Chapter 29: Development, Growth, Aging, and Genetics

I. Prenatal Development

A. General

1. The prenatal period is the time from __________ until __________

2. Define each of the three prenatal periods:
   a. Germinal Period ____________________________________________
      _______________________________________________________
   b. Embryonic Period _________________________________________
      _______________________________________________________
      _______________________________________________________
   c. Fetal Period ____________________________________________
      _______________________________________________________

3. How does the medical community calculate clinical age? _________
   _______________________________________________________
   a. Embryologists describe the timing of developmental events in terms
      of _____________________________________________________
   b. What is the time difference between these two approaches? _____

B. Fertilization

1. What is fertilization? _________________________________
   _______________________________________________________

2. The corona radiata is a ______________ to the __________________
   a. Action of the flagella propel ______________________________

3. The zona pellucida is an ______________ composed mostly of ___________
   a. It is located between the _________________ & the __________
   b. What is ZP3? _____________________________________________
   c. What happens when a sperm cell binds to ZP3? _______________
      ______________________________ 
      1. This process is called _________________________

4. The first sperm cell through the zona pellucida attaches to __________
   on the outer surface of the __________________________
a. The attachment causes ________________________________
   within ________________________________

b. Prevents additional sperm from ________________________________

c. The depolarization is called ________________________________

5. Depolarization causes a series of events including:
   a. Intracellular ________________________________
   b. Causes the exocytosis of ________ and ________ molecules
      1. What are cortical granules? ________________________________
   c. Causes the oocyte to ________________________________
   d. Zona pellucida denatures and ________________________________
      1. ZP3 is inactivated and no ________________________________
   e. This reaction is called ________________________________

6. What is the perivitelline space? ______________________________

7. Entrance of a sperm cell into the oocyte stimulates ________________________________
   ________________________________ and the ________________________________ formed
   a. What is the female pronucleus? ________________________________

8. When the male pronucleus and female pronucleus fuse together:
   a. Completes the process of ________________________________
   b. Restores the ________________________________
   c. What is a zygote? ________________________________

C. Early Cell Division
   1. The cells of the dividing embryonic mass are referred to as ________
      a. What does that mean? ________________________________
      ________________________________

D. Morula and Blastocyst
   1. When does the dividing embryonic mass become a morula? ________
      ________________________________
   2. Three or four days after ovulation, the morula consists of ________
      a. Near this time, ________ cavity called __________________
         begins to appear ________________________________
3. The blastocyst is a ________________________________
   a. The biastoceie is surrounded by a single layer of cells the ________
   b. At one end of the blastocyst the cells are _________________________
      1. The thickened area is called the _________________________
         and is the tissue ________________________________
   c. What does the trophoblast form? ______________________________

E. Implantation of the Blastocyst and Development of the Placenta
1. All of the events of the early germinal phase occur as the embryonic mass moves through the _________________
2. About 7 days after fertilization the ________________________ to the uterine wall, usually in the area of _________ and begins __________
   a. What is implantation? ______________________________
3. Two populations of ______________ develop and form the embryonic portion of the ______________
   a. Cytotrophoblast is a ________________________ trophoblast cells
   b. Syncytiotrophoblast is a _______________ or _____________ cell
4. The cytotrophoblast remains _________________________ and the syncytiotrophoblast invades the ______________________________
5. The syncytiotrophoblast is _______________ which means ______________
     ________________________________
6. As the syncytiotrophoblast encounters maternal blood vessels:
   a. Surrounds them and ________________________________
   b. Forming ________________________ called ______________
   c. Maternal blood circulates ______________________________
7. Cords of cytotrophoblast surround the syncytiotrophoblast and lacunae:
   a. Fingers called _______________ branch from ________________
      ________________________ and protrude into the lacunae
   b. What is the chorion? ________________________________
   c. Embryonic blood vessels follow ____________________________
8. In the mature placenta the ________________________ disappears.
Embryonic blood supply is separated from maternal blood supply by only:

1. Embryonic __________________________
2. _____________________________
3. Thin layer of _____________________________

F. Formation of the Germ Layers

1. After implantation a new cavity forms called the ______________
   a. The cavity forms inside the __________________
   b. The cavity is surrounded by a layer of cells called __________________
      or ______________________

2. Formation of the amniotic cavity causes a part of the ______________
   nearest the _____________________ to separate as a ______________
   ____________________________ called the ______________

3. The embryonic disk is composed of two layers of cells:
   a. Ectoderm _____________________________
   b. Endoderm _____________________________

4. The yolk sac forms ______________ from the ______________

5. Eventually the amniotic sac enlarges ______________________
   providing it with ______________________

6. About 13 or 14 days after fertilization, the embryonic disk becomes ______________
   a. Proliferating cells of the __________ migrate toward the __________
      and the __________ of the disk, forming a ____________ called
   b. Some ectoderm cells:
      1. Leave ______________
      2. Migrate through ___________________________
      3. Emerge ______________ as a new germ layer _____________

7. The three germ layers ______________, ______________, and __________
   are _____________________________
   a. All tissues _____________________________

8. What is the notochord? _____________________________
G. Neural Tube and Neural Crest Formation

1. About 18 days after fertilization the ectoderm near the ____________
of the primitive streak forms a thickened ____________________
a. The lateral edges of the neural plate begin to ________________
   1. The edges are called _____________________
   2. The low area between the edges is called ____________________
b. The underlying notochord stimulates ____________________
   ______________________ __________________________________
c. The crests of the neural fold ____________________ and fuse
   into a ________________ which is completely closed by ________
   1. The neural tube becomes the ________________
   2. Cells of the neural tube are called ____________________

2. As the neural folds come together and fuse ____________________
   ______________________ all along __________________________
a. These cells are called __________________________

3. Neural crest cells migrate ________________ to become:
   a. Part of the ____________________ and the __________________
   b. Migrate laterally to just below the ___________ where they become
       ____________________________

4. Neural crest cells can become other structures in the head, including:
   a. Contribute to ____________________
   b. Dentin of ____________________
   c. Few small ____________________
   d. General ____________________

5. The term mesenchyme refers to ____________________

H. Somite Formation

1. As the neural tube develops, the ____________ immediately adjacent
to the tube forms ____________________ called ____________________

2. Somitomeres are indistinct ____________ that develop in __________
3. The somites and somitomeres eventually give rise to:
   a. ______________________________
   b. ______________________________
   c. ______________________________

4. Most of the head muscles are derived from __________________

I. Formation of the Gut and Body Cavities

1. At the same time the neural tube is forming, the embryo is becoming a tube along the ______________________________

2. The ____________ & ____________ develop as the ________ & ____________ ends of the yolk sac separate from _________
   a. This is the beginning of the ______________________________
   b. The developing ____________ pinches off as a tube but remains attached in the center to the yolk sac by ____________

3. The foregut and hindgut are in close relationship to overlying _______
   a. Foregut forms ____________ that opens to form __________
   b. Hindgut forms ____________ that opens to form ____________ and ____________

4. Numerous evaginations occur along the early digestive tract that become:
   a. ______________________       d. ______________________
   b. ______________________       e. ______________________
   c. ______________________       f. ______________________

5. Solid bars of tissue called ____________ form along the _________ ____________ and the sides of the foregut expand as ____________ between ____________
   a. The central expanded foregut is called ______________________
   b. The pockets along both sides are called ______________________

6. Adult derivatives of the pharyngeal pouches include:
   a. ______________________       c. ______________________
   b. ______________________       d. ______________________

7. At the same time, a series of isolated ______ starts to form within the ________ beginning development of _________ or _________
a. The most cranial group of cavities ______ & ________ to form the ______________________
b. The celomic cavity extends __________________ as the 
   1. __________________________
   2. __________________________
c. Initially all three cavities are ______________

J. Limb Bud Development
1. Arms and legs first appear as __________ at about ______________
2. What is the apical ectodermal ridge? ______________________
   a. It develops on ______________ of each limb bud and ______
       __________________________
3. As the buds elongate, limb tissues are laid down in a ____________
       __________________________sequence

