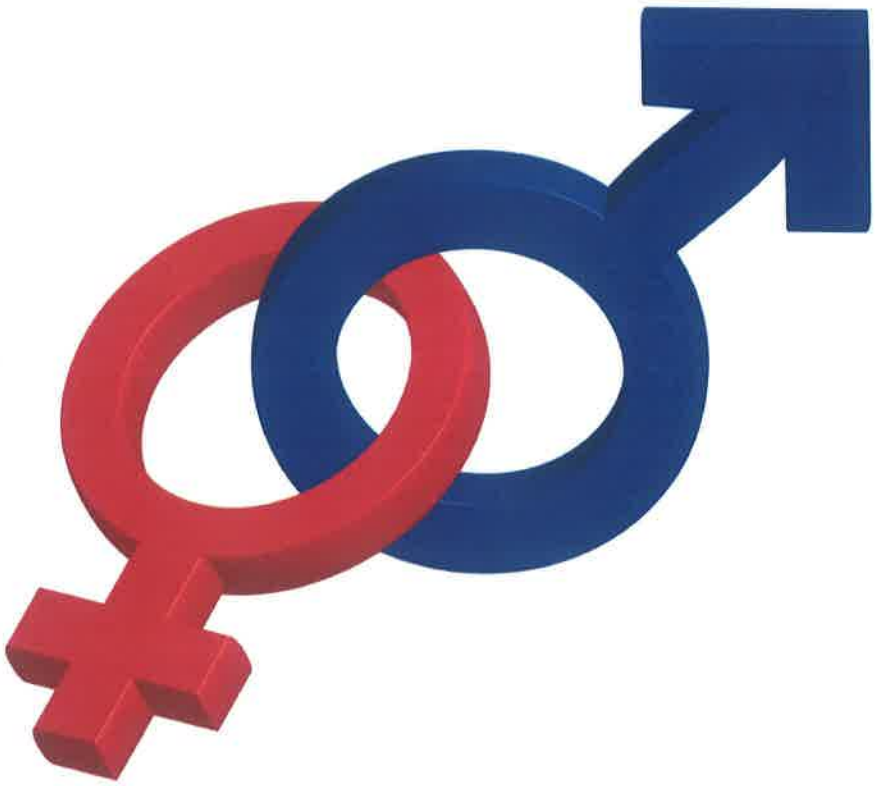
Unit Five:



Reproduction

Name_____ Date of Data Collection _____

Class Period _____ Lab Days/Period _____ Teacher _____

Menstrual Cycle Graphing Lab

Background: The seemingly simple action of conceiving a child in the human race is astounding at best given the number of events that must occur and the hormonal activity that must synchronize. Therefore, it is easy to understand why the human menstrual cycle is so crucial in the timing and efficiency of the female reproductive system. Without hormone cycles, feedback mechanisms, and near perfect timing, this system would not allow a human egg to be fertilized, developing into an embryo and ultimately being delivered as a human baby.

The cycles that are most important are those of four different hormones: follicle stimulating hormone (FSH), luteinizing hormone (LH), progesterone, and estrogen. These hormones, produced in the ovary, and specifically timed and influence each other's production and repression during the 28-day cycle and make it possible for a female to become pregnant.

Purpose: The purpose of this laboratory experience is:

- to examine the events of the human menstrual cycle with regard to hormone levels, ovarian function, and uterine structure;
- to graph the changing levels of FSH, LH, estrogen, and progesterone during the 28-day cycle;
- to study how hormone feedback levels and mechanisms control a cyclical functioning mechanism.

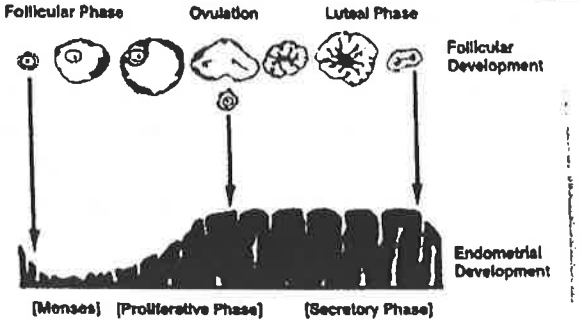
Materials: The following materials are used to perform this experience:

- lab papers
- graph paper
- pens and pencils
- colored pencils (optional)

