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

1. An undescended testis is surgically removed from a 24-year-old male. Histological analysis reveals that the chromosome complements(s) and DNA content of the germ cells in this testis are normal and thus can be described by which of the following?

A. Diploid and 4N  
B. Diploid and 2N  
C. Haploid and 2N  
D. Haploid and 1N  
E. All of the above

2. The stage of oocyte development in the female germ line with the same chromosome complement and DNA content as the spermatid in the male germ line is which of the following?

A. Primordial germ cell  
B. Primary oocyte  
C. Secondary oocyte  
D. Definitive oocyte

3. A 10 week-old male embryo is spontaneously aborted. When examined, it is found that all cells of its germ line have migrated to which of the following locations?

A. Primary ectoderm  
B. Primary yolk sac  
C. Secondary yolk sac  
D. Secondary ectoderm  
E. Posterior body wall
4. The germ cells of an 8-week male embryo are at which of the following stages of development?

A. Primordial germ cell  
B. Primary spermatocyte  
C. Secondary spermatocyte  
D. Definitive spermatocyte

5. The germ cells of a 12 year-old prepubertal boy are at which of the following stages of development?

A. Primordial germ cell  
B. Primary spermatocyte  
C. Secondary spermatocyte  
D. Definitive spermatocyte

6. In a ZIFT procedure, a polar body is removed from an oocyte for chromosome analysis and is found to contain only 22 chromosomes. Careful assessment of these chromosomes with the spectral karyotyping technique indicates that chromosome 21 is missing from this polar body. Assuming that this condition resulted from nondisjunction of chromosome 21 during the first meiotic division, fertilization of the oocyte by a normal spermatozoon (containing an X or Y chromosome) would most likely result in which of the following?

A. Spontaneous abortion  
B. Normal development  
C. Down syndrome  
D. Turner syndrome  
E. Kleinfelter syndrome

7. Administration of an antiprogesterone compound such as RU-486 is most likely to result in which of the following?

A. Arrest of follicle development  
B. Inhibition of oogenesis  
C. Prevention of fertilization  
D. Inhibition of ovulation  
E. Sloughing of the endometrium
8. The embryonal stem (ES) cell is totipotent. It may become incorporated into virtually any tissue of an injection chimera and is thus derived from which of the following tissues of a donor blastocyst?

A. Outer cell mass  
B. Trophoblast  
C. Inner cell mass  
D. Cytotrophoblast  
E. Syncytiotrophoblast

9. A conceptus is characterized by swollen stem villi and the complete absence of an embryo (complete hydatidiform mole). Which of the following best describes the chromosome complement of cells in this conceptus?

Karyotype Origin of Chromosomes

A. 46, XY paternal and maternal  
B. 46, XX all maternal  
C. 46, XX all paternal

10. While Angleman and Prader-Willi syndromes result from disturbances of the same gene, the phenotypes are different because one of the syndromes is inherited from the mother (Angelman) and the other is inherited from the father (Prader-Willi). Such differences in the expression of the mutated maternal and paternal genes result from which of the following mechanisms?

A. DNA methylation  
B. Point mutation  
C. Translocation  
D. Recombination  
E. Nondisjunction

11. A tertiary stem villus is distinguished from both primary and secondary stem villi by the presence of which of the following?

A. Extraembryonic endoderm  
B. Syncytiotrophoblast  
C. Extraembryonic mesoderm  
D. Blood vessels  
E. Cytotrophoblast
12. During the first week of development of the embryo, a number of events occur. Which of the following is an incorrect statement?

A. Implantation of the embryo in areas other than the uterus results in an ectopic pregnancy.
B. Cleavage results in an increase in the number of cells of the zygote but not in its size.
C. Fertilization of the oocyte by a sperm occurs in the ampulla of the oviduct.
D. The trophoblast secretes HCG (human chorionic gonadotropin) which stimulates the corpus luteum to continue to secrete progesterone.
E. Implantation can occur only when the zygote has reached the morula stage.

13. From your understanding of the process of gastrulation and of the nomenclature describing various germ layers, you would conclude that all of the cells of the human body are ultimately derived from which of the following tissues?

A. Primary ectoderm
B. Secondary ectoderm
C. Primary endoderm
D. Secondary endoderm
E. Mesoderm

14. The vertebral body at the T-1 level differentiates from (is derived from):

A. the notocord.
B. the T-1 sclerotome.
C. parts of both the C-8 and T-1 sclerotomes.
D. parts of both the T-1 and T-2 sclerotomes.
E. the T-1 dermomyotome.

