

SECTION 2

Neuroanatomy & Function

Directions: Choose the best answer

189. At the neuromuscular junction, action potentials are coupled to neurotransmitter release by voltage-gated
- Ca²⁺ channels
 - Na⁺ channels
 - K⁺ channels
 - Cl⁻ channels
 - Gap junctions between the presynaptic terminal and the muscle cell
190. True statement about most A-delta and C fibers
- Are myelinated
 - End as free nerve endings
 - Terminate in the deep dermis
 - End as specific nociceptive receptors
 - Terminate in specialized structures
191. A 29-year-old female has a 10-year history of migraine headaches. She can usually sense onset. Which of the following agents is the drug of choice for countering acute onset of her headaches?
- Ergotamine
 - Propranolol
 - Methysergide
 - Pseudoephedrine
 - Aspirin
192. The following is true regarding nitric oxide (NO):
- It is a large molecular neurotransmitter that is actively transported across neural membrane
 - It induces potent vasoconstriction and is inhibitory to inflammatory pain
 - It is a direct product of phospholipase-A
 - It is localized only within the vascular endothelium
 - It is a rapidly synthesized, small molecular modulator that is produced in peripheral and central neurons and can easily diffuse into non-neural tissues
193. During a voluntary movement, the Golgi tendon organ provides the central nervous system with information about
- The length of the muscle being moved
 - The velocity of the movement
 - The blood flow to the muscle being moved
 - The tension developed by the muscle being moved
 - The change in joint angle produced by the movement
194. The pain produced by ischemia is poorly localized and throbbing while pain from a needle stick is well localized and sharp. Which of the following comparisons of ischemic and needle stick pain is correct?
- Ischemic pain sensory fibers are classified as A delta sensory fibers
 - Ischemic pain is produced by overstimulating somatic touch receptors
 - Ischemic pain is transmitted to the brain through the neospinothalamic tract
 - Ischemic pain receptors quickly adapt to a painful stimulus
 - Ischemic pain sensory fibers terminate within the substantia gelatinosa of the spinal cord
195. Long term, durable sympathetic activation
- Can induce expression of alpha-adrenergic receptors on sensitized C-nociceptive fibers
 - Produces adrenomedullary mediated pain modulation
 - Causes desensitization of alpha-beta mechanoreceptors
 - Produces a rightward shift in nociceptive threshold and firing patterns
 - Is functional against neuropathic pain
196. Special receptors in the walls of the aortic arch and carotid arteries convey information concerning mean arterial blood pressure to reflex pathways in the CNS. The afferent limb of this pathway is carried by:

- A. CN V
B. CN VII
C. CN IX
D. CN X
E. CN XI
- 197. The cell body of the neospinothalamic tract is located in which lamina?**
A. II
B. III
C. IV
D. V
E. VII
- 198. Which one of the following hypothalamic nuclei is responsible for the detection of the core body?**
A. The lateral hypothalamus
B. The arcuate nucleus
C. The posterior nucleus
D. The paraventricular nucleus
E. The anterior hypothalamus
- 199. When an axon is cut, rapid local degeneration of the axon and myelin sheath occur, as well as changes in the cell body that affect synapses with other neurons. This pattern of degeneration is caused by**
A. Gliosis
B. Axonal transport
C. Phagocytosis
D. Excitatory neurotransmitters
E. Depolarization
- 200. Repetitive stimulation of a skeletal muscle fiber will cause an increase in contractile strength because repetitive stimulation causes an increase in**
A. The duration of cross-bridge cycling
B. The concentration of calcium in the myoplasm
C. The magnitude of the end-plate potential
D. The number of muscle myofibrils generating tension
E. The velocity of muscle contraction
- 201. Which of the following is absent from smooth muscle cells?**
A. Troponin
B. Calmodulin
C. Calcium
D. Myosin light chain kinase
E. Actin and tropomyosin interactions similar to skeletal muscle
- 202. The principal action of the Quadratus Lumborum muscle is:**
A. Lateral flexion of the lumbar spine
B. Axial rotation of the lumbar spine
C. Extension of the lumbar spine
D. Fixation of the 12th rib during respiration
E. Lateral rotation of the lumbar spine
- 203. The following is true regarding nitric oxide:**
A. It is preformed in the presynaptic terminal and stored in vesicles prior to release.
B. It is considered a large molecule neurotransmitter and is actively transported across neural synapses.
C. It is synthesized in the postsynaptic terminal by the enzyme cyclo-oxygenase.
D. It is found only in the dorsal horn
E. It is synthesized almost instantly in the presynaptic terminal and then diffuses into adjacent postsynaptic neurons.
- 204. The nucleus raphe Magnus is highly involved with the neural processing of what type of painful afferent input?**
A. Mechanical
B. Thermal
C. Mixed
D. All of the above
E. None of the above
- 205. An absent ankle reflex in a 35 year-old patient with acute-onset radicular pain would most likely involve which nerve root?**
A. L3
B. L4
C. L5
D. S1
E. S2
- 206. Of all the following endocrine glands, which one is not subject to control by the brain?**
A. Pancreatic islets
B. Pituitary
C. Parathyroid
D. Thyroid
E. Adrenal
- 207. Activation of transducin by light activates an enzyme which**
A. Hydrolyzes cGMP
B. Increases the dark current
C. Activates adenylyl cyclase
D. Releases calcium from intracellular stores
E. Depolarizes the membrane
- 208. One mechanism through which sympathetic and nociceptive afferent fibers can be cross-sensitized is**
A. Through remodeling of C-fiber projections into spinal sympathetic ganglia
B. By increased production of cyclo-oxygenase-2 in sympathetic pre-ganglionic fibers
C. Through ephaptic conduction and/or ionic spread
D. By down-regulation of alpha adrenergic receptors on peripheral C-fibers
E. By retraction of C- and A-beta fiber terminals from lamina VII

- 209. Acute, nociceptive pain:**
- Characteristically causes de novo expression of alpha adrenergic receptors in dorsal root ganglia
 - Decreases activity in bulbospinal pathways
 - Decreases adrenomedullary effects
 - Can engage sympathetic function to suppress pain perception through bulbospinal and limbic noradrenergic mechanisms
 - Induces decreased activity in ventral posterior lateral and medial nuclear groups of the thalamus
- 210. In skeletal muscle contraction, the “powerstroke” is initiated by**
- The initial binding of ATP to the myosin heads
 - Release of Pi from the myosin heads
 - Detachment of the myosin head from the actin
 - Phosphorylation of the myosin light chains
 - Release of ADP and subsequent addition of an ATP molecule
- 211. In patient who has had attacks of paroxysmal atrial tachycardia, an ideal prophylactic drug is**
- Adenosine
 - Procainamide
 - Lidocaine
 - Nifedipine
 - Verapamil
- 212. A 60-year-old male complains of severe headaches, nausea, dizziness and a diminution in vision. He has a decrease in oxygen (O₂)-carrying capacity without a change in the Po₂ of arterial blood. Which of the following might account for these findings?**
- Sulfur dioxide
 - Ozone
 - Nitrogen dioxide
 - Carbon monoxide (CO)
 - Carbon dioxide
- 213. The activities placing the greatest load on the L3 disc include:**
- Extension of 20°
 - Lifting 20 kg, back straight, knees bent
 - Lifting 20 kg, back bent, knees straight
 - Bending forward 20°
 - Bending sideways
- 214. The cells of the adrenal medulla are homologous to**
- Postganglionic parasympathetic neurons
 - Preganglionic sympathetic neurons
 - Cholinergic interneurons
 - Preganglionic parasympathetic neurons
 - Postganglionic sympathetic neurons
- 215. The fact that the pituitary secretion of endorphins is closely linked to the secretion of adrenocorticotrophic hormone (ACTH) suggests that endorphins facilitate the ability to respond to**
- Retarded growth
 - Hypertension
 - Stress
 - Chronic Pain
 - Tachycardia
- 216. A known NMDA/Glutamate receptor antagonist agent, such as topiramate would be most useful against:**
- A-delta mediated thermal pain
 - C-fiber mediated neuropathic pain
 - C-fiber mediated mechanical nociceptive pain
 - A-delta mediated cold
 - All of the above
- 217. The ascending noradrenergic pathway can engage sympathetic nervous system function**
- Only through indirect activation of preganglionic sympathetic neurons
 - Only by direct activation of sensory associative areas in the S-II somatosensory cortex
 - Via inhibition of the insular-anterior cingulate pathway
 - Only by engaging the thalamic intralaminar nucleus
 - By engagement of amygdalar, insular and hypothalamic paraventricular substrates
- 218. The mechanism of the transcutaneous electrical nerve stimulation (TENS) in relieving pain is**
- Direct electrical inhibition of type A-delta and C fibers
 - Depletion of neurotransmitter in nociceptors
 - Hyperpolarization of spinothalamic tract neurons
 - Activation of inhibitory neurons
 - Distortion of nociceptors
- 219. Acute intermittent porphyria is a contraindication of the use of**
- Enflurane
 - Nitrous oxide (N₂O)
 - Ketamine
 - Diazepam
 - Thiopental
- 220. A lesion of the axons of motor neurons that innervate skeletal muscle (lower motor neurons) will result in which one of the following consequences?**
- Paralysis of individual muscles on the contralateral side of the lesion
 - A paradoxical increase in reflex activity
 - Compensatory increase in muscle mass
 - Increase in muscle tone
 - Sealing off of the axoplasm
- 221. A patient presents with an acute onset of pain extending down to the radial aspect of the arm and complaints of a ‘numb thumb’. On physical exam there is weakness elbow flexion and supination, loss of sensation in the radial aspect of the forearm and the thumb. There is blunting of the brachioradialis reflex. An MRI of the neck confirms the presence of a paracentral disc protrusion at which level?**

- A. C4-5
B. C5-6
C. C6-7
D. C3-4
E. C7-T1
- 222. Sympathetically mediated pain**
A. Frequently produces temporally- dependent, variable sudo- and vaso- motor responses
B. Involves a loss of A-beta mechanoreceptors from lamina II in the dorsal horn
C. Is reflective of increased number, frequency and duration of parasympathetic discharge
D. Is explicitly dermatomal
E. Characteristically does not involve thermal effects along the peripheral nerve territory
- 223. In primary nociceptive afferents, excitatory conduction is mediated by**
A. A-2 purinoreceptors
B. Trk B receptors for nerve growth factor
C. Selective Na (v)1.8 and Na (v)1.9 cationic channels
D. The Silent Nociceptor which is not sensitized
E. All of the above
- 224. The projections of A-delta primary afferents**
A. Is identical to C-fiber afferents
B. Is Multilaminar within the superficial dorsal horn
C. Is exclusive to wide dynamic range neurons
D. A-Delta primary afferents project to laminae III, V and X
E. All of the above
- 225. The neurochemical effect of the 17 amino acid peptide dynorphin (1-17) is post- synaptically mediated by which receptor?**
A. mu type 1
B. delta
C. kappa
D. mu type 3
E. mu type 2
- 226. The majority of opioid receptors in the lumbar spinal cord are:**
A. Mu-1 and /or 2
B. Delta and Kappa
C. Sigma
D. Mu-3
E. Mu-2
- 227. Which is not a projection site of the neospinothalamic tract neurons that subtend painful afferent volleys?**
A. Nucleus reticularis gigantocellularis
B. Nucleus raphe Magnus
C. Periaqueductal grey region
D. All of the above
E. None of the above
- 228. In assessing and characterizing pain, the most useful distinctions about the typology of pain can best be made according to:**
A. Physiological characteristics
B. Temporal characteristics
C. Subjective characteristics
D. Radiological Investigations
E. Nerve Conduction studies
- 229. As a general practice**
A. Opiate maintenance dosing should be discontinued prior to trial of SCS
B. Antibiotics prophylaxis should be delivered when implanting devices
C. Patients should be considered for neurostimulation without a preoperative psychological assessment
D. Intrathecal drug delivery should be initiated with ziconotide as a primary infusion
E. Trial of patients for chronic neuromodulation should not be done by the individual who will maintain the device
- 230. An increase in the output of a primary and/or second-order pain afferent as a consequence of increased stimulation over a broader surface area of the affected region is known as:**
A. Temporal summation
B. Allodynia
C. Spatial summation
D. Cross-sensitization
E. All of the above
- 231. Paddle leads offer which of the following advantages over percutaneous leads:**
A. Increased power requirements
B. Decreased paresthesia overlap for an equivalent array
C. Greater array stability
D. Facilitated implant method
E. User flexibility in array construction
- 232. Following exposure to acute high threshold thermal stimulation, what event is likely in local population(s) of C-fiber afferents?**
A. Rightward shift in their response curve
B. Leftward shift in their response curve
C. A prolonged latency period during which they are non-responsive
D. All of the above
E. None of the above
- 233. One of the factors that contributes to the induction of Type-II pain is:**
A. "Un-masking" of post-synaptic NMDA receptors within the algescic neuraxis
B. Down-regulation of AMPA receptors within the spinal neural circuit
C. Increased serotonergic output from the nucleus reticularis
D. All of the above
E. None of the above

- 234. C-fiber primary afferents**
- A. Subtend transmission of Polymodal high threshold stimuli
 - B. Subtend transmission of high threshold thermal input only
 - C. Project exclusively onto Nociceptive specific second-order afferents
 - D. Project exclusively onto wide dynamic range neurons
 - E. All of the above
- 235. Discriminatory localization and intensity of pain appear to be primarily processed in which supratentorial area?**
- A. Hypothalamus
 - B. VPL thalamus
 - C. Reticular formation
 - D. Primary somesthetic cortex
 - E. All of the above
- 236. Chronic Intraspinal drug delivery most commonly is accomplished with:**
- A. One drug
 - B. Two drug
 - C. Three drug
 - D. Non-programmable pump
 - E. An epidural cathete
- 237. True statements regarding the Babinski Test include:**
- A. In a negative reaction the toes do not move or bunch up.
 - B. In a positive reaction the great toe extends while the other separate.
 - C. A positive Babinski reflex indicates an upper motor neuron lesion.
 - D. A positive Babinski s normal in a newborn.
 - E. All of the above
- 238. Which of the following nerve fibers is not myelinated?**
- A. A alpha fibers
 - B. A delta fibers
 - C. A gamma fibers
 - D. B fibers
 - E. C fibers
- 239. Mechanical nociception appears to be predominantly modulated by**
- A. The raphe-spinal system
 - B. The ceruleo-spinal system
 - C. The GABAergic system
 - D. All of the above
 - E. None of the above
- 240. Rubbing or patting a painful area can often reduce the sensations of pain. This is due, at least in part, to:**
- A. High-threshold C-fiber overload
 - B. Depletion of Substance-P within primary nocisponsive afferents
 - C. Stimulation of the dorsal columnar/medial lemniscal pathway
 - D. Provocation of a vasoconstrictive response to reduce local hyperemia
 - E. None of the above
- 241. The precentral gyrus and corticospinal tract are essential for**
- A. Vision
 - B. Olfaction
 - C. Auditory identification
 - D. Kinesthesia
 - E. Voluntary movement
- 242. Seizures produced by local anesthetics appear to arise from what area of the brain?**
- A. Thalamus
 - B. Geniculate bodies
 - C. Reticular activating system
 - D. Amygdala
 - E. None of the above
- 243. Cognitive and contextual aspects of the perceptual dimensions of pain appear to be processed in:**
- A. The VPL region of the thalamus
 - B. The periventricular grey region
 - C. The inferotemporal and frontal cortical regions
 - D. The hypothalamus
 - E. None of the above
- 244. The patient who favors a particular area and moves compensatorily to (reduce) pain sensation is said to be exhibiting:**
- A. Guarding
 - B. Allodynia
 - C. Antalgia
 - D. Hyperalgesia
 - E. Dystocia
- 245. Which of the following is most likely regarding phantom limb sensations?**
- A. Body parts that are sparsely innervated are most commonly represented
 - B. Phantom sensations are unpleasant with burning and jabbing
 - C. The incidence of phantom sensations decreases with age.
 - D. The amputated limb phantom may feel shortened
 - E. Phantom limb sensations require peripheral input
- 246. The source of noradrenergic projection to the cerebellum is the**
- A. Dorsomedial nucleus of the hypothalamus
 - B. Locus ceruleus
 - C. Raphe nucleus
 - D. Thalamus
 - E. Inferior olivary nucleus
- 247. Which of the following sensory pathways does NOT project to the thalamus ?**
- A. Visual sensation pathway
 - B. Auditory sensation pathway
 - C. Vibration sensation pathway
 - D. Olfactory sensation pathway
 - E. Temperature sensation pathway

248. The principal efferent neuron layer of the cerebral neocortex is
- II
 - III
 - IV
 - V
 - VI
249. The adrenal cortex influences the secretion of the adrenal medulla by
- Secretion of aldosterone into the intra-adrenal circulation
 - Secretion of glucocorticoids into the intra-adrenal circulation
 - Autonomic neural connections
 - Secretion of monoamine oxidase into the portal circulation
 - Secretion of androgens into the intrarenal circulation
250. Which of the following is true regarding drug absorption?
- Specialized transport systems are usually required
 - Passive diffusion is most common mechanism
 - Drug absorption usually is energy-dependent
 - Increased lipid solubility reduces uptake
 - Ionic charge facilitated drug uptake
251. The risk of acute dystonic reactions from antipsychotic agents is greatest for which of the following?
- Older women
 - Previous dystonic reaction
 - Administration by the oral route
 - Using lower doses of medication
 - Use of atypical antipsychotic medications
252. If quinidine and digoxin are administered concurrently, which of the following effects does quinidine have on digoxin?
- The absorption of digoxin from the GI tract is decreased
 - The metabolism of digoxin is prevented
 - The concentration of digoxin in the plasma is increased
 - The effect of digoxin on the AV node is antagonized
 - The ability of digoxin to inhibit the Na⁺ K⁺ -stimulated ATPase is reduced
253. The positions associated with the greatest amount of load on the lumbar intervertebral disks is
- Lying supine
 - Sitting, bending over
 - Sitting with back straight
 - Standing, flexed at the waist
 - Standing upright
254. A 30-year-old woman has difficulty phonating 15 minutes after initiation of interscalene block for closed reduction of a dislocated shoulder. The most likely cause is
- Cervical Sympathetic Block
 - Delayed systemic toxic reaction
 - Phrenic nerve paralysis
 - Pneumothorax
 - Recurrent laryngeal nerve block
255. The cerebellar cortex contains all of the following types of cells EXCEPT
- Pyramidal cells
 - Purkinje cells
 - Granule cells
 - Golgi cells
 - Basket cells
256. The Achilles reflex is used to test the integrity of
- L4
 - L5
 - S1
 - S2
 - L3
257. A patient presents with an acute onset of dorsal forearm pain. On physical exam there is a weakness of elbow extension and loss of the triceps reflex. Neck rotation and lateral flexion worsens the arm pain. An MRI of the neck confirms the presence of a paracentral disc protrusion at which level?
- C4-5
 - C5-6
 - C6-7
 - C3-4
 - C7-T1
258. The afferent limb of the oculocardiac reflex is by way of the following.
- Facial
 - Optic
 - Ophthalmic
 - Vagus
 - Ciliary
259. Which of the following is the best advantage of atypical antipsychotic medications over traditional antipsychotic medications?
- Purely adrenergic antagonists
 - More effective for positive symptoms
 - Lower risk for extrapyramidal side effects
 - More effective for mood disorders with psychotic features
 - Increased efficacy for behavioral symptoms with dementias
260. The substantia gelatinosa resides in the laminar segment of the spinal cord
- X
 - VII
 - V
 - II
 - I