Procedure: The following procedure is utilized to perform this experience:

1. Look at the "Data" portion of this lab, which shows the events of the menstrual cycle. Construct "Graph A" using the data table and the data for the relative levels of FSH and LH released from the pituitary gland.
2. After completing Graph A, construct "Graph B" using the data from the data table for the relative levels of estrogen and progesterone released from the ovary.
3. Make sure to notice that each graph has two different y-axes, one for each of the hormones listed.
4. **Teacher Hint:** When graphing from the left side y-axis, start with data from Day 1, then Day 2, Day 3… When graphing from the right side y-axis, start with data from Day 28, then Day 27, Day 26…
5. Compare the data that you graph to the diagram which shows changes in ovarian function and uterine structure and answer the questions.

	Concentrations of Hormones				
	Day	FSH	Estrogen	LH	Progesterone
Concentration of Hormones in Blood: Follicular Phase	1	9	30	9	0.6
	2	11	40	12	0.8
	3	13	50	16	1.0
	4	14	70	18	1.0
	5	15	80	19	1.0
	6	14	100	16	1.0
	7	14	130	12	1.2
	8	15	140	19	1.2
	9	13	180	15	1.3
	10	11	200	16	1.5
	11	9	220	20	1.5
	12	18	230	30	1.6
	13	13	220	75	1.8
	14	9	200	58	2.0
Concentration of Hormones in Blood: Luteal Phase	15	9	180	30	2.3
	16	8	150	14	3.7
	17	8	120	10	5.8
	18	8	100	9	8.3
	19	8	50	7	10.4
	20	7	30	5	12.0
	21	7	25	3	12.0
	22	6	25	3	11.8
	23	5	25	2	10.3
	24	5	25	3	7.2
	25	6	20	3	4.0
	26	7	20	4	3.0
	27	7	25	5	1.5
	28	8	25	7	0.8



Analysis Questions: Answer the following questions.

1. On what day foes FSH reach its' maximum concentration? What is happening with regard to the ovary at this point and what is happening with regard to the menstrual cycle?
2. What happens to the follicle during the first 14 days that you plotted?
3. What happens in the ovary and in the blood stream in days 1-14 that bring about a change in the uterus?
4. On what day does LH reach its' maximum concentration? What is happening with regard to the ovary at this point and what is happening with regard to the menstrual cycle?
5. What does the level of FSH decrease and remain at a relatively low level during days 15-28 of the cycle?
6. What signals at the end of one cycle and the beginning of another?
7. Why are the interactions of hormones and tissues in the menstrual cycle considered to be feedback mechanisms?
8. What roles does progesterone play in the feedback mechanism?
9. What roles does estrogen play in the feedback mechanism?

24–3 What are the Stages in the Menstrual Cycle?

The human female reproductive system has several different roles to perform. It produces a new egg each month for fertilization. It must prepare the lining of the uterus for a new embryo if fertilization of an egg does occur. This is accomplished by a thickening of the uterus lining.

It must shed the egg and thickened uterus lining if fertilization does not occur. All of these events occur in a cyclic pattern each month in a sexually mature female.

INTERPRETATION

OBJECTIVES

In this exercise, you will:

a. review the organs that form the human female reproductive system.
b. prepare a calendar that shows the changes occurring during the human menstrual cycle if no fertilization occurs.
c. prepare a calendar that shows the changes occurring during the human menstrual cycle if fertilization occurs.

PROCEDURE

Part A. Review of the Female Reproductive System

1. Use the following parts and their description for help in properly labeling Figure 1. NOTE: The diagram is 1/3 natural size.
   a. ovary—two are present, round in shape
   b. egg—small cells present within ovary
   c. uterus—large muscle, V-shaped, largest part of reproductive system
   d. oviduct—thin tube connecting each ovary to uterus
   e. uterus lining—inner wall or lining of uterus

Part B. Changes in the Menstrual Cycle; No Fertilization of Egg

1. Obtain a copy of Figure 2 from your teacher.
2. Use scissors to cut out the square diagrams in Figure 2. These diagrams show the different stages that occur during the menstrual cycle if fertilization does not occur.
3. Look over the calendar marked Figure 3. It describes a series of events that take place in the female reproductive system if fertilization does not take place.
4. Match the diagrams that you cut out with the events being described in the calendar.
5. When all diagrams have been properly matched, tape them onto the calendar in their proper location to the right of the brackets describing the events.

