Lesson 1 - Reproduction

Male Structures & Functions
Reproduction

Life Process: to produce offspring (necessary for survival of species, not individual)
Male Reproductive System

Functions:

1) Produce sperm (male gamete)
2) Produce testosterone
3) Secrete fluids to nourish sperm & protect it from the acidic female reproductive tract
4) Deposit sperm inside the female
Scrotum

Testis

Epididymis

Vas deferens

Rectum

Bulbourethral / Cowper’s Glands

Urethra

Prostate

Seminal Vesicle

Carries urine and semen out of the body

Carries sperm to the urethra

Site of sperm storage & maturation

Prostate: Produces fluid and glucose for sperm

Prostate: Carries urine and semen out of the body

Urethra

Penis: Adaptation for internal fertilization on land

Seminal Vesicle: Produces an alkaline (basic) substance to neutralize the female’s acidic tract

Seminal Vesicle: Carries sperm to the urethra

Testis

Epididymis

Scrotum

5. Epididymis

Testis

Scrotum

Scrotum: temp is lower than body temp

Prostate

Urethra

Rectum

Bulbourethral / Cowper’s Glands

Urethra

Penis

Prostate: Produces fluid and glucose for sperm

Prostate: Carries urine and semen out of the body

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Scrotum

Scrotum: temp is lower than body temp

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Testis

Epididymis

Scrotum

Scrotum: temp is lower than body temp
Sperm Structure

- Acrosome (contains digestive enzymes)
- Nucleus (contains DNA, half # of chromosomes)
- Mitochondria (provide energy to swim)
- Flagellum (tail for propulsion)
The Male Reproductive System

Sperm are produced in the testes and mature in the epididymis. To leave the body, they travel through the vas deferens and the urethra. Glands, including the seminal vesicles, produce seminal fluid that nourishes and protects the sperm.

Use the words below to label the diagram.

<table>
<thead>
<tr>
<th>epididymis</th>
<th>seminal vesicle</th>
<th>urethra</th>
</tr>
</thead>
<tbody>
<tr>
<td>penis</td>
<td>testis</td>
<td>vas deferens</td>
</tr>
</tbody>
</table>

Use the diagram to answer the questions. Circle the correct answer.

1. Through what structure does the urethra pass?
   - testis  - penis

2. Through which structure do sperm pass?
   - seminal vesicle  - vas deferens
Lesson 2

• Female Structures & Functions
Female Reproductive System

Functions:

1. Produces an egg cell / ovum (female gamete)
2. Produces estrogen & progesterone
3. Site of implantation & development of an embryo / fetus
4. Growth of placenta & umbilical cord for exchange of gases & nutrients/waste between mother and baby
2. **FALLOPIAN TUBE**
   - Site of fertilization

4. **BLADDER**

6. **VAGINA**
   - Receives sperm, birth canal

**OVARY**
- Contains follicles which mature into eggs, produces estrogen

**URETHRA**

**CERVIX**
- Entryway to the uterus, dilates during childbirth

**UTERUS**
- Site of implantation & development of embryo, lining thickens and sheds monthly

**RECTUM**
Lesson 3

• Menstrual Cycle
• Key Terms
  – Ovulation
  – Fertilization
  – Implantation
Ovulation – the release of a mature egg from ovary

Fertilization – sperm & egg join to form a zygote

Implantation – embryo burrows into thickened blood lining of uterus = pregnancy (not pictured here)

Ovary

Fallopian tube

Egg cell

Follicle

Ovulation – the release of a mature egg from ovary

Uterus

Cervix

Vagina

Sperm cell
The Female Menstrual Cycle

- begins at puberty & ends at menopause
- duration is approximately 28 days
- can vary & may be interrupted by pregnancy, illness, and other factors
4 Stages / Phases of the Menstrual Cycle

1. MENSTRUATION
   - uterine lining & unfertilized egg are shed if NO implantation occurs
   - Vaginal bleeding (Day 1 of cycle) lasts for 3 to 7 days
   - New egg in ovary begins to mature
2. FOLLICLE STAGE

- Follicle in the ovary continues to grow & mature
- Estrogen is secreted by ovary to begin thickening of uterus lining w/ blood vessels (vascularization)
3. OVULATION (Day 14 of 28)

- Pituitary releases a surge of LH
- Causes mature egg to be released from its follicle in the ovary
4. LUTEAL STAGE

