

2008 CELL BIOLOGY ANSWER SHEET

There 93 questions on 11 pages. No references allowed. **ALL CELL PHONES MUST BE CHECKED AT START OF EVENT.** FOR QUESTIONS INVOLVING MULTIPLE CHOICE, USE CAPITAL LETTERS ONLY!!

Complete school name _____

Team members _____

Score _____	Place _____		
1 _____	25 _____	49 _____	74 _____
2 _____	26 _____	50 _____	75 _____
3 _____	27 _____	51 _____	76 _____
4 _____	28 _____	52 _____	77 _____
5 _____	29 _____	53 _____	78 _____
6 _____	30 _____	54 _____	79 _____
7 _____	31 _____	55 _____	80 _____
8 _____	32 _____	56 _____	81 _____
9 _____	33 _____	57 _____	82 _____
10 _____	34 _____	58 _____	83 _____
11 _____	35 _____	59 _____	84 _____
12 _____	36 _____	60 _____	85 _____
13 _____	37 _____	61 _____	86 _____
14 _____	38 _____	62 _____	87 _____
15 _____	39 _____	63 _____	88 _____
16 _____	40 _____	64 _____	89 _____
17 _____	41 _____	65 _____	90 _____
18 _____	42 _____	66 _____	91 _____
19 _____	43 _____	67 _____	92. _____
20 _____	44 _____	68 _____	93. _____
21 _____	45 _____	69 _____	
22 _____	46 _____	70 _____	
23 _____	47 _____	71 _____	
24 _____	48 _____	72 _____	
		73 _____	

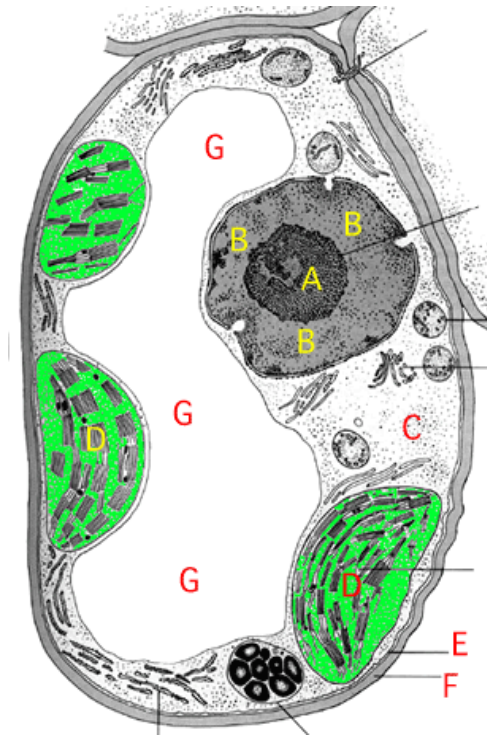
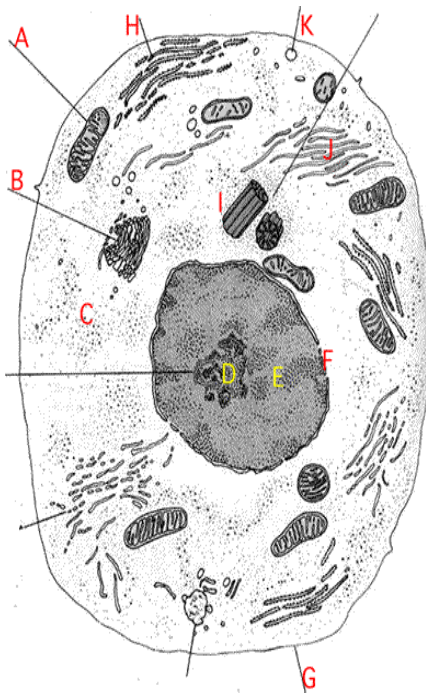
Questions 1-9

For questions 1-5, use the figure on the left. For questions 6-9, use the figure on the right.

1. Write the letter that corresponds to nucleus.
2. Write the letter that corresponds to mitochondrion.
3. Write the letter that corresponds to free ribosomes.
4. Write the letter that corresponds to lysosomes.
5. Write the letter that corresponds to cell membrane.

6-9 Use figure on right

6. Write the letter that corresponds to chloroplast.
7. Write the letter that corresponds to cell wall.
8. Write the letter that corresponds to vacuole.
9. Write the letter that corresponds to nucleus.



