

What is the function of reproduction?	To perpetuate the species. This matters because every species is important in the food chain.	
What types of reproduction are there?	Sexual- requires the use of gametes- and asexual- requires only one parent.	
What is regeneration?	When an organism grows back a lost body part. This is not reproduction.	
What are the advantages and disadvantages of asexual reproduction?	<b>Advantages</b>	<b>Disadvantages</b>
	Quick	No variety, which makes less room for evolution. All of one species then have the same weaknesses, causing danger of extinction.
	Produces more offspring	
	Easy/efficient	

Type of Asexual Reproduction	How it Works	Example
Cell division/binary fission	Mitosis	Bacteria
Spore formation	Organisms create microscopic structures that are haploid	Mold, ferns, moss
Budding	A mini-organism buds- branches off of it's parent.	Yeast
Fragmentation	Parts that break off of an organism grow into a new body	Starfish
Vegetative Propagation	Plants reproduce via fragmentation	A. Stem- potato eyes B. Bulb- tulip C. Roots- weeds D. Runners- spider E. Leaves- aloe vera F. Tubers- yam
Pathogenesis	Unfertilized eggs develop into new organisms	Some fish Termites/bees- hierarchical insects

What is fertilization?	The fusion of two or more nuclei.
What types of fertilization are there?	External, where the egg and sperm fuse in a body of water; and internal, where the egg and sperm fuse within the female.

What types of vertebrates use external fertilization?	Fish and amphibians.	
What types of vertebrates use internal fertilization?	Reptiles, birds, and mammals.	
What are the advantages and disadvantages of external fertilization?	<b>Advantages</b>	<b>Disadvantages</b>
	Freedom for the female	Offspring unprotected (Predation)
	Large numbers produced	Offspring left to injury
		Offspring left to pollution (chemical and thermal)

What are characteristics of fish?	Fins and removable scales, aquatic, cold blooded, gills.
About how many eggs do fish lay?	1,000
How are fish eggs fertilized?	The female lays them, and the male comes later to fertilize them. Eggs are out in the open.
What are characteristics of amphibians?	Live early life in water, develop lungs later. Have no cover to retard evaporation from their skin, so they must live near water. Frogs, toads, salamanders, newts.
About how many eggs do amphibians lay?	100.
Why fewer?	They are concealed. For example, frog eggs are laid near water plants. Their tops are dark, so they look like mud or plant from the top, and their bottoms are clear, so they look like water from the bottom.
What are reptiles?	Lizards, snakes, turtles, crocodiles, alligators, and dinosaurs. They have scales that merge together, are cold blooded, and do not exhibit maternalism (except crocs/alligators).
How do reptiles reproduce?	They fertilize internally, then lay 60-100 eggs, which they leave, usually buried (for protection).
Why do they only produce a few eggs?	1. They fertilize internally, which is safer- there is less danger that that they unfertilized gametes will be destroyed 2. There is a greater chance of fertilization internally 3. Their leathery shells keep them safer and retard evaporation
What are some characteristics of birds?	Most fly, feathers, beak, warm blooded, feet with claws.
How do birds reproduce?	They fertilize internally, then lay 1-12 hard-shelled eggs,

