a alar plate (dorsal)  l cranial nerves, sacral nerves
b basal plate (ventral)  m thoracic, lumbar
c hemocytoblast n yolk sac
d bone marrow o optic vesicle
e thymus p monozygotic twins
f liver q fraternal twins
g neural crest - dorsal ganglion r lacunae
h splanchnic mesoderm s forebrain
i myotome t midbrain
j myosin u hindbrain
k actin v allantois

1, Originate from the same inner cell mass,
?, possess two separate trophoblasts'
3. motor nerves are localized in this region of nerve tube
4. Sensory nerve cell bodies originate in this structure,
5. The parasympathetic: division of the nervous system is derived from these regions,
6. Region of the brain where no notochord underneath, no motor fibers,
7. Region of brain where most of the cranial nerves are attached,
8. Induces lens formation and becomes retina
9* Gives rise to striated skeletal muscle,
10, Gives rise to smooth muscle,
11, Form thin filaments of the I band of muscle;
12, ' Match the following, Use answers only once, 10 points,

A induction
B potency
C lung
D pharynx
E enamel organ
F sinus venosus
G ductus arteriosus
H interatrial foramen ovals
I cartilage replacement bone
J membrane bone
K sclerotome
L lacunae
M alpha chain
N teratoma
O gamma chain
P sex linked trait
Q allantois
R yolk sac
S Decidua basalis
T PC-surfactant
U Trisomy 21
V ventricle

1. Channels in placenta syntrophoblast where maternal blood circulates,
2, Region of somite giving rise to vertebrae,
3, Channel allowing blood to fill both right and left atria,
4, ~Embryonic blood vessel derived from the 6th aortic arch which allows blood to leave the right ventricle without going to the lungs,
5. Heart chamber of embryo which becomes the pacemaker.
6, Developmental pattern controlled by X chromosome and passed from father to daughter but not son,
7, Chain of hemoglobin found in both fetal and adult hemoglobin,
8, Chain of hemoglobin found only in fetal hemoglobin,
9, Anterior part of digestive system, developing pouches in early development,
10, Extraembrvonic membrane carrying circulation to the placenta,
11. Extraembryonic membrane forming first blood islands, blood and blood cells,
12. Prevents collapse of lungs after first breath,
13. The first part of the heart to fuse,
14. The epithelial rudiment which will form the tooth,
15. The part of the uterine lining where the placenta is attached,
16. Reduced by induction to the fate,
17. Type of bone found in vertebrae, long bones of appendages,
18. Type of bone as they grow, formed in roof of skull and around the girth of long bones
19. Form thick filaments of the A band of muscle,
20. Extraembryonic membrane which takes circulation to the placenta,
9. Takes blood to right atrium in embryo,
10. The part of the embryonic heart which forms the pacemaker,
11. Kind of circulation in the placenta which increases the amount of O2 which can be exchanged.
12. Causes shift of the oxygen dissociation curve to the right
13. Bloodtype for mother when fetus develops Rh incompatibility,
14. Causes congenital malformations of eye, heart, nervous system
15. Carries blood from right ventricle to aorta in embryo.
16. A kind of antigen on the surface of red blood cells,

True-false. Use scantron, 2 points each,
1. The lens forms from the mesoderm
2. Cross banding in striated muscle results from lining up actin and myosin filaments,
3. Twins with different amnions cannot be identical,
4. The primitive streak is at the anterior end of the embryonic disc,
5. Certain areas of zygote cytoplasm may contain special information for development of certain cells,
6. If the cleavage stage arrives at the uterus, it implants and starts development,
7. The IUD works as a mechanical contraceptive by causing contractions of the female tract,
8. Side effects of the pill are increased heart attack risk and blood clots,
9. Fetal blood cells contain hemoglobin with less oxygen bound than adult hemoglobin at the same oxygen tension.
10. Incomplete twinning can occur when the two primitive streaks are fused at some area,

Multiple choice. Enter the correct answer on the answer sheet. 2 points each.

11. The circulation is brought from the embryo to the placenta by
    a) the somatic mesoderm b) the splanchnic mesoderm of the allantois
c) the ectoderm of the trophoblast d) the amnion e) the yolk sac.

12. The embryo always implants with
    a) the inner cell mass next to the uterine lining b) the inner cell mass facing away from the uterine lilting
c) the cells of the inner cell mass digesting their way through the uterine tissue d) uterus tissue becoming incorporated into the placenta
e) embryonic blood mixing with the maternal blood.

13. Heart muscle is different from striated muscle because
    a) it is not striated b) it is not voluntary c) it is not multinucleated d) both a and b e) both b and c.

14. The first cleavage separates aj the egg into an animal pole cell and a vegetal pole cell
b) the sperm from the egg nucleus  c) the first polar body from the egg
d) the egg into two halves by dividing down the animal-vegetal axis
e) the egg randomly into two unequal cells.