- ruptured follicle in ovary becomes corpus luteum
- secretes progesterone to thicken uterus lining to prepare for possible implantation
- If no pregnancy occurs, menstruation begins & cycle repeats
Hormone Levels in the Blood

- FSH
- Estrogen
- LH
- Progesterone

Follicle Development

- Developing follicle
- Ovulation
- Corpus luteum

Uterine Lining

- Menstruation
- Follicle Phase
- Ovulation
- Luteal Phase

Time (days)
<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
<th>Time (days)</th>
<th>Changes in hormone levels in blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menstruation</td>
<td>Uterine lining is shed (the “period”)</td>
<td>Days 1-5</td>
<td>FSH - increases</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LH - increases</td>
</tr>
<tr>
<td>Follicular</td>
<td>follicle (egg) begins to grow &amp; mature, lining thickens again</td>
<td>Days 5-13</td>
<td>Estrogen - increases</td>
</tr>
<tr>
<td>phase</td>
<td></td>
<td></td>
<td>Progesterone - increases</td>
</tr>
<tr>
<td></td>
<td>mature egg released into fallopian tube from the ovary</td>
<td>Day 14</td>
<td>FSH - Inc then dec.</td>
</tr>
<tr>
<td>Ovulation</td>
<td></td>
<td></td>
<td>LH - Surge then dec.</td>
</tr>
<tr>
<td>Luteal phase</td>
<td>follicle → corpus luteum, makes progesterone to thicken uterine lining more</td>
<td>Days 14-28</td>
<td>Estrogen - Increase then decrease</td>
</tr>
</tbody>
</table>
Lesson 4

• Internal vs External Fertilization & Development
How would you group these organisms?
Fertilization

- 1 sperm cell & 1 egg cell join, forming a zygote
- half of offspring’s genetic material is from each parent
- can be internal or external (differs by organism)

Fertilization Video
<table>
<thead>
<tr>
<th>Who</th>
<th>fish &amp; amphibians (frogs &amp; toads)</th>
<th>mammals, reptiles, birds</th>
</tr>
</thead>
<tbody>
<tr>
<td>What</td>
<td>Fertilization outside the body</td>
<td>Fertilization inside the body</td>
</tr>
<tr>
<td></td>
<td>Produce MANY eggs to ensure survival of offspring due to:</td>
<td>Produce FEWER eggs due to</td>
</tr>
<tr>
<td></td>
<td>-Lack of parental care</td>
<td>-more parental care</td>
</tr>
<tr>
<td></td>
<td>-Harsh predatory environment</td>
<td>-Protective internal environment</td>
</tr>
<tr>
<td>Where</td>
<td>Mostly in water (aquatic organisms)</td>
<td>Mostly on land (terrestrial organisms)</td>
</tr>
</tbody>
</table>
Development

- physical changes & growth of unborn offspring
- can be internal or external (differs by organism)
<table>
<thead>
<tr>
<th>External in WATER</th>
<th>on LAND</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Who</strong></td>
<td></td>
</tr>
<tr>
<td>Most fish and amphibians</td>
<td>Birds and Reptiles, few mammals (ex. platypus)</td>
</tr>
<tr>
<td><strong>What</strong></td>
<td></td>
</tr>
<tr>
<td>Embryo growth outside the body; <strong>LOW</strong> survival rate due to:</td>
<td>Embryo growth outside the body; <strong>HIGHER</strong> survival rate due to:</td>
</tr>
<tr>
<td>- Harsh predatory conditions &amp; lack of parental care</td>
<td>- Protection of a shell (hard or leathery) &amp; some parental care</td>
</tr>
<tr>
<td>To compensate, <strong>MANY</strong> eggs are produced</td>
<td>Therefore, <strong>FEWER</strong> eggs are produced</td>
</tr>
<tr>
<td>Internal</td>
<td>PLACENTAL MAMMALS</td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>Who</strong></td>
<td>Humans (most mammals)</td>
</tr>
<tr>
<td><strong>What</strong></td>
<td>- Embryo develops in the uterus attached to an umbilical cord (cut after birth) which connects to the placenta (structure with many capillaries, allowing gas &amp; nutrient exchange between mother &amp; fetal blood)</td>
</tr>
</tbody>
</table>