	which they sit on- incubate, to keep them warm and protect them until they hatch.								
What are the differences between precocial and altricial birds?	<table border="1"> <tr> <th>Precocial</th> <th>Altricial</th> </tr> <tr> <td>Mature for their age</td> <td>Born naked, blind</td> </tr> <tr> <td>Totally self sufficient from birth (species knowledge)</td> <td>Depend on parents</td> </tr> <tr> <td></td> <td>Stay with parents, to learn</td> </tr> </table>	Precocial	Altricial	Mature for their age	Born naked, blind	Totally self sufficient from birth (species knowledge)	Depend on parents		Stay with parents, to learn
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What are some characteristics of mammals?	Fur/hair, warm blooded, have maternalism.								
What are monotremes, and how do they reproduce?	Duckbill platypus, echidna. These mammals actually lay eggs. They have a cloaca- one opening for a variety of functions (waste, sex, birth...)								
What are marsupials, and how do they reproduce?	Pouched mammals, such as the kangaroo and opossum. Their young are born as embryos (embryonic birth) and development finishes in the pouch. They climb out of the birth canal, still tiny, and into the pouch, where they latch onto the mammary glands for nutrients.								
What are placental mammals, and how do they reproduce?	These mammals use a placenta that connects between the mother and baby, to nourish the baby and remove it's wastes. There is one placenta per baby, per pregnancy.								
How do males attract mates?	<ul style="list-style-type: none"> <li>● Sound/song                             <ul style="list-style-type: none"> <li>○ Call- across long distances</li> <li>○ Song- to prove species (elaborate)</li> <li>○ Vibration</li> </ul> </li> <li>● Vibrant coloration (plumage)</li> <li>● Pheromones (“sex perfumes”)</li> <li>● Light</li> </ul>								
What is sexual dimorphism?	Genders are different- males tend to be larger and have something that protrudes from them. (Antlers, horns, mane, etc.)								

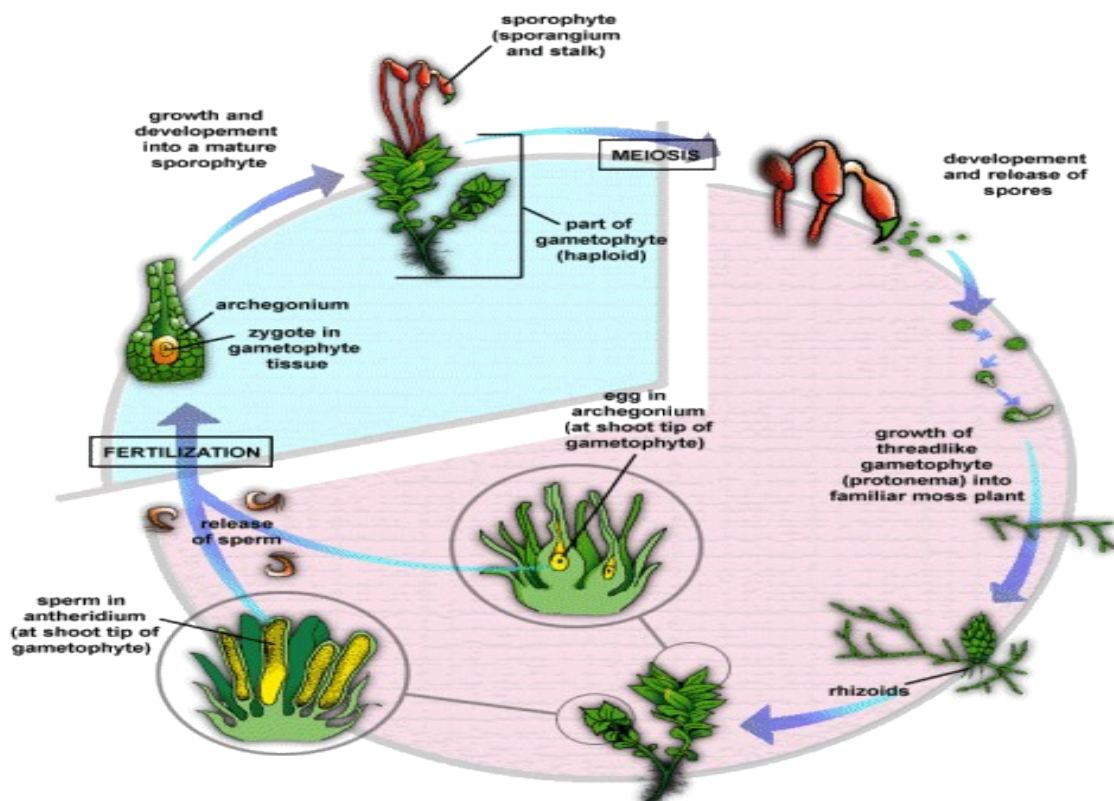
What are bryophytes?	Mosses, liverworts, and hornworts. These plants are very small, because they have no vascular tissue and cannot bring water up from the ground.
What is alternation of generations?	The diploid <b>sporophyte</b> (spore producing plant) produces, by mitosis, a haploid <b>gametophyte</b> (gamete producing plant). When two gametes fertilize, they produce a new sporophyte. Each plant exists on it's own, and one type does not undergo metamorphosis to become the other.
What is the bryophyte life cycle	<b>Bryophyte Life Cycle- In bryophytes, the gametophyte is the</b>

like?

