CHOOSE THE SINGLE BEST ANSWER FOR EACH OF THE STATEMENTS BELOW:

1. Which of the following statements about CNS development is TRUE:
   A. the most likely time for a neural tube defect is months 3-4 of gestation
   B. the thalamus develops from the telencephalic embryonic compartment
   C. the Arnold Chiari malformation is often accompanied by a meningomyelocele
   D. rostral defects in neural tube closure result in microgyria
   E. A and C are both correct

2. A patient shows loss of tactile sensation on the right side of the face, but pin prick sensation for the face and body are normal as well as tactile sensation for the body. This patient most likely has a lesion in the:
   A. spinal cord at C1
   B. medulla
   C. pons
   D. midbrain
   E. cortex

3. The process of proliferation and migration of differentiating neuroepithelial cells is associated with all of the following EXCEPT:
   A. anencephaly
   B. formation of cortical layers
   C. lissencephaly
   D. polymicrogyria
   E. shape of the cerebral hemispheres

4. Which type of glial cell participates in removing neurotransmitter from the synaptic cleft in the CNS:
   A. microglia
   B. schwann cell
   C. astrocyte
   D. oligodendrocyte
   E. ependymal cell

5. The myelin sheath around axons:
   A. can be formed by schwann cells
   B. is a continuous covering from cell body to terminals
   C. decreases the electrical capacitance of the axon
   D. A, B, C are all correct
   E. only A and C are correct

6. Which of the following statements about subdural hematomas is FALSE:
   A. they result from rupture of an artery
   B. resulting symptoms may be delayed by weeks or months
   C. they enlarge gradually as scarring and recurrent bleeding occurs
   D. they are usually caused by head trauma
   E. bleeding occurs slowly
7. Pyridostigmine bromide (Mestinon) improves strength in patients with myasthenia gravis by:
   A. reducing the acetylcholine antibody titer
   B. increasing presynaptic release of acetylcholine
   C. inhibiting acetylcholinesterase
   D. increasing the number of functional post-synaptic acetylcholine receptors
   E. slowing degradation of acetylcholine receptors

8. Which of the following statements about hydrocephalus is FALSE:
   A. it can result from a tumor in the cerebral aqueduct
   B. it can result from impaired reabsorption of CSF
   C. it often causes papilledema
   D. symptoms may include headache, nausea, and vomiting
   E. it is always associated with an increase in CSF pressure

9. Which statement below regarding brain edema is TRUE?
   A. the ventricles are enlarged
   B. the brain weight is increased
   C. in vasogenic edema, the fluid is restricted to the cells (intracellular)
   D. it is the hallmark of brain atrophy
   E. a major cause of edema is intracranial herniations (i.e. transtentorial)

10. Which of the following statements about degeneration and regeneration is TRUE:
    A. gliosis is an area of fibrosis in the CNS containing abundant collagen
    B. in the CNS, astrocytes release extracellular matrix molecules to promote axonal growth
    C. wallerian degeneration involves death of the schwann cells in the distal nerve
    D. the time for functional recovery of a peripheral nerve is about 1mm/day
    E. chromatolysis involves degeneration of the myelin sheath in a damaged nerve

11. A lesion in the ALS at the level of T2 on the right side would cause:
    A. loss of pain and temp at the level of C8 on the left
    B. loss of pain and temp at the level of T4 on the left
    C. loss of pain and temp at the level of C8 on the right
    D. loss of tactile sensation at the level of T2 on the right
    E. loss of tactile sensation at the level of T2 on the left

12. Concerning glutamate receptors, which statement is FALSE:
    A. there are both ionotropic and metabotropic types
    B. Ca ions normally block the pore of the NMDA receptor
    C. the EPSP from an NMDA receptor can be enhanced significantly by activation of another excitatory synapse just before the NMDA activation
    D. AMPA and NMDA are ionotropic receptors
    E. glutamate in the synaptic cleft can affect both presynaptic and postsynaptic membranes
13. Which statement about cells in nucleus cuneatus is **FALSE**:
   A. convergence of inputs allows them to respond better to larger stimuli
   B. it receives sensory information from the upper body
   C. inhibitory interneurons allow some cells to respond better to small stimuli than to large stimuli
   D. its axons cross to the opposite side of the nervous system
   E. it is located in the spinal cord

14. In the process of testing a new environmental pollutant as a potential neurotoxin you discover, after injecting the agent into the brain, that the levels of tyrosine hydroxylase decrease. Based on this data, which of the following neuronal cells would you predict is lesioned by this neurotoxin?
   A. dopaminergic and noradrenergic
   B. GABAergic and glutaminergic
   C. serotonergic and dopaminergic
   D. serotonergic and glutaminergic
   E. serotonergic and GABAergic

15. Which of the following events is associated with an increase in pain perception?
   A. decreased bradykinin synthesis
   B. decreased prostaglandin production
   C. inhibition of substance P receptors on mast cells
   D. decreased concentrations of voltage-sensitive sodium channels at neuromas
   E. decrease in pH of the tissue.