15. A newborn is diagnosed with a syndrome affecting the development of dorsal root ganglia and sympathetic chain ganglia. Disruption of development of which of the following precursors was the most likely cause of this anomaly?

A. Paraxial mesoderm
B. Neural crest
C. Neurectoderm
D. Lateral plate mesoderm
E. Definitive endoderm
16. Development of the erector spinae muscles of a newborn is abnormal. Which of the following muscle precursors was most likely affected during embryogenesis?

A. Dermatome  
B. Sclerotome  
C. Epimere  
D. Hypomere

17. A newborn has a tuft of hair at the L5 vertebral level. A CT scan shows that the L5 vertebral arch has failed to fuse. However, the underlying neural tube and meninges are normal. This condition is best described by which of the following terms?

A. Spina bifida occulta  
B. Meningocele  
C. Meningomyelocele  
D. Rachischisis  
E. Anencephaly

18. It is thought that as many as 75% of all human neural tube defects (ntds) could be prevented with material ingestion of at least 0.4 mg/day of folic acid. Which of the following times would be best to initiate this treatment?

A. Prior to conception  
B. Beginning of third month  
C. End of third month  
D. Beginning of fourth month  
E. End of fourth month

19. Behavioral testing of a newborn suggests that spinal motor neurons have not developed normally. This condition probably arose as a consequence of disruption of development of which of the following precursors in which of the following locations?

Precursor Location

A. neural crest dorsal root ganglia  
B. neural crest chain ganglia  
C. neuroblasts dorsal column  
D. neuroblasts ventral column
20. A developmental abnormality that affects the normal differentiation of the paraxial mesoderm would produce defects in the

A. axial skeleton.
B. urinary system.
C. mesothelial covering of the visceral organs.
D. smooth muscle.
E. genital system.

21. The brain and the spinal cord in the developing human are formed by the

A. notochord.
B. neural crest cells.
C. precordial plate.
D. neural groove.
E. neural plate.

22. A caudal malformation resulting from abnormal gastrulation characterized by a tracheal-esophageal fistula, renal defects, atresia, and abnormalities in vertebral development is

A. sirenomelia.
B. VACTERL association.
C. caudal agenesis.
D. VATER association.
E. brachyury.

23. As a first-year medical student and during your first physical examination of a patient who is coughing and wheezing, you wish to auscultate (listen to) the lungs. You recall that all of the following statements about the triangle of auscultation are correct EXCEPT that

A. the latissimus dorsi muscle forms the inferior border.
B. a portion of the triangle is found at the inferior angle of the scapula.
C. the triangle can be enlarged by having the patient flex his arms across his chest.
D. it overlies the 3rd intercostal space where the lung can be easily auscultated.
E. the medial border is formed by the trapezius.
24. A toddler tripped and fell backwards against the edge of the fireplace. He sustained a 4-inch gash along the external occipital protuberance and superior nuchal line severing a nerve. As a result of this nerve sectioning, the child probably had a lingering (permanent) clinical sign of

A. weakness during retraction of the scapula of the same side.
B. weakness during flexion of the head.
C. weakness during extension of the head.
D. loss of sensation to the posterior part of the scalp.
E. loss of sensation to the skin covering the spine of the scapula.

25. Eighty-year-old Mrs. Smith has pain in her back and hip which radiates down into her leg. Her physician diagnosed her condition as a disk herniation. You recall that all of the following statements about disk herniations are correct EXCEPT that

A. most disk protrusions occur at the L2-L3 vertebral levels.
B. they are protrusions of the nucleus pulposus into or through the anulus fibrosus.
C. the associated pain is due to compression or irritation of the emerging spinal nerve roots.
D. disk herniations occur due to degenerative or traumatic changes.
E. most herniations occur posterolaterally.

26. A 17-year-old man was accidentally shot at close range with shotgun pellets while squirrel hunting with his friends. The most serious wound was caused by a pellet that lodged at the upper surface of the posterior arch of the atlas, which would MOST LIKELY injure the

A. vertebral artery.
B. dorsal ramus of the C2 spinal nerve.
C. ventral root of the C2 spinal nerve.
D. posterior longitudinal ligament.
E. levator scapulae muscle.
27. During surgery to remove a bone tumor (sarcoma) that invaded the left side of several successive thoracic vertebrae, the dorsal roots of several spinal cord segments had to be sectioned (cut). The sectioning of these roots could result in

A. paralysis of portions of the longissimus muscle on the side of the cutting.
B. paralysis of the rhomboid major muscle on the side of the cutting.
C. loss of sensation to some of the skin overlying the pectoralis major muscle.
D. loss of sensation to some of the skin overlying the scalp.
E. loss of sensation to some of the skin overlying the cauda equina.

