Name: Gross Anatomy Examination for October 3, 2001

Instructions: For the following questions, indicate the letter that corresponds to the SINGLE MOST APPROPRIATE ANSWER.

Question 1: Multiple Choice

Question: A 60-year-old woman decided to have her first mammogram after a friend died of breast cancer. The radiologist observed numerous microcalcifications, indicators of malignancy, on the upper medial side of her right breast. If these tumor cells had spread, which of the following groups of lymph nodes would initially be enlarged?

Answer: Pectoral group of axillary nodes
Parasternal nodes
Supraclavicular nodes
Nodes between the pectoralis major and minor muscles
Lymph nodes of the abdominal area

Question 2: Multiple Choice

Question: A piece of shrapnel from a propane tank explosion penetrated the neck of a 24-year-old man and injured a nerve which passes between the posterior arch of the atlas and the posterior aspect of the occipital bone. This nerve lesion could result in

Answer: paralysis of the rectus capitis posterior major muscle.
paralysis of the longissimus cervicis muscle.
paralysis of the levator scapulae muscle.
loss of cutaneous sensation from the posterior aspect of the scalp.
loss of cutaneous sensation from the posterior part of the neck.

Question 3: Multiple Choice

Question: A 56-year-old man had a metastatic tumor of the conus medullaris. In order to expose and remove this tumor, the neurosurgeon most likely removed

Answer: fibers of the erector spinae muscle group covering the sacrum.
the lamina of at least one mid-thoracic vertebra.
the lamina of at least one upper lumbar vertebra.
the lamina of at least one lower lumbar
Question: A prominent American League slugger was sidelined for two weeks due to excruciating pain that he experienced when swinging a bat. The team physician suspected that he had strained muscles which rotate the vertebrae in his lower back. These muscles include the:

Answer: latissimus dorsi, serratus posterior inferior, longissimus, multifidus, iliocostalis.

Question: A 54-year-old woman had a mastectomy to remove all of the tissue of her left breast. A few days later she mentioned to the nurse that the skin adjacent to the body of her sternum felt numb. The nurse explained that some of her nerves were probably cut during the surgery. The nerve(s) that was (were) cut could include the:

Answer: medial pectoral nerve, lateral pectoral nerve, anterior cutaneous branches of the intercostal nerves, lateral cutaneous branches of the intercostal nerves, supraclavicular nerves.

Question: A neurosurgeon decided to sever the dorsal roots of spinal nerve S1 of a 65-year-old woman with postherpetic neuraglia (intractable pain), resulting from a herpes zoster infection. The surgeon knew that the dorsal roots of spinal nerve S1 emerge from the spinal cord at the level of the:

Answer: T1 vertebra, T6 vertebra, L1 vertebra, L4 vertebrae, S1 vertebra.

Question: You perform a lumbar puncture on a 37-year-old woman. Instead of clear CSF dripping from the needle, it is stained with blood. Gradually the bloody CSF becomes clear. You conclude that you have performed a "traumatic tap" during which you most likely entered vessels of the vertebral venous plexus located in the:

Answer: dural sac, epidural space, subarachnoid space, subdural space, lumber cistern.
Question 8 Multiple Choice

Question: The inability of a 76-year-old man to resist the force that you apply to his elbow (as shown in the figure below by the black arrow) could be the result of a deficit in the

Answer: thoracodorsal nerve.
dorsal scapular nerve.
spinal accessory nerve.
dorsal rami of C4-C5.
long thoracic nerve.

Question 9 Multiple Choice

Question: A 25-year-old man is brought to the emergency department after being stabbed in the back, immediately lateral to the spinous processes of the upper thoracic vertebrae. All of the following muscles could be damaged EXCEPT the

Answer: serratus posterior superior.
trapezius.
rhomboideus major.
levator scapulae.
spinalis.

Question 10 Multiple Choice

Question: A 59-year-old man visited his family physician with complaints of upper back pain that extended laterally to his right arm. An MRI examination revealed a bone tumor of the right T2 vertebral body that extended into the intervertebral foramen between the T2 and T3 vertebrae. The symptoms this man described were probably related to compression of the

Answer: dorsal ramus of the right T2 spinal nerve.
dorsal ramus of the right T3 spinal nerve.
dorsal root of the right T2 spinal nerve.
dorsal root of the right T3 spinal nerve.
ventral root of the right T3 spinal nerve.
Question 11  Multiple Choice

Question: During development in a female embryo, thoracic sclerotome cells near the notochord failed to develop on the left side. This resulted in a T10 hemivertebra (i.e. vertebral body present on the right side only). Of the following, the most likely condition resulting from this abnormality would be

Answer: compression of the nerve roots of the cauda equina.
- a bifid thoracic spine.
- kyphosis.
- scoliosis.
- an increase in the number of muscle fibers of the multifidus on the left side.

