

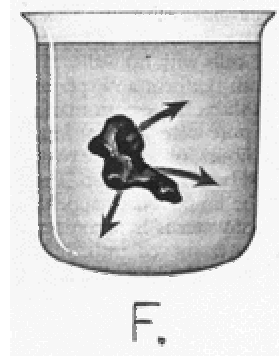
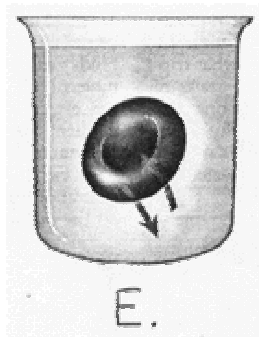
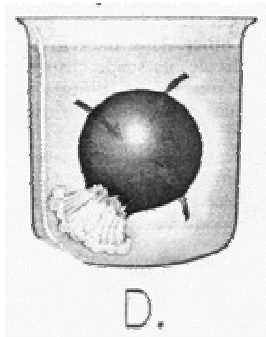
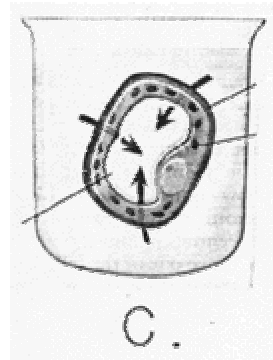
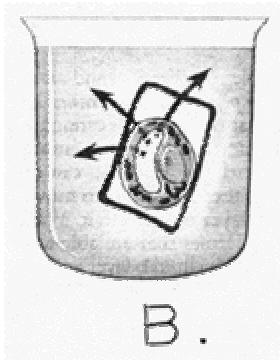
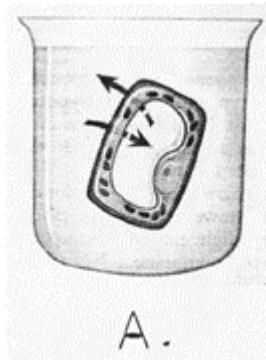
08 CELL BIOLOGY
SAMPLE TOURNAMENT
by Karen L. Lancour

Station A:

Use the experimental setup with cells in beakers of solutions.

Each beaker contains either distilled water, 7% NaCl or 12% NaCl.

1. What process is being studied in this experiment?
2. In which beaker(s) is the solution outside the cell made up of distilled water?
3. In which beaker(s) is the solution inside the cell hypotonic?
4. In which beaker(s) are the cells experiencing plasmolysis?
5. In which beaker(s) are the cells demonstrating an increase in turgor pressure?



Station B:

Examine the data on the cell cycle of normal and cancerous cells.

6. In which phase does a cell spend most of it's life?
7. In which phase does a cell spend the smallest amount of time? (Give the name from the data table and the letter from the diagrams.)
8. How many minutes does it take a normal cell to complete the cell cycle?
9. How many minutes does it take a cancerous cell to complete the cell cycle?
10. During which phase is the time most greatly reduced in the cancerous cells? Why is it so greatly reduced?

TIME FOR MITOSIS OF NORMAL AND CANCEROUS CELLS

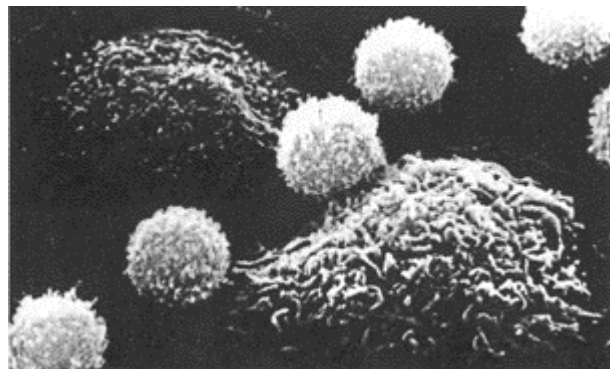
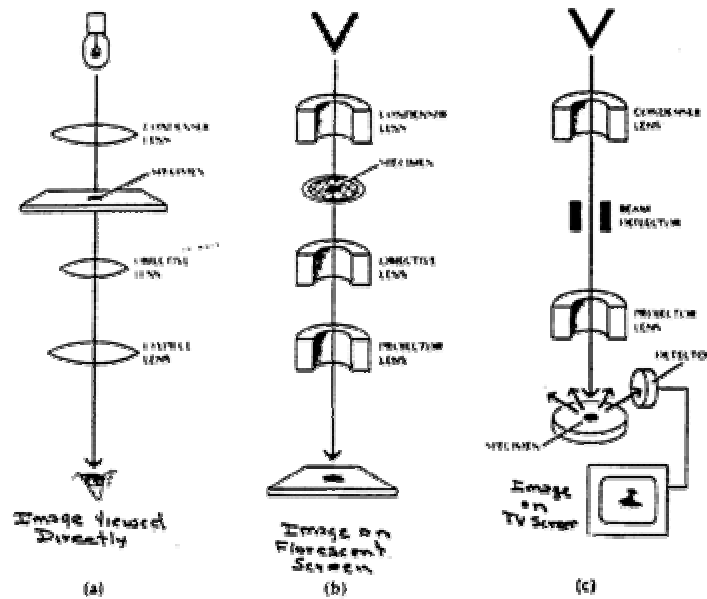
	NORMAL CELL IN MIN.	CANCEROUS CELLS IN MIN.
INTERPHASE	540	380
PROPHASE	60	45
METAPHASE	11	10
ANAPHASE	3	3
TELOPHASE	11	10