261. The intensity of a signal that is transmitted to the brain can be increased by increasing the frequency of impulses traveling along a single fiber. This is called
- Spatial summation
 - After-discharge
 - Temporal summation
 - Recruitment
 - Saltatory conduction
262. The central opioid peptides leu- and met-enkephalin are the principal endogenous ligands at which opioid receptors?
- delta and kappa
 - Spinal kappa only
 - Mu and delta
 - Mu and supraspinal kappa
 - kappa and Mu
263. Presynaptic inhibition in the central nervous system affects the firing rate of alpha motoneurons by
- Increasing the chloride permeability of the presynaptic nerve ending
 - Decreasing the potassium permeability of the alpha motoneuron
 - Decreasing the frequency of action potentials by the presynaptic nerve ending
 - Increasing (hyperpolarizing) the membrane potential of the alpha motoneuron
 - Increasing the amount of the neurotransmitter released by the presynaptic nerve ending
264. Which of the following ligands activate G-protein coupled receptors?
- Acetylcholine
 - Morphine
 - Insulin
 - Cortisol
 - GABA
265. Correct statements regarding rapid eye movement (REM) sleep include which of the following?
- It is the first state of sleep entered when a person falls asleep
 - It is accomplished by loss of skeletal muscle tone
 - It is characterized by a slow but steady heart rate
 - It occurs more often in adults than in children
 - It lasts longer than periods of slow-wave sleep
266. In a hypertensive patient who is taking insulin to treat diabetes, which of the following drugs is to be used with extra caution and advice to the patient?
- Hydralazine
 - Prazosin
 - Guanethidine
 - Propranolol
 - Methyldopa
267. Intradiscal pressure increases with
- Standing in flexion
 - Coughing
 - Sneezing
 - Over night
 - All of the above
268. Vertigo, inability to perceive termination of movement, and difficulty in sitting or standing without visual clues are some of the toxic reactions that are likely to occur in about 75% of patients treated with
- Penicillin G
 - Doxycycline
 - Amphotericin B
 - Streptomycin
 - INH
269. Which of the following is an H2-receptor antagonist?
- Sumatriptan
 - Cyproheptadine
 - Ondansetron
 - Cimetidine
 - Fluoxetine
270. Hypotension, bradycardia, respiratory depression, and muscle weakness, all unresponsive to atropine and neostigmine, would most likely be due to
- Diazoxide
 - Isoflurphate
 - Tubocurarine
 - Nicotine
 - Pilocarpine
271. Which of the following is an antiarrhythmic agent that has relatively few electrophysiologic effects on normal myocardial tissue but suppresses the arrhythmogenic tendencies of ischemic myocardial tissues?
- Propranolol
 - Procainamide
 - Quinidine
 - Lidocaine
 - Disopyramide
272. Free nerve endings contain receptors that encode the sensation of
- Fine touch
 - Vibration
 - Pressure
 - Temperature
 - Muscle length
273. A dopamine receptor agonist that is useful in the therapy of Parkinson's disease is
- Selegiline
 - Bromocriptine
 - Apomorphine
 - Amantidine
 - Belladonna
274. Which of the following is true about the trigeminal nerve nuclei?
- The trigeminal nerve has two sensory nuclei
 - Pain and temperature are carried predominantly by the

- spinal nucleus of the trigeminal nerve
- C. Most small fibers efferent of the spinal tract of the trigeminal nerve end in the main sensory nucleus of that nerve
- D. The motor nucleus of the trigeminal nerve innervates the muscle of mastication via its maxillary division
- E. The motor nucleus of the trigeminal nerve contains only alpha motor neurons
275. A 20-year-old male with herpes simplex of the lips is treated with famciclovir. What is the mechanism of action of famciclovir?
- A. Cross-linking of DNA
- B. Strand breakage of DNA
- C. Inhibition of viral DNA synthesis
- D. Inhibition of viral kinase
- E. Activation of viral DNA synthesis
276. The substantia gelatinosa of the spinal cord is located in
- A. Lamina I
- B. Lamina II
- C. Lamina IV
- D. Lamina VII
- E. Lamina IX
277. Which of the following is involved in glomerular filtration?
- A. Facilitated diffusion of large anionic proteins
- B. Maintenance of a charge barrier
- C. A physical barrier consisting of type II collagen
- D. Filtration slits between adjacent endothelial cells
- E. A positive charge in the basement membrane due to the presence of heparan sulfate
278. The hormone with the greatest role in aggression is
- A. Thyroxine
- B. Testosterone
- C. Estrogen
- D. Progesterone
- E. Aldosterone
279. The hypothalamic nuclei is responsible for controlling the normal circadian rhythm is:
- A. Paraventricular nucleus
- B. Ventromedial nucleus
- C. Arcuate nucleus
- D. Lateral nucleus
- E. Suprachiasmatic nucleus
280. The EKG of a patient who is receiving digitalis in the therapeutic dose range would be likely to show
- A. Prolongation of the QT interval
- B. Prolongation of the PR interval
- C. Symmetric peaking of the T wave
- D. Widening of the QRS complex
- E. Elevation of the ST segment
281. Lissauer's tract is:
- A. Composed of A-delta and C-fibers located in the superficial apex of the dorsal horn.
- B. The lateral ascending spinal tract which connects dorsal horn interneurons to supraspinal centers.
- C. The posterior descending tract which connects inhibitory supraspinal centers to dorsal horn neurons.
- D. The tract which transmits pain signals from one side of the spinal cord to the other.
- E. Connects post-ganglionic sympathetic fibers to the spinal nerve.
282. Which of the following extraocular muscles is innervated by a nucleus located on the contralateral side?
- A. Superior rectus
- B. Inferior rectus
- C. Medial rectus
- D. Lateral rectus
- E. Inferior oblique
284. The visceral afferent fibers of the heart are transmitted through what nerves?
- A. Vagus
- B. Middle cervical ganglia
- C. Thoracic cardiac nerves
- D. Thoracic ganglia 3-6
- E. Inferior cervical ganglia
285. A 27-year-old male has sprained his ankle, which is swollen and painful, while skiing. X-ray examination is negative except for the appearance of swelling. A nonsteroidal anti-inflammatory drug (NSAID) is administered. Which of the following would be decreased?
- A. Histamine
- B. Cortisol
- C. Bradykinin
- D. Prostacyclin
- E. Uric acid
286. The efferent limb of the cremaster reflex is provided by the
- A. Femoral branch of the genitofemoral nerve
- B. Genital branch of the genitofemoral nerve
- C. Ilioinguinal nerve
- D. Pudendal nerve
- E. Temperature differential between core body temperature and scrotal temperature
287. The cells responsible for the entry of human immunodeficiency virus (HIV) into the CNS are
- A. Microglial macrophages
- B. Astrocytes (astroglia)
- C. Oligodendrocytes (oligodendroglia)
- D. Endothelial cells
- E. Schwann cells

288. When testing sensation in the thoracic region, the dermatomes that would most likely approximate nipple level would be
- T3
 - T4
 - T6
 - T5
 - T7
289. The extensor hallucis longus deep is innervated by the branch of the peroneal nerve from the following nerve:
- L4
 - L3
 - L2
 - L5
 - S1
290. The nodes of Ranvier
- Occur only in the CNS
 - Contain few Na⁺-gated channels
 - Represent the midpoints of myelination segments
 - Are completely covered by myelin
 - Increase the efficiency of nerve conduction
291. A 55-year old morbidly obese female arrives at the clinic complaining of decreased sensation over the anterior thigh between the inguinal ligament and knee joint. She states that she has loss of sensation in the anterior thigh from the inguinal ligament to the knee and is generalized medial to lateral. The patellar, quadriceps reflex is generally intact. Nerves that most likely represent this innervation include:
- L1
 - L2
 - L3
 - L4
 - L5
292. A patient presents with an acute onset of medial forearm pain. On physical exam he demonstrates a positive Froment's sign and loss of sensation in little finger. Neck rotation and lateral flexion worsens the arms pain. An MRI of the neck confirms the presence of a paracentral disc protrusion at which level?
- C4-5
 - C5-6
 - C6-7
 - C7-T1
 - C3-4
293. Allodynia is defined as:
- Spontaneous pain in an area or a region that is anesthetic
 - Hypersensitivity to a painful stimulus
 - Pain initiated or caused by a primary lesion or dysfunction in the nervous system
 - An unpleasant abnormal sensation, whether spontaneous or evoked.
 - Pain caused by a stimulus that does not normally provoke pain.
294. In muscular dystrophy, the actin-binding protein dystrophin is absent or defective. Dystrophin contains similar actin-binding domains to the spectrins (I and II) and α -actinin and has a similar function. Which of the following is most likely to occur as a result of this deficiency?
- Deficiency in skeletal muscle actin synthesis
 - Enhanced smooth muscle contractility
 - Loss of binding of the I and M bands to the cell membrane
 - Loss of organelle and vesicle transport throughout the muscle cell
 - Loss of integrity of the desmosomal components of the intercalated discs of cardiac muscle
295. Cholinergic receptors are divided into the following two categories
- Nicotinic and adrenergic
 - Adrenergic and muscarinic
 - Cholinergic and adrenergic
 - Nicotinic and muscarinic
 - None of the above
296. The sympathetic response in a "fight or flight" reaction causes a decrease in
- The arterial blood pressure
 - The diameter of the pupil
 - The resistance of the airways
 - The heart rate
 - The blood glucose concentration
297. The actin-rich cell cortex is involved in the following cell functions
- Cytokinesis
 - Chromosomal movements
 - Bidirectional transport of vesicles
 - Fast axoplasmic transport
 - Ciliary movement
298. The major factor limiting oral bioavailability of morphine is
- Gastric emptying time
 - Intestinal enzymes
 - Liver metabolism
 - Hydrophilicity
 - Bile secretion
299. Regeneration of axons
- Occurs in the segment distal to the damage
 - Is independent of the survival of the perikaryon
 - Includes a decrease in the volume of the perikaryon
 - Is dependent on proliferation of Schwann cells
 - Is initiated with an increase in production of Nissl substance
300. What is the cause of neuroleptic malignant syndrome?
- Inhibition of serotonin reuptake in the CNS
 - Blockade of central dopamine receptors
 - Central dopamine receptor hypersensitivity to neuroleptics

- D. Depletion of synaptic dopamine stores in the CNS
- E. Anaphylactic reaction to a neuroleptic medication

301. The alpha rhythm appearing on an electroencephalogram has which of the following characteristics?

- A. It produces 20 to 30 waves per second
- B. It disappears when a patient's eyes open
- C. It is replaced by slower, larger waves during REM sleep
- D. It represents activity that is most pronounced in the frontal region of the brain
- E. It is associated with deep sleep

302. The receptors responsible for measuring the intensity of a steady pressure on the skin surface are

- A. Pacinian corpuscle
- B. Ruffini ending
- C. Merkel's disk
- D. Meissner's corpuscle
- E. Krause ending

303. The treatment of choice of rapid cycling bipolar disorder is

- A. Carbamazepine
- B. Lithium
- C. Clonazepam
- D. Haloperidol
- E. Valproic acid

304. The reversible cholinesterase inhibitor indicated in the treatment of Alzheimer's disease is

- A. Tacrine
- B. Edrophonium
- C. Neostigmine
- D. Pyridostigmine
- E. Ambenonium

Directions: Each question below contains four suggested responses of which **one or more** is correct. Select

- A if **1, 2 and 3** are correct
- B if **1 and 3** are correct
- C if **2 and 4** are correct
- D if **4** is correct
- E if **All (1, 2, 3 and 4)** are correct

305. The recurrent laryngeal nerve supplies motor function to the following intrinsic muscles of the larynx

- 1. Sternothyroid
- 2. Sternohyoid
- 3. Thyrohyoid
- 4. Cricothyroid

306. True statements about Histamine include that

- 1. It causes edema

- 2. It causes activation of nociceptors
- 3. It causes vasodilation
- 4. It is released from injured cells

307. Accurate descriptions of visceral afferent fibers include that they

- 1. Travel with sympathetic fibers
- 2. Are autonomic fibers
- 3. Have large receptive fields
- 4. Do not undergo sensitization

308. A patient is taking part in a sleep study. When the patient begins to dream, the following physiologic change would be expected:

- 1. Increase in sternocleidomastoid tonus
- 2. More visual imagery during non-REM (NREM) sleep
- 3. Delta waves on electroencephalogram
- 4. Electroencephalographic desynchrony

309. Prolonged activation of the NK-1 receptor by Substance-P has been shown to:

- 1. Sensitize post-synaptic NMDA receptors to mediate summatory responses
- 2. Possibly activate proto-oncogenes responsible for synaptic facilitation.
- 3. Result or most likely occur in type III pain
- 4. Up-regulate dynorphin receptors on spinal interneurons

310. Both cerebral hemispheres are destroyed, but the brain stem is relatively intact. Many of these patients are unresponsive for the first few weeks, and then stabilize into an "eyes-open unconsciousness", with complete lack of cognition. They do have wake-sleep cycles, eye movements, intact reflexes, pupillary responses and spontaneous respirations. Choose the correct statements.

- 1. Coma
- 2. Semi-coma
- 3. Brain Death
- 4. Permanent Vegetative State (PVS)

311. Enkephalins are found in the

- 1. Lungs
- 2. CNS
- 3. Bladder
- 4. adrenal medulla

312. The patellar jerk or knee reflex is innervated by:

- 1. L2
- 2. L5
- 3. L3
- 4. L4

- 314. A neuron contains**
1. A cell body
 2. A dendrite
 3. An axon
 4. Asynapse
- 315. All the following are true regarding visceral pain.**
1. Traction and distention usually produce pain
 2. Pain can commonly be referred
 3. Pain is diffuse and poorly localized
 4. Viscera have fewer nociceptors than somatic structures
- 316. The major anatomic areas of the CNS involved in opioid-mediated analgesia include the**
1. Periventricular region
 2. Rostroventral medulla
 3. Periaqueductal gray matter
 4. Thalamus
- 317. The following ganglia transmit purely sympathetic impulses.**
1. Stellate
 2. Otic
 3. Superior cervical ganglion
 4. sphenopalatine
- 318. The difference between a plexus and ganglion include the following**
1. A plexus refers to prevertebral ganglia only
 2. A plexus refers to a site of synaptic connections specific to the sympathetic system
 3. A plexus may be either sympathetic or para-sympathetic
 4. A plexus refers to ganglia and axons (sympathetic and parasympathetic) in a defined anatomic location
- 319. Clinical situation associated with an increase in parasympathetic activity include**
1. Manipulation of the carotid sinus
 2. Intestinal insufflation during colonoscopy
 3. Traction of superior oblique muscle during strabismus surgery
 4. Caudal anesthesia for excision of a pilonidal cyst
- 320. Administration of substance P causes the following.**
1. Plasma extravasation
 2. Pain on local injection
 3. Neurogenic inflammation
 4. Activation of nociceptors
- 321. The following statements are true regarding sympathetic modulation of nociceptive transmission**
1. Acute sympathetic nervous function can engage limbic mechanisms to produce attentional analgesia.
 2. Sympathetic activation can produce a relatively short term modulation against nociceptive pain.
 3. Sympathetic activation can induce release of adrenal opioids to modulate nociceptive pain.
 4. Long term stress can produce durable inhibition of neuropathic pain
- 322. Which of the following are cardinal features of mania?**
1. Insomnia
 2. Distractibility
 3. Flight of ideas
 4. Low self-esteem
- 323. A-beta fiber terminal remodeling:**
1. Produces projections to laminae III, V, VI and VII.
 2. Lamina II projections activate nociceptive-specific and wide dynamic range neurons
 3. Can produce analgesia via activation of the medial lemniscal pathway.
 4. Lamina VII projections can directly engage intermedio-lateral sympathetic nervous system pre-ganglionic neurons.
- 324. Saltatory conduction is correctly described by the following:**
1. It occurs in myelinated nerves
 2. It occurs in unmyelinated nerves
 3. It greatly increases the velocity of nerve conduction
 4. It expends more energy
- 325. Muscarinic receptors are located in all effector cells stimulated by**
1. Preganglionic sympathetic neurons
 2. Postganglionic parasympathetic neurons
 3. Preganglionic parasympathetic neurons
 4. Postganglionic cholinergic sympathetic neurons
- 326. Cranial tissues that are sensitive to pain include**
1. Pia mater
 2. Arteries of the dura mater
 3. Brain parenchyma
 4. Cranial sinuses and afferent veins