K. Development of the Face
1. Fusion of five embryonic structures occurs in development of the face:
   a. Frontonasal process forms ______________________________
   b. Two maxillary processes form __________________________
   c. Two mandibular processes form __________________________
2. Nasal placodes develop at the __________ of the __________
   a. Become the ______________
3. As the brain enlarges and the face matures:
   a. Nasal placodes approach ______________________________
   b. Medial edges ______________________________
   c. This is between the __________________________ that fuses with
      them to form the ______________ known as the __________
4. The lateral edges of the ______________ fuse with the ________
       __________ to close off ______________________________
   a. The inferior margins of the ______________ fuse with the superior
      margins of the ______________ to decrease the __________
5. By about day 50 all processes result in a ______________________
6. The roof of the mouth, known as the __________________________
a. Begins to form as ______________________________
b. Swing ___________________ and begin to ________________
____________________ at about _______________________
c. Fusion is not complete until about _________________________
d. If the secondary palate does not fuse, a _______________ in the
_______________results, called a________________________

L. Development of the Organ Systems What is the period of organogenesis?

1. Skin
   a. What is the epidermis derived from? ________________________
   b. What is the dermis derived from? ___________ or _____________
   c. What structures develop from the epidermis?
      1. ______________________  3. ______________________
      2. ______________________
   d. Melanocytes and sensory receptors are derived from ____________

2. Skeleton
   a. The bones of the face develop from ______________________
   b. Somite-derived or somitomere-derived mesoderm forms:
      1. Rest of ________________  3. ______________________
      2. ______________________
   c. The appendicular skeleton develops from _________________

3. Muscle
   a. What are myoblasts? ______________________________
   b. Myoblasts migrate from somites or somitomeres to _____________
   c. What are myotubes? _________________________________
      ______________________________________
      1. Myotubes enlarge to become ________________________
   d. Shortly after myotubes form __________________________
   e. The total number of muscle fibers is ______________________
      and remains _________________________________
   f. What causes muscle enlargement after birth? ______________
4. Nervous System
   a. The nervous system is derived from _______ & ____________
   b. Neural tube closure begins in the _____________ and proceeds
      into the ___________ and ______________________
   c. Soon after the neural tube has closed, the part that becomes the
      brain begins to _______________________________
   d. The central cavity of the neural tube becomes:
      1. ________________ in the brain
      2. ________________ in the spinal cord
   e. Neuron cell bodies within the neural tube become:
      1. Somatic ______________________________
      2. Preganglionic ______________________________
   f. Neural crest cells become:
      1. ________________ neurons
      2. Postganglionic ______________________________

5. Special Senses
   a. The olfactory bulb and nerve develop as _______________ from _______________
   b. The eyes develop as _______________ from ______________
      1. Each evagination elongates to form an _______________
      2. The optic vesicle develops at the _______________
      3. At the side of the head the optic vesicle stimulates the _______________
   c. The sensory part of the ear appears as an _______________
      or ______________ that invaginates and _______________

6. Endocrine System
   a. The posterior pituitary forms __________________________
   b. The anterior pituitary develops from __________________________
      in the roof of _______________ and grows __________________
   c. The thyroid gland originates as __________________________
d. The parathyroid glands are derived from the ______ & ___________

__________ migrate ____________________________________

e. The adrenal medulla arises from __________________________

1. Consists of specialized ______________________________

f. The adrenal cortex is derived from __________________________

g. The pancreas originates as ________________________ from the

__________________ which come together to _______________

7. Circulatory System

a. The heart develops from ____________________ which fuse into a

__________________ ______________________

b. Blood vessels form from ________________ on the surface of the

__________________ and ________________ on the inside

1. What are blood islands? ____________________ that become

a. ____________________ on the outside

b. ____________________ on the inside

2. The islands fuse to form the ____________________________

c. A series of dilations appear along the length of the primitive heart tube:

1. Sinus venosus ______________________________________

2. Single __________________

3. Single __________________

4. Bulbus cordis ______________________________________

d. The elongating heart, confined within the ______________, becomes

bent into a loop, the apex is the ______________________

1. The atrium and ventricle ______________________________

2. The right part of the sinus venosus becomes ______________

3. Bulbus cordis is absorbed into ______________________

4. Sinus venosus initiates ______________________________

a. Later part of the sinus venosus becomes the ______________

e. The single ventricle is divided into ________________ when an

______________________ develops
1. ______________________
2. ______________________
g. What is the foramen ovale? _______________________________
1. What does it allow? ________________________________

8. Respiratory System
a. The lungs begin to develop as a _____________________________
   from the _______________ in the region of the _______________
   1. The evagination branches to form _____________________________
b. The lung buds elongate and branch:
   1. First forming ______________________________
   2. Then forming ______________________________
   3. Branching continues until, by the end of _______________
      about ________________ occurred
   4. Branching continues after birth until about _________________

9. Urinary System
a. The kidneys develop from ________________ located between the
   ________________ and the ________________
b. About 21 days after fertilization, mesoderm in the _______________
   region differentiates into ________________________________
c. The pronephros consists of a __________ and _____________
   connecting the duct to the _______________________________
   1. Probably not functional and soon ___________________
d. The mesonephros is a __________________________ in the embryo
   1. It consists of:
      a. Duct which is a ______________________________
      b. Number of ______________________________
         1. One end of each tubule opens into the _______________.
         2. The other end forms a __________________
   e. As the mesonephros is developing the caudal end of the ________
begins to ______________ to form the ____________________

1. This is the common junction of the __________________

________________________ & __________________ systems

f. The cloaca is divided into two parts by the

1. Digestive part called ______________________
2. Urogenital part called ______________________

g. The cloaca has two tubes associated with it:

1. ______________________
2. ______________________

a. A blind tube extending into the ______________________

b. The part of the allantois nearest the cloaca __________
to form _____________________________

c. The remainder ______________________

h. The mesonephric duct extends __________________ as it
develops and eventually joins the ______________________
1. At the point of junction, another tube begins to form called _____

a. The distal end ______________ & ______________ to form the

____________________________ of the adult kidney called _________
2. The metanephros takes over the function of the ______________

____________________________

10. Reproductive System

a. The male and female gonads appear as _______________ the

b. The primordial germ cells, destined to become ______ or _______

1. Form on the __________________________
2. Migrate __________________________________
3. Enter _________________________________

c. The female ovaries originate high in the abdomen and __________
to a position ________________________________

d. As the male testes descend and reach the ______________ wall

1. A pair of tunnels called ______________________ form through the
2. The testes pass through the ___________
   a. Leaving the ____________________
   b. Coming to lie within the ____________________
3. Descent begins about ______________________
4. Testes enter the ___________________ about _____________
   e. Paramesonephric ducts begin to develop __________________
      and grow _____________________________ where they
   f. Testosterone secreted by the fetal ________________ causes the
      _____________ duct system to ___________ & ___________ into
      a. __________________________
      b. __________________________
   g. Testes also secrete _____________ hormone which causes the
      _____________________________ to degenerate
   h. If neither testosterone or mullerian-inhibiting hormone is secreted:
      1. The mesonephric duct system ______________________________
      2. Paramesonephric system develops into ____________________
         _____________, and part of the ______________________________
   i. An enlargement called the _____________ develops in the groin.
      1. Urogenital folds develop on __________________________
      2. Labioscrotal swellings develop __________________________
      3. Urethral groove develops along the __________________________
   j. In the male, under the influence of dihydrotestosterone:
      1. The _________________ & _________________ close over the
         _____________________ & the __________ to form_______
         a. If the closure does not __________________________
            results in a defect called __________________________
      2. The testes move into the _________________ which become
         the _____________________________
k. In the female, in the absence of testosterone:
   1. Genital tubercle becomes the ________________________
   2. Urethral groove ______________________
   3. Urogenital folds ________________________________
   4. The urethra opens ____________ to the to the ______ but
      ______________ to the _________________________
   5. Urogenital folds become __________________________
   6. Labioscrotal folds become __________________________