CONDUCTED BY THE CANCER RESEARCH CENTER

Station C:

Examine the diagrams of the microscopes and the photos taken using these microscopes.

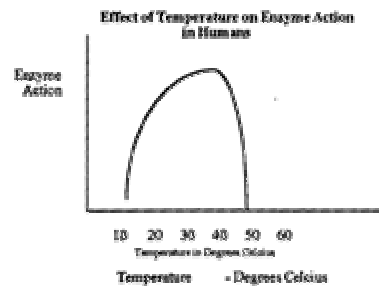
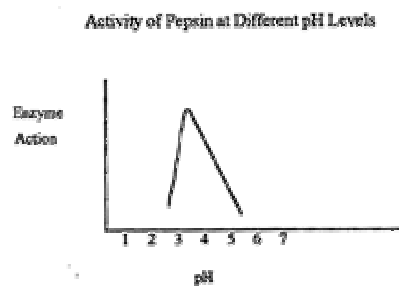
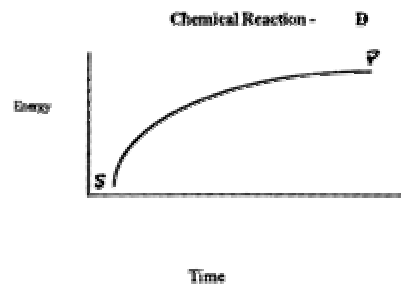
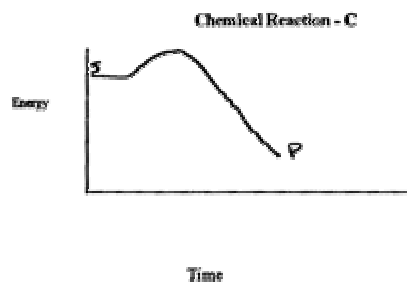
11. Give the letter of the diagram which illustrates the operation of a light microscope.
12. Give the letter of the diagram which illustrates the operation of a scanning electron microscope.
13. Give the letter of the diagram which illustrates the operation of a transmission electron microscope.
14. Which microscope can examine a living organism. Give the letter of the diagram and name of the microscope.
15. This photo was taken using which of these kinds of microscopes. Give the letter of the diagram and the name of the microscope.



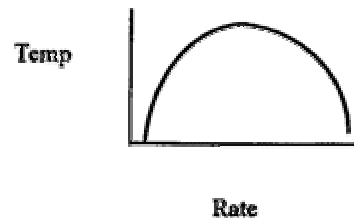
Station D:

Examine the graphs regarding enzymes and chemical reactions.

16. Give the letter of the graph that would illustrate the type of chemical reaction involved in photosynthesis? (C or D)
Justify your answer.
17. Give the letter of the graph that would illustrate the type of chemical reaction involved in respiration? (C or D)
Justify your answer.
18. What is the optimal pH for pepsin?
19. What is the Human optimal temperature?
20. What is wrong with the graphs concerning pH and temperature affecting the rate of reactions?



Effect of pH & Temperature on Rate of Reactions



Station E:

The nitrogen base sequence along the coding strand of DNA is
GAATTCATGCCC

21. What will be the sequence of codons along the mRNA produced by this coding strand of DNA?
22. What will be the sequence of anticodons on the tRNA that will attach to this mRNA?
23. What are the stop codons for M-RNA?
24. How many amino acids will be produced from the codons on the M-RNA? What will be the first one?
25. If a mutation occurred in that DNA coding strand changing **GAA** to **CAA**, what would be the new M-RNA codon and it's amino acid?