- 327. True statements about the changes that have been shown to take place after peripheral nerve injury include the following.**
1. The primary afferent nerve endings in the spinal cord sprout new connections within the dorsal horn
 2. Injured primary afferents may change neuropeptide production from substance P and calcitonin gene-related peptide (CGRP) to neuropeptide γ , galanin, and vasoactive intestinal polypeptide (VIP)
 3. Upregulation of C-Fos in intrinsic spinal neurons occurs
 4. There is a large increase in the endogenous opioid dynorphin
- 328. Correct statements regarding cell bodies include that those**
1. Of somatic motor nerves lie in the anterior horn of the spinal cord
 2. Of cranial nerves lie in the sensory nuclei of the cranial nerve
 3. Of somatic sensory nerves lie in the dorsal root ganglia
 4. Of visceral sensory nerves lie in the autonomic nervous system
- 329. The following statements are true regarding WDR (wide dynamic range) neurons:**
1. They are dorsal horn interneurons that reside primarily in Rexed's lamina V (the nucleus proprius).
 2. They are called convergence neurons and are thought to represent the neural basis for referred pain
 3. After receiving repetitive, low level stimulation from C-fibers, they enter a state of continuous discharge called "wind up".
 4. They are activated by low threshold, innocuous stimuli (light touch) as well as high threshold, nociceptive stimulation.
- 330. True statements regarding serotonin include that it**
1. Is an analgesic substance
 2. Is released by platelets
 3. Has no known antagonist
 4. Has receptors located on peripheral nerves
- 331. Adrenergic receptors are involved in which of the following functions?**
1. Depression
 2. Anxiety
 3. Arousal
 4. Learning
- 332. During muscle testing, extension of the quadriceps is primarily innervated by all of the following:**
1. L2
 2. L3
 3. L4
 4. L1
- 333. True statements concerning the oculocardiac reflex include:**
1. It is more likely to occur in a patient with hypercarbia than in a patient with normocarbia
 2. It is not seen during operative procedures on an empty orbit
 3. Its afferent limb is the trigeminal nerve
 4. It does not occur in the awake patient
- 335. Receptor types that mediate analgesia include**
1. delta
 2. kappa
 3. mu-1
 4. mu-2
- 336. The true statements about the reticular formation are:**
1. It regulates motor, sensory, and autonomic functions
 2. It consists of nuclei located in the brainstem
 3. It responds to noxious stimulation
 4. It is involved with the affective component of pain
- 337. Stimulation of the following receptors serves as a negative feedback mechanism**
1. Beta-1
 2. Beta-2
 3. Alpha-1
 4. Alpha-2
- 338. Cranial nerves involved in the corneal reflex include**
1. 7th cranial nerve
 2. 3rd cranial nerve
 3. 5th cranial nerve
 4. 6th cranial nerve
- 339. The corpus striatum is formed by all of the following structures EXCEPT the**
1. Caudate nucleus
 2. Olfactory tubercles
 3. Nucleus accumbens
 4. Globus pallidus
- 340. The true statements regarding the termination of the C-fiber primary afferents in the spinal cord are.**
1. C fibers collateralize into the tract of Lissauer
 2. C fibers enter mostly medial to the A-beta fibers in the dorsal root entry zone
 3. C fibers project rostrally and caudally in the tract of Lissauer
 4. No C fibers exist within the ventral nerve roots

- 341. The class of compounds considered prostanoids include:**
1. Prostacyclins
 2. Thromboxanes
 3. Prostaglandins
 4. leukotrienes
- 342. Acetylcholine is released at**
1. Preganglionic parasympathetic nerve endings
 2. Preganglionic sympathetic nerve endings
 3. Postganglionic parasympathetic nerve endings
 4. Postganglionic sympathetic nerve endings
- 343. The parasympathetic nervous system includes**
1. Axons that travel with the accessory nerve
 2. Cell bodies of preganglionic fibers in cranial nerve nuclei
 3. Short preganglionic fibers
 4. Cell bodies in the intermediolateral gray area of the sacral spinal cord
- 344. True statements regarding serotonin include**
1. It is found in the rostromedullary medulla
 2. It inhibits nociceptive neurons in laminae V and X
 3. It is involved in descending antinociceptive pathways
 4. Its direct application to the spinal cord has no effect on pain
- 345. Neuronal excitability is enhanced by:**
1. Alkalosis
 2. Inhaled anesthetics
 3. Hyperventilation
 4. Hypoxemia
- 346. Ascending nociceptive pathways in the anterolateral quadrant (ALQ) of the spinal cord include the**
1. Spinothalamic tract
 2. Spinomesencephalic tract
 3. Spinoreticular tract
 4. Spinomedullary system
- 347. Laminae I, II, and V in the dorsal horn**
1. Project to the brainstem
 2. Abolish cutaneous pain when cut
 3. Produce analgesia when stimulated
 4. Are major areas for convergence of nociceptive transmission
- 348. Cells found in the dorsal horn include**
1. Excitatory interneurons
 2. Inhibitory interneurons
 3. Projection cells
 4. Wide dynamic range (WDR) neurons
- 349. Bradykinin, a peptide produced by activation of the kinin system,**
1. Decreases vascular permeability
 2. Has binding sites in the dorsal horn
 3. Inhibits leukocyte chemotaxis
 4. Is produced as sites of tissue injury
- 350. True statement(s) concerning peripheral nerve structure and function include of the following:**
1. Both nonmyelinated and myelinated nerves are surrounded by Schwann cells
 2. The speed of propagation of an action potential along a nerve axon is greatly enhanced by myelin
 3. Generation of an action potential is an “all-or-nothing” phenomenon
 4. Propagation of an action potential along myelinated nerve axons occurs by saltatory conduction via the nodes of Ranvier
- 351. The true statements about cremaster reflex are.**
1. It is mediated through the ilioinguinal nerve
 2. It is mediated through the genitofemoral nerve
 3. It is evoked by stroking in inner thigh
 4. It results in bilateral elevation of the testicles
- 352. Somatic pain is usually:**
1. Sharp
 2. Precisely localized
 3. Hurts where the stimulus is
 4. Tends to increase with increasing stimulus intensity
- 353. Which of the following is a labeled indication for prescribing CNS stimulants?**
1. Chronic pain with thalamic strokes
 2. Reversing opioid induced sedation
 3. Enhanced alertness for driving
 4. Narcolepsy
- 354. The complex nociceptive system is balanced by an equally complex anti-nociceptive system which makes up the internal pain control apparatus. The following statements are true regarding modulation of nociceptive transmission:**
1. Pain signals arriving from peripheral tissues stimulate the release of endorphins in the periaqueductal gray matter of the brain and enkephalins in the nucleus raphe magnus of the brainstem.
 2. Endorphins inhibit propagation of nociception by binding to presynaptic mu-receptors on primary afferent terminals and post-synaptic receptors on dorsal horn interneurons.
 3. Enkephalins bind to delta receptors on inhibitory interneurons in the substantia gelatinosa causing release of GABA and other chemicals that inhibit neurotransmitter release.
 4. Enkephalin initiates the release of dynorphin which activates kappa opioid receptors on inhibitory interneurons.

- 355. A patient undergoes a mid-thoracic ventrolateral cordotomy for control of intractable pain. The following statements are true regarding effects of this procedure:**
1. The patient would likely experience loss of pain sensation on the contralateral side several segments below the lesion.
 2. Light touch sensation would be lost on the ipsilateral side at the level of the lesion and below.
 3. Temperature (hot and cold) sensation would be lost on the contralateral side several segments below the lesion.
 4. The pain relieving effects of the lesion would likely be complete and permanent.
- 356. Which factors contribute to the sensory experience(s) of Type-II pain?**
1. Polymodal nature of the primary afferents that subserve Type-II pain
 2. Multiplicity of synaptic contacts within different types of second order afferents within the dorsal horn
 3. The distinct nature of the receptive field of the primary afferents involved
 4. The possibility of after-discharges and summation of primary and second-order afferents
- 357. True statements regarding substance P include that it**
1. Is synthesized in the dorsal root ganglia
 2. Is released by stimulation of primary afferent nociceptors
 3. Is transported to peripheral and central terminals
 4. Inhibits the release of histamine
- 358. Hyperalgesia is defined as an increased sensitivity to a normally painful stimuli. Which of the following statements are true regarding primary and secondary hyperalgesia:**
1. Primary hyperalgesia is caused by sensitization of C-fibers and occurs immediately within the area of the injury.
 2. Secondary hyperalgesia is caused by sensitization of dorsal horn neurons and occurs in the undamaged area surrounding the injury.
 3. Secondary hyperalgesia is driven mainly by increased excitability of central neurons via activated NMDA receptors
 4. Intrathecal NMDA antagonists block primary but not secondary hyperalgesia.
- 359. Which of the following are extradural lesions that can cause radicular pain?**
1. Herniated nucleus pulposus
 2. Lumbar intraspinal facet joint synovial cyst
 3. Epidural abscess
 4. Tarlov cyst
- 360. Withdrawal reflexes are correctly described by the following statements:**
1. They are most often elicited by a stretch stimulus
 2. They are transmitted by pathways that pass directly to anterior motor neurons
 3. They typically take 0.2 to 0.5 s to occur
 4. They are associated with extension of the opposite limb
- 361. The facet joints, in the lumbar spine**
1. Permit rotation
 2. Comprise two arthroial joints lined with synovium
 3. Allow lateral flexion or bending in the lordotic curve
 4. Lie in a vertical sagittal plane, permitting flexion and extension
- 362. A surgical incision:**
1. Releases chemical mediators that sensitize nociceptors
 2. Primarily activates A-alpha and A-beta fibers
 3. Increases general sympathetic tone
 4. Stimulates insulin release
- 363. Which of the following correctly describes effects of low frequency (2 - 4 Hz) electrical stimulation acupuncture?**
1. Generalized
 2. Slow in onset
 3. Cumulative effect
 4. Enkephalin-dependent
- 364. Intraspinal opioid infusions became important for pain relief with the discovery of**
1. delta-receptors
 2. gamma-receptors
 3. beta-receptors
 4. mu-receptors
- 365. The following statements are true regarding C-polymodal nociceptors:**
1. They are called polymodal because they respond to a variety of innocuous low threshold as well as noxious high threshold stimuli.
 2. The distal axons arborize into unspecialized free nerve endings in peripheral tissue.
 3. The central axons connect to interneurons primarily in Rexed's lamina III and VI in the dorsal horn.
 4. They are unipolar neurons with cell bodies that reside in the dorsal root ganglion.
- 366. The following tracts are primarily involved with transmission of pain, temperature and touch**
1. Spinocerebellar
 2. Fasciculus gracilis
 3. Spinothalamic
 4. Fasciculus cuneatus

- 367. Physiologic processes involved in nociception include**
1. Transmission
 2. Modulation
 3. Perception
 4. transduction
- 368. Statements that correctly describe mechanothermal nociceptors include**
1. They are the most common type of nociceptors
 2. They activate both A-delta and C fibers
 3. They respond to both noxious mechanical and thermal stimuli
 4. They may also be referred to as C-polymodal nociceptors
- 369. Visceral nociception is accurately characterized by the following statements.**
1. It typically has a significant autonomic component
 2. It respond to cutting, burning, or stimuli
 3. It is often diffuse and poorly localized
 4. It involves more nociceptors than cutaneous nociception
- 370. Sensitization of high-threshold mechanoreceptors**
1. Is associated with a higher threshold to thermal stimulation
 2. Requires repeated stimulation
 3. Is associated with a lower threshold to mechanical stimulation
 4. Results in increased frequency of discharge
- 371. Descending inhibitory pathways typically involve the following neurochemical mechanisms.**
1. Noradrenergic
 2. Enkephalinergic
 3. Serotonergic
 4. Cholinergic
- 372. Each of the following is a function of the facial nerve.**
1. It carries parasympathetic secretory fibers to the lacrimal glands
 2. It is involved in the afferent limb of the orbicularis oculi reflex
 3. It innervates muscles of facial expression
 4. It conveys exteroceptive sensation from the region of the eardrum
- 373. Muscle-stretch reflexes are diminished or absent in each of the following conditions:**
1. Deep sedation
 2. Deep coma
 3. Hypothyroidism
 4. Strychnine poisoning
- 374. The sequence of events involved in neurogenic inflammation includes**
1. Spreading vasodilation
 2. Sensitization of C-PMNs
 3. Edema
 4. Secondary hyperalgesia
- 375. True statements about A-delta fibers include the following:**
1. They are myelinated
 2. They do not respond to mechanical stimulation
 3. They conduct impulses at a rate of 20m/s
 4. They are also called low-threshold mechano-receptors
- 376. Which of the following correctly describe an agonist drug?**
1. Produces an effect by inducing conformation change
 2. May displace an endogenous ligand from the receptor
 3. Receptor interaction mediated by weak molecular forces
 4. Binds by covalent forces to the receptor
- 377. True statements regarding C fibers include that they**
1. Are unmyelinated
 2. Are mostly nociceptive
 3. Respond to mechanical, thermal, and chemical stimuli
 4. Make up a small proportion of fibers in a peripheral nerve
- 378. True statements about characteristics of skin injury are:**
1. Local edema
 2. Intense vasoconstriction
 3. Secondary vasodilation in adjacent areas
 4. Increased threshold for nonnoxious stimuli
- 379. C-polymodal nociceptors (C-PMNs)**
1. Have large receptive fields
 2. Do not undergo sensitization
 3. Are involved with secondary hyperalgesia
 4. Respond only to mechanical and thermal stimulation
- 380. True statements about NMDA receptors are:**
1. The pharmacology of central sensitization has shown that the N-methyl-d-aspartate (NMDA) receptors are involved
 2. Interventions that prevent the establishment of central sensitization are considered as preemptive analgesia
 3. Co-administration of NMDA receptor antagonist with an opioid may prevent central sensitization
 4. Co-administration of NMDA receptor antagonist with an opioid may enhance opioid-induced anti-nociception and may prevent tolerance to opioid analgesia

- 381. Inhibitory neurotransmitters include**
1. Glutamic acid
 2. Glycine
 3. substance P
 4. gamma-aminobutyric acid
- 382. What is the underlying focus in the clinical assessment of pain?**
1. Objectify a subjective variable
 2. Recognize and quantify qualitative phenomena
 3. Correlation of medical findings (eg.- clinical tests) with patient history and complaint(s)
 4. Filter and reduce patient reports in favor of objective tests
- 383. Based upon a mechanistic knowledge of pain transmission and conduction, why would the clinician expect a diabetic patient to have heightened sensations of durable neuropathic pain?**
1. Polyol sugar- induced disruption of Na-K ATPase function
 2. Increase in A-beta fiber function
 3. Hyper sensitization of C-fibers caused by enhanced sodium flux and membrane conductance
 4. Loss of C-fiber conductivity
- 384. The precise role(s) of mesencephalic (midbrain) opioids is to:**
1. Inhibit a GABAergic neuraxis
 2. Enhance output of the anterolateral system
 3. Disinhibit bulbospinal anti-nociceptive systems
 4. Act at specific dynorphin receptors in the spinal cord
- 385. Pain caused by a brief noxious stimulus and experienced as brief and sharp (first pain)**
1. Can be blocked by applying local anesthetic
 2. Can be blocked by applying pressure
 3. Is mediated by C-PMNs
 4. Can occur in response to a thermal stimulus
- 386. A-delta fibers subtypes:**
1. High threshold mechanical input
 2. Lo-medium threshold mechanical input
 3. High threshold thermal input
 4. Polymodal and chemical high threshold input
- 387. Spondylolisthesis refers to:**
1. Fracture of both pars interarticularii
 2. Fracture of one pars interarticularii
 3. The slip of the cephalad vertebral body posteriorly with respect to the caudad vertebral body
 4. A slip of the cephalad vertebral body anteriorly with respect to the caudad vertebral body
- 388. Criteria for neurotransmitters in primary afferent nociceptors include**
1. The substance is present in the dorsal horn synapse
 2. The substance is released on noxious stimulation
 3. Release of the substance causes the same effect as stimulation of the primary effect
 4. Injection of the substance causes pain
- 389. A patient has atypical facial pain of five years duration. She experiences continuous burning pain in the right mid face and right forehead. When pain is severe, she also feels pain in the right occiput. The following statements are more than likely true:**
1. The central processes of the involved pain fibers synapse in the subnucleus caudalis portion of the cervicotrigeminal nucleus
 2. The cell bodies of the nociceptive afferent fibers transmitting her pain reside in the trigeminal ganglion.
 3. V2 is most likely involved in pain transmission.
 4. The occipital pain can be explained by convergence of trigeminal fibers and C2 nerve root fibers onto interneurons in the pons.
- 390. Nerve fibers primarily responsible for the transmission of pain impulses include**
1. A-beta fibers
 2. A-delta fibers
 3. B fibers
 4. C fibers
- 391. G-protein coupled receptor activation produces pharmacologic effects by modulation of which of the following?**
1. Cyclic AMP
 2. Ionic channels
 3. Phospholipases
 4. Protein kinases
- 392. Difficulties in evaluating sympathetically mediated pain include:**
1. Controlling the thermal testing environment when conducting topical thermometric evaluations.
 2. Apparent need for repeated assessments to enhance sensitivity
 3. Direct correlation of sensitivity to diagnostic accuracy
 4. Pain quality and intensity is frequently not reflected in quantitative assessments
- 393. Neurogenic inflammation:**
1. Is mediated, in part by antidromically released Substance P.
 2. Causes depletive desensitization of C-fiber afferents
 3. Can produce central hyperalgesia.
 4. Is not at all reliant on cyclooxygenase-derived products for initiation or maintenance

- 394. The central nervous system consists of**
1. Brain
 2. Cranial nerves
 3. Spinal cord
 4. Spinal nerves
- 395. All of the following are true regarding the intervertebral discs**
1. They have multiple innervations
 2. Intradiscal pressure raises over night
 3. Intradiscal pressure decreases with standing in flexion
 4. Intradiscal pressure raises with valsalva
- 396. Autonomic pain is usually:**
1. Poorly localized
 2. Vague
 3. May be referred pain
 4. Sharp
- 397. The following drugs are known to provide NMDA receptor antagonism**
1. Dextromethorphan
 2. Dextrorphan
 3. Ketamine
 4. Neostigmine
- 398. Mechanically sensitive discs are defined as**
1. Pressure between 0-25 PSI
 2. Pressure between 10-35 PSI
 3. Pressure between 25-50 PSI
 4. Pressure between 50-75 PSI
- 399. Which of the following are most likely to be associated with sympathetic efferent activity.**
1. Cutaneous nociceptive sensitivity
 2. Alteration in piloerection
 3. Alteration in blood flow to skin and muscle
 4. Alteration of sweating
- 400. Trigeminal neuralgia is characterized by**
1. Unilateral, intense, paroxysmal pain of sudden onset
 2. Diminished sensation in the distribution of the maxillary division of the trigeminal nerve
 3. Normal function of the glossopharyngeal nerve
 4. Resolution of symptoms by injection of local anesthetic in trigger points

Answers

189. Answer: A

Explanation:

(Junqueira, 9/e, pp 157-159,186,194. Kandel, 4/e, pp 43,175-177, 183, 210-211.)

A. Ca^{2+} entry through specific channels results in fusion of acetylcholine-containing synaptic vesicles with the presynaptic membrane and ultimately the release of neurotransmitter. Neuromuscular, or myoneural, junctions represent the site at which end feet (boutons terminaux) come in close proximity to the surface of muscle cells. The arrangement is similar to that found in a synapse, and a neuromuscular junction can be considered the best-studied synapse.

Ca^{2+} influx into the end feet may have a direct effect on phosphorylation of synapsin I, a vesicular membrane protein, which in its nonphosphorylated state blocks vesicle fusion with the presynaptic membrane.

B, C, D. Na^{+} , K^{+} , and Cl^{-} voltage-gated channels are involved in the transmission of a nerve impulse but are not involved in the coupling of the action potential (an electrical signal) to neurotransmitter release (a chemical alteration).

Source: Klein RM and McKenzie JC 2002.