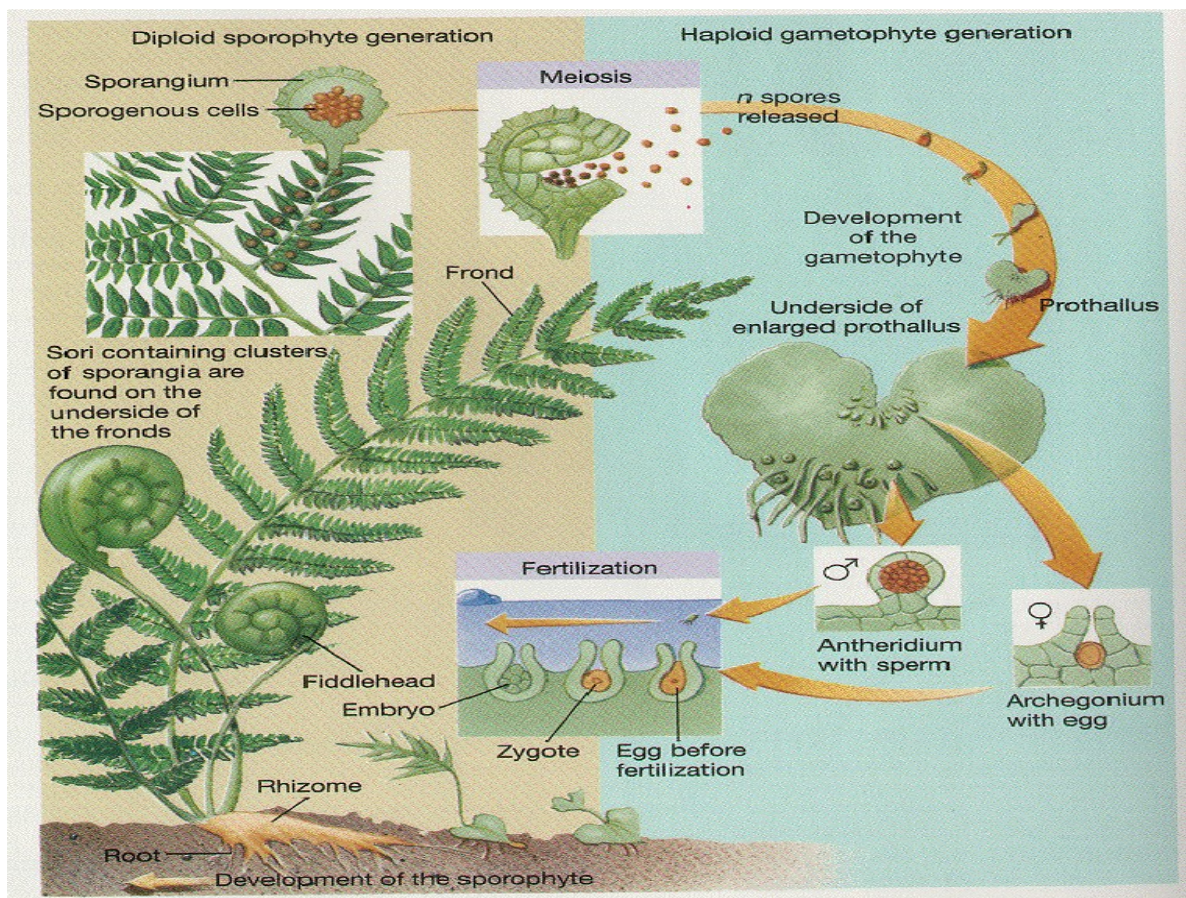
**dominant, recognizable stage of the life cycle and is the stage that carries out most of the plant's photosynthesis. The sporophyte is dependent on the gametophyte.**