Part C. Changes in the Menstrual Cycle; Fertilized Does Occur

1. Obtain a copy of Figure 4 from your teacher.
2. Use scissors to cut out the square diagrams in Figure 4. These diagrams show the different stages that occur during the menstrual cycle if fertilization does occur.
3. Look over the calendar marked Figure 5. It describes a series of events that take place in the female reproductive system if fertilization does take place.
4. Match the diagrams that you cut out with the events being described in the calendar.
5. When all diagrams have been properly matched, tape them onto the calendar in their proper location to the right of the brackets describing the events.

ANALYSIS QUESTIONS:

1. Describe the role or function of each of the following structures:
    a. ovary
    b. uterus lining
    c. uterus muscle
    d. oviduct

2. Draw and label a diagram of the female reproductive system. Include all of the terms from the previous question.

3. Describe what happens to the unfertilized egg, the uterus lining, and the egg in the ovary during days 1-4 of the menstrual cycle (menstrual phase).

4. Describe what happens to the uterus lining and the egg in the ovary during days 5-13 of the menstrual cycle (follicle phase).

5. What happens on day 14? Name the phase and describe the event.

6. If no fertilization occurs, what happens during days 15-28?

7. If fertilization DOES occur, what happens during days 15-21?

8. If fertilization DOES occur, what happens during days 21-266?

Name _____ Class _____ Period _____

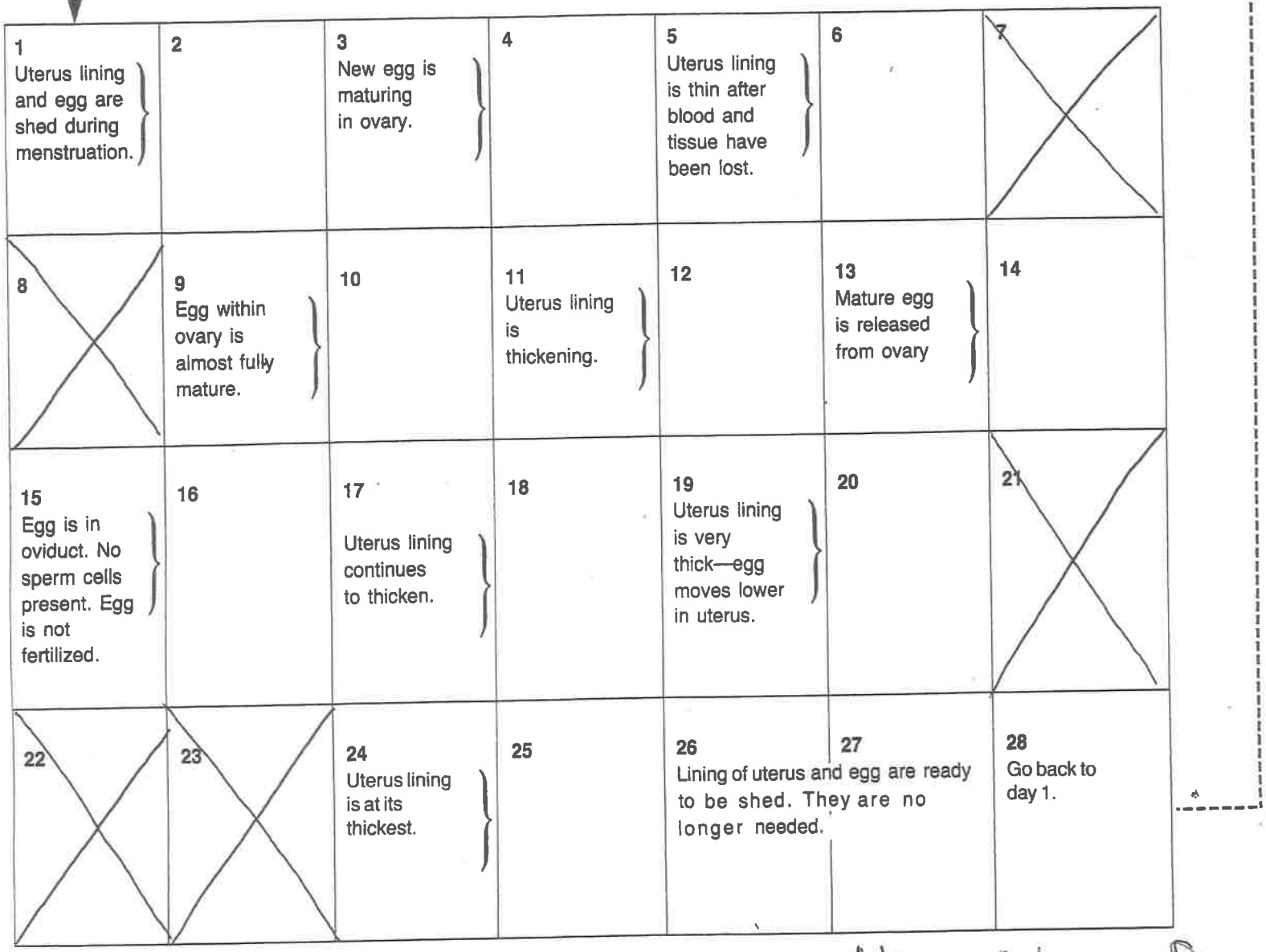


FIGURE 3. Day by day changes in the menstrual cycle—no fertilization of egg

Use pictures from Figure 2
(place pictures only in empty boxes)

Use pictures from Figure 4.
(place pictures only in empty boxes)