Questions 10-19

10-19. A drug company has produced drugs that affect many different cellular processes in the following ways. Which organelle is most likely to be the site of action or most likely to be affected for the following drugs? Organelles can either be used more than once or not all. Only one answer per drug action. **USE CAPITAL LETTERS.**

- | | |
|---------------------------------|---------------------|
| A. nucleus | F. Mitochondria |
| B. Vacuole | G. Chloroplast |
| C. Cilia | H. Lysosome |
| D. Smooth endoplasmic reticulum | I. Ribosome |
| E. Rough endoplasmic reticulum | J. Answer not given |

10. Prevents water regulation in plants.
11. Interferes with the metabolism of many antibiotics taken orally.
12. Prevents enzymes from being made.
13. Interferes with formation of microtubules.
14. Increases RNA production.
15. Increases absorption of red and blue light.
16. Stimulates ATP production and formation of water.
17. Interferes with production of digestive enzymes in the pancreas.
18. Prevents DNA duplication.
19. Interferes with Krebs cycle.

Questions 20-27

20. All of the following statements are true of the typical eukaryotic cell cycle EXCEPT
 - A. The S phase is far removed from cell division.
 - B. G1 occurs after the S phase *
 - C. The shortest phase in terms of time is usually M.
 - D. many of the enzymes necessary DNA replication are typically produced during G1.
21. Most of the ATP made during cellular respiration is made during what stage of cellular respiration?

22. All of the following statements are true of prokaryotic cells EXCEPT

- A. They are usually larger than eukaryotic cells
- B. They lack mitochondria
- C. They contain both DNA and RNA.
- D. They usually possess a cell wall.

23. Approximately how many more hydrogen ions are in a solution with a pH of 3 compared to a solution with a pH of 8? Answer must be in correct exponential form.

24. Excess vitamin A may result in the rupture of lysosomes within cells. Which of the following statements represents the most probable result of such rupturing?

- A. The cells will begin to divide more rapidly.
- B. The cells will begin to burst or leak components into the environment.
- C. The cells will make more ATP.
- D. The cells will begin to form viruses.

25. Provide one general type of situation that will result in the change of enzyme activity within a cell.

26. The acetylcholine receptor is a protein that spans the plasma membrane and extends into the cytoplasm and extracellular space. Which of the following amino acid compositions most likely describes this receptor?

- A. exclusively hydrophilic amino acids
- B. exclusively hydrophobic amino acids
- C. regions of hydrophilic amino acids and regions of hydrophobic amino acids
- D. one hydrophilic region and one hydrophobic region

27. Suppose a single-celled organism has a microtubular defect that results in non-motility. Which of the following cell types will be unaffected by this defect?

- A. sperm
- B. algae
- C. protozoans
- D. bacteria

Questions 28-38

28-37 True/false. Use the capital letters T or F for each of your answers.

28. In cellular respiration, most of the ATP is made in the electron transport system.
29. Oxygen is formed during the light independent reactions of photosynthesis.
30. Glucose must be phosphorylated before it can begin to be broken down.
31. Pyruvate is the end product of the Krebs cycle.
32. CO₂ is used in the light independent reactions.
33. Glycolysis occurs in the mitochondria.
34. Hydrogen carriers are needed in cellular respiration but not in photosynthesis.
35. Plants do not use a Krebs cycle.
36. Electrons used in photosynthesis ultimately come from the breakdown of water.
37. ATP is produced by creating an electric current caused by the movement of hydrogen ions.
38. What molecule does iodine react with to produce a blue-black color?