190. Answer: B

Explanation:

A. Most A-delta and C fibers are non-myelinated.

B. Most A-delta and C fibers end as free nerve endings.

C. A-delta fibers terminate in the epidermis, while C fibers may end in the superficial dermis.

D. The transduction of noxious stimulation occurs in the free nerve ending.

E. They do not terminate in specialized structures.

Source: Kahn and Desio

191. Answer: A

Explanation:

Reference: Hardman, p 495.

Explanation: Ergotamine has several pharmacologic properties, including the blockade of α -adrenergic receptors; however, its mechanism of action in treating migraine headaches is primarily related to its agonistic interaction with serotonin receptors (5-HT_{1D}), resulting in vasoconstriction. Although chronic treatment with this non-sedative, nonanalgesic drug does not decrease the frequency of or prevent migraine attacks, an oral dose of ergotamine is the drug of choice for combating an incipient attack of migraine headache, especially during the prodromal stage.

Source: Stern - 2004

192. Answer: E

Explanation:

Reference:

Bonica's Management of Pain, 3rd Ed: Ch 3. Peripheral pain mechanisms and nociceptive plasticity. Nitric oxide is a small gaseous molecule that is rapidly synthesized in neural and vascular endothelial tissue via convergent pathways that ultimately increase the catalytic activity of nitric oxide synthase. NO easily and passively diffuses across neural and vascular membranes and can engage second messenger signaling systems to initiate vasodilatation and promote inflammation and resultant inflammatory pain.

Source: Giordano J, Board Review 2005

193. Answer: D

Explanation:

(Berne, 3/e, pp 118-121.) The Golgi tendon organ (GTO) is located in the tendon of skeletal muscles and therefore is in series with the muscle. Each time the muscle contracts, the tension developed by the muscle causes the GTO to be stretched. The Ib afferent fibers, which innervate the GTO, fire in proportion to the amount of GTO stretch, and therefore their firing rate provides the CNS with information about the amount of tension developed by the muscle. The muscle length and speed of shortening are sent to the CNS by Ia afferents that innervate the intrafusal fibers within muscle spindles.

194. Answer: E

Explanation:

(Guyton, pp 552-555.) Activating nociceptors on the free nerve endings of C fibers produces ischemic pain. The C

fibers synapse on interneurons located within the substantia gelatinosa (laminae II and III) of the dorsal horn of the spinal cord. The pathway conveying ischemic pain to the brain is called the paleospinothalamic system. In contrast, well-localized pain sensations are carried within the neospinothalamic tract. Ischemic pain does not adapt to prolonged stimulation. Pain is produced by specific nociceptors and not by intense stimulation of other mechanical, thermal, or chemical receptors.

195. Answer: A

Explanation:

Reference:

Bonica's Management of Pain, 3rd Ed: Ch 3. Peripheral pain mechanisms and nociceptive plasticity. Also Bonica's Management of Pain, 3rd Ed: Ch4. Spinal mechanisms and modulation. Longitudinal sympathetic activation can induce denovo expression of alpha adrenergic receptors on (chemically pre-sensitized) nociceptive C-fiber afferents and a-beta mechanoreceptors. Direct stimulation of these alpha-receptors by epinephrine released from sympathetic terminals can sensitize a-beta mechanoreceptors, produce a leftward shift in firing thresholds of a-beta and C-fibers and induce both peripheral and ultimately central sensitization. Chronic sympathetic activation does not produce stress induced modulation of nociceptive or neuropathic pain.

Source: Giordano J, Board Review 2005

196. Answer: C

Explanation:

(Waxman, 24/e, p 256.) Information from baroreceptors in the vascular wall passes via cardiac depressor nerves to the glossopharyngeal nerve (CN IX). The cell bodies of these neurons are located in the petrosal ganglion, and their central processes terminate on second-order interneurons in the nucleus of the solitary tract. These interneurons project to preganglionic parasympathetic cardioinhibitory neurons in the nucleus ambiguus, which reach ganglia on the surface of the heart via CN X (vagus nerve) and branches of the cardiac plexus. CN V (trigeminal) carries general somatic afferents from the face and innervates muscles involved in mastication. CN VII (facial) innervates the muscles of facial expression. CN XI primarily innervates the trapezius and sternocleidomastoid muscles.

Source: Klein RM and McKenzie JC 2002.

197. Answer: D

Source: Raj P, Pain medicine - A comprehensive Review - Second Edition

198. Answer: E

Explanation:

(Guyton, pp 826-830.) The hypothalamus regulates body temperature. Core body temperature, the temperature of the deep tissues of the body, is detected by thermoreceptors located within the preoptic area and the anterior hypothalamic nuclei. The preoptic area also

contains neurons responsible for initiating reflexes, such as vasodilation and sweating, which are designed to reduce body temperature. Heat-producing reflexes, such as shivering, and head maintenance reflexes, such as vasoconstriction, are initiated by neurons located within the posterior hypothalamus.

199. Answer: B

Explanation:

(Kandel, pp 730-735.)

When the axon is cut, the axon and synaptic terminals are deprived of essential metabolic connections with the cell body. With axonal transport in both directions, there is a rapid local degeneration of the axon and myelin sheath, with the cell body also being affected.

Synapses mediate both electric signals and nutritive interactions between neurons. Thus, changes occur in the cell body (retrograde changes) and also in subsequent neurons that receive synapses from the damaged neurons.

Macrophages from the general circulation enter the trauma area and phagocytose axonal debris, and glial cells (astrocytes and microglia) proliferate to assist in the process. This proliferation of fibrous astrocytes forms a glial scar around the trauma area, which can then block the course of regenerating axons and the reformation of central connections.

The behavioral effects of nerve lesions are peculiar to the location of the lesion in the brain and the nerve cell connections, so the same type of injury will have different behavioral effects depending on its location

Source: Ebert 2004

200. Answer: A

Explanation:

(Berne, 3/e, pp 155-158.) Each time a skeletal muscle fiber is stimulated by an alpha motoneuron, enough Ca^{2+} is released from its sarcoplasmic reticulum (SR) to fully activate all the troponin within the muscle. Therefore, every cross bridge can contribute to the generation of tension. However, the transmission of force from the cross bridges to the tendon (or bone or measuring device) does not occur until the series elastic component (SEC) of the muscle is stretched. Repetitive firing increases the amount of SEC stretch by maintaining cross-bridge cycling for a longer period of time. This occurs because each time the muscle is activated, the Ca^{2+} released from the SR replaces the Ca^{2+} that has been resequestered since the last stimulus. Repetitive firing increases neither the concentration of Ca^{2+} within the myoplasm, the number of myofibrils that are activated, nor the magnitude of the end-plate potential. Because all of the cross bridges are activated each time a skeletal muscle fiber is activated, an

increase in Ca^{2+} concentration would have no effect on muscle strength.

201. Answer: A

Explanation:

(Alberts, 3/e, pp 856-857. Junqueira, 9/e.) Smooth muscle is the least specialized type of muscle and contains no troponin. The contractile process is similar to the actin-myosin interactions that occur in motility of nonmuscle cells. In the smooth muscle cell, actin and myosin are attached to intermediate filaments at dense bodies in the sarcolemma and cytoplasm. Dense bodies contain α -actinin and, therefore, resemble the Z lines of skeletal muscle. Contraction causes cell shortening and a change in shape from elongate to globular. Contraction occurs by a sliding filament action analogous to the mechanism used by thick and thin filaments in striated muscle. The connections to the plasma membrane allow all the smooth muscle cells in the same region to act as a functional unit. Sarcoplasmic reticulum is not as well developed as that in the striated muscles. There are no T tubules present; however, endocytic vesicles called caveolae are believed to function in a fashion similar to the T tubule system of skeletal muscle.

When intracellular calcium levels increase, the calcium is bound to the calcium-binding protein calmodulin. Ca^{2+} -calmodulin is required and is bound to myosin light chain kinase to form a Ca^{2+} -calmodulin-kinase complex. This complex catalyzes the phosphorylation of one of the two myosin light chains on the myosin heads. This phosphorylation allows the binding of actin to myosin. A specific phosphatase dephosphorylates the myosin light chain, which returns the actin and myosin to the inactive, resting state. The actin-tropomyosin interactions are similar in smooth and skeletal muscle.

Smooth muscle cells (e.g., vascular smooth muscle cells) also differ from skeletal muscle cells in that they are capable of collagen, elastin, and proteoglycan synthesis, which is usually associated with fibroblasts.

Source: Klein RM and McKenzie JC 2002.

202. Answer: D

Explanation:

D. The principal action of the Quadratus Lumborum (QL)

muscle is to fix the 12th rib during respiration. It is a weak lateral flexor of the lumbar spine.

The QL is a flat rectangular muscle that arises below from the iliolumbar ligament and the adjacent iliac crest.

The insertion is into the lower border of the twelfth rib and the transverse processes of the upper four lumbar vertebrae.

Patients usually present with low back pain.

They have difficulty turning over in bed, increased pain with standing upright.

Coughing or sneezing may exacerbate their pain.

Source: Chopra P, 2004

203. Answer: E

Explanation:

Reference:

Bonica's Management of Pain, Third Edition, Chapter 3, Peripheral Pain Mechanisms and Nociceptor Plasticity. pp. 40-42.

Nitrous oxide is a diffusible gas with numerous intracellular and extracellular effects. It is considered a small molecule neurotransmitter but it differs from other neurotransmitters in that it is not stored in vesicles. Instead it is synthesized almost instantly as needed within the presynaptic terminal by the action of the enzyme nitric oxide synthase. Once created it diffuses out of the presynaptic terminal within seconds and diffuses into adjacent neurons to affect numerous intracellular metabolic processes which modify neuronal excitability for seconds, minutes or longer. The actions of nitric oxide early in the inflammatory response are largely protective with facilitation of blood flow, moderation of cell toxicity and scavenging of reactive oxygen molecules. Later in the inflammatory cascade, nitric oxide becomes damaging and cytotoxic. Nitric oxide is thought to be involved in the development of neuropathic pain states. It is prevalent in various tissues including brain, gonads and dorsal horn.

Source: Schultz D, Board Review 2004

204. Answer: B

Source: Giordano J, Board Review 2003

205. Answer: D

Source: (Raj, Pain Review, 2nd Ed., page 68)

206. Answer: C

Explanation:

(Baum, pp 569-570.)

B. Most glands receive either direct neural control from the brain or indirect control from hormones secreted by the hypothalamus.

C. The parathyroids are notably free of brain control; in regulating calcium metabolism, they in turn are regulated by blood levels of calcium.

D. Thyroid secretion is subject to hypothalamic control, whereas insulin secretion depends in part on adrenergic influence from the autonomic nervous system.

Source: Ebert 2004

207. Answer: A

Explanation:

(Rhoades, pp 73-76.) Transducin is the G protein that mediates the response to light by rods and cones in the eye. When transducin is activated, it activates an enzyme that hydrolyzes cyclic GMP (cGMP). In the dark, cGMP binds to Na^{+} channels, keeping them open. The flow of Na^{+} through these channels keeps the rods and cones

depolarized. The activation of transducin by light and the subsequent hydrolysis of cGMP cause the Na⁺ channels to close and the membrane to hyperpolarize. Hyperpolarization of the membrane prevents the release of an inhibitory transmitter by the rods and cones, which ultimately results in stimulation of optic nerve fibers and the awareness of a visual image.

208. Answer: C

Explanation:

Reference:

Bonica's Management of Pain, 3rd Ed: Ch 3. Peripheral pain mechanisms and nociceptive plasticity. Also Bonica's Management of Pain, 3rd Ed: Ch 4. Spinal mechanisms and modulation. Nociceptive afferents and sympathetic fibers are frequently anatomically co-located, and adjacent within the dorsal root ganglia and peripheral nerve trunks. As well, peripheral tissue insult can produce a pathologic intermingling of nociceptive afferent and sympathetic fibers both in neuromas and in non-neuromatous insult. These anatomically adjacent fibers can, and frequently do permit ephaptic conduction signal transmission through low resistance zones and by ionic spread through shared, transmembrane ion channels. C-fiber projections do not remodel into spinal sympathetic ganglia; sympathetic-nociceptive afferent fiber interaction is not reliant upon arachidonic acid cascade (i.e. Cox-2 mediated) products, and alpha adrenergic receptors are frequently upregulated on C-fibers consequential to longitudinal sympathetic stimulation/sensitization.

Source: Giordano J, Board Review 2005

209. Answer: D

Explanation:

Reference:

Bonica's Management of Pain, 3rd Ed: Ch 4. Spinal mechanisms and modulation.

Acute nociceptive pain can engage bulbospinal (descending) and ascending noradrenergic pathways to the limbic system to suppress pain sensation and perception through inhibition of afferent dorsal horn input and supratentorial, "attentional analgesia" respectively. Such pain does not lead to novel expression of alpha adrenergic receptors in the periphery or DRG, as is commonly seen in chronic pain. Acute nociceptive pain can enhance activation of the adrenal medullary system, causing a release of adrenal opioids that subsequently produce analgesia. As well, such pain directly engages the neo-and paleo-spinal thalamic tracts to activate the ventralposterolateral and medial thalamic nuclei, respectively.

Source: Giordano J, Board Review 2005

210. Answer: B

Explanation:

(Alberts, 3/e, pp 851-853. Junqueira, 9/e, pp 185-190.) The

"powerstroke" is initiated by the release of Pi from the myosin heads, leading to the tight binding of actin and myosin. The tight binding induces a conformational change in the myosin head. The myosin head subsequently pulls against the actin filament to cause the "powerstroke" of the myosin head walking along the actin filament. This walking process is unidirectional and is based on the polarity of the actin filament (i.e., walking occurs from the minus to the plus end of the actin filament). The cycle of ATP-actin-myosin interactions during contraction begins with the resting state. In the quiescent period, ATP binds to myosin heads; however, hydrolysis occurs slowly and only allows the weak binding of myosin heads to the actin filaments. Tight binding occurs only when Pi is released from myosin heads, leading to the "powerstroke."

Recycling occurs through the release of ADP and the subsequent addition of an ATP molecule and detachment of the myosin head from actin. Rigor results from the lack of ATP because one ATP molecule is required for each myosin molecule present in the muscle. Rigor mortis occurs from the total absence of ATP.

Myosin is composed of two coiled heavy chains and four light chains.

It may be separated into heavy and light meromyosin by enzymatic treatment. Heavy meromyosin has two segments: S1 (the globular head region) and S2. The S1 subfragment includes the light chains that are associated with the globular head regions. This region is significant because it is the site of the actin binding that activates ATPase activity. S2 is a dimeric population of the myosin molecule that connects the two S1 segments to the coiled light meromyosin subunit. The P light chain is one of the two light chains associated with the globular heads and is phosphorylated by myosin light chain kinase. In skeletal muscle, phosphorylation of the light chain is not required for binding to actin.

Source: Klein RM and McKenzie JC 2002.

211. Answer: E

Explanation:

Reference: Hardman, pp 858-874

Because verapamil, a Ca channel blocker, has a selective depressing action on AV nodal tissue, it is an ideal drug for both immediate and prophylactic therapy of supraventricular tachycardia (SVT). Nifedipine, another Ca channel blocker, has little effect on SVT. Lidocaine and adenosine are parenteral drugs with short half-lives and, thus are not suitable for prophylactic therapy.

Procainamide is more suitable for ventricular arrhythmias and has the potential for serious adverse reactions with long-term use.

Source: Stern - 2004

212. Answer: D

Explanation:

Reference: Hardman, pp 1676-1678. Katzung, pp 990-991.

Carbon monoxide is a common cause of accidental and suicidal poisoning. Its affinity for hemoglobin is 250 times greater than that of O₂. It therefore binds to hemoglobin and reduces the O₂ – carrying capacity of blood. The symptoms of poisoning are due to tissue hypoxia; they progress from headache and fatigue to confusion, syncope, tachycardia, coma, convulsions, shock, respiratory depression, and cardiovascular collapse. Carboxy-hemoglobin levels below 15% rarely produce symptoms; above 40%, symptoms become severe. Treatment include establishment of an airway, supportive therapy, and administration of 100% O₂. Sulfur dioxide, ozone, and nitrogen dioxide are mucous membrane and respiratory irritants. Methane is a simple asphyxiant.
Source: Stern - 2004

213. Answer: C

Explanation:

The loads on a L3 disc in a 70-kg person are as follows:
supine 30 kg;
standing 70 kg;
upright sitting without support 100 kg;
walking 85 kg;
bending sideways 95 kg;
jumping 110 kg;
bending forward 20° 120 kg;
lifting 20 kg with back straight and knees bent 210 kg;

lifting 20 kg with back bent and knees straight 340 kg
Source: Bonica

214. Answer: E

Explanation:

Norepinephrine is the neurotransmitter found in postganglionic sympathetic (adrenergic) nerve endings. The cells of the adrenal medulla are homologous to postganglionic sympathetic neurons and contain both epinephrine (80 percent) and norepinephrine (20 percent).

Source: Kahn and Desio

215. Answer: C

Explanation:

(Kandel, pp 286-296.)

C. Under stressful conditions, the organism secretes endorphins and ACTH together. Proopiomelanocortin is a common precursor.

The close link between endorphins and ACTH suggests that they serve a mediation function for a closely related set of adaptation responses.

They can facilitate one's response to stress and at the same time help one to withstand pain and mobilize for coping activity to deal with the stressful challenge or threat. Almost every physical stress agent increases plasma levels of β-endorphin as well as adrenocorticotropin and

corticosterone.

Source: Ebert 2004

216. Answer: B

Explanation:

C-fiber mediated neuropathic pain is primarily subserved by glutamate-induced activation of both NMDA and mGlu receptors

Source: Giordano J, Board Review 2006

217. Answer: E

Explanation:

Reference:

Bonica's Management of Pain, 3rd Ed: Ch4. Spinal mechanisms and modulation. The ascending noradrenergic pathway is activated via input from the paleo-spinal thalamic tract. Ascending noradrenergic fibers from the reticulomagnocellular group (RMC), together with PSTT fibers project to the parabrachial nucleus to engage the amygdala, insula, cingulate and ultimately, hypothalamic paraventricular nucleus to evoke sympathetic nervous system activity. As well, the intra-laminar nucleus of the thalamus can be activated by both NE neurons of the RMC and the PSTT to engage hypothalamic-sympathetic activation. Thus, multiple pathways can be activated by the ascending NE tracts to act singularly or in concert through the hypothalamus to engage sympathetic neural output.

Source: Giordano J, Board Review 2005

218. Answer: D

Explanation:

Transcutaneous nerve stimulation is low-intensity, mixed-frequency (2 and 100 Hz) electrical stimulation that is thought to produce analgesia by releasing endorphins. This technique is effective in treating nociceptive and deafferentation syndromes by a mechanism that is not reversed by naloxone. The mechanism is thought to be activation of inhibitory neurons and/or release of endogenous opiates.