Kangaroo birth video (start at :25sec)
Assisted Reproductive Technology

Egg Donation

Sperm Donation

Needle passes through vaginal wall and into follicle to retrieve egg
Artificial Insemination / IUI (Intrauterine Insemination)

- sperm is inserted into the female reproductive tract by catheter

Video - IUI (0:50 to 1:50)
In Vitro Fertilization (IVF)

- retrieved sperm & egg are combined in a lab
- resulting embryos are implanted in the uterus

IVF Video (from 0:50 to 2:40)
Surrogacy

a woman becomes pregnant by artificial insemination or surgical implantation of a fertilized egg for the purpose of carrying the fetus to term for another woman.
1. In some species very few eggs are produced by the females. Which reproductive pattern is most characteristic of these species?
   (1) internal fertilization followed by internal embryonic development
   (2) internal fertilization followed by external embryonic development
   (3) external fertilization followed by internal embryonic development
   (4) external fertilization followed by external embryonic development
2. In most animal species with internal development, the embryo becomes implanted in the lining of the
   (1) stomach    (3) ovary
   (2) liver      (4) uterus

3. Which event would most probably result in the production of fraternal twins?
   (1) One egg is fertilized by two sperm cells.
   (2) Two egg cells are fertilized by one sperm cell.
   (3) Two egg cells are each fertilized by separate sperm cells.
   (4) Two eggs develop without fertilization.
4. Which characteristic of sexual reproduction has specifically favored the survival of animals that live on land?

(1) fusion of gametes in the outside environment
(2) male gametes that may be carried by the wind
(3) fertilization within the body of the female
(4) female gametes that develop within ovaries
5. The diagram below represents part of the human female reproductive system.

![Diagram of the female reproductive system]

Fertilization and development normally occur in structures

(1) 1 and 5
(2) 2 and 4
(3) 3 and 1
(4) 4 and 5
6. Which type of fertilization and development occurs in the life cycle of the organisms represented below?

(1) internal fertilization and internal development
(2) internal fertilization and external development
(3) external fertilization and internal development
(4) external fertilization and external development
7. Identical twins develop from
   (1) one egg, fertilized by one sperm cell
   (2) one egg, fertilized by two separate sperm cells
   (3) two eggs, both fertilized by the same sperm cell
   (4) two eggs, each fertilized by a separate sperm cell
8. Why is the release of 2,000 to 10,000 eggs by a female salmon during one season considered a favorable reproductive adaptation?
   (1) External fertilization increases the chance of sperm reaching the eggs.
   (2) Overproduction decreases the rate of embryo development.
   (3) The species is declining, so the reproductive rate has increased.
   (4) Unfavorable environmental conditions may destroy gametes.
9. Which diagram best illustrates an event in sexual reproduction that would most directly lead to the formation of a human embryo?

(1) [Diagram]

(2) [Diagram]

(3) [Diagram]

(4) [Diagram]
10. Complex organisms produce sex cells that unite during fertilization, forming a single cell known as

(1) an embryo  (3) a gonad
(2) a gamete  (4) a zygote
Lesson 5

Early Embryonic Development

• Twinning

• Gastrulation & Differentiation
Types of Twins

Fraternal Twins:

• 2 separate eggs are fertilized by 2 separate sperm

• NOT genetically identical (can be same or opposite sexes)
Identical Twins:

- 1 sperm fertilizes 1 egg which then splits into 2 embryos
- Are genetically identical
  – May be conjoined if embryo does not fully separate

Conjoined Twins, Abby & Brittany video
Video - early embryo development

- **OVULATION**
- **FERTILIZATION**
- **ZYGOTE**
- **Cleavage begins** (Early cell divisions)
- **IMPLANTATION**
- **Uterus lining**
- **Ovary**
- **OVULATION**

Diagram showing stages of early embryo development.
Implantation of a Blastocyst
Early Embryo Development

• Mor – Mass
• Ula – small one
• Gastru – stomach cavity
• Zygous – yoked
• Blast – hollow

• Cleav – break or separate
• Endo – inner
• Meso – middle
• Ecto - outer
Gastrulation: 3 embryonic germ(cell) layers form after implantation

- Ectoderm: outermost layer
  - skin, hair, nails, brain / nervous system
- Mesoderm: middle layer
  - Bones, cartilage, muscle, gonads, circulatory, excretory systems
- Endoderm: innermost layer
  - Digestive Tract, Respiratory System, Glands
**Endoderm layer**
1) Digestive system
2) Liver
3) Pancreas
4) Lungs (inner layers)

**Mesoderm layer**
1) Circulatory system
2) Lungs (epithelial layers)
3) Skeletal system
4) Muscular system

**Ectoderm layer**
1) Hair
2) Nails
3) Skin
4) Nervous system
Differentiation - embryonic stem cells from each layer begin to specialize into different specific cells.
2. The three embryonic germ layers are the ____________, ____________, and ____________.