A spore lands in a moist place and germinates, growing into a bunch of tangled green filaments, called a *protenema*. This grows, forming *rhizoids*, small rootlike things (not true vascular tissue) and shoots in the air. It's "leaves" go through photosynthesis, but have no vascular tissue. This is the gametophyte stage of it's life cycle. Gametes are formed in reproductive structures at the tips of the gametophytes. Sperm are produced in the *antheridia* and eggs in the *archegonia*. Once sperm are released, they fertilize egg cells, forming a diploid zygote. Water- raindrops, for example- is needed for fertilization, because the sperm must swim to the eggs, inside the archegonium. This is internal fertilization.

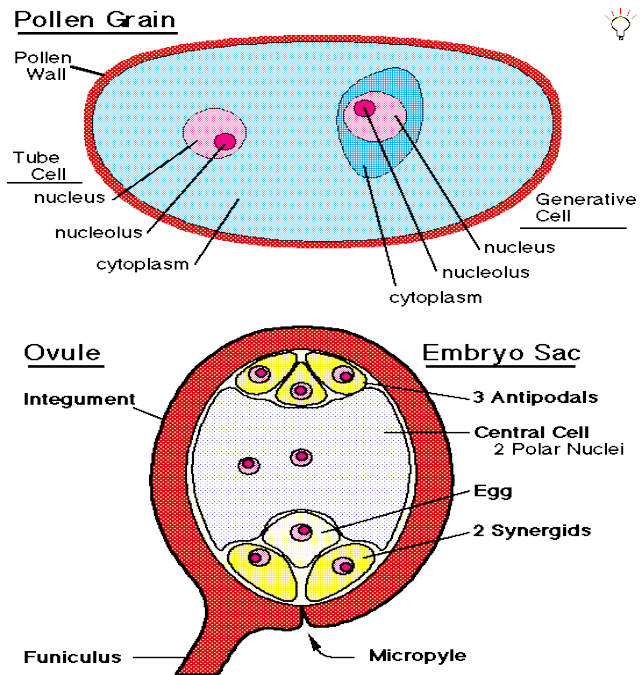
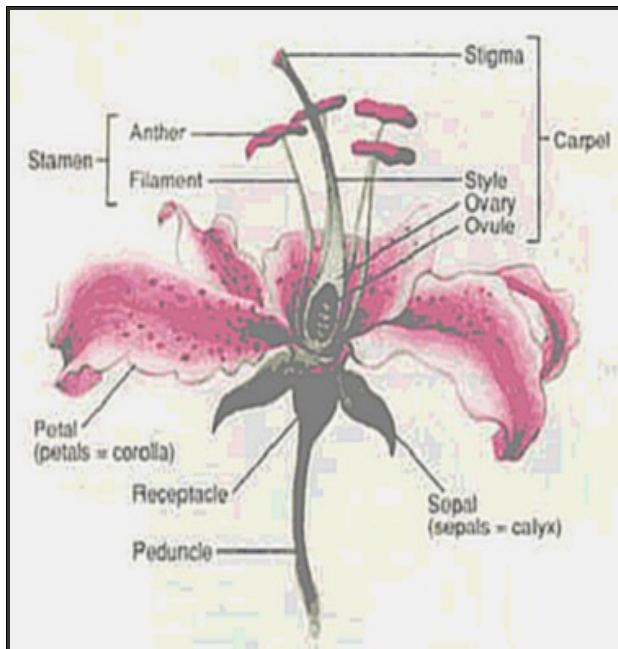
Thus begins the sporophyte stage of life. It grows out of the gametophyte body, depending on it for water and nutrients. The mature sporophyte is a long stalk, ending in a capsule that looks like a saltshaker. By meiosis, it produces haploid spores, which are released when the capsule hardens and it's cap cracks off. They are scattered anywhere and everywhere by the wind, where they grow and begin the cycle again.