M. Growth of the Fetus
   1. When does the embryo become a fetus? ________________
      a. In the embryo most of the organ systems are ________________
      b. In the fetus the organs ______________________
      c. Most morphological changes occur ________________________
      d. The fetal period is primarily a __________________________
   2. What is lanugo? _________________________________
   3. What is vernix caseosa? ______________________________
      a. Functionally the vernix caseosa protects the fetus from __________
      ________________formed by ______________________
      from ______________________
   4. Subcutaneous fat accumulates in the _____________ & ___________
      a. Provides a _________________________________
      b. Helps _________________________________
      c. Aids the baby in ________________ by ________________ &
         ________________the cheeks so ______________________
      can be developed in ______________________
   5. Peak body growth occurs _______________________________
      a. As placental ___________ and _______limits are approached
         the growth rate __________________________
      b. Growth of the placenta essentially stops at ________________
         restricting _________________________________
   6. At about 38 weeks of development __________________________
II. Parturition

What is parturition? ____________________________________________

A. Late Gestation

1. Near the end of pregnancy the uterus becomes ________________
   ________________
   a. Usually exhibits _______________________________ that become
      __________ and _________________ until parturition is initiated
   b. Amniotic sac __________________
   c. Amniotic fluid flows ________________________________

B. Labor

1. First Stage
   a. Begins with the onset of ________________ and extends until the
      ________________
   b. Normally the head of the fetus is in _____________________________
      1. The head acts as a wedge, forcing the ____________________
         ______________________________________________

2. Second Stage
   a. Lasts from the time of ____________________________ until the
      ________________
   b. Contractions of ________________ assist the ________________
   c. Contractions generate enough pressure to ___________________
      1. Blood flow to the fetus ______________________
      2. During periods of relaxation _________________________

3. Third Stage
   a. Involves the ________________________________
   b. Contractions of the uterus cause _________________________
   c. Some bleeding occurs because of _________________________
   d. Bleeding normally is restricted ________________________
      ____________________________________________
4. Once the placenta has been removed, blood levels of _____________ & _____________ fall ________________

5. Following parturition:
   a. Uterus becomes much _________________
   b. Cell of the uterus _________________ & many _______________
   c. Vaginal discharge persists for 1 week or more composed of:
      1. Small _________________
      2. Degenerating ______________________

6. The precise signal that triggers parturition is unknown but factors include:
   a. Progesterone levels _____________________________________
      1. Progesterone has _________________________
   b. Near the end of pregnancy _________________ rapidly increase
      1. Excitatory influence of _________________________
         overcome the _________________________
   c. The adrenal glands of the fetus are greatly _________________
      1. The anterior pituitary of the fetus increases the secretion rate of _________________
         due to stress of:
         a. Confined _________________________
         b. Limited _________________ resulting from a
            more______________________________
             than size of _________________________
      2. ACTH causes the fetal adrenal cortex to produce _______________
         which travel to the _________________ where they:
         a. Decrease _________________
         b. Increase _______________________
         c. Initiate synthesis of _________________ which strongly
            _________________________
      d. Stretch of the uterine cervix initiates __________ that cause
         ______________ to be released from _________________
         1. Oxytocin stimulates _______________________
         2. Which move the fetus _________________________
3. Causing _________________ and release of more oxytocin
   a. This establishes a _________________ in which stretch _________________ & oxytocin _________________
   b. When does the positive-feedback system stop? ___________
   e. Progesterone inhibits _________________ so the decreased _________________ can support increased _________________
   f. Estrogen makes the uterus _________________ by increasing the synthesis of _________________
   g. Oxytocin may also stimulate _________________
   h. All of these events support _________________ which results in parturition

III. The Newborn
   A. Respiratory and Circulatory Changes
      1. Expansion of the lungs at birth:
         a. Reduces the resistance to ______________________________
         b. Resulting in increased _______________________________
         c. More blood flows from right _______________________________
            and into _______________________________
            1. Less blood flows from _______ to _________ through ________
         d. An increased volume of blood _______________________________
         e. Which increases the _______________________________
         f. Increased _________________ & decreased _________________
            forces blood against _________________ causing _________________
            1. This functionally completes the separation _________________
            2. What does the foramen ovale become? _________________
      2. Ductus Arteriosus
         a. What two vessels does the ductus arteriosus connect in the fetus?
            1. _______________________________ 2. _______________________________
b. How long after birth does the ductus arteriosus close? __________
c. The closure occurs because of _____________________________
   _________________________________________________________
d. The ductus arteriosus is replaced with connective tissue and is
   known as the _________________________________