3. Mitotic division in embryonic development is commonly called ____________.
Video – Gastrulation & Differentiation Animation
Lesson 6

• Fetal Development
A Mammal Embryo

a. embryo – offspring during 1st 8 weeks of gestation

b. placenta - organ for gas & nutrient/waste exchanges between mother and fetus; NOTE: Their blood supplies do NOT mix!!!

c. Fallopian tube – where fertilization occurs; carries egg from ovary to uterus

d. uterine wall – muscular part of uterus, contracts during labor
e. umbilical cord – attaches embryo/fetus to the placenta
f. amnion – protective sac around fetus
g. amniotic fluid – fluid in protective sac
h. vagina – birth canal
i. uterus – site of fetal development (40 weeks gestation in humans)
Fill in the blanks with the correct answers.

After two months of development, the embryo is called a (an) _______ _______. The _______ _______ is formed in part from the inner lining of the uterus and in part from other membranes. It is through the placenta that the embryo/fetus is nourished while in the _______ _______ and _______ _______ are carried away. The _______ _______ connects the embryo/fetus with the placenta. It provides a transport system for placental-fetal circulation. The _______ _______ is the innermost of the extra embryonic membranes, and it forms a fluid-filled _______ _______, around the embryo/fetus.
If maternal and fetal blood supplies do **NOT** mix then how are the nutrients, gases, and wastes exchanged? **Diffusion** across the capillary membranes!
cervix
umbilical cord
placenta
fallopian tube
amniotic fluid
amniotic sac
uterus
fetus
cervix
vagina
Warning – Graphic Photos (umbilical cord & placenta)

Video - Computer Animated Vaginal Birth

Video - Computer Animated C-section

Baby born in sac (en caul)

Vaginal birth (less than 1 min)

In the Womb Birth Clip 9 minutes (GRAPHIC)
Lesson 7

• Factors Affecting Fetal Development
Part A. Stages of Birth

1. Look at the diagrams of four stages of birth shown in Figures 1 and 2.

FIGURE 1.

- placenta
- uterus
- cord
- sac surrounding fetus
- vagina
- liquid within sac
- three days before birth
- two hours before birth

= contractions of uterus
<table>
<thead>
<tr>
<th>Question</th>
<th>Three days before birth</th>
<th>Two hours before birth</th>
<th>During birth</th>
<th>Few minutes after birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is baby inside the uterus?</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Is baby inside the vagina?</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Is baby outside the mother’s body?</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Is baby inside the sac?</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Has the sac broken?</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Are contractions occurring?</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Is baby attached to the cord?</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Is the cord attached to the placenta?</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Is the placenta attached to the uterus?</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Is the placenta being pushed out?</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Has the vagina opened?</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Is baby attached to the mother?</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Has liquid been lost from the sac?</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Is baby still dependent on the mother?</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>
Part B. What Is a Caesarean Birth?

1. Look at the diagram in Figure 3 that shows the outline of the pelvis and the head of a fetus just before the time of birth.
2. Note carefully that the head must be able to pass through the opening in the pelvis during birth.
3. Measure line a. This represents the width of the opening in the pelvis.
4. Measure line b. This represents the width of the head of the fetus.

5. Record your data here:
   a. width of pelvis opening
   b. width of fetus head

FIGURE 3. Sizes of pelvis and head of fetus

3 cm
3.4 cm
6. Notice that this fetus would not be able to pass through this pelvis opening.
7. A caesarean operation must be done to deliver the baby.
8. Look at how a caesarean birth is done in Figure 4. This is usually done before the mother goes into labor.
9. To compare a birth canal delivery with a caesarean delivery, answer the questions in Table 2.
<table>
<thead>
<tr>
<th>Trait</th>
<th>Birth canal</th>
<th>Caesarean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the fetus pass through opening in the pelvis?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Does the fetus pass through the vagina?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Does the placenta move through the vagina?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Is the fetus lifted from the uterus?</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Is the uterus cut open?</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Is the sac cut open?</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Must the cord be cut to separate the fetus from the placenta?</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Do contractions occur?</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>
Amniotic sac filled with fluid and uterus