<p>What is vascular tissue?</p>	<p>A system of veins/arteries, tubes/vesicles, that transport food (phloem) and xylem (minerals and water). This allows plants to draw water from to soil, up to great heights, and live in sunny and dry places.</p>
<p>What is the life cycle of fern like?</p>	<p>Fern sporophytes (dominant phase in the fern life cycle) produce haploid spores on the underside of their fronds, in <i>sporangia</i>, which grow in structures known as <i>sori</i>. Spores are released, and germinate, developing into haploid gametophytes. These grow rootlike rhizoids, then flattens into a thin, heart-shaped green structure, which is the mature gametophyte, independent of the sporophyte. The antheridia and the archegonia (reproductive structures) are on the underside of the gametophyte. Once the gametophyte produces gametes, they fertilize, and the zygote grows into a new sporophyte plant while the gametophyte dies. The sporophyte lives for several years, releasing spores that grow into new gametophytes.</p>

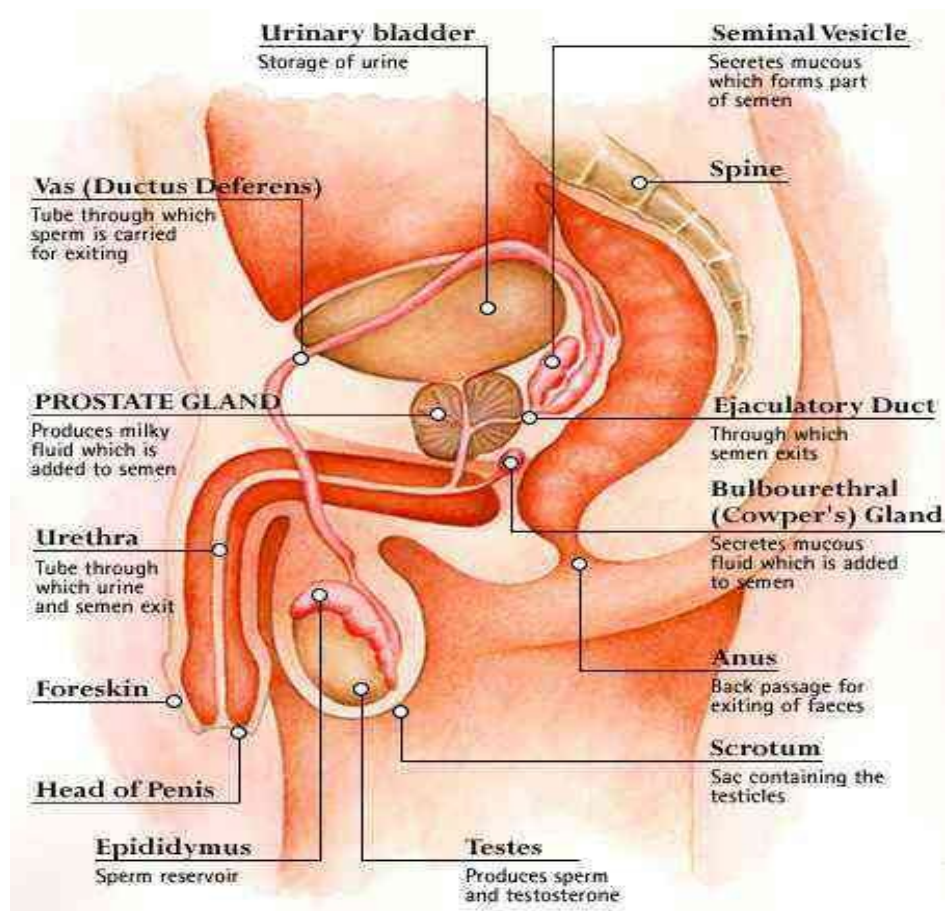


What are angiosperms?	Flower-producing, seed-bearing, vascular plants. They enclose their seeds in fruit.
What is the structure of an angiosperm?	A mature, diploid plant grows a flower. The male <i>stamen</i> produces pollen cells- male gametophytes. These are located in the <i>anthers</i> , which sit, held high so pollen can be spread, atop the <i>filaments</i> . The female <i>pistil</i> produces eggs in the <i>ovules</i> , which are located in the <i>ovary</i> . Nectar- a sweet, sugary substance- is produced within the <i>nectaries</i> , which are also in the ovary. Atop the ovary sits the <i>style</i> , and atop it the style is the sticky <i>stigma</i> .
How does wind-pollination happen?	Wind shakes pollen grains off of the anthers. They are blown away and attach to the stigmal of a flower, where they proceed to fertilize it.
How does vector pollination happen?	Plants produce colorful, sweet-smelling blossoms, to attract animals that will come to them. These animals come and drink the nectar, from the ovary. When they go for nectar, they become dusted in pollen, when they touch the anthers. These animals go from flower to flower in search of more nectar (there is only a little in each flower) and, invariably, some pollen grains get stuck on the stigma.
How are eggs produced?	Inside the ovule, a diploid cell undergoes meiosis. Out of 4 cells, 3 die. The one that is left undergoes mitosis 3 times, so there are 8 haploid nuclei. Three of these are known as the antipodals; these are near the top of the embryo sac, which is contained within the ovule wall. Two, which sit in the middle of the embryo sac, are the polar nuclei. Two more sit on each side of the egg nucleus.
How are pollen grains produced?	One diploid cell undergoes meiosis. Each of the four haploid cells undergoes a mitotic division- it ends up with two nuclei. These cells develop a hard outerlayer and protrusions, which will eventually help them attach to the stigma.