3. Placental Blood Vessels
a. During fetal life:
   1. Fetal blood passes to the placenta through ________________
      from the _______________________________
   2. Fetal blood returns from the placenta through _______________
      a. Blood passes through the liver via the ________________
      b. Which joins the ________________

b. When the umbilical cord is tied and cut:
   1. No more blood flows through the ________________
      and they ________________________________
   2. The remnant of the umbilical vein becomes the ________
      _______ or ____________________________ of the liver
   3. The ductus venosus becomes the ________________

B. Digestive Changes
1. What is meconium? ________________________________
2. Meconium consists of:
   a. Amniotic ________________________________
   b. Cells ________________________________
   c. Mucus ________________________________
   d. ____________________ from the liver
4. Maximum stomach acidity is reached at ________________
   a. Over the next 10-30 days the pH ________________
5. The neonatal liver is ________________________________
   a. Lacks adequate amounts of the enzyme ____________________
1. This enzyme system usually develops within __________________
   b. The lack of this enzyme system can cause ____________________
6. What is the newborn capable of digesting at birth? ________________
   a. Which organ is sufficiently mature for a milk diet? ______________
7. The digestive system gradually develops the ability to digest more solid foods over the ________________________________
8. Amylase secretion remains low until __________________________
9. Lactase activity in the small intestine is _____________________ but _______________
   a. Lactose activity is lost in _________________

C. Apgar Scores
1. Apgar scores are an assessment of the newborn’s ________________
2. The acronym “Apgar” stands for:
   a. a____________________
   b. p____________________
   c. g____________________
   d. a____________________
   e. r____________________
3. Each characteristic is rated on a scale of ______________
   a. 2 denotes _________________
   b. 1 denotes _________________
   c. 0 denotes _________________
4. What is considered a normal Apgar score? _____________________

IV. Lactation
A. During Pregnancy
1. High concentration and continuous presence of _____________ and ________________ cause ______________________________________
   a. Ducts grow and ______________________________________
   b. Additional ______________________________________
2. Which hormone is primarily responsible for breast growth during pregnancy?
3. Progesterone causes development of __________________________
a. Which enlarge but __________________________

4. The other hormones involved in breast development include:
   a. ____________________  d. ____________________
   b. ____________________  e. ____________________
   c. ____________________

5. The placenta secretes __________________________ and
   __________________________ that help support breast development

6. Prolactin
   a. Where is prolactin produced? __________________________
   b. Prolactin is the hormone responsible for ____________________
   c. Before parturition, high levels of estrogen stimulate ____________
      __________________
   d. Milk production is inhibited during pregnancy because ____________
      __________________
   e. After parturition, ____________ levels __________________
      1. With lower ____________ levels, ____________________________
      2. Despite a decrease in response produces ________ a reflex
         1. During suckling, __________________________ of the breasts
            a. Initiates __________________________
            b. That reach _______________________
               1. Causing the secretion of __________________
               2. Inhibiting the release of __________________
               2. Therefore, prolactin levels ____________________

7. What is colostrum?
   a. When is colostrum secreted? __________________________
8. In addition to nutrients, colostrum and milk contain ________________
   a. Help protect the nursing baby ________________________________
9. If nursing stops, within a few days the ability to produce ___________
   ___________ and _______________________________
10. Because it takes time to produce milk:
    a. Nursing causes an increase in ________________________________
    b. Results in production of milk to be used in _____________________
11. Stored milk is released during nursing as a result of a reflex response:
    a. Mechanical _____________________________________________
    b. Cause the release of ___________ from the _________________
    c. Which stimulates _________________________________________
    d. Milk is then _______ from the breasts in a process ____________
12. Higher brain centers can stimulate ______________________________
    a. Hearing an infant cry ____________________________________