Question 12  Multiple Choice

Question: A 31-year-old man was brought to the emergency room following a gunshot accident. A surgeon has to remove a pellet lodged in his semispinalis muscle. The surgeon knows that this muscle is part of the

Answer: erector spinae muscle group.
- superficial muscle group.
- intermediate muscle group.
- transversospinalis muscle group.
- suboccipital muscle group.

Question 13  Multiple Choice

Question: A photograph of a laminectomy and subsequent exposure of the spinal cord at vertebral levels T2 to T6 is shown below. An area of infarct (tissue death) resulting from the occlusion (blockage) of a blood vessel is indicated by the arrow. The artery most likely responsible for the area of spinal cord infarction is

Answer: an anterior radicular artery.
- a vertebral artery.
- the artery of Adamkiewicz.
- a posterior spinal artery.
Question 14  Multiple Choice

**Question:** During surgery to remove a tumor in a 70-year-old man, the surgeon inadvertently cuts a spinal nerve. All of the following statements about typical spinal nerves are correct EXCEPT that they

**Answer:** divide into ventral and dorsal rami.
- are mixed nerves containing motor and sensory fibers.
- contain sensory fibers whose cell bodies are in the ventral gray horn.
- are connected with the sympathetic chain ganglia by rami communicantes.
- are formed by dorsal and ventral roots.

Question 15  Multiple Choice

**Question:** A young child is brought to the emergency room with a fever and a stiff neck. The doctor wants to do a lumbar puncture followed by a bacterial culture of the CSF to rule out bacterial meningitis. During a midline lumbar puncture, the needle passes through all of the following structures EXCEPT the

**Answer:** dura mater.
- supraspinous ligament.
- ligamentum flavum.
- arachnoid mater.
- posterior longitudinal ligament.

Question 16  Multiple Choice

**Question:** While performing cell-tracing experiments, mesodermal cells are labeled with a blue dye. In a fetus, which of the following tissues would contain the blue dye?

**Answer:** The inside lining of the digestive tract
- The epidermis of the skin
- The lining of the intraembryonic coelom
- The brain
- Cells of neural crest origin

Question 17  Multiple Choice

**Question:** Which of the following will give rise to sperm?

**Answer:** Primordial germ cells
- Primary (medullary) sex cords
- Secondary (cortical) sex cords
- Mesothelial lining of the genital ridges
- Mesenchyme of the genital ridges
Question 18  Multiple Choice  2.5 Points

Question: The genetic complement of an ovulated oocyte is

Answer: N, haploid.  
N, diploid.  
2N, haploid.  
2N, diploid.  
4N, diploid.

Question 19  Multiple Choice  2.5 Points

Question: Cleavage typically occurs within the lumen of the

Answer: ovary.  
oviduct.  
uterus.  
vagina.  
peritoneal (abdominal) cavity.

Question 20  Multiple Choice  2.5 Points

Question: The activity of which of the following tissues is largely responsible for the ability of the embryo to implant into the wall of the uterus?

Answer: Epiblast  
Hypoblast  
Amnioblast  
Cytotrophoblast  
Syncytiotrophoblast

Question 21  Multiple Choice  2.5 Points

Question: A primary stem villus in the developing placenta consists of

Answer: cytotrophoblast only.  
syncytiotrophoblast only.  
syncytiotrophoblast and cytotrophoblast.  
syncytiotrophoblast, cytotrophoblast, and extraembryonic mesoderm.  
syncytiotrophoblast, cytotrophoblast, extraembryonic mesoderm and blood vessels.

Question 22  Multiple Choice  2.5 Points

Question: Down's syndrome, resulting from trisomy of chromosome 21, is typically caused by a(n)

Answer: translocation.  
inversion.  
nonsense mutation.  
nondisjunction.  
deletion.
Question 23 Multiple Choice

Question: Which of the following contribute to the lining of the amniotic cavity?

Answer: Epiblast
       Cytotrophoblast
       Hypoblast
       Syncytiotrophoblast
       Extraembryonic mesoderm

Question 24 Multiple Choice

Question: Hypoblast cells contribute to all of the following EXCEPT (the)

Answer: intraembryonic mesoderm.
       Heuser’s membrane.
       lining of the primary yolk sac.
       lining of the secondary yolk sac.
       lining of the blastocyst cavity.