How does fertilization occur?	A pollen grain with two nuclei attaches to the stigma. Enzymes on the stigma surface open the pollen grain. One of the nuclei, the tube nucleus, “blazes a trail”. The other nucleus- the generative nucleus- follows, then splits into two sperm. When the tube nucleus reaches the micropyle- the entrance to the ovule- it disintegrates. One sperm fertilizes the egg, and one fertilizes the polar nuclei ( <i>double fertilization</i> ). The sperm and polar nuclei fusion results in a 3N (triploid) cell, which becomes the endosperm. It nourishes the zygote. After fertilization, the flower withers away.
How does seed dispersal occur?	The seed is made up of a seed coat, which is a the hardened ovule, the embryo, and the endosperm tissue. <ul style="list-style-type: none"> <li>● The ovary hardens, becoming a tasty fruit. Animals take it and eat it; the seeds end up in different places.</li> <li>● The ovary becomes aerodynamic, like a “helicopter” and flies away.</li> <li>● The ovary floats away, as in coconuts.</li> <li>● The ovary becomes clingy, like a “hitchhiker”.</li> </ul>



<p>What are primary sex characteristics?</p>	<p>Gonads, which produce both hormones and gametes. M- testes; F- ovaries</p>																			
<p>What are secondary sex characteristics?</p>	<p>Caused by hormones (M- testosterone; F- estrogen)</p> <ol style="list-style-type: none"> <li>1. Emotional/behavioral</li> <li>2. Physical/morphological</li> <li>3. Physiological</li> </ol> <p>These develop at puberty...</p> <table border="1" data-bbox="553 1241 1461 1772"> <thead> <tr> <th data-bbox="553 1241 1008 1289">Male</th> <th data-bbox="1016 1241 1461 1289">Female</th> </tr> </thead> <tbody> <tr> <td data-bbox="553 1299 1008 1348">Sex drive</td> <td data-bbox="1016 1299 1461 1348">Sex drive</td> </tr> <tr> <td data-bbox="553 1358 1008 1407">Growth</td> <td data-bbox="1016 1358 1461 1407">Growth</td> </tr> <tr> <td data-bbox="553 1417 1008 1465">Voice change</td> <td data-bbox="1016 1417 1461 1465">Voice change</td> </tr> <tr> <td data-bbox="553 1476 1008 1535">Pubic hair (sign that person is becoming a reproductive adult)</td> <td data-bbox="1016 1476 1461 1535">Pubic hair</td> </tr> <tr> <td data-bbox="553 1545 1008 1593">Body hair</td> <td data-bbox="1016 1545 1461 1593">Smoother skin</td> </tr> <tr> <td data-bbox="553 1604 1008 1663">Oil and sweat glands (which lead to acne and body odor)</td> <td data-bbox="1016 1604 1461 1663">Oil and sweat glands</td> </tr> <tr> <td data-bbox="553 1673 1008 1722">Increase in muscle</td> <td data-bbox="1016 1673 1461 1722">Feminine figure</td> </tr> <tr> <td data-bbox="553 1732 1008 1780">Facial hair</td> <td data-bbox="1016 1732 1461 1780">Body hair</td> </tr> </tbody> </table>		Male	Female	Sex drive	Sex drive	Growth	Growth	Voice change	Voice change	Pubic hair (sign that person is becoming a reproductive adult)	Pubic hair	Body hair	Smoother skin	Oil and sweat glands (which lead to acne and body odor)	Oil and sweat glands	Increase in muscle	Feminine figure	Facial hair	Body hair
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<p>What are the testes?</p>	<p>Male reproductive organs where testosterone (which makes sperm fully functional) and sperm are produced. They are located within the scrotum- a sac that keeps them suspended below the body and slightly</p>																			