Name _____ Class _____ Period _____

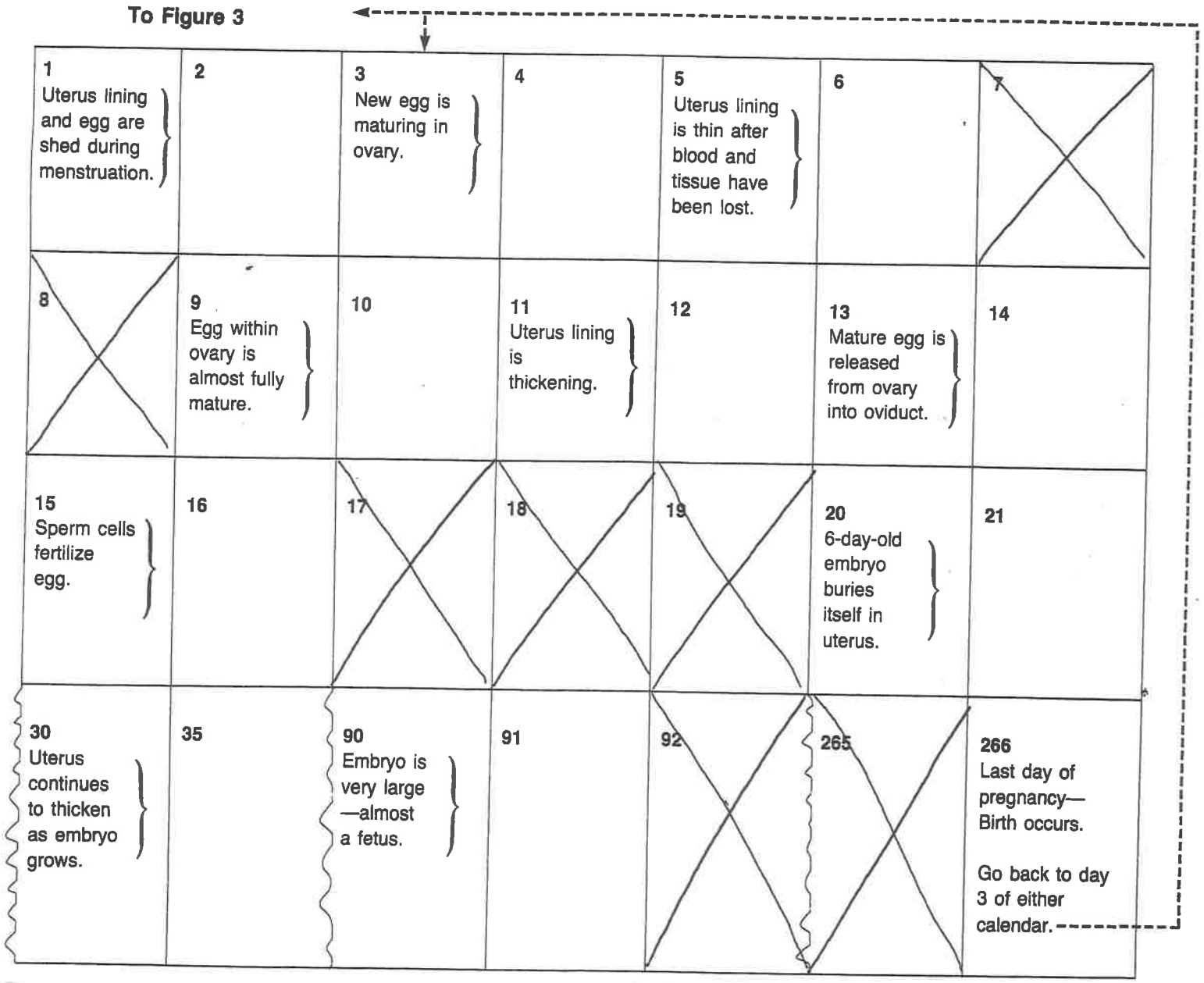


FIGURE 5. Day by day changes in the menstrual cycle—fertilization of egg

Name _____ Class _____ Period _____