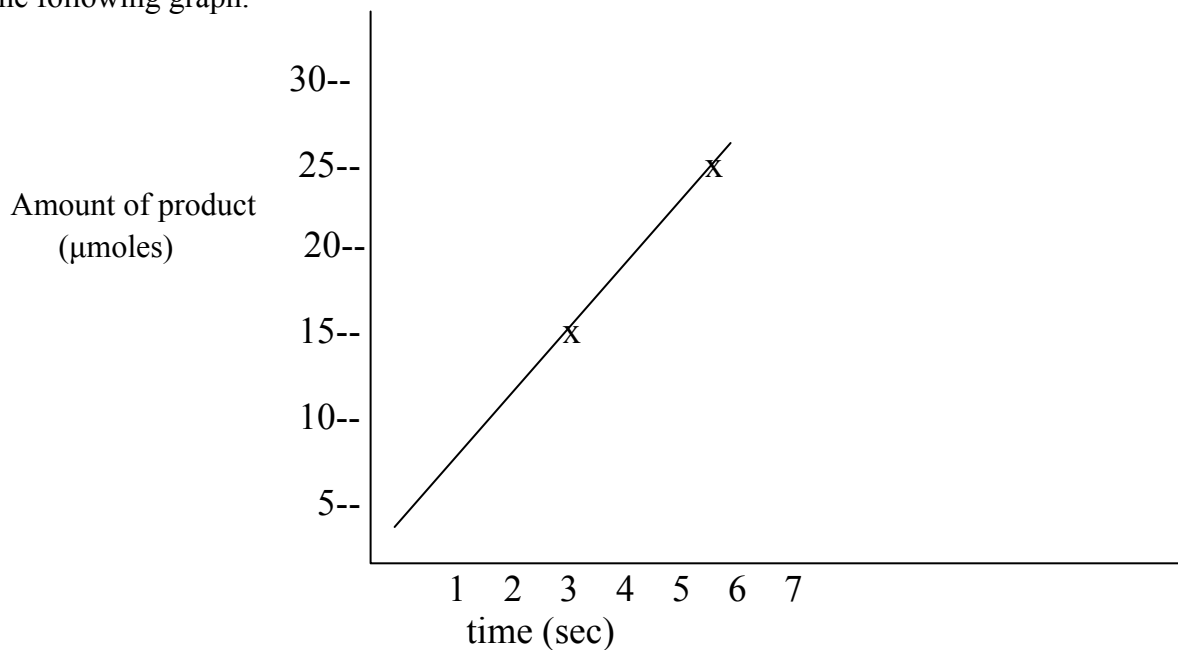
Questions 39-48

39-40 The following statements refer to the movement of molecules into and out of cells. If more than one answer is correct, LIST ALL ANSWERS. ALL ANSWERS MUST BE LISTED IN ORDER TO RECEIVE CREDIT

- A. Water moves from an area of high concentration to an area of lower concentration across a selective membrane.
 - B. Movement of molecules is from an area of high concentration to an area of lower concentration.
 - C. The movement of molecules involves carrier proteins.
 - D. The movement of molecules requires energy.
 - E. The cell changes shape and wraps itself around the large complexes.
39. Which of the above statement(s) apply(ies) to active transport.
 40. Which of the above process(es) do(es) not occur in plant cells?

Questions 49-55

49-50 Refer to the following graph.



49. How much product is produced at 2 seconds?

50. What is the total amount of product produced during the first 5 seconds of the reaction?

51. What is the approximate rate of the reaction. You must use correct units for credit.

52. What is the name of the molecule that brings amino acids to the ribosome?

53-55. Cell type A has doubling time of 8 hours; Cell type B has a doubling time of 12 hours, and Cell type C has a doubling time of 20 hours. An investigator sets up a culture of each cell type, each with a beginning concentration of 100 cells/ml, and then examines the cultures 5 days later.

53. How many doublings will the culture with cell type A undergo?

54. What will be the concentration of cell type C at the end of 5 days?

55. What is the ratio of B to C cells at the end of the 5 days?

Questions 56-61

56. Three different human cells, A, B, C, are exposed to hormone X. Type A cells begin to divide, Type B cells remain unchanged, and type C cells begin to secrete a slimy substance. What would be a reasonable hypothesis for these observations?

- A. The cells have been exposed to the hormone for different lengths of time.
- B. The cells each have different genes.
- C. The cells have different receptor molecules in their membranes.
- D. Hormone X changes the pH of the medium.

57. A scientist exposes plants to various wavelengths of light and measures the rate of photosynthesis for each wavelength. What is an appropriate control for this experiment?

- A. plants exposed to white light
- B. plants exposed only to green light
- C. plants exposed only to UV light.
- D. plants exposed only to blue light.

58. A water plant is placed in a test tube of water, and bubbles appear on the leaves when the plant is exposed to light. What is the most probable composition of the bubbles?