16. The corneal reflex is mediated by all of the following **EXCEPT**:
   A. spinal trigeminal tract
   B. trigeminal ganglion
   C. motor nucleus of CN VII
   D. ophthalmic division of CN V
   E. ventral trigeminothalamic tract

17. A 50 year-old man who comes into your office tends to slap his feet down on the floor as he walks toward you. On examination you find that he cannot tell the position of his legs when you move them passively and that there is decreased tactile and vibratory sensation in both lower limbs. Sensation to pin prick is normal. The most likely reason for these symptoms is:
   A. Syringomyelia
   B. Brown-Sequard Syndrome
   C. Tic Douloureux
   D. Tabes Dorsalis
   E. Myasthenia Gravis

18. Descending pathways that modulate pain involve all of the following **EXCEPT**:
   A. ventral posterior lateral nucleus (VPL)
   B. periaqueductal gray
   C. serotonin
   D. substantia gelatinosa
   E. nucleus raphe magnus
19. Type Aδ fibers are associated with which of the following structures:
   A. spinoreticulo-thalamic tract
   B. nucleus gracilis
   C. VPL
   D. intralaminar thalamic nuclei
   E. internal arcuate fibers

20. In which of the following locations are tactile sensory fibers representing the upper body positioned dorsal and tactile sensory fibers for the lower body positioned ventral:
   A. caudal midbrain
   B. rostral medulla
   C. cervical area of spinal cord
   D. rostral pons
   E. thalamus

21. Which of the following patients most likely has cluster headaches?
   A. 24 year old female with a 10 year history of unilateral throbbing headaches with associated nausea and vomiting. The patient has headaches every month right before her menstrual period
   B. 47 year old female with bilateral non-throbbing headaches that begin around noon every day and peak in the late afternoon
   C. 60 year old male who gets flurries of brief "electric shock" pains in his right lower face triggered by chewing
   D. 30 year old female with headaches lasting 2-4 days after receiving epidural anesthesia for the delivery of each of her four children
   E. 25 year old male with a two month history of severe non-throbbing left fronto-orbital headaches which last 30-40 minutes and awaken him from sleep in the early morning on a nearly daily basis. He had similar headaches for 10 weeks, 3 years ago.

22. All of the following headache patients require urgent evaluation EXCEPT:
   A. patient with a severe headache every day for the past five years
   B. patient presenting with "the worst headache of my life"
   C. elderly patient with new onset headaches of mild-moderate severity
   D. patient with associated fever and confusion
   E. patient with papilledema

23. A 45 year old female gives a history of intermittent unilateral throbbing headaches with associated nausea and photophobia since age 20. She is currently having headaches 2-3 times a week lasting 4-8 hours. She has a history of hypertension. The most appropriate medication for treatment of her symptoms when they occur is:
   A. a narcotic analgesic
   B. a combination preparation containing butalbital, caffeine and aspirin
   C. anticonvulsant
   D. tricyclic antidepressant
   E. calcium channel blocker
24. Opioid agonist-antagonists like buprenorphine:
   A. have analgesic effects that increase linearly with drug concentration
   B. have high potential for drug addiction.
   C. are recommended for use in patients who have coronary artery disease
   D. are not effective for postoperative analgesia.
   E. can precipitate withdrawal effects in addicts.

1. C
2. C
3. A
4. C
5. E
6. A
7. C
8. E
9. B
10. D
11. B
12. B
13. E
14. A
15. E
16. E
17. D
18. A
19. C
20. B
21. E
22. A
23. B
24. E
26. Tapping the lower jaw causes a reflexive closing of your lower jaw as the masseter muscle contracts when its tendon is stretched. On the diagram below, draw the pathway that mediates this reflex. You must indicate the locations and names of AXONS and CELL BODIES for each neuron in the pathway (4 pts)