Second Base in Codon

	U	C	A	G	
F i r s t	Phenylalanine	Serine	Tyrosine	Crysteine	U T
	Phenylalanine	Serine	Tyrosine	Crysteine	C h
	U Leucine	Serine	Stop Codon	Stop Codon	A i
	Leucine	Serine	Stop Codon	Tryptopan	G r
B a s e	Leucine	Proline	Histidine	Arginine	U d
	Leucine	Proline	Histidine	Arginine	C B
	C Leucine	Proline	Glutamine	Arginine	A a
	Leucine	Proline	Glutammine	Arginine	G s
i A n	Isoleucine	Throenine	Asparagine	Serine	U e
	Isoleucine	Throenine	Asparagine	Serine	C
	A Isoleucine	Throenine	Lysine	Arginine	A i
	Methionine	Throenine	Lysine	Arginine	G n
C o d o n	Valine	Alanine	Aspartic Acid	Glycine	U C
	Valine	Alanine	Aspartic Acid	Glycine	C o
	G Valine	Alanine	Glutamic Acid	Glycine	A d
	Valine	Alanine	Glutamic Acid	Glycine	G o

Station F:

Examine the **items** and use the **indicator key** to answer the questions.

ITEMS INCLUDE THE FOLLOWING: CORN SYRUP, EGG WHITE, BUTTER, CRACKERS, AND A SOLUTION OF WATER THAT A GAS WAS BUBBLED INTO WITH A STRAW.

26. Which indicator(s) should be used to test for the main ingredient in the **Corn Syrup**?
27. Which indicator(s) should be used to test for the main ingredient in the **Egg White**?
28. Which indicator(s) should be used to test for the main ingredient in the **Butter**?
29. Which indicator(s) should be used to test for the main ingredient in the **Crackers**?
30. Which indicator(s) should be used to test for the **carbon dioxide** bubbled into water.

CHEMICAL ANALYSIS - INDICATOR KEY

BIURET REAGENT TEST

BENEDICT'S SOLUTION

NITRIC ACID TEST

IODINE

BROWN PAPER BAG TEST

GLUCOSE TEST STRIPS

pH PAPER

NINHYDRIN TEST

BROMTHYMOL BLUE

Station G:

Use the data concerning the parental case and answer the following questions.

31. What is the blood type of the child? What is it's genotype?
32. What is the blood type of the mother? What is her genotype?
33. What are the blood types of the possible fathers ?
34. Based upon the blood types, which of the possible fathers **could be** the biological father of the child?
35. Based upon all of the evidence, which of the possible fathers is **most likely** the father of the child?

PARENTAL CASE

Blood Analysis

Mother	$I^A i$
Child	$i i$
Possible Father #1	$I^A I^B$
Possible Father #2	$I^A i$
Possible Father #3	$I^B i$

DNA ANALYSIS KEY

#1-Sample from mother's blood
#2-Sample from child's blood
#3-Sample from possible father #1
#4-Sample from possible father #2
#5-Sample from possible father #3

DNA ANALYSIS

1	2	3	4	5
_____	_____	_____		
	_____		_____	_____
_____	_____	_____		
_____	_____			
	_____		_____	
_____	_____	_____	_____	_____
	_____	_____	_____	_____
_____	_____	_____	_____	_____
	_____	_____	_____	
_____	_____	_____		_____

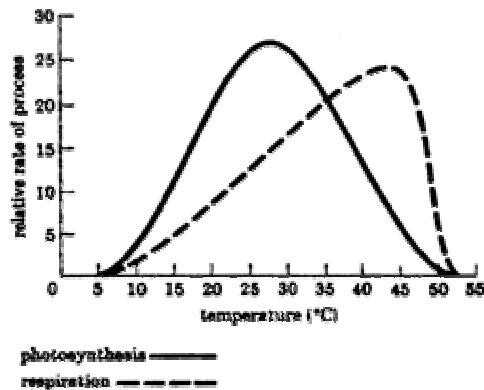
Station H:

Any cell that is carrying on photosynthesis is also carrying on respiration. On the average, if a plant is to grow, the photosynthesis rate must exceed the rate of respiration by a factor of at least three.

Examine the graph provided and answer the questions.

36. At what temperature is the compensation point reached in this experiment?
37. At what temperature would you expect the growth to be most rapid? Why?
38. Where in the plant cell would photosynthesis occur and at what temperature does it reach it's peak rate for this plant?
39. Where in the plant cell would respiration occur and at what temperature does it reach it's peak rate for this plant?
40. Certain foods such as apples are frequently stored under refrigeration in a carbon dioxide rich atmosphere. How would this help to keep the fruit fresh?