Source: Hall and Chantigan.

219. Answer: E

Explanation:

Reference: Hardman, p 323.

Induction of anesthesia by parenteral administration of thiopental sodium and other barbiturates is absolutely contraindicated in patients who have acute intermittent porphyria. These patients have a defect in regulation of delta-aminolevulinic acid synthetase; thus, administration of barbiturate that increases this enzyme may cause a dangerous increase in levels of porphyrins. Administration of a barbiturate would exacerbate the symptoms of gastrointestinal and neurologic disturbances, cause extensive demyelination of peripheral and cranial nerves, and could lead to death.

Source: Stern - 2004

220. Answer: E

Explanation:

(Kandel, pp 1108-1109.) The cutting of a nerve tract within the brain or of a peripheral nerve results in the following sequence: both ends of the cut axon immediately seal off the axoplasm, retract, and begin to swell; there is rapid degeneration of the axon and the myelin sheath; the macrophages from the general circulation enter the area and phagocytose axonal debris; there is also a proliferation of glial cells, which act as phagocytes; and fibrous astrocytes proliferate in the central nervous system, which leads to glial scar formation around the zone of trauma that often blocks the course taken by regenerating axons and causes a barrier against the reformation of central connections. Degeneration spreads along the axon in both directions from the zone of trauma. The retrograde reaction in the proximal segment usually progresses a short distance and appears in the cell body after 2 to 3 days. In the distal segment, degeneration appears in the axon terminal in about 1 day, and within 2 weeks the distal synapses degenerate completely.

Source: Ebert 2004

221. Answer: B

Source: (Raj, Pain Review, 2nd Ed., page 62)

222. Answer: A

Explanation:

Reference:

Bonica's Management of Pain, 3rd Ed: Ch 3. Peripheral pain mechanisms and nociceptive plasticity. Sympathetically mediated pain may initially produce vasodilatation and hyperhidrosis. However, as this pain persists, loss of vascular tone produces reactive vasoconstriction and prolong sympathetic activity alters sudomotor responses to produce a characteristic anhidrosis. Such thermal and sudomotor effects are not explicitly dermatomal but frequently involve the territory of multiple branches of affective peripheral nerve(s). Characteristically, parasympathetic modulation does not produce rebound or compensatory effects and the expression of alpha-adrenergic receptors on peripheral alpha-beta mechanoreceptors may be an initiative mechanism that ultimately affects genomic-phenotypic expression and can enhance alpha-beta projections into laminae II of the spinal cord.

Source: Giordano J, Board Review 2005

223. Answer: C

Explanation:

There are specific sodium channels that mediate the propagation and conductance of the action potential in nociceptive afferents; these have been identified using molecular biological techniques that have elucidated their transcriptional and translational precursors.

A-2 purinoreceptors subserve the transduction of the nociceptive signal in response to adenosine.

TrkB receptors subserve the transduction of the nociceptive signal in response to BDNF.

A Silent Nociceptor exists, but, is very difficult to activate under normal circumstance. Easily activated after sensitization.

Source: Giordano J, Board Review 2005

224. Answer: B

Explanation:

A-delta primary afferents project to laminae I, II, and IIa of the dorsal horn.

This is anatomically distinct from the projection sites of C-fibers in that C-fibers project to lamina V and not I.

A-delta fibers appear to form synaptic contacts exclusively upon NS second order neurons.

Source: Giordano J, Board Review 2005

225. Answer: C

Explanation:

Dynorphin is the selective endogenous ligand at the kappa opioid receptor. Endorphins and met-enkephalin are the endogenous ligands at mu 1 and 2 receptors.

Leu-enkephalin and to a lesser extent, endorphin, are the endogenous ligands at delta opioid receptors.

Source: Giordano J, Board Review 2005

226. Answer: B

Explanation:

Autoradiographic, pharmacologic, and molecular biologic investigations have shown that the lumbar spinal cord contains primarily delta and kappa type opioid receptors. Mu opioid receptors are found in highest concentration in the midbrain, forebrain, and rostral (cervico-thoracic) spinal cord. Mu-3 receptors have been localized to smooth muscle and leukocytes.

Sigma (PCP) receptors are primarily supratentorial.

Source: Giordano J, Board Review 2005

227. Answer: D

Explanation:

The NSTT is a direct pathway to the thalamus.

The paleospinothalamic tract (PSTT) projects to the brainstem raphe and magnocellular nuclei as well as the mesencephalic PAG region en route to its thalamic terminations.

Source: Giordano J, Board Review 2005

228. Answer: A

Explanation:

Physiologic distinctions (eg. nociceptive versus neuropathic) are useful referents that describe the nature of pain relevant to its typologic classification.

Temporal characteristics (immediate, acute, chronic) are often laden with ambiguity regarding relative length of time and are of little use in classifying the functional or pathologic basis of pain.

Subjective characteristics are useful referents in describing the cognitive dimensions of pain, but may not directly reflect underlying neural processes that are explicitly relevant to pathology for clinical purposes.

Source: Giordano J, Board Review 2006

- 229. Answer: B**
Source: Feler C, Board Review 2005
- 230. Answer: C**
Explanation:
Pain afferents are capable of summing output as a consequence of enhanced stimulation of numerous transductive receptors within their receptive field(s). This is known as spatial summation; the greater the surface area stimulated, the greater the response output (amplitude and duration) of the respective nociceptive afferent. Temporal summation involves an increased number of noxious stimuli activating the receptive field of a given nociceptor per unit time.
Allodynia is the sensation of pain produced by non-noxious stimuli as a result of nociceptor sensitization. Cross-sensitization involves the enhanced sensitivity of a nociceptor to distinct noxious stimuli following activation by another type of noxious stimuli. This process is due to enhanced transcription, translation, and expression of multiple membrane receptors that subserve transduction of distinct, specific noxious input.
Source: Giordano J, Board Review 2006
- 231. Answer: C**
Source: Feler C, Board Review 2005
- 232. Answer: B**
Explanation:
C-fibers show sensitization following exposure to acute thermal stimuli; this leads to enhanced temporal activation and a decrease in sensitivity threshold to both noxious and non-noxious stimuli.
Source: Giordano J, Board Review 2005
- 233. Answer: A**
Explanation:
Glutamate-induced activation of post-synaptic AMPA receptors “ungates” an ionotropic NMDA receptor that is a functional substrate of type II pain.
AMPA receptors do not appear to be sensitized or regulated as a consequence of continued exposure to glutamate.
Serotonin is produced primarily in neurons of the raphe nuclei, not the nucleus reticularis; increased output of bulbospinal serotonergic neurons produces analgesia.
Source: Giordano J, Board Review 2006
- 234. Answer: A**
Explanation:
C-fibers respond to high threshold thermal, mechanical, and noxious chemical stimuli.
C-fibers project to laminae II, IIa, and V and synapse upon both NS and WDR second order neurons.
Source: Giordano J, Board Review 2005
- 235. Answer: D**
Source: Giordano J, Board Review 2003
- 236. Answer: A**
Source: Feler C, Board Review 2005
- 237. Answer: E**
Source: Hoppenfeld, Stanley, Physical Examination of the Spine and Extremities, Appleton-Century-Cross/Norwalk, CT p.256
- 238. Answer: E**
Source: Day MR, Board Review 2004
- 239. Answer: B**
Source: Giordano J, Board Review 2003
- 240. Answer: C**
Source: Giordano J, Board Review 2003
- 241. Answer: E**
Explanation:
(Guyton, pp 638-640.) The precentral gyrus is the motor area of the cortex and the corticospinal tract is the pyramidal tract proper. These two structures are essential for voluntary movement. A supplementary motor area, whose function is still unknown, exists on the medial side of the hemisphere.
- 242. Answer: D**
Source: Raj P, Pain medicine - A comprehensive Review - Second Edition
- 243. Answer: C**
Source: Giordano J, Board Review 2003
- 244. Answer: C**
Explanation:
A. Guarding is a patient’s reactions to protect or retract a painful bodily region against contact or insult.
B. Allodynia is the sensation of pain produced by non-noxious stimuli and occurs as a consequence of peripheral and/or central sensitization.
C. Antalgia literally translates as “against pain” and is any posture or movement that functions to prevent provocation of nociception.
D. Hyperalgesia is hypersensitivity to a painful stimulus dysthesia is unpleasant abnormal sensation.
E. Dystosia is abnormal or difficult labor.
Source: Giordano J, Board Review 2006
- 245. Answer: D**
Explanation:
Phantom limb sensation is an almost universal occurrence at some time during the first month following surgery.

- A. The strongest sensations come from body parts with the highest brain cortical representation, such as the fingers and toes. These highly innervated parts are also the areas of most persistent phantom limb sensation.
- B. Phantom sensations are either normal in character or as pleasant warmth and tingling. These are not painful.
- C. The incidence of phantom limb sensation increases with the age of the amputee. In children who have amputation before 2 years of age, the incidence of phantom limb sensation is 20%; the incidence of phantom limb sensation is nearly 100% when amputation occurs after 8 years of age.
- D. The phantom limb may undergo the phenomenon known as telescoping, in which the patient loses sensations from the mid portion of the limb, with subsequent shortening of the phantom. Telescoping is most common in the upper extremity. During telescoping, the last body parts to disappear are those with the highest representation in the cortex, such as the thumb, index finger, and big toe. Only painless phantoms undergo telescoping, and lengthening of the phantom may occur if the pain returns. Thus, patients may feel that the amputated phantom limb shortened.
- E. Phantom limb sensations do not appear to require peripheral nervous system input. Phantom limb sensations may be an attempt to preserve the self image and minimize distortion of the self image or may be a permanent inherited neural memory of postural patterns.

Reference: Hord and Shannon. Chapter 16. Phantom Pain. In: Practical Management of Pain, 3rd Edition. Raj et al. Mosby, 2000, page 212-213.

246. Answer: B

Explanation:

The monoaminergic projections to the cerebellum originate from the pontine raphe nuclei, the locus ceruleus, and the hypothalamus. The raphe nuclei are the source of serotonergic projections to both the granular and molecular layers.

The locus ceruleus is the source of noradrenergic projection to the three layers of the cerebellar cortex. The dorsomedial, dorsal, and lateral areas of the hypothalamus are the sources of histaminergic projections to all three layers of the cerebellar cortex. (Afifi and Bergman, 322)

Source: Neurology Examination and Board Review By Nizar Souayah, MD and Sami Khella, MD

247. Answer: D

Explanation:

The olfactory pathway is the only sensory pathway that does not project to the thalamus. The olfactory nerve penetrates the cribriform plate of the ethmoid bone and enters the olfactory bulb to synapse with the second-order neurons: mitral and tufted cells. The axons of the second-order neurons course

posteriorly as the olfactory tract in the orbital surfaces of the frontal lobe and project to the primary olfactory cortex in the temporal lobe. (Parent, 748-754)

SOURCE: Souayah, N, and Khella S; Neurology Examination & Board Review; McGraw-Hill, New York. Source: Neurology Examination and Board Review By Nizar Souayah, MD and Sami Khella, MD

248. Answer: D

Explanation:

The cerebral neocortex has a laminar pattern of organization because of the distribution and size of neuronal cells and the horizontal pattern of incoming efferents. It is divided into six layers: Layer I, primarily a synaptic area, is the molecular layer. It is the most superficial layer of the cerebral cortex; its most characteristic cells are horizontal cells. Layer II, the external granular layer, is characterized by an abundance of small, densely packed neurons and a paucity of myelinated fibers. The dendrites of neurons in this layer project to layer I, while their axons project to deeper layers. Layer III, the external pyramidal layer, contains medium-large pyramidal cells and granule cells. Axons of most pyramidal cells descend through the cortex, forming cortical association fibers, both callosal and intrahemispherical. Layer IV, the internal granular layer, is the principal receiving station of the cerebral cortex. Layer V, the internal pyramidal layer, is the principal efferent layer of the cortex. This layer contains pyramidal cells that send their axons through the cortical white matter to the internal capsule and all subcortical sites except the thalamus, which receives fibers from Layer VI. Layer VI, the fusiform layer, contains fusiform and pyramidal cells, which are the principal source of corticothalamic fibers and contribute to the intrahemispheric cortical association fibers. (Afifi and Bergman, 340-343; Burt, 451-452)

Source: Neurology Examination and Board Review By Nizar Souayah, MD and Sami Khella, MD

249. Answer: B

Explanation:

(Braunwald, 15/e, pp 439--440, 2088. Junqueira, 9/e, pp 387-389.) Metabolism in the adrenal medulla is regulated by glucocorticoids because they induce the enzyme phenylethanolamine-N-methyltransferase, which catalyzes the methylation of norepinephrine to epinephrine. Most of the blood supply entering the medulla passes through the cortex. Glucocorticoids synthesized in the zona fasciculata of the adrenal are released into the sinusoids and enter the medulla. The adrenal gland is not usually considered a classic portal system although there are similarities. Monoamine oxidase is a mitochondrial enzyme that regulates the storage of catecholamines in peripheral sympathetic nerve endings. The adrenal gland

functions as two separate glands. The adrenal cortex is derived from mesoderm and the adrenal medulla from neural crest. The blood supply to the adrenal is derived from three adrenal arteries: (1) the superior adrenal (suprarenal) from the inferior phrenic, (2) the middle adrenal from the aorta, and (3) the inferior adrenal from the renal artery.

Source: Klein RM and McKenzie JC 2002.

250. Answer: B

Explanation:

Most uptake is by passive diffusion

Source: Boswell MV, Board Review 2004

251. Answer: B

Explanation:

B. Previous dystonic reaction is a risk factor for acute dystonic reaction, as are male sex, younger age, higher doses of drugs and parenteral administration.

Atypical agents have less risk.

Source: Boswell MV, Board Review 2004

252. Answer: C

Explanation:

Reference: Hardman, pp 870-871.

Quinidine is often given in conjunction with digitalis. It has been found by pharmacokinetic studies that this combination results in quinidine's replacing digitalis in tissue binding sites (mainly muscle), thus raising the blood level of digitalis and decreasing its volume of distribution. A mechanism by which quinidine interferes with the renal excretion of digitalis has also been proposed.

Source: Stern - 2004

253. Answer: B

Explanation:

A. The load decreases significantly in supine position.

B. With the patient sitting with the back unsupported or sitting and bending over, the load shows greater increase.

C. In the sitting position with the back straight, the load is increased 40 percent above relaxed standing.

D. With the subject standing and bending, the load increases 50 percent.

E. Upright standing is equal to 100 percent of the relative load.

254. Answer: E

255. Answer: A

Explanation:

The cerebellar cortex contains three laminated cellular layers: the outermost molecular cell layer, a sheet of single large neurons; the Purkinje cell layer; and a deeper

granular cell layer. These layers contain six types of neurons; basket, satellite, Purkinje, Golgi, granule cells, and the relatively rare Legato cells. Pyramidal cells are the most abundant cells of the cerebral cortex neuron types, are not found in the cerebellum, and are the most characteristic of the cerebral cortex. (Afifi and Bergman, 308-310)

Source: Neurology Examination and Board Review By Nizar Souayah, MD and Sami Khella, MD

256. Answer: C

Source: Hoppenfeld S. Physical Examination of the Spine and Extremities. Appleton-Centry-Cross/Norwalk, CT p. 227.

257. Answer: C

Source: (Raj, Pain Review, 2nd Ed., page 62)

258. Answer: C

Explanation:

The oculocardiac reflex is defined as a slowing of the pulse in response to traction on the extraocular muscles or from pressure on the eye.

C. The afferent arc is by way of the ophthalmic branch of the trigeminal nerve. Impulses travel through the reticular network to the visceral motor nuclei of the vagus nerve, which is the efferent limb of the reflex to the heart.

259. Answer: C

Explanation:

Older antipsychotics are being phased out because of the risk of EPS

Source: Boswell MV, Board Review 2004

260. Answer: D

Explanation:

Rexed divided the spinal gray into ten laminae.

Laminae I through VI make up the dorsal horn.

Laminae VII through IX make up the ventral horn.

Lamina X is composed of a column of cells clustered around the central canal of the cord.

Lamina I is the marginal layer, lamina II is the substantia gelatinosa, and laminae II through V make up the nucleus propius (magnocellular layer).

261. Answer: C

Explanation:

The overall pattern of several impulses relaying similar information is termed a signal.

A. The intensity of signal (such as pain) that is transmitted to the brain can be increased by increasing the number of parallel fibers participating (spatial summation).

