of nucleic acids? **store and transmits genetic information**
3. During digestion food must be broken down into smaller molecules for use by the body. Which type of biomolecule does this job?
(Circle one) Carbohydrates Lipids **Proteins (enzymes)** Nucleic Acids
4. The biomolecule that is structurally important in cell membranes is a...
(Circle one) Carbohydrates **Lipids** Proteins Nucleic Acids
5. Nucleic acids are most important in which characteristic of life? **Universal genetic code**
6. **(B.9C)** The graphs show the reaction rate for an enzyme across a range of temperatures and pH.

Based on these data, this enzyme functions best at what temperature and pH?

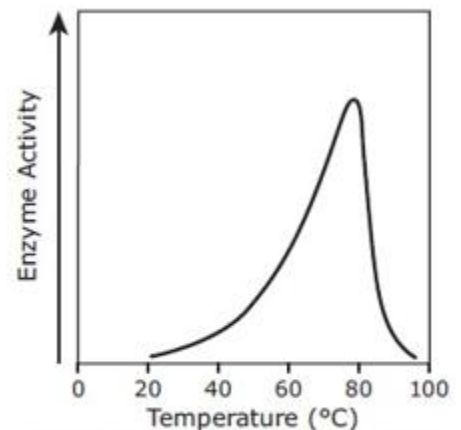
- a. Temperature of 27°C and a pH of 4
- b. Temperature of 37°C and a pH of 6**
- c. Temperature of 40°C and a pH of 8
- d. Temperature of 50°C and a pH of 10



7. **(B.9C)** Taq polymerase is an enzyme used in the polymerase chain reaction (PCR) to replicate fragments of DNA. A study published in 1976 examined the properties of Taq polymerase after the enzyme was isolated from *Thermus aquaticus*, a thermophilic bacterium that lives in the hot springs of Yellowstone National Park. The graph shows one of the results of the study.

Which statement about enzyme activity is best supported by this graph?

- a. An enzyme must be composed of multiple polypeptides, or subunits to be active
- b. An enzyme's rate of activity increases with time until it becomes inactive
- c. An enzyme function best under specific temperature conditions**
- d. An enzyme works equally well in bacteria that are adapted to high temperatures and in eukaryotic cells such as humans.

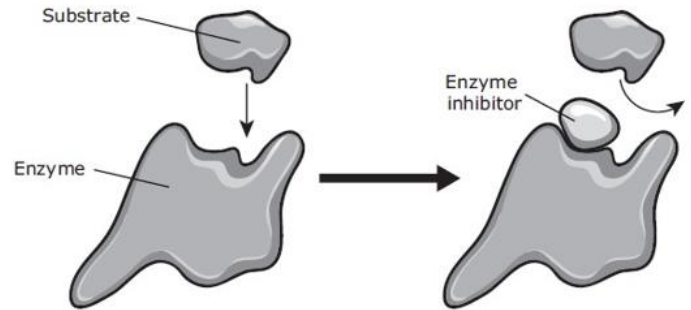


Source: Chien et al., "Deoxyribonucleic Acid Polymerase from the Extreme Thermophile *Thermus aquaticus*," *Journal of Biology*, 1976

8. (B.9C) The diagram represents one way an enzyme can be inhibited.

Which statement explains the effect of an inhibitor of an enzyme?

- a. A substrate will be able to bond with the enzyme
- b. The enzyme will likely be attacked by immune cells
- c. The enzyme will be unable to produce more enzymes
- d. A substrate will be unable to attach to the enzyme



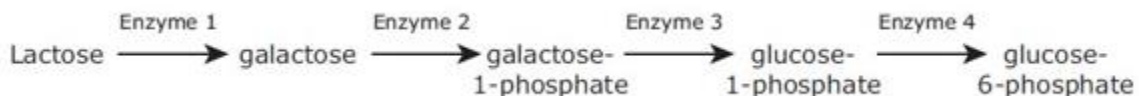
9. (B.9C) People who have Alzheimer's disease experience an increasing loss of brain function and cognition over time. Alzheimer's is characterized by a buildup of abnormal protein fragments that damage brain cells. Recently scientists have discovered an enzyme, BACE2, which decreases these abnormal protein fragments in the brain of a person with Alzheimer's disease. Which statement explains how BACE2 most likely works.