FIGURE 2. No fertilization of egg (pictures are not in correct order)

Place in Figure 3 calendar in proper order

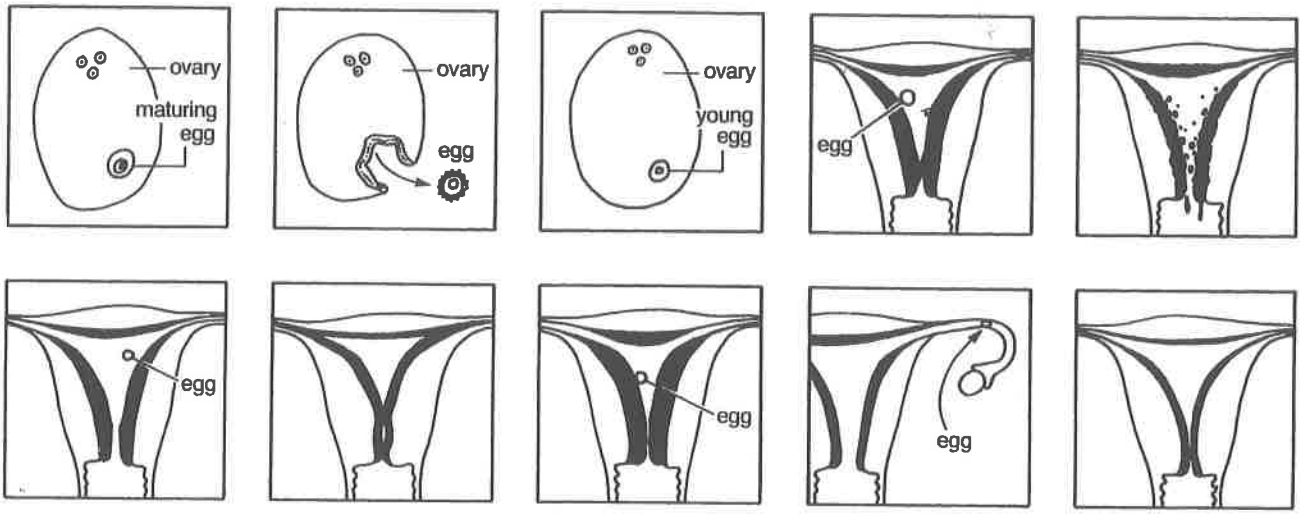
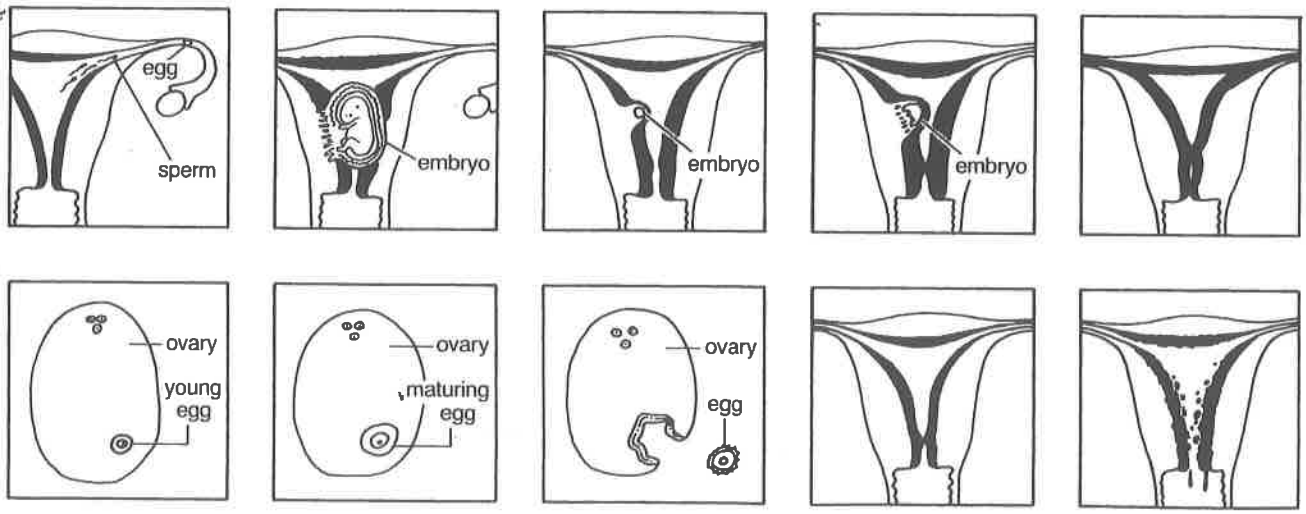