- B. After-discharge is production of output signals for prolonged periods by a single input stimulus.
- C. An intensity of signal (such as pain) that is transmitted to the brain can be increased by increasing the frequency of impulses traveling along a single fiber is called temporal summation.
- D. The increase in the number of participating fibers as the intensity of a signal increases is termed recruitment.
- E. Saltatory conduction is the process of successive excitation of nodes of Ranvier by an impulse that jumps between successive nodes.
- 262. Answer: C**
Source: Giordano J, Board Review 2003
- 263. Answer: A**
Explanation:
(Guyton, p 516-517, 523.) Presynaptic inhibition caused by interneurons that secrete a transmitter which increases the Cl⁻ conductance of the presynaptic nerve ending. The increase in Cl⁻ conductance causes a partial depolarization of the presynaptic nerve ending and a decrease in the magnitude of the action potential in the presynaptic nerve ending. Because the amount of mediator released at the synapse is related to the magnitude of the action potential, less transmitter is released and the firing rate of the postsynaptic alpha motoneuron is decreased. Presynaptic inhibition does not change the membrane potential of the alpha motoneuron, and therefore the membrane potential of the alpha motoneuron is not affected.
- 264. Answer: B**
Explanation:
Acetylcholine and GABA bind ionic channel receptors, insulin binds Tyrosine Kinase receptors and cortisol binds nuclear receptors.
Source: Boswell MV, Board Review 2004
- 265. Answer: B**
Explanation:
(Guyton, pp 689-691.) In a normal sleep cycle, a person passes through the four stages of slow-wave sleep before entering REM sleep. In narcolepsy, a person may pass directly from the waking state to REM sleep. REM sleep is characterized by irregular heart beats and respiration and by periods of atonia (loss of muscle tone). It is also the state of sleep in which dreaming occurs.
- 266. Answer: D**
Explanation:
Reference: Hardman, pp 855-856.
Propranolol, as well as other nonselective beta blockers, tends to slow the rate of recovery in a hypoglycemic attack caused by insulin. Beta blockers also mask the symptoms of hypoglycemia and may actually cause hypertension because of the increased plasma epinephrine in the presence of a vascular beta2 blockade.
Source: Stern - 2004
- 267. Answer: E**
Source: Rozen. Pain Practice: SEP 2001
- 268. Answer: D**
Explanation:
Reference: Hardman, pp 1110-1113.
Streptomycin and other aminoglycosides can elicit toxic reactions involving both the vestibular and auditory branches of the eighth cranial nerve. Patients receiving an aminoglycoside should be monitored frequently for any hearing impairment owing to the irreversible deafness that may result from its prolonged use. None of the other agents listed in the question adversely affect the function of the eighth cranial nerve.
Source: Stern-2004
- 269. Answer: D**
Explanation:
Reference: Katzung, p 275.
Cimetidine is an H₂ antagonist that decreases gastric acid secretion. Sumatriptan is a 5-HT_{1D} serotonin agonist. Cyproheptadine acts as a histamine and serotonin antagonist. Ondansetron is a serotonin antagonist. Fluoxetine is an antidepressant agent that selectively inhibits serotonin reuptake.
Source: Stern - 2004
- 270. Answer: D**
Explanation:
Reference: Hardman, pp 192-193.
Nicotine is a depolarizing ganglionic blocking agent that initially stimulates and then blocks nicotinic muscular (NM) (skeletal muscle) and nicotinic neural (NN) (parasympathetic ganglia) cholinergic receptors. Blockade of the sympathetic division of the autonomic nervous system (ANS) results in arteriolar vasodilation, bradycardia, and hypotension. Blockade at the neuromuscular junction leads to muscle weakness and respiratory depression caused by interference with the function of the diaphragm and intercostal muscles. Atropine, a muscarinic receptor blocker, would be an effective antagonist, as would neostigmine, a cholinesterase inhibitor. Pilocarpine and isofluorphate are cholinomimetics and can be antagonized by atropine; the effects of tubocurarine can be inhibited by neostigmine. Diazoxide, a vasodilator, would cause tachycardia, rather than bradycardia.
Source: Stern 2004
- 271. Answer: D**
Explanation:
Reference: Hardman, pp 865-867
Lidocaine usually shortens the duration of the action potential and, thus, allows more time for recovery during diastole. It also blocks both activated and inactivated Na channels. This has the effect of minimizing the action of

lidocaine on normal myocardial tissues as contrasted with depolarized ischemic tissues. Thus lidocaine is particularly suitable for arrhythmias arising during ischemic episodes such as myocardial infarction (MI).

Source: Stern - 2004

272. Answer: D

Explanation:

(Guyton, pp 561-563.) Free nerve endings contain receptors for temperature, pain, and touch. However, fine touch, pressure, and vibration are detected by nerve endings contained within specialized capsules that transmit the stimulus to the sensory receptors. Muscle length is encoded by the primary nerve endings of Ia fibers which are located on intrafusal fibers within the muscle spindle.

273. Answer: B

Explanation:

Reference: Katzung, pp 468-469:

A. Selegiline is an MAO-B inhibitor.

B. Bromocriptine mimics the action of dopamine in the brain but is not as readily metabolized. It is especially useful in parkinsonism that is unresponsive to L-dopa.

C. Apomorphine is also a dopamine receptor agonist, but its side effects preclude its use for this purpose.

D. Amantadine is an antiviral agent that probably affects the synthesis or uptake of dopamine.

E. Atropine is belladonna preparation.

Source: Stern - 2004

274. Answer: B

Explanation:

The trigeminal nerve has three sensory nuclei: The spinal nucleus, the main sensory nucleus and the mesencephalic nucleus. The spinal nucleus of the trigeminal nerve is a long column of neurons extending from the point of entry of the trigeminal nerve to the upper cervical spinal cord. It is divided into three parts: The oral part, responsible for tactile sensation from the oral mucosa; the interpolar part, receiving efferents for dental pain; and the caudal part, receiving pain and temperature sensations from the face. Most of the small efferent fibers of the spinal tract of the trigeminal nerve terminate in the spinal nucleus. Most of the efferent large fibers that originate from the trigeminal ganglion end in the main sensory nucleus and are responsible for the transmission of discriminative touch. The mesencephalic nucleus is located at the rostral pons. It receives efferent fibers conveying kinesthesia and pressure from the teeth, periodontium, hard palate, joint capsules, the stretch receptors from the muscles of mastication. It sends efferent fibers to the cerebellum, the thalamus, the motor nuclei of the brain stem, and the reticular formation.

The motor nucleus of the trigeminal nerve provides somatic visceral efferents that innervate the muscles of mastication via the mandibular division and contains ? and ? motor neurons. (Afifi and Bergman, 171-175)

Source: Neurology Examination and Board Review By Nizar Souayah, MD and Sami Khella, MD

275. Answer: C

Explanation:

Reference: Katzung, pp 827-828.

Famciclovir is active against herpes simplex and varicella zoster viruses. It is activated by a viral kinase to a triphosphate. The triphosphate is a competitive substrate for DNA polymerase. The incorporation of the famciclovir triphosphate into viral DNA results in chain termination. Source: Stern-2004

276. Answer: B

Explanation:

The gray matter of the spinal cord is divided into the 10 laminae of Rexed, which form a cytoarchitectonic map of this spinal cord that correlates well with synaptic connections and neurophysiological data. Laminae I, II, III, and IV encompass most of the dorsal horn, which receives primary sensory fibers. Lamina I corresponds to the nucleus postmarginalis, Lamina II corresponds to the substantia gelatinosa and lamina III and IV correspond to the nucleus proprius dorsalis. All these nuclei integrate and modulate sensory information. They relay sensory information to higher centers like the cerebellum, thalamus, and brain stem. (Afifi and Bergman, 66)

Source: Neurology Examination and Board Review By Nizar Souayah, MD and Sami Khella, MD

277. Answer: B

Explanation:

(Junqueira, 9/e, pp 360-364, 372-373.) The glomerular filtration barrier is a physical and charge barrier that exhibits selectivity based on molecular size and charge. The barrier is formed by three components: (1) glomerular capillary endothelial cells, (2) glomerular basement membrane, and (3) podocyte layer. The presence of collagen type IV in the lamina densa of the basement membrane presents a physical barrier to the passage of large proteins from the blood to the urinary space. Glycosaminoglycans, particularly heparan sulfate, produce a polyanionic charge that binds cationic molecules. Filtration slits are found between adjacent podocyte foot processes and provide a gap of approximately 50 µm. The foot processes are coated with a glycoprotein called podocalyxin, which is rich in sialic acid and provides mutual repulsion to maintain the structure of the filtration slits. It also possesses a large polyanionic charge for repulsion of large anionic proteins. Source: Klein RM and McKenzie JC 2002.

278. Answer: B

Explanation:

Carlson, pp 352-359.

B. Testosterone administered postpubertally to castrated

rats can restore aggressiveness to almost normal levels. Similarly, neonatal female mice develop masculine aggressive behavior on receiving androgens. Androgens also promote aggression in humans.

C. Boys are more aggressive than girls at ages 3 to 10, as has been demonstrated in studies of children.
Source: Ebert 2004

279. Answer: E

Explanation:
(Rhoades, pp 130-132.) A variety of physiological functions, such as alertness (the sleep-wake cycle), body temperature, and secretion of hormones, exhibits cyclic activity that varies over a 24-h period of time. These variations in activity are called circadian rhythms and are controlled by the suprachiasmatic nucleus of the hypothalamus. The paraventricular nucleus secretes oxytocin and vasopressin, the ventromedial and lateral nuclei control food intake, and the arcuate nucleus secretes gonadotropin-releasing hormone.

280. Answer: B

Explanation:
Reference: Hardman, pp 813-814.
The usual electro cardiographic pattern of a patient receiving therapeutic doses of digitalis includes an increase in the PR interval, depression and sagging of the ST segment, and occasional biphasia or inversion of the T wave. Symmetrically peaked T waves are associated with hyperkalemia or ischemia in most cases. Shortening of the QT interval, rather than prolongation, is characteristic of digitalis treatment.
Source: Stern - 2004

281. Answer: A

Explanation:
Reference:
Bonica's Management of Pain, Third Edition, Chapter 3, Spinal Mechanisms and their Modulation. pp. 74-76.

A. Lissauer described a tract running in the superficial apex of the dorsal horn that differed in microscopic appearance from the rest of the cord. Ablation of this tract created analgesia in experimental animals. Later study revealed that this tract contained the axons of A-delta and C-fibers that were entering the cord from the periphery. These fibers ascended and descended for one or more segments in the tract prior to synapsing with dorsal horn interneurons.

B. The lateral spinothalamic tract and other ventrolateral cell columns connect dorsal horn interneurons to supraspinal centers.

C. The posterior spinal columns transmit mainly tactile information from large, fast conducting A-beta fibers.

E. Pre-ganglionic sympathetic fibers enter the sympathetic

ganglion via the gray rami communicantes while post-ganglionic sympathetic fibers exit the ganglion and enter the spinal nerve through the white rami communicantes.
Source: Schultz D, Board Review 2004

282. Answer: A

Explanation:
General somatic efferent fibers of the oculomotor nerve arise from the oculomotor nucleus situated near the midline of the midbrain at the level of the superior colliculus. This nucleus is formed by subnuclei for each of the extraocular muscles. The superior rectus muscle receives innervation from neurons in the contralateral subnucleus. The levator palpebral superioris muscle receives innervation from a medial subnucleus. The inferior rectus, medial rectus, and inferior oblique muscles receive innervation from ipsilateral subnuclei. (Burt, 403-406)
Source: Neurology Examination and Board Review By Nizar Souayah, MD and Sami Khella, MD

284. Answer: A

Explanation:
Ref: Raj. Chapter 43. Thoracoabdominal Pain. In: Practical Management of Pain. 3rd Edition. Raj et al, Mosby, 2000. page 618.
Source: Day MR, Board Review 2003

285. Answer: D

Explanation:
Reference: Hardman, p 617. Katzung, p 318.
Most NSAIDs inhibit both cyclooxygenase I and II, resulting in decreased synthesis of prostaglandins, prostacyclins, and thromboxanes.
Source: Stern - 2004

286. Answer: B

Explanation:
(April, 3/e, p 429.) The cremaster reflex is mediated by the genitofemoral nerve. The femoral branch supplies the afferent limb, and the genital branch supplies the efferent

limb. The ilioinguinal nerve provides sensory innervation to the medial aspects of the thigh and the anterior aspects of the mons or the base of the penis. The pudendal nerve provides sensation to most of the skin of the perineum as well as the motor supply to the perineal muscles. The involuntary scrotal reflex is based on temperature: warmth causes relaxation of the dartos muscle, whereas cold causes contraction.

Source: Klein RM and McKenzie JC 2002.

287. Answer: A

Explanation:

(Kandel, 4/e, p 20. Braunwald, 15/e, pp 1873, 1890-1891.) Microglia are the macrophages of the brain. They become infected with HIV and carry the virus into the CNS. The virus remains latent until a stimulus activates viral production. These cells are the most conspicuous elements of HIV-induced CNS pathology. Infection, proliferation, and fusion of microglia/macrophages appear to be involved in the development of giant cell encephalitis of acquired immune deficiency syndrome (AIDS) and other pathologies associated with neuronal damage in AIDS dementia. The CNS effects of AIDS are extensive as indicated by the fact that 90% of AIDS patients show abnormalities in the cerebrospinal fluid (CSF), even in asymptomatic stages of the disease.

Source: Klein RM and McKenzie JC 2002.

288. Answer: B

Source: Hoppenfeld S. Physical Examination of the Spine and Extremities. Appleton-Centry-Cross/Norwalk, CT p.31.

289. Answer: D

Source: Hoppenfeld S. Physical Examination of the Spine and Extremities. Appleton-Centry-Cross/Norwalk, CT p. 227.

290. Answer: E

Explanation:

(Junqueira, 9/e, pp 170, 171, 174. Kandel, 4/e, pp21-22, 148, 160.)

B. Most of the Na⁺-gated channels are located in the bare areas.

Therefore, spread of depolarization from the nodal region along the axon occurs until it reaches the next node.

This is often described as a series of jumps from node to node, or saltatory conduction.

C. The nodes of Ranvier represent the space between adjacent units of myelination.

D. This area is bare in the CNS, whereas in the PNS the axons in the nodes are partially covered by the cytoplasmic

tongues of adjacent Schwann cells.

E. The nodes of Ranvier increase the efficiency of nodal conduction because of restriction of energy-dependent Na⁺ influx to the node.

Source: Klein RM and McKenzie JC 2002.

291. Answer: C

Source: Hoppenfeld S. Physical Examination of the Spine and Extremities. Appleton-Centry-Cross/Norwalk, CT p. 250.

292. Answer: E

Source: (Raj, Pain Review, 2nd Ed. Page 62; Bonica, 3rd Ed., page 1089)

293. Answer: E

Explanation:

The International Association for the Study of Pain has defined several pain terms.

A. Spontaneous pain is an area or region that is anesthetic is called anesthesia dolorosa

B. Hypersensitivity to a painful stimulus is called hyperalgesia

C. Pain initiated or caused by a primary lesion or dysfunction in the nervous system is called neuropathic pain

D. An unpleasant abnormal sensation, whether spontaneous or evoked is called dysesthesia

E. The perception of pain produced by stimuli that are usually non-painful is called allodynia

294. Answer: C

Explanation:

(Alberts, 31e, p 855. Braunwald, 15/e pp 2529-25. Kumar, 6/e, pp 689-690.) Dystrophin, like these other actin-binding proteins, binds actin to the skeletal muscle membrane and, therefore, binds I and M bands to the cell membrane. The inability to bind actin to plasma membrane of skeletal muscle leads to disruption of the contraction process, weakness of muscle, and abnormal running, hopping, and jumping. Gowers' maneuver is the method used by persons suffering from muscular dystrophy to stand from a sitting position. Respiratory failure occurs in these persons because of disruption of diaphragmatic function. Dystrophin is found in muscle of all types and is part of a complex that regulates interactions of the sarcolemma with the extracellular matrix through associated glycoproteins (dystrophin-glycoprotein complex). Therefore, loss of dystrophin causes a destabilization of the sarcolemma. Muscular dystrophy refers to a group of progressive hereditary disorders (1/3500 male births) that involve mutations in the dystrophin gene. Dystrophin is similar in structure to spectrins I and II and a-actinin. Dystrophin is absent in Duchenne muscular dystrophy. Becker muscular dystrophy is a less severe dystrophy in which dystrophin is defective. Synthesis of actin is not reduced in skeletal muscle from these patients; in fact, hypertrophy and

pseudohypertrophy (replacement of muscle with connective tissue and fat) occurs. Microtubules perform vesicular and organelle transport functions, and intermediate filaments not actin form the intracellular connection in desmosomes.

Source: Klein RM and McKenzie JC 2002.

295. Answer: D

Source: Raj P, Pain medicine - A comprehensive Review - Second Edition

296. Answer: C

Explanation:

(Guyton, 9/e, pp 705-707.) The entire sympathetic nervous system is activated when a person is frightened, preparing the individual for flight or to fight. As part of this preparation, the smooth muscle of the airways is relaxed, increasing the airway diameter, making it easier for the person to breathe. At the same time, heart rate and cardiac output are increased, causing a rise in blood pressure, and blood glucose concentrations are increased, making fuel available for whatever choice is made.

297. Answer: A

Explanation:

(Alberts, 3/e, pp 813-814, 834.) The cell cortex is an area of the cell immediately underneath the plasma membrane and is rich in actin, which is required for cytokinesis. This region is important in maintaining the mechanical strength of the cytoplasm of the cell. It is also essential for cellular functions that require surface motility. These functions include phagocytosis, cytokinesis, and cell locomotion. Although movement of vesicles along filaments is regulated by minimyosins (myosin 1), movement of vesicles and organelles is predominantly a function of microtubules under the influence of the unidirectional motors kinesin and dynein. The movements of cilia and flagella are driven by dynein and chromosomal movements occur through microtubular kinetics.

Source: Klein RM and McKenzie JC 2002.

298. Answer: C

Explanation:

First pass metabolism is the main factor that reduces the amount of morphine that reaches the systemic circulation. Source: Boswell MV, Board Review 2004

299. Answer: D

Explanation:

(Junqueira, 9/e, pp 176-180. Kandel, 4/e, p 1108-1109.) Regeneration depends on the proliferation of Schwann cells, which guide sprouting axons from the proximal segment toward the target organ. This process is referred to as Wallerian regeneration. Axonal regeneration occurs in neurons if the perikarya survive following damage. The segment distal to the wound, including the myelin, is phagocytosed and removed by macrophages. The proximal segment is capable of regeneration because it remains in

continuity with the perikaryon. Chromatolysis is the first step in the regeneration process in which there is breakdown of the Nissl substance, swelling of the perikaryon, and migration of the nucleus peripherally. Degeneration of perikarya and neuronal processes occurs when there is extensive neuronal damage. Transneuronal degeneration occurs only when there are synapses with a single damaged neuron. In the presence of inputs from multiple neurons, transneuronal degeneration does not occur.

Source: Klein RM and McKenzie JC 2002.

300. Answer: B

Explanation:

Neuroleptic malignant syndrome is an uncommon but potentially fatal idiosyncratic reaction characterized by the development of altered consciousness, hyperthermia, autonomic dysfunction, and muscular rigidity on exposure to neuroleptic (and probably other psychotropic) medications. The pathophysiology of neuroleptic malignant syndrome (NMS) is poorly understood. The postulated mechanism involves blockade of central dopamine receptors in the basal ganglia, the hypothalamus, and peripherally in postganglionic sympathetic neurons and smooth muscle

Source: Laxmaiah Manchikanti, MD

301. Answer: B

Explanation:

(Guyton, pp 691-692.) In a totally relaxed adult with eyes closed, the major component of the electroencephalogram (EEG) will be a regular pattern of 8 to 12 waves per second, called the alpha rhythm. The alpha rhythm disappears when the eyes are opened. It is most prominent in the parieto-occipital region. In deep sleep, the alpha rhythm is replaced by larger, slower waves called delta waves. In REM sleep, the EEG will show fast, irregular activity.

302. Answer: B

Explanation:

(Rhoades, pp 69-70.)

B. The Ruffini ending is a tonic receptor that produces a train of action potentials proportional to the intensity of pressure applied to the skin.

A. The Pacinian corpuscle is a very rapidly adapting receptor that fires once or twice in response to skin deformation.

It can produce a continuous train of action potentials if the stimulus is repetitively applied and withdrawn. Therefore, the Pacinian corpuscle is used to encode vibration.

303. Answer: E

Explanation:

Valproate can also be useful in the treatment of AIDS-related mania. Valproic acid was approved by the FDA for the treatment of acute mania. A therapeutic blood-level

window of 45 to 125 µg/mL has been demonstrated to correlate with antimanic response. Valproate might have better efficacy than lithium in the treatment of mixed manic states, rapid cycling mania or other complex, comorbid forms of bipolar disorder, and could synergize with lithium to prevent relapses.