1. BACE2 breaks down into smaller pieces that react with the abnormal protein fragments, forming more complex molecule.
2. BACE2 speeds up the reaction that breaks down the abnormal protein fragments
3. BACE2 molecules link several abnormal protein fragments together, forming a complete protein
4. BACE2 is a reactant the combines with the abnormal protein fragments.

10. (B.9C) Fireflies emit light. The production of light by an organism is called bioluminescence. To generate visible light, cells in a firefly's tail produce thousands of luciferase enzymes. Luciferase binds to a chemical called luciferin. Once bound, the luciferase enzyme speeds up a chemical reaction that combines an oxygen molecule and luciferin to produce oxyluciferin. This reaction requires energy and releases light. Which of the following best describes how the luciferase enzyme speeds up the chemical reaction?

1. Luciferase increases the amount of time the light is visible.
2. Luciferase decreases the amount of energy required for the reaction to start.
3. Luciferase increases the number of sites on luciferin that must bind to the oxygen
4. Luciferase decrease the temperature of the environment inside the body of the firefly

11. (B.9C) Lactose is found in milk products. It is converted by the body into a usable form in a series of chemical reactions. The diagram shows the series of reactions that convert lactose into a usable form.



If Enzyme 2 is denatured, the levels of which substance will increase?

1. Lactose
2. Galactose
3. Galactose-1-phosphate
4. Glucose-6-phosphate

12. (B.6C) Enzymes are proteins that help increase the rate of chemical reactions inside cells. These proteins are composed of many simpler molecules called amino acids. Which of the following suggests that the shape of an enzyme determines the enzyme's function?

1. Enzymes are specific to a substrate
2. Enzymes can operate in a wide range of conditions
3. Enzymes are activated by neighboring molecules
4. Enzymes are found in all life forms

13. What are the 3 principles of the cell theory?

1. All living things are made of 1 or more cells
2. Cells come from pre-existing cells
3. Cells are the basic unit of structure and function

14. Eukaryotes have a container for their DNA. What is the name of this structure? nucleus

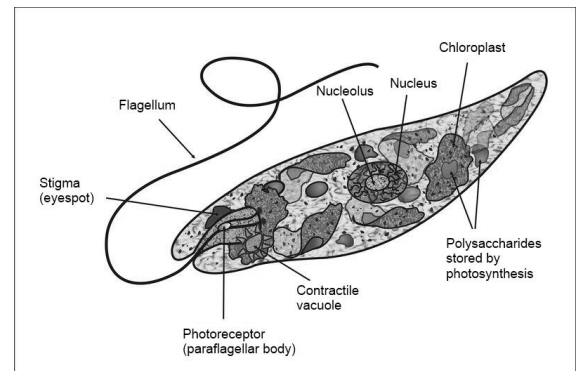
15. What is an example of a prokaryote? bacteria

16. What is the function of the nucleus? Stores DNA, controls the cell's processes, contains the nucleolus

17. Which biomolecules is the phospholipid bilayer composed of (there are 3 total)?

1. CARBOHYDRATES
2. LIPIDS
3. PROTEINS

18. The organism to the right is a (circle one)
Prokaryote Eukaryote

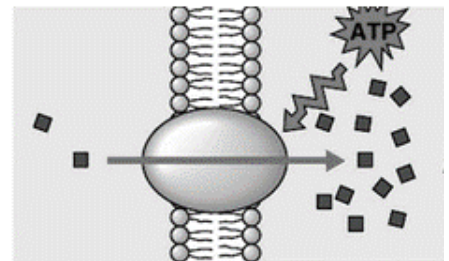


19. What is the main function of the mitochondria? To make energy via cellular respiration

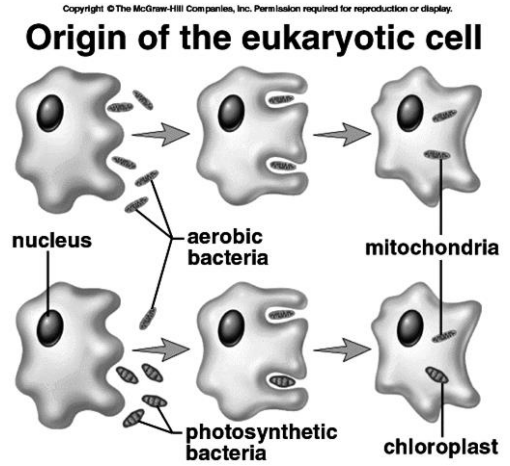
20. You will NOT find a cell wall in what kind of kind of cell? Animal cells