FIGURE 4. Fertilization of egg (pictures are not in correct order)

Place in Figure 5 calendar in proper order



Human Fetal Growth

Complete development of a human fetus takes about 38 weeks. Increases in size and mass are two of the many changes that the fetus undergoes. The increases do not occur at the same rate. Many factors affect the birth size of a human baby, but there is an average mass and an average length standard for each stage of development. The appropriate age of a fetus can be determined from its mass and length.

Objectives:

- Measure and calculate the length of a human fetus at various stages of development
- Graph the length of a developing human fetus
- Graph the mass of a developing fetus
- Determine the period of fetal development during which the greatest changes in mass and length occur

Procedure:

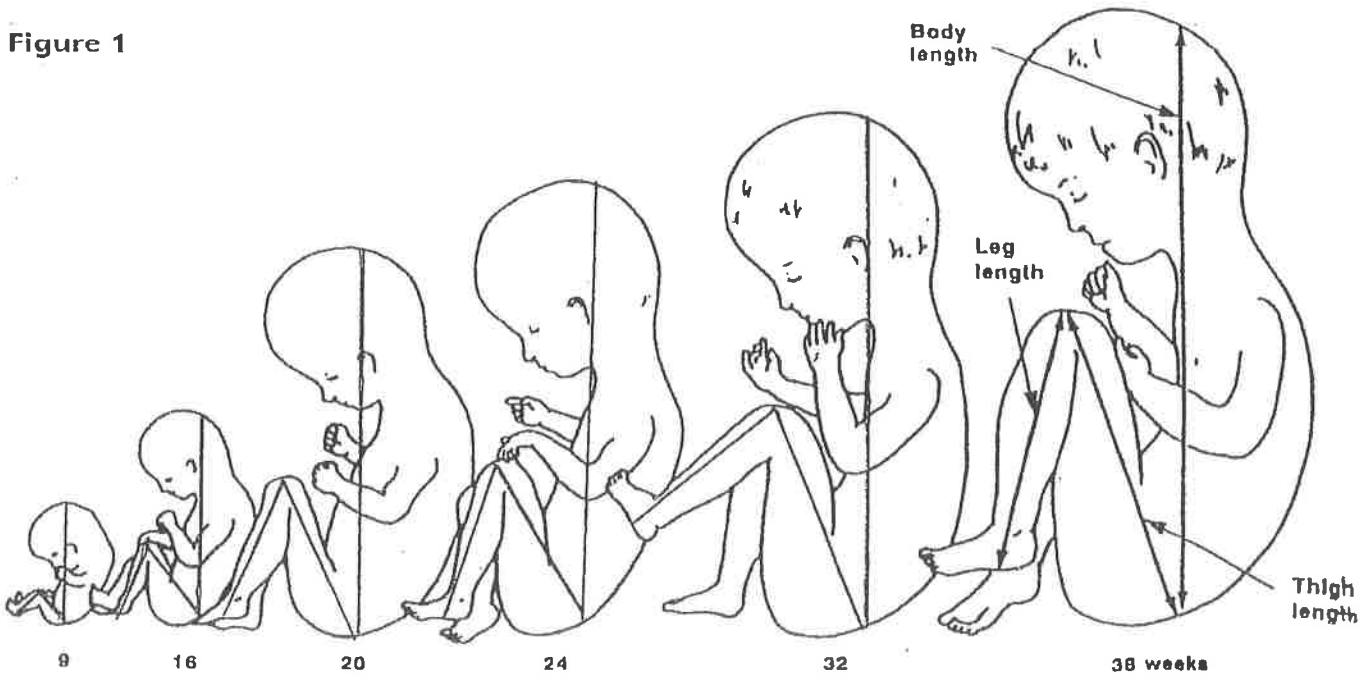
Part A. Development of a Human Fetus

1. Figure 1 shows six stages of a developing human fetus. The stages are shown at 40% of the actual size.
2. Use the lengths indicated on the diagram of the 38-week fetus as a guide to measuring the other diagrams.
3. Measure each length in millimeters. Record your data in a table like Table 1 shown below. Be sure to include enough rows in your table to account for data for each stage of development from 2-weeks up to 38-weeks.
    a. Measure the body length from the rump to the top of the head.
    b. Measure the thigh length from the rump to the knee.
    c. Measure the leg length from the heel to the knee.
4. Add the three measurements for each stage together. Record the total length in your data table.
5. Multiply the total length by 2.5 to calculate the actual length of the fetus at each stage. The actual length for the fetus at 2 –weeks is provided below. Include it in your own data table also. The lengths for each body part are not available in millimeters because they are too small to measure with your ruler.