Source: Laxmaiah Manchikanti, MD

304. Answer: A

Explanation:

Reference: Katzung, p 1040.

Patients with Alzheimer's disease present with progressive impairment of memory and cognitive functions such as a lack of attention, disturbed language function, and an inability to complete common tasks. Although the exact defect in the central nervous system (CNS) has not been elucidated, evidence suggests that a reduction in cholinergic nerve function is largely responsible for the symptoms.

Tacrine has been found to be somewhat effective in patients with mild-to-moderate symptoms of this disease for improvement of cognitive functions. The drug is primarily a reversible cholinesterase inhibitor that increases the concentration of functional ACh in the brain. However, the pharmacology of tacrine is complex; the drug also acts as a muscarinic receptor modulator in that it has partial agonistic activity, as well as weak antagonistic activity on muscarinic receptors in the CNS. In addition, tacrine appears to enhance the release of ACh from cholinergic nerves, and it may alter the concentrations of other neurotransmitters such as dopamine and NE.

Of all of the reversible cholinesterase inhibitors, only tacrine and physostigmine cross the blood-brain barrier in sufficient amounts to make these compounds useful for disorders involving the CNS. Physostigmine has been tried as a therapy for Alzheimer's disease; however, it is more commonly used to antagonize the effects of toxic concentrations of drugs with antimuscarinic properties, including atropine, antihistamines, phenothiazines, and tricyclic antidepressants. Neostigmine, pyridostigmine, and ambenonium are used mainly in the treatment of myasthenia gravis; edrophonium is useful for the diagnosis of this muscular disease.

Source: Stern - 2004

305. Answer: E (All)

Explanation:

Below the level of the vocal cords the larynx and trachea are innervated by the recurrent laryngeal branch of the vagus nerve.

The recurrent laryngeal nerve not only provides sensation to the structures below the level of the cords, it also supplies motor function to all the intrinsic muscles of the larynx except the cricothyroid muscle.

Bilateral blockade of the recurrent laryngeal nerve will result in loss of phonation as well as an inability to close the glottis.

306. Answer: E (All)

Explanation:

Histamine is released from injured cells and from mast cells stimulated by substance P.

It causes activation of nociceptors, vasodilation, and edema.

307. Answer: B (1 & 3)

Explanation:

1. Visceral afferents generally travel with sympathetic fibers.

2. They are not autonomic fibers.

3. Visceral afferents generally have large, confluent receptive fields.

4. They can be sensitized in response to certain conditions (inflammation).

Source: Kahn and Desio

308. Answer: D (4 Only)

Explanation:

(Kandel, pp 945-946.)

The physiologic responses to dreaming listed in the question can easily be recorded in most people several times each night. If awakened at such times, people usually confirm that they were dreaming.

A. The complex of physiologic signs (e.g., electroencephalographic desynchrony, rapid eye movements, loss of muscle tonus, and cardiorespiratory irregularities) is commonly referred to as REM sleep or paradoxical sleep.

The term paradoxical sleep was applied originally because the associated electroencephalographic pattern is characteristic of the alert waking state even though the dreaming person is, in fact, sound asleep.

Dreams occurring during NREM sleep are less easily recalled, less vivid, less visual, less emotional, and more pleasant.

Source: Ebert 2004

309. Answer: D (4 Only)

Source: Giordano J, Board Review 2003

310. Answer: D (4 Only)

311. Answer: C (2 & 4)

Explanation:

Endogenous opioids modulate nociception. All endogenous opioids contain the amino acid sequence tyrosine-glycine-phenylalanine. They are cleaved from three precursor molecules: proenkephalin A, proopiomelanocortin, and prodynorphin (proenkephalin B).

Proenkephalin A is cleaved to form met- and leu-enkephalins.

Prodynorphin is cleaved to form dynorphin and alpha-neoendorphin, which are not potent analgesics. They are found in the same distribution as the enkephalins. Their function has not been fully determined.

2. Enkephalins are found in highest concentration in the GI tract, sympathetic nervous system, adrenal medulla, periaqueductal gray, the rostroventral medulla, and Rexed's laminae I, II, V, and X.

4. Beta-endorphin, which is derived from proopiomelanocortin, is released from the pituitary gland along with ACTH. It is the most potent opioid and is found in high concentrations in the hypothalamus, periaqueductal gray, and locus ceruleus.

312. Answer: D (4 Only)

Source: Hoppenfeld S. Physical Examination of the Spine and Extremities. Appleton-Centry-Cross/Norwalk, CT p.256.

314. Answer: A (1, 2, & 3)

Explanation:

1. A neuron consists of a cell body (soma)
2. A neuron contains a dendrites
 - Dendrites are extensions of the cell body.
3. The axon of one neuron terminates near the cell body or dendrites of another neuron.
4. A synapse is the junction between neurons and serves as an important control mechanism for transmission of impulses.

315. Answer: E (All)

Explanation:

There are significant clinical differences between visceral and cutaneous nociception.

1. Cutting and burning of mesentery, the uterine cervix, or other visceral organs do not necessarily produce clinical pain. However, traction, distention, or ischemia will produce this type of pain.
2. The visceral nociceptors have wide receptive fields that prevent accurate localization of visceral sensation, which may explain the phenomenon of referred pain.
3. This pain is often diffuse and poorly localized and often has a significant autonomic component.
4. There are fewer nociceptors in the viscera than in the skin, and these receptors may have a different activation profile.

316. Answer: A (1, 2, & 3)

Explanation:

- Exogenously administered opioids exert their analgesic effects by acting directly on the CNS.

- The major anatomic areas involved in opioid-mediated analgesia include the periventricular and periaqueductal gray matter and the rostroventral medulla.

317. Answer: B (1 & 3)

Explanation:

1. The stellate ganglion is another term for the inferior cervical ganglion, which lies behind the subclavian artery, near the origin of the vertebral artery at the level of the seventh cervical vertebra. It is sometimes fused with the first thoracic ganglion.

2, 4. Autonomic ganglia include the ciliary, sphenopalatine, otic, and submaxillary ganglia, which are situated in a relation to the respective cranial nerves (III, VII, and IX).

Each ganglion receives sympathetic postganglionic fibers, parasympathetic preganglionic fibers, and sensory fibers.

3. The superior, middle, intermediate, and inferior ganglia compose the sympathetic chain within the cervical region. Source: Kahn and Desio

318. Answer: D (4 Only)

Explanation:

1, 2, 3. A ganglion refers to a site of synaptic connections specific to the sympathetic or parasympathetic systems.

4. Plexus refers to a number of ganglia and axons (sympathetic and parasympathetic, as well as visceral afferent) converging in a well-defined anatomic location.

319. Answer: E (All)

320. Answer: B (1 & 3)

Explanation:

1. Administration of substance P provokes plasma extravasation; other peptides do not produce extravasation despite its role in the initiating and augmentation of neurogenic inflammation.
2. Substance P does not produce pain on local injection.
3. Substance P causes neurogenic inflammation.
4. Substance P does not activate nociceptors.

321. Answer: A (1, 2, & 3)

Explanation:

Reference:

Bonica's Management of Pain, 3rd Ed: Ch4. Spinal mechanisms and modulation. Yaksh T In: Waldman, interventional pain management, 2nd Ed, Ch. 2. Acute sympathetic activation is a principle substrate of stress induced analgesia (SIA). SIA involves both the release of adrenal opioids as well as engagement of multiple non-opioid peptide and non-peptide brain mechanisms that can produce peripheral and central ("attentional" analgesia against nociceptive pain. Long term stress and chronic sympathetic activation is pain promotional and certainly not modulatory of neuropathic pain.

Source: Giordano J, Board Review 2005

322. Answer: A (1, 2, & 3)

Explanation:

The diagnosis of manic episodes is established by the presence of irritability or euphoria associated with 3 (euphoria) or 4 (irritability) of the 7 cardinal symptoms of mania. The cardinal symptoms of mania are distractibility, insomnia, grandiosity, flight of ideas, increased activities, pressured speech, and thoughtlessness.

Source: Laxmaiah Manchikanti, MD

323. Answer: C (2 & 4)

Explanation:

Reference:

Bonica's Management of Pain, 3rd Ed: Ch 3. Peripheral pain mechanisms and nociceptive plasticity. Also Bonica's Management of Pain, 3rd Ed: Ch4. Spinal mechanisms and modulation. Chronic neuropathic pain can induce plastic, genotypic changes in a-beta mechanoreceptors that promote phenotypic remodeling of a-beta terminal projections within the superficial dorsal horn. A-beta projections "migrate" into lamina II to activate nociceptive specific and wide dynamic range neurons to produce mechanical hyperalgesia. Increased penetrance to lamina VII can directly engage sympathetic preganglionic neurons of the intramedial lateral zone to increase sympathetic

outflow and contribute to the cyclisity of SMP. Such remodeling in the synaptic fields of a-beta mechanoreceptors decreased input to second order wide dynamic mechanospecific neurons that comprise the dorsal column/medial lemniscal pathway. This can lead to

a change in mechanosensation and decrease in dorsal columnar inhibition of even mild noxious input.

Source: Giordano J, Board Review 2005

324. Answer: B (1 & 3)

Explanation:

The successive excitation of nodes of Ranvier by an impulse that jumps between successive nodes is termed saltatory conduction.

1, 2. Action potentials are conducted from node to node by myelinated nerves rather than continuously along the entire fiber as occurs in the unmyelinated nerve.

3. Saltatory conduction greatly increases the velocity of nerve transmission in myelinated fibers.

4. Saltatory conduction conserves energy because only the nodes of Ranvier depolarize, resulting in lower loss of ions than would otherwise occur.

Source: Kahn and Desio

325. Answer: C (2 & 4)

Explanation:

- Muscarinic receptors are located in all effector cells stimulated by postganglionic parasympathetic neurons as well as postganglionic cholinergic sympathetic neurons.

- Nicotinic receptors are located in the ganglionic synapses between pre- and postganglionic neurons of the sympathetic and parasympathetic nervous system.

Source: Kahn and Desio

326. Answer: C (2 & 4)

Explanation:

1, 3. Structures insensitive to pain include the intracranial structures of the parenchyma of the brain, ependyma, choroids plexus, pia mater, arachnoid membrane, and parts of the dura mater, as well as the extracranial skull (except for the periosteum, which is slightly pain-sensitive).

2, 4. Pain-sensitive structures include such intracranial structures as the cranial sinuses and afferent veins, the arteries of the dura mater, the arteries of the base of the brain and their major branches, and parts of the dura mater in the vicinity of large vessels.

Extracranial structures that are pain-sensitive include the skin, scalp, fascia, muscles, mucosa, arteries, and veins.

- The trigeminal, facial, vagal, glossopharyngeal, and second and third cranial nerves are also sensitive.

Source: Kahn and Desio

327. Answer: E (All)

Explanation:

1. All peripheral nerve injury appears to have a central effect. After peripheral nerve injury, the primary afferents arborize into new areas of the dorsal horn.

2. In addition, they stop making substance P and CGRP and start making neuropeptide γ , galanin, and VIP.

3. There is upregulation of the early immediate gene C-Fos, which stimulates production of Fos protein.

4. There is increased production of dynorphin by second-order neurons.

Source: Kahn CH, DeSio JM. PreTest Self Assessment and Review. Pain Management. New York, McGraw-Hill, Inc., 1996.

328. Answer: B (1 & 3)

Explanation:

Cell bodies of somatic motor nerves lie in the anterior horn of the spinal cord or in motor nuclei of cranial nerves.

Those of somatic sensory neurons reside in dorsal root ganglia, which are located in the intervertebral foramina.

Sensory nerves subserving visceral sensation also have their cell bodies in dorsal root ganglia, through their axonal processes may travel with autonomic nerves to the periphery.

329. Answer: E (All)

Explanation:

Reference:

Bonica's Management of Pain, Third Edition, Chapter 4, Spinal Mechanisms and their Modulation pp. 73-85

1. Wide dynamic range (WDR) neurons are found mainly in dorsal horn lamina V (nucleus proprius).

2. They are interneurons that have large cutaneous as well as visceral receptive fields.

- Single WDR neurons receive diverse input from various visceral and cutaneous tissues and are commonly called "convergence neurons".

They are thought to be responsible for the spinal component of referred pain.

3. Low frequency, repetitive stimulation of C-fibers produces a gradual increase in the frequency of WDR neuron activity until the neuron is in a state of virtually continuous discharge called "wind-up".

4. They are activated by innocuous as well as noxious stimuli. Light innocuous touch evokes activity that increases with the intensity of pressure or pinch into the noxious range.

Source: Schultz D, Board Review 2004

330. Answer: C (2 & 4)

Explanation:

1. Serotonin has been implicated as an algogenic substance.

2. It is released by platelets in response to platelet-activating factor, a substance released by degranulating mast cells.

3. Serotonin causes pain directly and by potentiation of the nociceptive effect of bradykinin.

4. Serotonin receptors are found on peripheral nerves, and antagonists will block the nociceptive effects of serotonin.

331. Answer: E (All)

332. Answer: A (1, 2, & 3)

Source: Hoppenfeld S. Physical Examination of the Spine and Extremities. Appleton-Centry-Cross/Norwalk, CT p.189.

333. Answer: B (1 & 3)

335. Answer: A (1, 2, & 3)

Explanation:

1. Spinal analgesia is mediated by the delta and kappa receptors.

Delta-receptor activation results in spinal analgesia without sedation or respiratory depression.

The delta-receptor ligand (D-ala, D-leu enkephalin;DADL) has been found to be five times more potent than morphine (a mu-receptor agonist) when given intrathecally.

2. Kappa-receptor activation results in spinal analgesia and sedation without respiratory depression.

3. Activation of mu-1 receptors has analgesic effects (mostly supraspinal, though some mu-1 receptors are found in the spinal cord).

4. Activation of mu-2 receptors produces respiratory depression, bradycardia, and depression of GI motility.

336. Answer: E (All)

Explanation:

1. The reticular formation participates in the regulation of motor, sensory, and autonomic functions.

2. The reticular formation consists of a number of vaguely defined nuclei situated in the core of the brainstem and extending throughout its rostrocaudal aspect.

3. Many reticular neurons respond to noxious stimulation, and many respond exclusively to specific noxious modalities.

4. The reticular formation is thought to participate in the affective/motivational component of pain and in the integration of pain with autonomic and motor behavior.

337. Answer: D (4 Only)

Explanation:

1, 2. Activation of beta receptors results in relaxation of bronchial muscles and increases in cardiac rate and force of contraction.

3. Activation of alpha receptors results in increased peripheral vascular resistance, mydriasis, and contraction of pilomotor muscles.

4. The alpha-2 receptors are found in both presynaptic and postsynaptic locations. Stimulation of presynaptic alpha-2 receptors inhibits norepinephrine release, serving as a negative feedback mechanism.

338. Answer: B (1 & 3)

Explanation:

1. The efferent limb is mediated by the facial nerve (7th cranial), which conveys the impulse to the orbicularis oculi.

3. The afferent limb of the reflex is the ophthalmic division of the trigeminal nerve (5th cranial).

339. Answer: D (4 Only)

Explanation:

The striatum is the main receiving station for the basal ganglia. It receives massive projections from all areas of the cerebral cortex and from certain thalamic nuclei, the substantia nigra, and other brain stem nuclei. The caudate nucleus and the putamen are the largest of the nuclei composing the striatum. The ventral striatum consists of the ventral portion of the caudate nucleus, the putamen, the deep layers of the olfactory tubercle, the nucleus accumbens, and the substantia innominata. Although the nucleus accumbens and the substantia innominata are frequently referred to as parts of the olfactory system, they play an important functional role in the basal ganglia. (Afifi and Bergman, 275-294)

Source: Neurology Examination and Board Review By Nizar Souayah, MD and Sami Khella, MD

340. Answer: B (1 & 3)

Explanation:

As small afferent axons (C and A-delta) enter the spinal cord, they are displaced lateral to the A-beta fibers (from muscle spindles and proprioceptive afferents) and trifurcate in the tract of Lissauer at the level of entry and with projections rostrally and caudally.

Unmyelinated C fibers arising from the dorsal root ganglion cells also send projections into the ventral roots, which accounts for pain sensation that can occur with ventral root stimulation.

341. Answer: A (1, 2, & 3)

Explanation:

- The prostanoids are the arachidonic acid metabolites of the cyclooxygenase pathway that comprise the thromboxanes, prostacyclins, and prostaglandins.

- The eicosanoids are the arachidonic acid metabolites of the lipoxygenase pathway including 5-hydroxyeicosatetraenoic acid (5-HETE) and the leukotrienes.

342. Answer: A (1, 2, & 3)

Explanation:

1. Acetylcholine is released at all preganglionic nerve endings (both sympathetic and parasympathetic)

2. Acetylcholine is released at preganglionic sympathetic nerve endings.

3. Acetylcholine is released at postganglionic parasympathetic nerve endings.

- Sympathetic postganglionic innervation to sweat glands is also cholinergic.

4. Norepinephrine is the neurotransmitter found in postganglionic sympathetic nerve endings.

343. Answer: C (2 & 4)

Explanation:

The parasympathetic nervous system consists of cranial and sacral portions.

The cell bodies of preganglionic parasympathetic fibers are located in cranial nerve nuclei of the brainstem. The long preganglionic fibers of the oculomotor, facial, and glossopharyngeal nerves synapse with short postganglionic fibers of the ciliary, sphenopalatine, and otic ganglia. The very long preganglionic fibers of the vagus synapse in intramural ganglia of the heart, lungs, and gastrointestinal tract. Preganglionic neurons of the sacral portion of the parasympathetic nervous system have cell bodies located in the intermediolateral gray of the second, third, and fourth sacral cord segments.

Source: Kahn and Desio

344. Answer: B (1 & 3)

Explanation:

1. The rostroventral medulla is rich in serotonergic neurons that project to the spinal cord.

2. Stimulation of neurons in the rostroventral medulla with serotonergic terminals in the dorsal horn inhibits nociceptive neurons in laminae I and II.

3. Serotonin is a neurotransmitter in descending antinociceptive pathways.

4. Application of serotonin to the spinal cord inhibits discharge of spinothalamic tract neurons and relieves pain.

345. Answer: B (1 & 3)

Explanation:

Neurons are highly responsive to changes in the pH of the surrounding interstitial fluids.

1. Alkalosis enhances neuronal excitability as does hyperventilation.

Acidosis depresses neuron excitability.

2. Inhaled anesthetics suppress neuronal excitability.
3. Hyperventilation causes alkalosis and enhances neuronal excitability.
4. Lack of oxygen can cause total inexcitability of neurons within 3 to 5 s.