21. Active transport moves molecules AGAINST the concentration gradient and requires the use of ENERGY IN THE FORM OF ATP

22. Which process allows a cell to move particles from a region of lower concentration to a region of higher concentration? ACTIVE TRANSPORT



23. The image to the right depicts the **endosymbiotic theory**. This theory explains how the eukaryotic cell originated from a prokaryotic cell by the **engulfing** other specialized prokaryotic cells. Which cellular process allowed the **cell to intake these bacteria** that are now referred to as mitochondria and chloroplasts in eukaryotic cells?
ENDOCYTOSIS

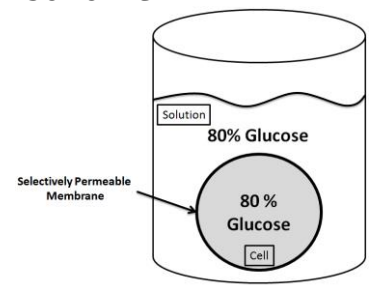
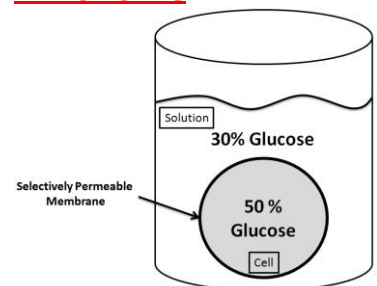
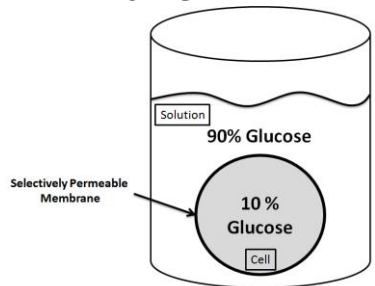


24. A cell is placed into a strong sugar solution (i.e. corn syrup) and left for 24 hours. Where will water move? (in or **out of the cell**) STRONG SUGAR SOLUTION IS HYPERTONIC

25. (B.4B) Water will move into a cell placed in a (n) **HYPOTONIC** solution.

26. (B.4B) Which condition below would cause a cell to swell and possibly burst?

- a. HYPERTONIC b. **HYPOTONIC** c. ISOTONIC

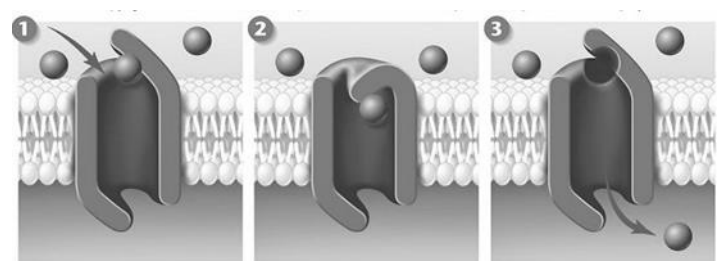


27. (B.4B) What are the types of 3 passive transport?

1. **OSMOSIS**
2. **DIFFUSION**
3. **FACILITATED DIFFUSION**

28. (B.4B) What cell process is responsible for the effect shown below? (**Hint: count the number of molecules on each side of the membrane**).

FACILITATED DIFFUSION



29. (B.4B) A person with swollen gums rinses his mouth with a warm **salt water solution**, and **the swelling decreases**. Explain what has occurred? **THE GUMS WERE PLACED IN A HYPERTONIC SOLUTION**

30. List the letters of the diagrams to the right in the correct order.

DACB

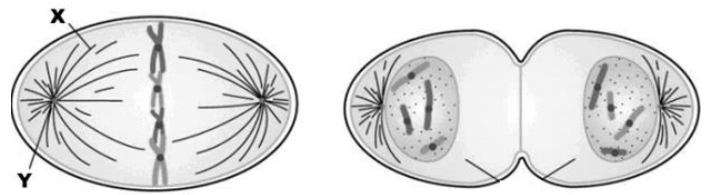


diagram A

diagram B

31. In which phase of mitosis does the nucleus disappear and the chromosomes and spindles appear for the first time?

PROPHASE

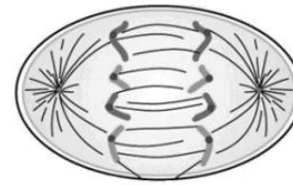
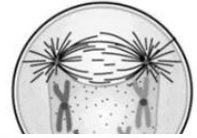


diagram C



32. The chromosomes shown in Figure 8-6 are in which phase of mitosis? **ANAPHASE**

33. What are the 3 main events of prophase?

1. **nucleus disappear**
2. **chromosomes become visible**
3. **spindles appear**