To allow nutrient and gas exchange between mother & fetal blood supplies by diffusion

To connect the fetus to the placenta

The uterus contractions that help push the baby out through the vagina

The placenta is birthed after the baby

Uterus contractions begin, cervix dilates, amnion breaks

Umbilical cord is clamped & cut, placenta detaches from uterus and is expelled, baby is placed on mother for skin to skin contact and breastfeeding
Should you wait to have a child? Get the facts.

The Fertility Factor

Most women who are on a career track do not worry about the consequences of delaying childbirth—they’re confident that all the technical advances they hear about will enable them to become pregnant well into their 40s and beyond.

The truth is that fertility declines steadily with age. A woman’s best chance of becoming pregnant is between 18 and 25. Over the next 10 years, that number drops by half. By age 40, her fertility is only 15% of what it was at age 25. At 44 and beyond, there’s only a 1% chance of success each month.

The success of in vitro fertilization in a woman over 35 drops significantly if her own eggs are used. If she’s pushing 50, her best chance of becoming pregnant is with eggs from

Infection and abnormalities of the pelvic organs. The doctor looks for sexually transmitted diseases, evaluates the hormonal status and checks the efficiency of the immune system. An ultrasound may be needed to search for ovarian cysts and uterus abnormalities. A dye test checks the shape of the uterus and if the fallopian tubes are open. More invasive procedures—such as laparoscopy, hysteroscopy or an endometrial biopsy—also may be needed.

A post-coital test performed during or near ovulation also may be done. The cervix is scraped a few hours after intercourse to obtain a sample of the cervical fluid to see if any sperm has "made it."

Treatment depends on the findings. For example, irregular or absent ovulation can be treated with drugs. In endometriosis, the aberrant tissue sometimes can be removed surgically or with lasers, or treated with birth-control pills or hormones. Infections are eradicated with an antibiotic; scar tissue can be removed; missing or deficient hormones can be replenished. Lifestyle changes also may be necessary, especially eliminating tobacco and reducing alcohol consumption.

Assisted-reproduction techniques also are available (see box). They take sacrifice, patience, time, money, optimism and an expert in the field. An easier alternative is to work on both your career and motherhood when you’re young, if you can.

Alternatives
Some commonly recommended
cantly if her own eggs are used. If she’s pushing 50, her best chance of becoming pregnant is with eggs from a younger donor.

**Your Eggs And Your Age**

The reason for all this lies in the number and characteristics of the eggs themselves. At birth, a girl’s ovaries contain 1 million to 2 million eggs. At puberty, that number drops to 400,000 and continues to fall—especially quickly approaching 35. There also is some deterioration in egg “quality” with age. No one knows why.

When a couple can’t conceive, both partners should be evaluated—statistically they’re equally “at fault.” While sperm is a key player and can be inadequate for various reasons, a woman’s age does not appear to be a major factor in the infertility equation.

**Is There A Problem?**

If you’ve been trying to start a family without success and are in your 20s and healthy, give it a year before seeking professional help.

But don’t wait longer than six months if you’re female and over 30, or if you have one or more of the following: chronic pelvic infection, endometriosis (uterine tissue occurring elsewhere in the pelvis or abdomen), painful or irregular periods, or recurrent miscarriages.

If, after several months without success, a couple decides to get help, the male should see a urologist (who may refer him to a specialist in infertility).

**Testing And Treatment**

Testing a woman for fertility usually is more involved. A careful history is taken and a physical exam is done, especially looking for evidence of pelvic

**Alternatives**

Some commonly recommended assisted-reproduction procedures:

- **Artificial insemination.** Sperm is inserted into the uterus, usually via a catheter. This technique, which works about 15% to 20% of the time, is appropriate when the male partner’s sperm is unhealthy or he is impotent and cannot penetrate.

- **In vitro fertilization (IVF).** Sperm is introduced with a needle to fertilize eggs in a test tube. The resulting embryo is transferred to the mother’s uterus two or three days later. It’s successful in 20% to 26% of cases.