28. During a midline "lumbar tap" to remove a sample of cerebrospinal fluid, the needle used to remove fluid passes through all of the following EXCEPT

A. the arachnoid mater.
B. the dura mater.
C. an interspinous ligament.
D. an intervertebral foramen.
E. extradural (epidural) fat.

29. You have been introduced to one concept in anatomy which states that "many muscles, in their development, migrate to regions of the body distant from their embryological origin, and carry their previously established nerve supply along with them." Using this anatomical concept, which of the following muscles is NOT a true muscle of the back proper?

A. Longissimus capitis
B. Semispinalis cervicis
C. Rhomboideus major
D. Splenius capitis
E. Rotatores

30. At a tennis tournament in 1993, Monica Seles was stabbed in the back just medial to the vertebral border of the scapula while it was retracted. Muscles which could have been injured include all of the following EXCEPT the

A. rhomboideus major muscle.
B. serratus posterior superior muscle.
C. longissimus muscles.
D. trapezius muscle.
E. iliocostalis muscles.
31. During a physical examination of the vertebral column, your patient complains of pain as you palpate the skin over the upper thoracic spinous processes. This tenderness may be the result of inflammation of the attachment of the

A. semispinalis muscle.
B. latissimus dorsi muscle.
C. levator scapulae muscle.
D. iliocostalis muscles.
E. inferior oblique muscle.

32. In addition to the information in the question above, the physician also knew that ligaments that attach to the spinous processes of vertebrae include the

A. posterior longitudinal ligament.
B. ligamentum flavum.
C. anterior longitudinal ligament.
D. ligamentum nuchae.
E. intertransverse ligaments.

33. A lesion of the lateral pectoral nerve would cause a partial loss of function of the

A. pectoralis major muscle.
B. subclavius muscle.
C. pectoralis minor muscle.
D. latissimus dorsi muscle.

34. Destroying a ventral primary ramus of a typical spinal nerve would damage

A. motor fibers only.
B. sensory and motor fibers.
C. sensory fibers only.
D. GSE and GVA fibers only.
E. GSA and GVE fibers only.

35. A crushing injury, which has severely damaged the coracoid process of the scapula, would most likely disrupt the normal function of the

A. latissimus dorsi muscle.
B. pectoralis major muscle.
C. subclavius muscle.
D. pectoralis minor muscle.
E. levator scapulae muscle.
36. A 40-year-old woman was diagnosed with breast cancer. The tumor is located in the lateral portion of the mammary gland. Cells from this tumor would most likely metastasize initially to the

A. clavicular lymph nodes.
B. pectoral group of axillary lymph nodes.
C. parasternal lymph nodes.
D. contralateral (opposite side) lymph nodes between the pectoralis major and pectoralis minor muscles.
E. abdominal lymph nodes.

37. During surgery of the anterior chest wall, you are required to resect (cut off a part of) the clavipectoral fascia. You are careful to locate and preserve a blood vessel that pierces the clavipectoral fascia, namely the

A. axillary vein.
B. lateral thoracic artery.
C. thoracoacromial artery.
D. axillary artery.

38. Unable to release his right hand from the reins, Christopher Reeve was hurled headlong to the ground, resulting in a compression injury to his cervical vertebrae and spinal cord. Concerns of the emergency department physician included possible damage to the first cervical vertebrae and he recalled that a unique feature of that vertebra is that it has no

A. superior articular facets.
B. transverse foramina.
C. body.
D. transverse processes.
E. posterior tubercle.

39. Pat Day was thrown from his mount at Arlington. Suspecting possible vertebral column damage, the course physician reviewed vertebral anatomy and recalled that all of the following muscles are attached to transverse processes of vertebrae EXCEPT for the

A. levator scapulae muscle.
B. longissimis muscles.
C. multifidus muscle.
D. rectus capitis posterior major muscle.
E. semispinalis muscle.
40. The Hunchback of Notre Dame suffered numerous maladies. His most apparent condition was an abnormal curvature of the vertebral column referred to as

A. scoliosis.
B. lordosis.
C. kyphosis
D. ptosis
E. anhydrosis

Answers: 1e2d3e4a5a6c7e8c9c10a11d12e13a14c15b16c17a18a19d20a21e22d23d24d25a26a27c28d29e30e31a32d33a34b35d36b37c38c39d40c