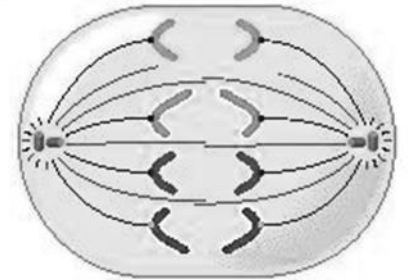


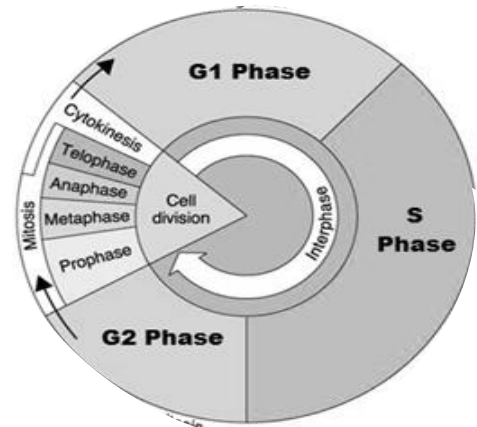
Figure 8.6

34. What happens in...

- a. G1 phase: **GROWTH, PREP FOR DNA REPLICATION**
- b. G2 phase: **GROWTH, PREP FOR CELL DIVISION**
- c. S phase: **DNA REPLICATION**
- d. M phase: **CELL DIVISION**

35. In which phase does a cell spend the majority of its life cycle. **INTERPHASE**

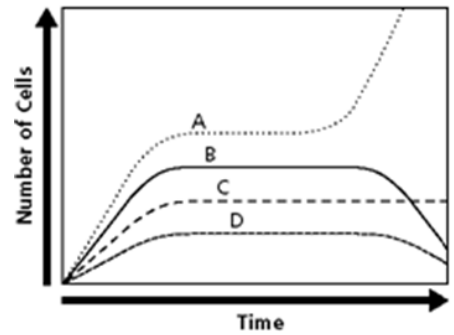
36. During normal mitotic cell division, a parent cell having four chromosomes will produce two daughter cells, each containing (how many chromosomes?) **4 CHROMOSOMES**. **GOAL MAKE IDENTICAL CELLS FOR REPAIR AND GROWTH**



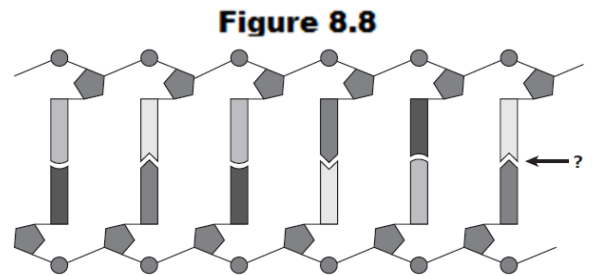
37. There are multiple checkpoints within the cell cycle. The purpose of these check points is to...

To assess whether the processes of each phase been accurately completed before moving into the next phase.

38. (B.5D) Which of the cells depicted in the line graph in Figure 8-8 are most likely cancerous? A



39. (B.6A) A model of a DNA molecule is shown to the right. The arrow indicates — Hydrogen bonds



40. (B.6A) What are the three parts of a nucleotide?

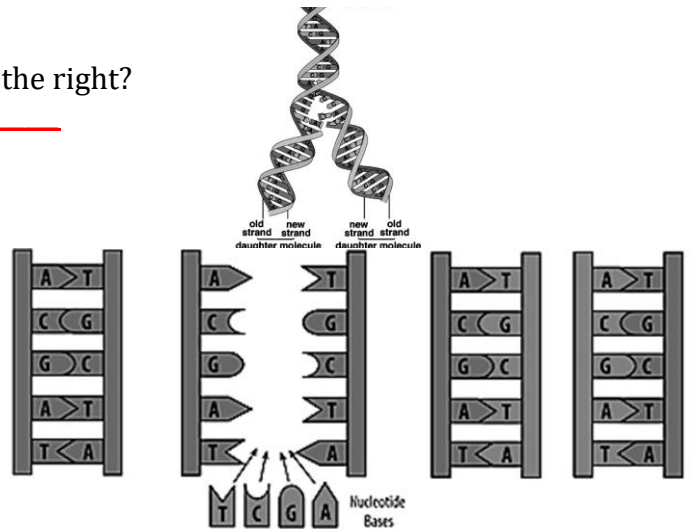
1. 5 carbon sugar
2. nitrogen base
3. phosphate

41. (B.9D) What process is represented by the diagram to the right?