Table 1

Age of fetus in weeks	Body length (mm)	Thigh length (mm)	Leg length (mm)	Total length (mm)	Actual length (mm)
2	n/a	n/a	n/a	n/a	2
9					

Figure 1



Part B. Graphing the Length of a Developing Fetus

1. Using the data in Table 1, mark a point that shows the age and actual length of each fetal stage.
2. Begin at 0, and connect the points to complete the graph.

Part C. Graphing the Mass of a Developing Fetus

1. Graph the data provided in Table 2 (at right) to show the age and mass of each fetal stage.
2. Begin at 0, and connect the points to complete the graph.

Table 2. Mass of a Developing Fetus

Time (weeks)	Mass (grams)
4	0.5
8	1
12	15
16	100
20	300
24	650
28	1100
32	1700
36	2400
38	3300

Part D. Examining Survival Rates by Developmental / Gestational Age

1. Evaluate the information in Table 3 (below) and apply this information to answering the analysis questions.

Table 3. Survival Rates of Babies by Developmental Age

Time (weeks)	% Survival		Time (weeks)	% Survival
10	0		25	65 (50–80)
21	0		26	85 (80–90)
22	5 (0–10)		28 (7 months)	95
23	23 (10–35)		30	97
24 (6 months)	55 (40–70)		36 (9 months)	99

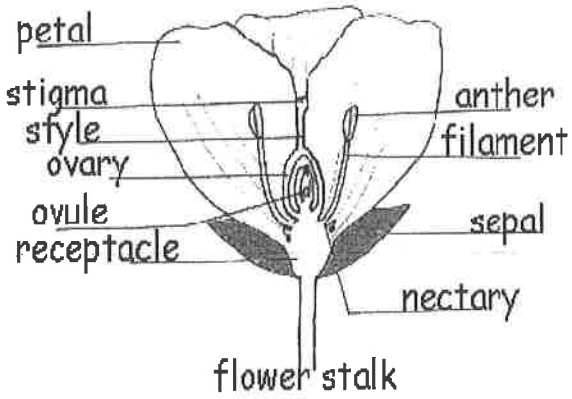
Analysis:

1. During which time period does the fetus show the greatest increase in actual length?
2. During which time period does the fetus show the greatest increase in mass?
3. Why was the total length of each fetus multiplied by 2.5 to obtain the actual length?
4. Why do you think the length of a fetus increases more rapidly than the mass of a fetus?
5. At what week does the fetus reach
    a. about half its full length?
    b. about half its full mass?
6. If a premature baby is born with a mass of
    a. 2200 grams, what is the baby's developmental age?
    b. 1800 grams, what is the baby's developmental age?
7. Describe the improvements that happen to survival rates of babies from week 21-24. Explain why you think this occurs.