Question 25 Multiple Choice

Question: A 34-year-old woman, who had previously been told that she was pregnant, came to see her physician because of a bloody vaginal discharge. Upon examination, it was discovered that she had spontaneously aborted the embryo. One month later, blood tests revealed that she had high levels of circulating human chorionic gonadotrophin. Based on the results of these blood tests, she may have (a)

Answer: sirenomelia.
       spinal bifida.
       sacrococcygeal teratoma.
       invasive moles.
       caudal regression.

Question 26 Multiple Choice

Question: Formation of the trilaminar germ disk is the primary feature of

Answer: neurulation.
       gastrulation.
       fertilization.
       compaction.
       cleavage.

Question 27 Multiple Choice

Question: The buccopharyngeal membrane is composed of

Answer: endoderm only.
       endoderm and mesoderm.
       ectoderm and mesoderm.
       endoderm and ectoderm.
       endoderm, ectoderm and mesoderm.
Question 28 Multiple Choice

Question: The splitting of which of the following produces the intraembryonic coelom?

Answer: Notochord
Lateral plate mesoderm
Caudal eminence
Intermediate mesoderm
Paraxial mesoderm

Question 29 Multiple Choice

Question: Genes that are involved in early development, such as master control genes, segmentation genes, homeotic genes, etc., typically have all of the following characteristics EXCEPT that they

Answer: are transcription factors.
control the actions of other genes.
are involved in determination of the body axis.
encode for proteins such as actin.
often are redundant.

Question 30 Multiple Choice

Question: Which of the following statements concerning neurulation is correct?

Answer: The neural plate is continuous with the surface ectoderm.
The neural plate initially forms from mesoderm.
Separation of the neural folds from the surface ectoderm to form the neural tube begins at the cranial end of the embryo and proceeds caudally.
Separation of the neural folds from the surface ectoderm to form the neural tube begins at the caudal end of the embryo and proceeds cranially.
Neural tube formation is under the direction of the underlying endoderm.

Question 31 Multiple Choice

Question: Neural crest cells give rise to all of the following EXCEPT

Answer: Schwann cells.
cells bodies within the dorsal root ganglia.
cell bodies of postganglionic neurons of the parasympathetic system.
cell bodies of postganglionic neurons of the sympathetic system.
cell bodies of somatic motor neurons.
Question 32  Multiple Choice

Question: Sclerotome cells will give rise to all of the following structures EXCEPT

Answer: vertebral bodies, vertebral pedicles, vertebral laminae, the annulus fibrosis of the intervertebral disks, the nucleus pulposus of the intervertebral disks.

Question 33  Multiple Choice

Question: Cells from somitomere #8 will give rise to

Answer: somite #8, somite #1, sclerotome C1, sclerotome C8, vertebra C7.

Question 34  Multiple Choice

Question: Which of the following statements concerning development of the ribs and sternum is correct?

Answer: The two sternal bars initially meet at their inferior ends and fuse together in a caudal-cranial fashion. The ribs develop as extensions of the transverse processes of the vertebra. Development of the costovertebral joints separates the ribs from their respective vertebrae. Rib formation begins ventrally and progresses dorsally around the body wall.

Question 35  Multiple Choice

Question: The trapezius muscle is derived from (the)

Answer: dermatomes, epimere, sclerotomes, hypomere, prechordal plate
Question 36

Multiple Choice

Question: Expansion of the amniotic cavity eventually obliterates the

Answer: intraembryonic coelom.
chorionic cavity (extraembryonic coelom).
neural canal.
blastocyst cavity.
primary yolk sac.

Question 37

Multiple Choice

Question: Failure of closure of the neural tube, resulting in an exposed mass of nervous tissue in the occipital/cervical regions, is called

Answer: spina bifida.
craniorachischisis totalis.
craniorachischisis (encephaloschisis, anencephaly).
rachischisis (myeloschisis).
inionschisis.

Question 38

Multiple Choice

Question: Migration of the connecting stalk from its original position, attached to the amniotic membrane, to its definitive position on the ventral side of the embryo (i.e. as the umbilical cord) is largely due to

Answer: cranial folding.
lateral folding.
caudal folding.
migration of mesenchyme cells.

Question 39

Multiple Choice

Question: Hox d9 is expressed in the lumbar, sacral, and coccygeal regions of the developing mouse vertebral column (i.e. L1 through Coccygeal 4). A knockout mouse that fails to express this protein is likely to exhibit

Answer: scoliosis.
kyphosis.
an extra rib.
no tail.
three lower limbs.

Question 40

Multiple Choice

Question: You are curious about signals that are involved in inductive mechanisms. In your studies, you remove the notochord from one developing embryo, and place it just lateral to the endogenous notochord of a second embryo. You then wait until the second embryo completes development, and are not surprised when the newborn exhibits

Answer: two spinal cords and two vertebral columns.
two digestive tracts.
only one forelimb.
an unusually thick dermis.