DNA REPLICATION

42. (B.5A) The process represented in the graphic to the right takes place during which phase of the cell cycle?

S-PHASE



43. (B.9D) Given the DNA strand, 5' AGTCAT 3', what would the complementary strand look like that is produced during DNA REPLICATION?

3' TCAGTA 5'

44. (B.9D) What is the primary function of DNA replication? To ensure daughter cells have a complete copy of the DNA.

45. (B.6A) Individuals differ in their appearance and physical makeup because of what part of the DNA molecule? Sequence of DNA nucleotides

46. (B.6C) In what 3 ways is RNA different from DNA?

1. URACIL
2. RIBOSE
3. SINGLE STRAND
4. CAN LEAVE NUCLEUS

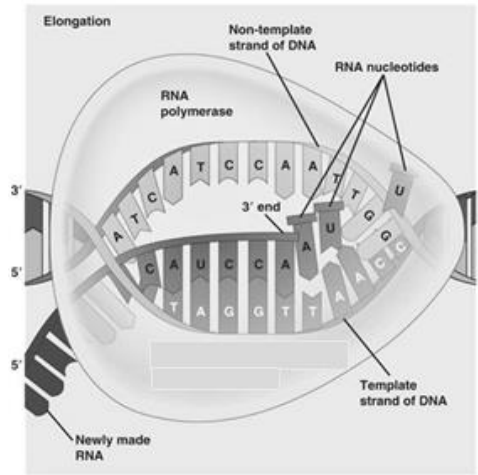
47. (B.6C) Base pairing rules state that in RNA adenine will always bond with which nucleotide? URACIL

48. (B.6C) What process is represented in the diagram to the right? **TRANSCRIPTION**

49. (B.6C) Where in the cell does this process take place? **NUCLEUS**

50. (B.6C) (B.9C) There are many enzymes that play an important role in DNA replication and protein synthesis. What enzyme is involved in the production of mRNA? **RNA POLYMERASE**

51. (B.6C) What is the mRNA strand that would complement this DNA strand AGTCGA? **UCAGCU**



Each of these steps shows an event in the processes of transcription and translation.

1. mRNA travels from the nucleus to the cytoplasm
2. DNA unwinds; mRNA nucleotides form mRNA
3. Ribosomes bind to mRNA and “read” the message
4. tRNA brings amino acids to the ribosome

52. (B.6C) What is the correct order of the steps above? **2, 1, 3, 4**

53. (B.6C) Which part of this diagram represents the process of Translation? **D.**

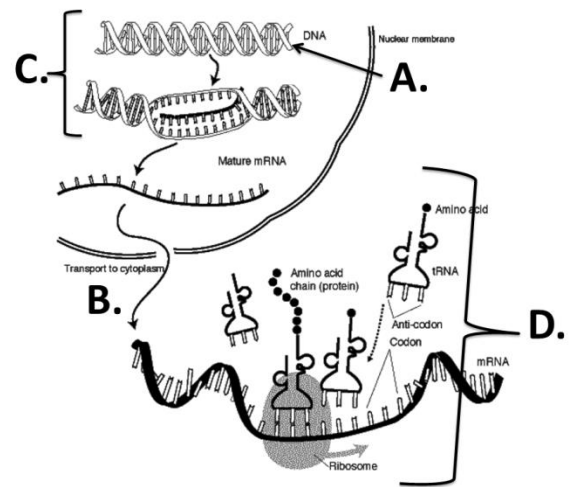
54. (B.6C) What occurs during Translation? **THE mRNA STRAND IS READ BY THE RIBOSOME TO MAKE A PROTEIN**

55. (B.6C) During translation, amino acids continue to be added to the growing protein (polypeptide) chain until reaching... **STOP CODON**

56. (B.6C) Using the chart, transcribe and translate the following DNA strand: ATA GGA AAG
TYR, PRO, PHE

57. (B.6C) (B.6E) A cell is damaged in such a way that it's unable to produce RNA from DNA. What would be a result of this damage?

- a. **The genetic code could not be translated into proteins.**
- b. The genetic material could be replicated during mitosis.
- c. The structure of DNA would not be able to form a double helix.
- d. The genetic material would only be able to exist in the cytoplasm.