- **Intra-cytoplasmic sperm injection.** A single sperm is injected into one egg. This is especially useful when the man has a low sperm count; it also avoids the risk of multiple pregnancies.

- **Donor eggs.** If your own eggs are not viable, those from a younger woman can be fertilized and the embryo transferred to grow in your uterus.
The Fertility Factor (October 12, 2003, Parade Magazine)

Read the article and fill in the following:

1. A woman's best chance of becoming pregnant is between the ages of _____ and _____.

2. From age 25 to 35 a woman's chance of becoming pregnant drops by ______.

3. From age 44 and up a woman's chance of becoming pregnant is only ___% each month.

4. The success of ____________ drops significantly if her own eggs are used.

5. At birth a girl's ovaries contain ____________ eggs.

6. At puberty the number of eggs drops to ____________.

7. There is deterioration in egg _________ as a woman ages.

8. Define:
   endometriosis__________________________
9. What are some of the conditions mentioned that explain why some women cannot conceive (become pregnant)?

10. List four commonly recommended assisted-reproduction procedures.
Factors That Affect Prenatal Development

- MUTAGENS like x-rays can cause mutations in the developing embryo/fetus’ DNA
Some harmful substances can diffuse across the placenta.
Alcohol can cause:

• brain damage

• birth defects such as **fetal alcohol syndrome** (FAS), a form of mental retardation

• Highest risk during early pregnancy when organs are still developing
Cigarette smoke can increase risk of:

- pre-mature birth
- low birth weight
- Heart defects
- Cleft lip / palate
- Miscarriage / stillbirth
- Ectopic pregnancy (implants outside of uterus)
- Placental abruption (separates from uterus)
Mercury exposure can lead to:

- Stunted neurological development
- Vision and hearing problems

Pregnant women should avoid eating large fish – shark, swordfish, king mackerel, tuna
### Pregnancy-Safe
- crab
- crayfish
- trout
- tilapia
- sole
- anchovies
- oysters
- shrimp
- perch
- squid
- herring
- sardines
- scallops
- haddock
- pollock
- salmon

### Limit Servings*
- bass
- lobster
- carp
- mahi mahi
- halibut
- grouper
- albacore tuna
- yellowfin tuna
- cod

### Avoid
- king mackerel
- shark
- tilefish
- marlin
- orange roughy
- bigeye tuna
- ahi tuna

*Limit to 3 to 6 servings a month or less
Prenatal Care—A Case Study

Martha was happy to find out that she was pregnant. She and Bill had wanted to have a child for more than a year, with no success. Now that the pregnancy test was positive, Bill and Martha breathed a sigh of relief. They looked forward to being able to relax and enjoy themselves over the next nine months as they waited for the arrival of the new member of the family.

Before long Martha began to realize that having a baby was not as simple as she had at first thought. She discovered that there was much to think about and many things to do to help ensure that the baby would be born healthy.

Soon after she knew she was pregnant, Martha visited an obstetrician, a doctor who specializes in caring for pregnant women and delivering their babies. Dr. Thomas set up a regular schedule of appointments so that he could observe how Martha’s pregnancy was proceeding. This would also give him the opportunity to advise Martha concerning how to care for herself during her pregnancy. The doctor took a complete medical history. He advised Martha concerning her diet, the need to keep her weight under control, the kinds of exercise that would be good for her, and the importance of staying away from alcohol, drugs, and tobacco.

The nurse explained that good nutrition is essential to the health of pregnant women and their developing babies. The doctor prescribed special vitamins that contained extra amounts of the minerals iron and calcium. The doctor’s nurse explained that the extra iron would reduce the chances of complications arising from anemia (a medical condition in which there are too few red blood cells or too small an amount of hemoglobin in the blood). A pregnant woman needs extra calcium so that her bones and those of her developing baby will be strong. The vitamins would contribute toward good nutrition for both Martha and her developing baby, and would help ensure that the baby does not have an abnormally low birth weight, which can be harmful to the health of the baby and is associated with birth defects.

Following the advice of Dr. Thomas, Martha exercised to develop and
Following the advice of Dr. Thomas, Martha exercised to develop and strengthen her body. She knew that staying in good shape would help make childbirth easier. She took regular walks and did breathing and stretching exercises. She kept up her weekly swim at the Y and her tennis game with Bill on Thursdays. She and Bill started spending more time together.