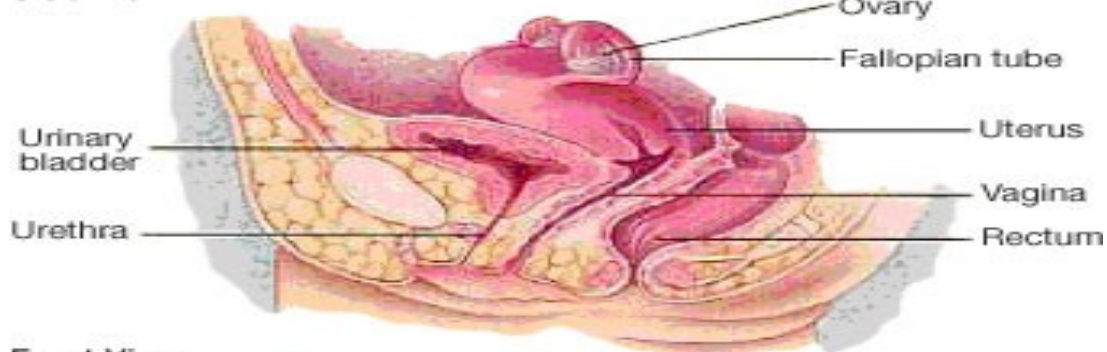
	cooler, since sperm die at body heat.
What is the epididymis?	Here sperm are stored and mature (get flagellum). Here old sperm also die and are recycled.
How do sperm exit the body?	When the automatic nervous system signals to build up blood pressure near the penis and the penis becomes stiff and hard. The sperm are ejected from the body.
What are the vas deferens?	“Sperm ducts”. There is one for each testes. The sperm travel through these on their way out of the body.
What is semen?	Sperm pass through the seminal vesicles (this fluid has fructose, to power the sperm), the prostate gland (this fluid is a viscous lubricant, so sperm can swim easily), and the bulbourethral (Cowper's) gland. The fluid produced by these glands is known as seminal fluid. Coupled with sperm, it is semen. This is released during sex.
What are sperm like?	Sperm have heads, which consist only of their nuclei and an enzyme, mid-pieces that contain mitochondrion, and tails, to swim.
What is a vasectomy?	A male's vas deferens are cut and tied, effectively sterilizing him.