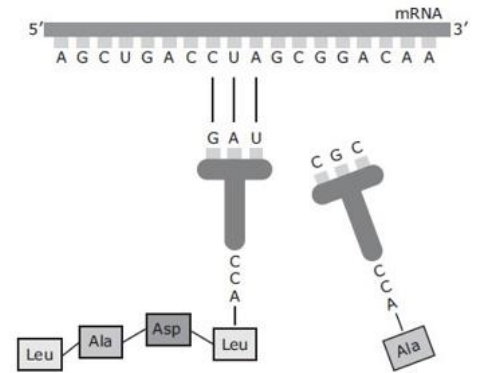


		2nd base in codon				
		U	C	A	G	
1st base in codon	U	Phe Phe Leu Leu	Ser Ser Ser Ser	Tyr Tyr STOP STOP	Cys Cys STOP Trp	U C A G
	C	Leu Leu Leu Leu	Pro Pro Pro Pro	His His Gln Gln	Arg Arg Arg Arg	U C A G
	A	Ile Ile Ile Met	Thr Thr Thr Thr	Asn Asn Lys Lys	Ser Ser Arg Arg	U C A G
	G	Val Val Val Val	Ala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

58. (B.6C) A model of a biological process is shown.

What is the purpose of this process?

- To replicate the DNA of an organism before cell division
- To assemble nucleotides in an mRNA chain along a DNA template
- To synthesize amino acids used to unzip strands of DNA and copy the genetic code
- To translate the genetic code into a specific sequence of amino acids



59. (B.6E) The sentences below represent a gene. There are many different ways to alter a gene, just as there are many different ways that spelling errors can change a sentence. What type of DNA mutation does the above mutated sentence represent? **FRAMESHIFT DELETION**

Original Sentence:	The	fat	cat	ate	the	wee	rat.
Mutated Sentence:	The	fat	caa	tet	hew	eer	at.

60. (B.6E) One human disease is caused by a change in one codon in a gene from GAA to GUA. This disease is the result of (what kind of mutation) **POINT MUTATION**

61. (B.6C) What are the steps of the central dogma of protein synthesis?

TRANSCRIPTION--> TRANSLATION--> PROTEIN

62. (B.6E) Which of these would most likely cause a mutation?

- The placement of ribosome on the endoplasmic reticulum.
- The insertion of a nucleotide into DNA
- The movement of transfer RNA out of the nucleus
- The release of messenger RNA from DNA

63. (B.6G) What occurs during meiosis that does not during mitosis **crossing over**

ANSWER THE QUESTIONS BELOW FOR EACH PROCESS.	Mitosis	Meiosis
64. What type of cells undergo this process (somatic cells or germ cells)?	<u>SOMATIC</u>	<u>GERM</u>
65. How many divisions occur?	<u>1</u>	<u>2</u>
66. How many daughter cells are produced?	<u>2</u>	<u>4</u>
67. Are parent cells diploid or haploid?	<u>DIPLOID</u>	<u>DIPLOID</u>
68. Are daughter cells diploid or haploid?	<u>DIPLOID</u>	<u>HAPLOID</u>
69. Are daughter cells identical to the parent cell?	<u>YES</u>	<u>NO</u>
70. Are daughter cells identical to each other?	<u>YES</u>	<u>NO</u>
71. Does crossing over occur?	<u>NO</u>	<u>YES</u>
72. Is this process reduction division?	<u>NO</u>	<u>YES</u>
73. Does genetic recombination occur?	<u>NO</u>	<u>YES</u>

74. **(B.6G)** In the early 1900s, Thomas Hunt Morgan was among the first scientists to contribute to the chromosome theory of heredity. Morgan's investigations into heredity in fruit flies led him to propose that the event represented in the diagram sometimes occurs.



Which statement about the event represented in the diagram is valid?

- a. The event represent RBA translation in the smooth endoplasmic reticulum
- b. The event takes place in bacterial cells
- c. The event produces genetically identical daughter cells
- d. The event provides genetic diversity in eukaryotic cells



75. **(B.6G)** Sexual reproduction in animals depends on the production of gametes. Which of these processes produces gametes in animals?

- a. Mitosis
- b. Fertilization
- c. Meiosis
- d. Binary fission

76. If you cross a heterozygous red flower with a homozygous recessive white flower, what will be the resulting phenotype?

$Rr \times rr$
2 red: 2 white