Perhaps most important of all, Martha took seriously her doctor's warning that she should not take any drugs or medicines without his permission. Drugs, medicines, and most other kinds of chemicals that a pregnant woman takes into her body can cross the placenta and affect the baby. Even such common drugs as aspirin, nicotine, and alcohol can be harmful. The pregnant woman who uses cocaine and barbiturates runs a high risk of giving birth to a baby who is addicted to these drugs. If she smokes and drinks alcoholic beverages during her pregnancy, her baby is more likely to have low weight and be sickly than are the babies of pregnant women who avoid smoking and drinking. Dr. Thomas pointed out that babies of drinking women have higher death rates and are more likely to be born premature.
From Martha and Bill’s story, answer the following questions about prenatal care.

1. Why is prenatal care important? 

2. What are some factors that can cause low-birth-weight babies? 

3. Name some diseases of the pregnant woman that can harm unborn children. 

4. What extra mineral supplements are important for the diet of a pregnant woman? 

5. What do these extra nutrients do? 

6. List eight physical symptoms that should prompt a pregnant woman to call her obstetrician immediately. 

7. List some rules that a pregnant woman should follow to ensure giving birth to a healthy child.
Lesson 8

Sexual Reproduction in Plants
Seeds
Flowers
Seed Dispersal

• Methods:
  – Wind
    • Maple Copters - YouTube
  – Mechanical
    • Exploding Seeds
  – Animal
Structure of a Flower

Pollination – transfer of pollen (containing sperm) from the male anther to the female stigma
Cross pollination – transfer between 2 flowers
Self pollination – transfer on the same flower
Pistil (female)
- Stigma
- Style
- Ovary

Stamen (male)
- Filament
- Anther
- Receptacle

12. Ovules (egg cells) become fruit’s seeds

Petal (brightly colored to attract pollinators)

Sepal - supports the petals

Stem

Stem supports the anther
Reproduction Review
The outermost germ layer of an embryo

Ectoderm
Three accessory glands that produce semen/prepare sperm to leave body

Cowper’s (bulbourethral)
Prostate
Seminal Vesicle
Fertilization occurs here

Fallopian tube
Two ovarian human hormones that control the female reproductive cycle

Progesterone
Estrogen
Two pituitary human hormones that control the female reproductive cycle

FSH
LH
The male sex hormone is produced in the Testes.
True or false?
Mother’s blood mixes with fetal blood to transfer vital nutrients and remove waste products.

FALSE!!! These materials are transferred through diffusion! Blood doesn’t mix
Put the following in order:

fetus, blastula, gastrula, zygote, embryo

zygote, blastula, gastrula, embryo, fetus
Put the following in order:

cleavage, differentiation, fertilization, gastrulation, growth, implantation

fertilization, cleavage, implantation, gastrulation, differentiation, growth
When stem cells begin to specialize, this is called... 

differentiation
Most fish have ____________ fertilization and ________________ development!

external, external
Most birds have ______________ fertilization and ___________ development.

internal, external
What is a reproductive adaptation for reproduction on land?

Penis
Seminal fluid
Which stage of the female reproductive cycle is characterized by the development of a “yellow body” which releases the hormone progesterone to maintain the lining of the uterus?

Luteal phase
Characterized by a permanent ending of the menstrual cycle

Menopause
Human Development Summary

1. Sperm and egg /ovum join in the oviduct/fallopian tube: **FERTILIZATION**
2. The fertilized egg is called a **ZYGOTE**
3. The zygote moves down the fallopian tube toward the uterus and divides many times: **CLEAVAGE**
4. Within the next 2 weeks, the zygote will become an **EMBRYO**, and continue to divide
5. The embryo implants itself into the uterine lining and **GASTRULATES** (hollows out) forming 3 germ layers
6. The embryo starts to form distinctive specialized cells, beginning the process of **DIFFERENTIATION & GROWTH**
7. The embryo develops its umbilical cord and **PLACENTA**, where **DIFFUSION** of gases, nutrients and wastes between mother and fetus occurs.

8. During **GESTATION** (time in the womb), the fetus is protected from shock by the fluid-filled **AMNION**.

9. As the fetus grows larger, it may be exposed to many environmental factors that **DIFFUSE** across the placenta.

10. **MUTAGENS** like x-rays can cause mutations in the developing fetus!

11. Other toxic materials like alcohol, cigarette smoke, and mercury can cause birth defects and low birth weight as well!