- A. H_2
- B. CO_2
- C. O_2
- D. N_2

59-60 Refer to this information

You have three unlabeled solutions, A, B, and C. You know that one is an enzyme solution, another contains the substrate (molecule worked on by enzyme), and the third contains an inhibitor of the enzyme. You know that when the enzyme and substrate interact, a red color is produced. You mix various amounts of the solutions and the results appear in the table below

Reaction number	Amount of solution A (ml)	Amount of solution B (ml)	Amount of solution C (ml)	color
1	0	0.1	0.1	Red
2	0.1	0	0.1	Colorless
3	0.1	0.1	0	Colorless
4	0.1	0.1	0.1	Med. Pink
5	0.2	0.1	0.1	Light pink
6	0.1	0.2	0.1	Dark pink
7	0.1	0.4	0.2	Red

59. Which solution, A, B, or C, contains the inhibitor?

60. Which solution, A, B, or C, contains the enzyme?

61. Solution 1 has a pH of 3 and solution 2 has a pH of 8. Which of the following statements describes the amount of hydrogen ions in the two solutions?

- A. Solution 1 has 5 times as many hydrogen ions as solution 2
- B. Solution 1 has 15 times as many hydrogen ions as solution 2
- C. Solution 1 has 50 times as many hydrogen ions as solution 2
- D. Solution 1 has 10^5 times as many hydrogen ions as solution 2.

Questions 62-73

Match the following techniques/equipment with a possible use. Each numbered question will have only one answer. Some answers may be used more than once, others not all. Use capital letters.

- | | |
|-------------------------------------|-------------------------|
| A. Electrophoresis | F. Metric ruler |
| B. Centrifugation | G. Spectrophotometer |
| C. Light microscope | H. Paper chromatography |
| D. Scanning electron microscope | I. Answer not given |
| E. Transmission electron microscope | |

62. Examining the surface of cells.

63. Looking at the internal structure of chloroplasts.

64. Watching cells with flagella move.

65. Determining the speed of snails.

66. Separating proteins based on charge.

67. Determining how much of a colored product is produced.

68. Separating pigments of a leaf.

69. Determining how much water a plant needs.

70. Determining which kinds of cell have the largest number of lysosomes.

71. Isolating nuclei from cells.

72. Measuring the amount of gas produced by an enzyme.

73. Separating different organelles in a cell.

74. What is the name of the reagent used to detect glucose?

75. What is the main molecule in all biological membranes?

76. A drug inhibits the function of the Golgi apparatus. Which of the following cells will be least affected by this drug?

- A. bacteria
- B. protists
- C. plants
- D. animals

77. A cell is found with a cell wall and a nucleus, but it is not photosynthetic. What kind of cell is it?

- A. bacterial
- B. animal
- C. fungal
- D. plant

78. Another cell is found to be motile and photosynthetic, and to have various membranous structures inside of the cell. What organelles are most likely to be present in this cell?

- A. nucleus, ribosome, flagella
- B. nucleus, chloroplast, flagella
- C. chloroplast, ribosome, but no mitochondria,
- D. nucleus, chloroplast, but no mitochondria.

79. Which of the following represents the correct order of electron flow during photosynthesis?

- A. water to chlorophyll to NADPH
- B. water to NADPH to chlorophyll
- C. chlorophyll to water to NADPH
- D. chlorophyll to NADPH to water

80-86.

Match the process with its function. Some processes may be used more than once, others not all. Each function will have only one answer. Use capital letters.

- | | |
|--------------------------------|------------------------------|
| A. Light dependent reactions | D. Krebs cycle |
| B. Light independent reactions | E. Electron transport system |
| C. Glycolysis | |

80. Make ATP from light.

81. Breakdown glucose into smaller carbon compounds.

82. Make sugar from CO₂.

83. Make ATP and water.

84. Make ATP and split water.

85. Remove H^+ from carbon compounds.

86. Produce pyruvic acid.

87. You wish to isolate an enzyme that produces a colored product from mitochondria. What is the correct order of steps to accomplish this goal?

A. homogenize, centrifuge, electrophorese, use spectrophotometer

B. homogenize, electrophorese, use spectrophotometer, centrifuge

C. electrophorese, use spectrophotometer, homogenize, centrifuge

D. centrifuge, electrophorese, use spectrophotometer, homogenize

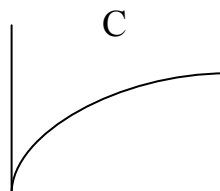
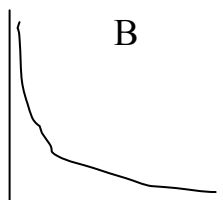
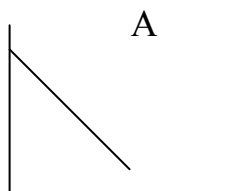
88-90A scientist isolated Enzyme A and found that each gram of enzyme was associated with 2 molecules of iron. The affects of iron concentration on enzyme activity was tested in different tubes and the results appear in the table below:

Amount of iron (molecules)	Molecules of product produced (mg)
1	400
2	100
3	44
4	25
5	16

88. What term describes the iron as it relates to the enzyme?

89. What amount of iron represents the control tube?

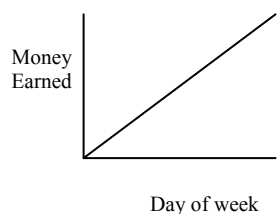
90. Which of the following graphs, A, B, or C, best represents the results of the above table? In all cases, y axis is amount of product and x axis is amount of iron.