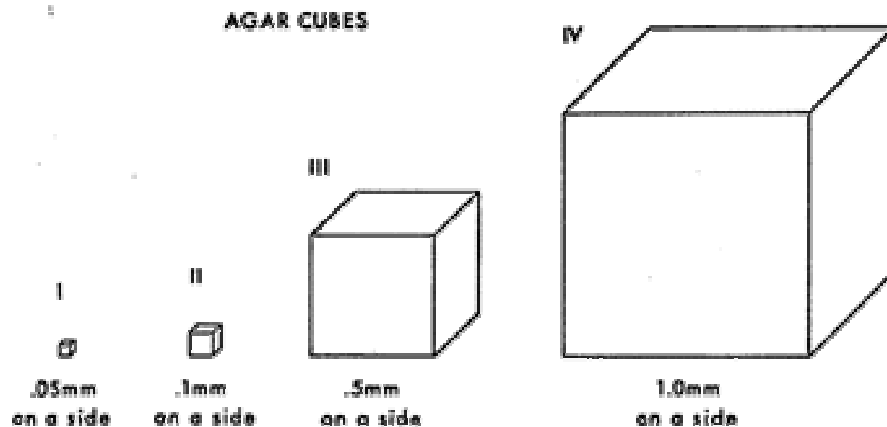
The following graph shows the effect of temperature on the rates of photosynthesis and respiration of one plant. The temperature at which the two rates are equal is referred to as the *compensation point* and is not the same for all plants.



Station I:

Examine the diagram of agar cubes. Assume each cube represents the shape of a particular cell.

41. What is the surface area of the 1.0 mm cube?
42. What is the volume of the 1.0 mm cube?
43. Which cell would have the greatest surface area to volume ratio?
44. Which cell would probably have the slowest metabolic rate? Why?
45. How might the shape of these cells be changed to allow for greater size while maintaining a great surface area to volume ratio? Draw the cell shapes.



Surface area of a cube = length x width x number of surfaces

Volume of a cube = length x width x height

Station J:

Use the key of scientific processes to identify the correct procedure to accomplish each of the following tasks.

- 46. Separate a homogenous mixture of cell organelles.
- 47. Produce a micrograph of a mitochondrion.
- 48. Examine a print of a person's chromosomes to determine if the chromosome number and size is correct.
- 49. Separating fragments of DNA by size of fragments.
- 50. Breaking up cells so the components can be separated.

Key:

- A. gel electrophoresis
- B. electron microscopy
- C. light microscopy
- D. centrifugation
- E. pH measurement
- F. spectrophotometry
- G. karyotyping
- H. fragmentation

SAMPLE TOURNAMENT
CELL BIOLOGY

SCHOOL NUMBER_____.
SCHOOL_____.
STATE._____.

STUDENT NAMES: (PLEASE PRINT)

1. Answer Key
2. _____

RAW SCORE._____.
RANK._____.
POINTS._____.

BE SURE TO INCLUDE APPROPRIATE UNITS WITH ALL ANSWERS!!!

STATION A:

1. Osmosis
2. C,D
3. B,F
4. B,F
5. C

STATION F:

26. B,F
27. A,C,H
28. E
29. D
30. I

STATION B:

6. Interphase-A
7. Anaphase-D
8. 625 min.
9. 448 min.
10. Interphase-reduced time
in normal cell activities

STATION G:

31. O i i
32. A I^Ai
33. AB,A,B
34. Dads #2 & #3
35. Dad #2

STATION C:

11. A
12. C
13. b
14. a-light microscope
15. c-scanning electron microscope
(3D)

STATION H:

36. 35° C
37. 20-25° C Highese pho/res ratio.
38. Chloroplast-25° C
39. Mitochondria-23° C
40. stops ripening process

STATION D:

16. D-Product gain energy
17. C-Produce loses energy
18. 3
19. 35-40° C

STATION I:

41. SA=1.00mm*1.0mm*6=6mm²
42. Vol=1.0mm*1.0mm*1.0mm=1mm³
43. I
44. IV-largest cell/smallest SA/V
ratio

20. pH & temp should be on X-axis,
rate on Y-axis

45. any shape other than cube or
sphere (e.g. oblong)

STATION E:

21. CUU AAG UAC GGG

22. GAA UUC AUG CCC

23. UAA UAG UGA

24. 4-Leucine

25. GUU-Valine

STATION J:

46. D

47. B

48. G

49. A

50. H