Flower Dissection - Lab # _____ Name:_____

1. Purpose:

2. Use a magnifying lens to examine each of the following parts. Record how many you find in YOUR flower. Sketch and label the parts of the flower. An example is provided for you.



Example Sketch

Your Sketch

Count and record how many of each your flower has:

3. Sepals? _____
4. Petals? _____
5. Anthers? _____
6. Pollen grains? _____
7. Pistils? _____
8. Eggs? _____

9. Describe smell of your flower: _____

Carefully mount a sample of each of the following parts. If there is only 1 you may draw instead.

10. Sepal	11. Petal	12. Anther	13. Pistil (draw)	14. Pollen

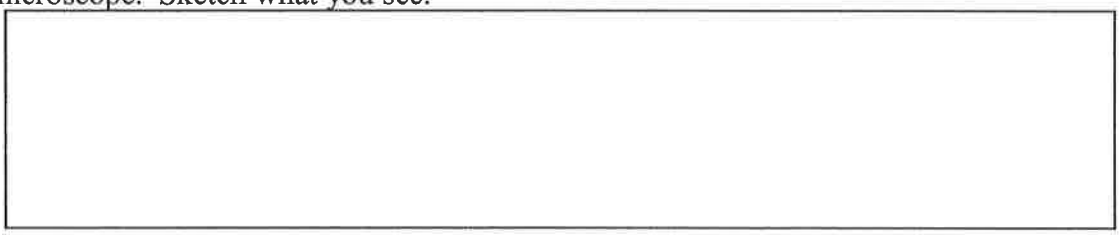
15. Pollen grains are the male sex cells of the flower. Ovules are the female sex cells. When the pollen is brought to the female part of the flower it is called pollination. Why do you think that the pistil is sticky at the top?

16. There are a few different ways that pollen can be brought to the pistil: insects, wind, birds, animals and water. Which do you think pollinates your flower and why?

17. Name an insect that you have seen pollinating flowers. _____

18. Why do you think flowers are brightly colored?

18. "Hay fever" is an allergic reaction to pollen floating in the air. Some plants that use the wind to spread their pollen are grass, trees and corn. Take a sample of your pollen and look at it under the microscope. Sketch what you see:



19. The male sex cells in the pollen are called sperm. When the sperm and eggs combine, sexual reproduction occurs and the egg is fertilized. The fertilized egg becomes a seed. Where would you predict you would find seeds in a fertilized flower?

20. How many seeds could your flower produce? (you may need to estimate) _____

21. Do all flowers look the same? Why do you think that is?

22. If there are more flowers in the summer time, why do more people suffer from pollen allergies in the winter time? (hint, think about how flowers are pollinated)

Microviewer Lab: Plant Mitosis
Lab # _____

Directions: Use the accompanying microviewer slides and lab booklets to answer the following questions.

1. What stage is cell A in? Draw and label what you see.

2. What do you see in the nucleus of cell A?

3. Why is interphase sometimes referred to as the "resting phase"?

4. In slide 2, what seems to be happening to the shape of the nucleus?

5. What stage is the cell in slide 3 going through? Draw and label what you see.

6. Describe what characterizes a cell going through metaphase.

7. Describe what is occurring in slide 5. What stage is cell E in? Draw and label what you see.

8. Look at the cells marked B in this slide. Are they in the same phase of mitosis as cell E? If not, what phase are they in? How can you tell?

9. Observe cell F in slide 6. Describe what is happening and draw and label what you see.

10. Observe slide 7. What is the faint line that is seen between the masses across the spindle fibers?

11. Describe what is happening in cell E, slide 8. Draw and label what you see.

12. What is the difference between the cells labeled A and the cells labeled H in this slide?

13. Describe in complete sentences what events occur during each of the following: Interphase, Prophase, Metaphase, Anaphase, Telophase, and Cytokinesis.