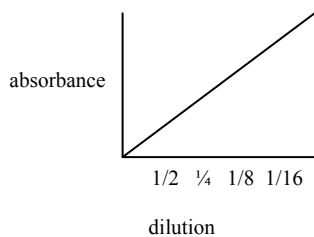
91-93 Choose from the following choices to indicate the error in each graph. Choices may be used more than once, or not all. Each graph will have only one answer.

- A. Independent and dependent variables plotted on the wrong axes.
- B. Improper units indicated
- C. Bar graph should be used
- D. Spacing between points is not constant
- E. Answer not given

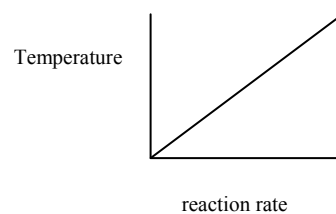
91.



92.



93



2008 CELL BIOLOGY ANSWER KEY
DO NOT COPY WITH EVENT

- | | | | |
|---------------------------|--|----------------------------|--------------|
| 1 <u>E</u> | 26 <u>C</u> | 51 about 5 μ moles/sec | 76 <u>A</u> |
| 2 <u>A</u> | 27 <u>D</u> | 52 <u>t(transfer) RNA</u> | 77 <u>C</u> |
| 3 <u>C</u> | 28 <u>T</u> | 53 15 doublings | 78 <u>B</u> |
| 4 <u>K</u> | 29 <u>F</u> | 54 6400 | 79 <u>A</u> |
| 5 <u>G</u> | 30 <u>T</u> | 55 16 or 16:1 | 80 <u>A</u> |
| 6 <u>D</u> | 31 <u>F</u> | 56 <u>C</u> | 81 <u>C</u> |
| 7 <u>F</u> | 32 <u>T</u> | 57 <u>A</u> | 82 <u>B</u> |
| 8 <u>G</u> | 33 <u>F</u> | 58 <u>C</u> | 83 <u>E</u> |
| 9 <u>B</u> | 34 <u>F</u> | 59 <u>A</u> | 84 <u>A</u> |
| 10 <u>B</u> | 35 <u>F</u> | 60 <u>B</u> | 85 <u>D</u> |
| 11 <u>D</u> | 36 <u>T</u> | 61 <u>D</u> | 86 <u>C</u> |
| 12 <u>I (E)</u> | 37 <u>T</u> | 62 <u>D</u> | 87 <u>A</u> |
| 13 <u>C</u> | 38 <u>STARCH</u> | 63 <u>E</u> | 88. cofactor |
| 14 <u>A</u> | 39 <u>C, D</u> | 64 <u>C</u> | 89 <u>2</u> |
| 15 <u>G</u> | 40 <u>E</u> | 65 <u>F</u> | 90 <u>B</u> |
| 16 <u>F</u> | 41 <u>A</u> | 66 <u>A</u> | 91 <u>C</u> |
| 17 <u>E</u> | 42 <u>B</u> | 67 <u>G</u> | 92. <u>D</u> |
| 18 <u>A</u> | 43 <u>C</u> | 68 <u>H</u> | 93. <u>A</u> |
| 19 <u>F</u> | 44 <u>D</u> | 69 <u>I</u> | |
| 20 <u>B</u> | 45 <u>B</u> | 70 <u>E</u> | |
| 21 electron transport | 46 <u>D</u> | 71 <u>B</u> | |
| 22 <u>A</u> | 47 <u>A</u> | 72 <u>I</u> | |
| 23 <u>10⁵</u> | 48 <u>D</u> | 73 <u>B</u> | |
| 24 <u>B</u> | 49 about 10 μ moles | 74 Benedict's | |
| 25 <u>temperature, pH</u> | (9-11 is acceptable) | solution | |
| <u>or metal</u> | 50 <u>60-65 μ moles</u> | 75 phospholipid | |
| <u>concentration</u> | | | |