MULTIPLE CHOICE

Enter the letter of the one correct answer on your scantron, each 2 points.

19. The decidua basalis is the part of the uterus next to
   a) the amnion
   b) the yolk sac,
   c) the placental villi

20. For normal eyecup and retina development,
   a) there must be normal lens development,
   b) eye nerves will grow out from the brain into the retina
   c) there is no dependence on induction.

21. Smooth muscles
   a) develop from myotubes
   b) are striated
   c) are voluntary
   d) contain no thick or thin filaments
   e) lack sarcomeres, and are involuntary,

22. Foregut pouches give rise to
   a) thyroid
   b) parathyroid
   c) thymus
   d) skull
   e) all but d

2 points

23. The notochord
   a) gives rise to the spinal cord
   b) is incorporated into the vertebra centrum
   c) is in entirety retained as an adult skeletal element
   d) is not essential to development,

24. The dermatome can give rise to
   a) dermal bone
   b) dermis of the skin
   c) splanchnic mesoderm
   d) a and b

2 points

25. Sex linked traits are passed from
   a) carrier mothers to half the sons
   b) fathers to sons
   c) normal mothers to all daughters
   d) fathers to daughters and sons

26. Autosomal linked congenital abnormalities are distributed
   a) in males only
   b) in females only
   c) equally between males and females
   d) without being easily detected.

27. Tranquilizers like thalidomide =
   a) are harmful to the mother,
   b) cause developmental abnormalities of limbs,
   c) cannot cross the placenta
   d) often help fetal health,
1. In the placenta, the maternal blood passes through the lacuna near the blood vessels of the chorionic villi.

2. One-way herpes and cytomegalovirus can be caught by a newborn as it passes through an infected birth canal.

3. The liver is the first organ to form blood cells in the embryo.

4. In the early embryo the blood enters the heart at the sinus venosus, not the atrium.

5. The liver develops from the somatic mesoderm.

6. Fetal hemoglobin is more saturated with O2 than adult hemoglobin at the same tension of O2.

7. In the very early embryo blood going to the body goes through aortic arch 5.

8. The bulbus of the heart is important in pulmonary artery and aorta formation.

9. Bone cells control calcium reabsorption or deposition.

10. The vertebrae and long bones of the limbs are dermal bone.

11. Cell death is important for normal development, particularly in the limb.

12. Striated muscles normally develop from the sclerotome.

13. Cardiac muscle is striated and involuntary.

14. Eyes develop as outgrowths of the brain.

15. The sensory cells of the retina develop at the very back of it so they receive light only after it has passed through several cell layers.

16. Drugs or diseases cause mostly heart defects in fetuses in the last trimester.

17. The amnion and chorion are very nourishing due to their plentiful blood supply.

18. Cleft palate occurs because of abnormal splitting of the mouth field after it is formed.

True-false. Enter answer on answer sheet.

1. The sinus venosus is the last part of the two heart fields to fuse, sex linked traits are passed from fathers to sons,

2. The blood leaves the ventricle and goes into the bulbus arteriosus in the early embryo.

3. The sclerotome gives rise to the lung mesenchyme.
5. The part of the uterus surrounding the implanted embryo where there are placental villi is called the decidua capsularis.
6. Vertebrae are cartilage replacement bones.
7. The yolk sac contains somatic mesoderm.
8. Lack of a lipid surfactant in the lung of premature babies can cause death.
9. The interventricular foramen normally remains open until birth.
10. Pharynx endodermal pouches and associated mesenchyme give rise to the thymus.
11. Fetal hemoglobin contains 2 alpha and 2 beta chains.
13. The ductus arteriosus allows blood to pass from the right to the left side of the heart.
14. Membrane bone forms the roof of the skull and the jaws.
15. The apical ridge determines what kind of limb will form.
16. The fetal blood passes next to the maternal blood in countercurrent flow.
17. At low oxygen tension, fetal blood can become more saturated with oxygen than maternal blood can.
18. The adult arteries of the head arise from aortic arch 3 and the dorsal aorta, and the ventral aorta.
19. German measles causes more serious defects in the third trimester.
20. Herpes and Cytomegalovirus can be caught by the newborn as it passes through an infected birth canal.
28. Down's syndrome is due to the presence of
   a) xxx
   b) XXY,
   c) XO,
   d) trisomy
29. Blood returning from the placenta to the heart passes through the a) vitelline veins
    b) cardinal veins c) umbilical artery d) umbilical vein e) carotid artery.
30. Aortic arches that are maintained and kept as blood vessels in adult condition are
    a. 1,2,5
    b. 2,3,5
    c. 3, 4,6
    d. 3,4,5
31. Adult hemoglobin is different from fetal hemoglobin because
    a) all the polypeptide chains are different b) because the adult binds oxygen much more tightly c) because the adult type is made in the liver and the fetal type is made in the bone marrow d) because the fetal type has two of the same polypeptides, but two different ones,