V. First Year After Birth
   A. Central Nervous System
      1. The brain is still developing and ______________________________
         _________________________________
      2. It is estimated that the total ________________________________ is
         present in the CNS at birth
         a. Subsequent ______________ and _________________ of the
            brain involve:
            1. Addition of new ________________________________
               a. Some of which form ________________________________
            2. Addition of new ________________________________
               a. Which may continue ________________________________

VI. Life Stages
   A. List the life stages from fertilization to death:
      1. _____________________________________________
      2. _____________________________________________
VII. Aging
A. Cell Proliferation
1. During early development cells proliferate ______________________
   then the process ___________________________________________
2. Many cells of the body continue to ____________________________
   replacing ___________ or ________________________________
3. Many other cells cease to ____________________________________
   and dead cells are _______________________________________
   a. After the number of neurons reaches a peak at _________________
      1. Numbers begin to _____________________
         a. Loss is most rapid ______________________________
         b. Later _________________________________________
B. Mitochondrial DNA
1. Mitochondrial DNA function _____________________ with age
2. If the decline in function reaches a threshold ____________________
   _______________________ & the tissue or organ may _____________
3. Can result in premature _____________________
C. Physical Plasticity
1. What is physical plasticity? _________________________________
2. The physical plasticity of young embryonic tissues results from the
   presence:
   a. Large amounts of ________________________________
   b. Relatively small amounts of ________________________________
   c. Collagen and other related proteins are not _________________
      1. Thus tissues are ________________________________
3. As the individual ages __________________ cross-links form between __________________ rendering the tissues
   a. More __________________ b. Less __________________
4. One of the first structures to exhibit pathologic changes as a result of increased rigidity is ________________________________
5. Structures with reduced functional ability, due to loss of elasticity, include:
   a. ____________________ d. ____________________
   b. ____________________ e. ____________________
   c. ____________________

D. Muscle Tissue

1. Mature muscle cells don’t normally __________________
   a. Total number of skeletal and cardiac muscle fibers ________________
2. The strength of skeletal muscle reaches a peak between _____________ ___________ and ________________________________
3. The macromolecules of muscle undergo ________________________
   a. A good exercise program can _____________________________
4. The heart loses _____________________ & ___________________
   a. Total cardiac output _____________________
   1. Results in less ___________ & fewer ____________ reaching cells in tissues contributing to ________________________________
   2. May result in decreased blood flow to ________________________
      a. Contributes to a decrease in ________________________________

E. Blood Vessels

1. What is atherosclerosis? ________________________________
   a. When these deposits are calcified or fibrotic it results in ____________
2. Arteriosclerosis interferes with ________________________________
   a. What is a thrombus? ________________________________
   b. What is an embolus? ________________________________
3. Atherosclerosis is more likely to occur in people with ________________
F. Free Radicals
   1. What is a free radical? ________________________________
   2. A free radical can ___________ with & ___________ the structure of 
      molecules that are ______________________________________
   3. Free radicals are produced as _______________________ and 
      introduced to the body __________________________________
   4. Damage by free radicals may __________________________
   5. Antioxidants can donate ___________ to _________________ without 
      themselves _________________________________

G. Immune System
   1. The aging immune system:
      a. Loses ______________________________
      b. Becomes _____________________________
   2. Autoimmune changes add to ____________________________
      and may be responsible for such things as:
      a. ___________________________________
      b. ___________________________________
      c. ___________________________________
   3. T lymphocytes tend to lose _____________________________
      and cannot _____________________________
      a. This may be one reason that __________________________

VIII. Death
   A. Definitions
   1. Death was once defined as the loss of __________ & __________
   2. Modern definitions of death are based on the ____________________
      ____________________ ______________________________________
   3. Brain death, a widely accepted indication of death in humans, is defined as:
      a. Irreparable __________________________ manifested clinically by the:
         1. Absence of ________________________________
         2. Absence of ________________________________ &
3. Isoelectric (flat) ________________ in
   the absence of known ___________________________