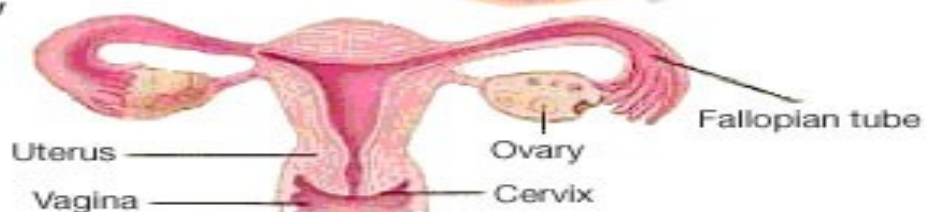


What is the ovary?	Where estrogen and eggs are produced.
What are the fallopian tubes?	One for each ovary. Fertilization occurs here, and these tube connects the ovaries to the uterus, for implantation. They are lined with cillia, which moves a fluid through them, along with the egg. The eggs process through these tubes takes about 5 days.
What is an ectopic pregnancy?	When the egg is fertilized in the fallopian tubes and remains there. Pregnancy is terminated, tubes are removed.
What is the uterus?	The embryo <i>implants</i> , attaches to the uterine wall for protection and nourishment, here. The baby develops here.
What is the cervix?	The “neck”- entrance- of the uterus.
What is the vaginal canal?	The point of entry for the sperm. It is very large.
Why are so many sperm needed?	The vaginal canal has acidic substances in it, to kill anything foreign trying to get into the body. Also, body heat hurts kills sperm, as well as white blood cells, which come to fight off anything foreign. Only 200-300 of the strongest sperm reach the egg.
How does fertilization occur?	The sperm reach the egg and begin hitting it. Eventually, the enzyme sac on their heads break, changing the permeability of the egg membrane. The head of one sperm enters the egg, and then the membrane re-seals. The head breaks, and the nuclei fuse.
What is a pap smear?	A test for cervical cancer, where a swab of the cervical surface is taken and cultured. Cervical cancer cells can be detected.
What is a hysterectomy?	The removal of a uterus.
What is a total hysterectomy?	The removal of a uterus, fallopian tubes, and ovaries.
What is a tubal ligation?	A female vasectomy. Fallopian tubes are cut and tied.

Side View



Front View



What are hormones, and how do they work?	The body communicates with itself using these “chemical messengers”. They travel through the bloodstream to target organs, where they tell them to turn something off (negative feedback) or turn something on (positive feedback).
What types of hormones are involved in the menstrual cycle?	Ovarian (estrogen, progesterone) Pituitary (FSH, LH) (“master gland” at the base of brain)
How does the menstrual cycle begin?	In a pre-pubescent female, the hypothalamus gland “wakes” the pituitary. The pituitary begins to secrete Follicle Stimulating Hormone (FSH).
What is a follicle?	A compartment of cells, with an immature egg at the center.
After the pituitary secretes FSH, what happens?	FSH sends positive feedback to the ovaries, signaling estrogen production. Secondary sex characteristics develop. Estrogen levels rise, and the menstrual cycle begins.
What is menstruation?	The first stage of the menstrual cycle. The uterus wall breaks down, since the egg never fertilized or implanted. Since it isn't needed, the body wants to slough off the lining, of blood cells that would have cushioned the embryo. This takes 1-5 days on average, and is brought about by a lowering of FSH levels. Consequently, estrogen levels go down, and the uterine levels break down.
What is the follicle stage?	The second stage. FSH levels rise, and stimulate the follicles to produce estrogen. This causes the uterus lining to be built up again.
What is ovulation?	The third stage. Estrogen goes to the pituitary with negative feedback, so FSH levels go down and LH (lutening hormone) is produced. This hormone stimulates ovulation- the egg is released in the middle of the month (day 14-ish). The uterine level drops quickly after ovulation, as soon as the estrogen levels drop. Then, the lining is rapidly built up. This is because the follicle that matured fastest and catapulted its egg into the fallopian tube becomes a corpus luteum and secretes a hormone progesterone to build up the uterine lining.
What is the luteal phase?	Estrogen and progesterone, secreted by the corpus luteum, build up and create the uterine lining. As these hormone levels peak, if fertilization hasn't occurred, the pituitary is told to stop LH production. The corpus luteum disintegrates and estrogen/progesterone levels drop, causing menstruation. When these levels are low enough, FSH production will be signaled to begin.
What happens if the fertilization occurs?	The embryo in the Fallopian tubes sends chorionic-gonadotropin hormone? (CGH) to keep the uterus line. If production fails, the result is a miscarriage.