346. Answer: E (All)

Explanation:

The major ascending nociceptive tract in the anterolateral quadrant (ALQ) is the spinothalamic tract (STT). Other tracts of the ALQ that are thought to be involved in pain perception are: - the spinoreticular tract (SRT)- the spinomesencephalic tract (SMT),- the dorsal column postsynaptic spinomedullary system, and - the propriospinal multisynaptic ascending system. Source: Kahn and Desio

347. Answer: C (2 & 4)

Explanation:

1. Laminae I, II, and V are the major areas for convergence of nociceptive transmission at the spinal cord.
2. Cells from these areas project to the thalamus, and cutting this projection abolishes cutaneous pain.
3. Stimulating the projections of laminae I and II produces pain.
4. Discharge of these cells increases with increasing noxious stimulation.
 - In response to a brief noxious stimulus, laminae I and V neurons have early and late discharges, analogous to first and second pain.

348. Answer: E (All)

Explanation:

Three classes of cells are found in the dorsal horn:

1. Excitatory interneurons relay nociceptive transmission to projection cells, to other interneurons, or to motor cells concerned with reflexes
2. Inhibitory interneurons modulate nociceptive transmission.
3. Projection cells relay information to rostral center
4. Other cells in the dorsal horn receive additional input from nonnociceptive afferents. These cells are called wide dynamic range (WDR) neurons and respond to a wide range of stimuli from low to high intensity.

349. Answer: C (2 & 4)

Explanation:

- Bradykinin is a 9-amino acid peptide produced at sites of tissue injury by enzymatic action.
- Bradykinin produces pain in humans at concentrations equivalent to those found in injured tissue.
- Binding sites for bradykinin are found on sensory fibers and in the dorsal horn.

1. Bradykinin increases vascular permeability.
 2. Bradykinin has binding sites in the dorsal horn.
 3. Bradykinin enhances leukocyte chemotaxis, and sensitizes nociceptors.
 4. Bradykinin is produced at sites of tissue injury.
- Source: Kahn and Desio

350. Answer: E (All)

Explanation:

1. Peripheral nerve axons are always enveloped by a Schwann cell.
 - The myelinated nerves may be enveloped many times by the same Schwann cell.
2. Transmission of nerve impulses (i.e., action potentials) along nonmyelinated nerves occurs in a continuous fashion, whereas transmission along myelinated nerves occurs by saltatory conduction from one node of Ranvier to the next.
 - Myelination speeds transmission of neurological impulses; it also renders nerves more susceptible to local anesthetic blockade.
3. An action potential is associated with an inward flux of sodium that occurs after a certain membrane threshold has been exceeded.

4. Propagation of an action potential along myelinated nerve axons occurs by saltatory conduction via the nodes of Ranvier.

Ref.: Hall and Chantigan.

351. Answer: A (1, 2, & 3)

Explanation:

- 1, 2. The innervation for cremaster reflex is through the L1 and L2 segments (ilioinguinal and genitofemoral nerves).
3. Stroking the skin on the upper, inner aspect of the thigh elicits the cremaster reflex. The response consists of a contraction of the cremasteric muscle, with ipsilateral elevation of the testicle.

352. Answer: E (All)

Source: Nader and Candido – Pain Practice. June 2001

353. Answer: D (4 Only)

Source: Boswell MV, Board Review 2004

354. Answer: E (All)

Explanation:

Reference:

Bonica's Management of Pain, Third Edition, Chapter 3, Spinal Mechanisms and their Modulation.

Anti-nociceptive pathways are activated when pain signals ascending in the ventrolateral tracts reach the brain stem and thalamus. Stimulation of the periventricular gray area in the thalamus and the nucleus raphe magnus in the brain stem stimulates release of endorphins and enkephalins respectively. These ligands bind to their respective receptors and initiate a series of physiochemical changes that inhibit pain transmission in the spinal cord as outlined in answers 1-4 above.

Since 70% of the endorphin and enkephalin receptors are located in the presynaptic membranes of nociceptive afferent terminals, most of the pain transmission is stopped before it reaches the dorsal horn. The pain signals that get through are further weakened by enkephalin-induced dynorphin activity in the spinal cord. Dynorphin activation of kappa receptors on inhibitory interneurons causes release of GABA which hyperpolarizes dorsal horn cells and further inhibits pain transmission.

Source: Schultz D, Board Review 2004

355. Answer: B (1 & 3)

Explanation:

Reference:

Yaksh, Tony in Waldman, Interventional Pain Management, Second Edition; Chapter 2,

Bonica's Management of Pain, Third Edition, Chapter 4, Spinal Mechanisms and their Modulation

If the spinal cord is completely transected, all sensory and motor functions distal to the transaction are blocked. If the spinal cord is transected only on a single side, the Brown-Sequard syndrome occurs:

- Loss of motor function ipsilateral to the lesion at all levels below the lesion.

Pain and temperature sensation is lost on the contralateral side 2 to 6 dermatomes below the lesion.

- Light touch and tactile sensation is lost ipsilateral to the lesion at all levels below the lesion.

This pattern of loss occurs because:

- Pain and temperature sensation is a crossed neural pathway. Pain and temperature fibers enter the dorsal horn through the dorsal root, ascend and descend for several segments in Lissauer's tract in the superficial cap of the dorsal horn, then enter the dorsal horn, synapse with interneurons and move across the cord in the anterior commissure to the contralateral side where they ascend in the ventrolateral columns (especially the spinothalamic tract). Transection of the ventrolateral tract will transect pain and temperature fibers which originate on the contralateral side of the cord several segments below the lesion.

- Motor function is not crossed. Motor fibers stay

ipsilateral at the cord level so transaction of the one side of the cord will cause ipsilateral motor loss below the lesion.

- Light touch is transmitted by A-beta fibers which ascend ipsilaterally in the dorsal columns. Hemisection of the cord will also cause ipsilateral light touch loss below the lesion.

1. With ventrolateral cordotomy, the target is isolated to the spinothalamic tract.

- This tract primarily transmits ascending pain and temperature fibers which originate contralaterally.

- The expected result would be loss of pain and temperature sensation several segments below the lesion on the contralateral side with no effect on motor strength or tactile sensation.

2. Light touch and tactile sensation is lost ipsilateral to the lesion at all levels below the lesion.

3. Temperature (hot and cold) sensation would be lost on the contralateral side several segments below the lesion.

4. The pain relieving effects of ventrolateral cordotomy are typically incomplete because some nociceptive fibers do not cross and ascend ipsilaterally. The effects are typically short-lived with anomalous recovery of pain after 3-12 months. This suggests that relevance of other pain pathways outside of the crossed, spinothalamic path.

Source: Schultz D, Board Review 2004

356. Answer: E (All)

Explanation:

Type-II pain is a multi-dimensional neural event that is reliant upon peripheral and central sensitizing effects and the summative physiologic characteristics of both primary afferent and second-order neurons.

Source: Giordano J, Board Review 2006

357. Answer: A (1, 2, & 3)

Explanation:

1. Substance P is synthesized in the neuronal cell bodies in the dorsal root ganglia.

2. Substance is released on stimulation of primary afferent nociceptors and causes vasodilation and edema.

3. It is transported to peripheral and central terminals, where it is stored in vesicles.

4. Substance P causes release of histamine from mast cells, resulting in further vasodilation and edema.

358. Answer: A (1, 2, & 3)

Explanation:

Reference:

Yaksh, Tony in Waldman, Interventional Pain Management, Second Edition; Chapter 2, pp. 26-27.

Bonica's Management of Pain, Third Edition, Chapter 3, Spinal Mechanisms and their Modulation.

The hallmarks of neuropathic pain are chronic allodynia and hyperalgesia. Allodynia is defined as pain resulting from a stimulus that ordinarily does not elicit a painful response (eg. light touch). Hyperalgesia is defined as an increased sensitivity to a normally painful stimulus. There are two types of hyperalgesia which are triggered by different neural mechanisms.

1. Primary hyperalgesia occurs at the site of injury, for instance within the confined area of capsaicin application.
- It reflects sensitization of peripheral nociceptors and involves altered physiology and pharmacology of the sensory nociceptive terminals to produce a leftward shift in the stimulus and response curve for activation.
- It is triggered by inflammatory mediators, persisting noxious stimuli, or both, and is characterized by lowered threshold, increased rate of action potentials, spontaneous activity and increased pain sensation to supra-threshold stimuli.

2. Secondary hyperalgesia occurs in the area surrounding the area of injured tissue and reflects the process of central sensitization that forms the basis for many types of pathological pain.

3. Secondary hyperalgesia is driven mainly by increased excitability of central neurons via activated NMDA receptors.

4. Intrathecal application of NMDA receptor antagonists do not attenuate the initial hyperalgesia response to capsaicin application (primary hyperalgesia) but the secondary delayed pain and sensitivity outside the region of injured tissue (secondary hyperalgesia) is substantially reduced if the NMDA antagonist is administered prior to the initial pain stimulus.

Source: Schultz D, Board Review 2004

359. Answer: E (All)

Source: (Bonica, 3rd Ed., page 1566)

360. Answer: D (4 Only)

Explanation:

1. Withdrawal flexor reflexes are most often elicited by a painful stimulus.

2. Pathways for eliciting the withdrawal reflex do not pass directly to the anterior motor neurons but instead pass first through several interneurons.

3. Associated with withdrawal of the stimulated limb is extension of the opposite limb, which occurs 0.2 to 0.5 s later and serves to push the body away from the object causing the painful stimulus.

4. Withdrawal reflexes are associated with extension of the opposite limb.

Source: Kahn and Desio

361. Answer: C (2 & 4)

Explanation:

1. The orientation of the facets determines the direction of motion of that spinal segment.

2. Facet joints comprise two arthroal joints lined with synovium and lubricated with synovial fluid.

3. In the thoracic spine, the facets are convex-concave and lie in the horizontal plane, permitting lateral flexing, side bending, and rotation about a vertical line.

4. In the upper lumbar spine, the facets lie in a vertical sagittal plane and permit flexion and extension but prevent lateral flexion or bending in the lordotic curve.

362. Answer: B (1 & 3)

363. Answer: E (All)

Source: Helms. Acupuncture Energetics. 1995

364. Answer: D (4 Only)

Source: Lou Etal. Pain Practice: march 2001

365. Answer: C (2 & 4)

Explanation:

Reference:

Yaksh, Tony in Waldman, Interventional Pain Management, Second Edition; Chapter 2, pp. 11-19.

1. C-polymodal nociceptors are slow-conducting, unmyelinated fibers that are activated only by high threshold stimulation.

- They are not activated by low threshold stimuli.

- They are called polymodal because they are activated by a variety of noxious, nociceptive chemical, mechanical and thermal stimuli.

* These neurons are pseudounipolar with cell bodies residing in the dorsal root ganglion.

2. A short stem connects the cell body to the peripheral axon which travels out to the peripheral tissues where it arborizes into unspecialized free nerve endings.

3. Central axons synapse with dorsal horn neurons primarily in Rexed's lamina I (called the marginal zone), II (called the substantia gelatinosa) and V (which along with lamina III and IV, make up the nucleus proprius).

4. They are unipolar neurons with cell bodies that reside in the dorsal root ganglion.

Source: Schultz D, Board Review 2004

366. Answer: E (All)

Explanation:

1. Unconscious sensation is mediated by the spinocerebellar tract.

2. The Fibers associated with proprioception and crude

touch enter the dorsal horn and ascend ipsilaterally in the dorsal columns (fasciculus gracilis and fasciculus cuneatus).

3. The spinothalamic tract subserves the sensations of pain and temperature.

4. The Fibers associated with proprioception and crude touch enter the dorsal horn and ascend ipsilaterally in the dorsal columns (fasciculus gracilis and fasciculus cuneatus).

367. Answer: E (All)

Explanation:

Nociception involves four physiologic processes.

1. Transmission is the propagation of impulses throughout the sensory nervous system.

2. Modulation is the process whereby nociceptive transmission is modified through a number of neural influences

3. Perception is the final process in which all aspects of pain are experienced.

4. Transduction is the process whereby noxious stimuli are translated into electrical activity at the sensory endings of nerves.

368. Answer: E (All)

Explanation:

1. The most common nociceptor appears to be the cutaneous mechanothermal nociceptor, which responds to noxious mechanical and thermal stimuli.

The most common nociceptor in humans appears to be the C-fiber mechanothermal nociceptor, which responds to mechanical, thermal, and chemical stimuli.

2. Cutaneous mechanothermal nociceptors activate both A-delta and C fibers.

3. Modality-specific (e.g., heat) nociceptors exist, but the majority appear to respond to more than one noxious stimulus.

4. They may also be referred to as C-polymodal nociceptors

369. Answer: B (1 & 3)

Explanation:

There are significant clinical differences between visceral and cutaneous nociception.

There are relatively fewer nociceptors in the viscera than in the skin, and these receptors may have a different activation profile.

Cutting and burning mesentery, uterine cervix, or other organs does not necessarily produce clinical "pain", but traction, distention, or ischemia will

produce pain.

Visceral is often diffuse and poorly localized and often has a significant autonomic component.

370. Answer: C (2 & 4)

Explanation:

1. After repeated thermal stimulation, HTMs will become more sensitive (achieve a lower threshold to thermal stimulation) and will increase their frequency of discharge. This process is known as sensitization.

2. High-threshold mechanoreceptors (HTMs) do not fire in response to thermal stimulation unless stimuli are applied repeatedly.

3. The threshold for mechanical stimulation is unchanged by this process.

4. Sensitization of high-threshold mechanoreceptors, results in increased frequency of discharge.

371. Answer: A (1, 2, & 3)

Explanation:

Centrifugal control of nociceptive transmission through the dorsal horn arises from a variety of structures that project descending inhibitory pathways.

1, 2, 3. The pathways descending from these areas primarily involve noradrenergic, serotonergic, and enkephalinergic mechanisms. However, other mechanisms might also be involved.

Source: Kahn and Desio

372. Answer: E (All)

Explanation:

1. The facial nerve carries parasympathetic secretory fibers to the salivary and lacrimal glands and to the mucous membranes of the oral and nasal cavities.

2. The facial nerve contributes to the afferent limb of the orbicularis oculi reflex in conjunction with the trigeminal nerve.

3. The facial nerve innervates the muscles of facial expression.

4. The facial nerve conveys various types of sensation, including exteroceptive sensation from the region of the ear drum, taste sensation from the anterior two-thirds of the tongue, and general visceral sensation from the salivary glands and mucosa of the nose and pharynx.

373. Answer: A (1, 2, & 3)

Explanation:

Diminution of the reflexes usually results from an interference with the conduction of an impulse through the

reflex arc. Absence indicates a break in the reflex arc.

1, 2. The muscle-stretch reflexes may be either diminished or absent in deep coma, narcosis, deep sedation, and often

in deep sleep.

3. Hypothyroidism and severe toxemias result in diminished or lost reflexes.

4. Muscle-stretch reflexes are typically increased with pyramidal system lesions, early stages of coma and anesthesia, tetany, tetanus, and strychnine poisoning.
Source: Kahn and Desio

374. Answer: E (All)

Explanation:

After injury just outside their receptive fields, C-PMNs become sensitized and develop spontaneous depolarization.

1, 2, 3. This activity of C-PMNs in areas of undamaged tissue causes spreading vasodilation, edema, and further sensitization of other C-PMNs within adjacent receptive fields. This sequence of events has been termed neurogenic inflammation because of its similarity to the inflammatory process.

4. Secondary hyperalgesia depends on activity in unmyelinated primary afferents with sensitization of C-PMNs.

375. Answer: B (1 & 3)

Explanation:

1. They are myelinated.

2. They respond to mechanical stimulation.

3. Myelinated fibers activated by noxious stimuli generally conduct in the A-delta range, about 20 m/s.

4. A-delta fibers are called high-threshold mechanoreceptors.

376. Answer: A (1, 2, & 3)

Source: Boswell MV, Board Review 2004

377. Answer: A (1, 2, & 3)

378. Answer: B (1 & 3)

Explanation:

The characteristic sequence of events following a skin injury is known as the triple response:

1. Local edema (wheal).

2. Intense vasodilation.

3. Secondary vasodilation spreading to adjacent regions (flare).

4. The subject will also note a decreased threshold to noxious stimuli and increased pain in response to noxious stimulation (primary hyperalgesia) in the injured area.

379. Answer: B (1 & 3)

Explanation:

1. The receptive field for a C-PMN may be quite large (up to 17mm²).

2. C-PMNs become sensitized after repeated noxious stimulation and may develop an ongoing discharge.

3. Secondary hyperalgesia depends on activity in unmyelinated primary afferents with sensitization of C-PMNs.

4. Respond to mechanical, thermal and chemical stimuli.
(DR M CHECK)

Source: Kahn and Desio

380. Answer: E (All)

Explanation:

Dextromethorphan, the D isomer of the codeine analog of levorphanol, has been used clinically as a central antitussive drug for more than 40 years. It has weak affinity for the μ -opioid receptor and has a sedative effect. Dextromethorphan and its metabolite, dextrorphan, have non-competitive NMDA receptor antagonist properties.

1. The pharmacology of central sensitization has shown that the N-methyl-d-aspartate (NMDA) receptors are involved.

2. Interventions that prevent the establishment of central sensitization are considered as preemptive analgesia

3. Co-administration of NMDA receptor antagonist with an opioid may prevent central sensitization

4. Co-administration of NMDA receptor antagonist with an opioid may enhance opioid-induced anti-nociception and may prevent tolerance to opioid analgesia

381. Answer: C (2 & 4)

Explanation:

1. Glutamic acid is an excitatory neurotransmitter secreted by many of the sensory pathways of the CNS.

2. Glycine is secreted mainly at synapses in the spinal cord, where it functions predominantly as an inhibitory neurotransmitter.

3. Substance P is an excitatory neurotransmitter presumed to be released by terminals of pain fibers in the substantia gelatinosa of the spinal cord.

4. GABA is an inhibitory neurotransmitter secreted by neurons in diverse areas of the nervous system including the spinal cord, cerebellum, and basal ganglia.

382. Answer: A (1, 2 & 3)

Explanation:

Pain assessment focuses upon quantifying primarily qualitative variables that have unique subjective experience for each patient. Attribution of such findings to

particular pathologies is accomplished by relating clinical findings with patients' subjective reports of the nature, extent, and characteristics of their pain.
Source: Giordano J, Board Review 2005

383. Answer: B (1 & 3)

Explanation: Disruption of glucose metabolism yields increased polyol end products that are incorporated into neural membranes and disrupt ionic gradients by interfering with the Na-K ATPase function. This can lead to enhanced sodium flux and membrane conductance, primarily in unmyelinated nociceptive afferents (C-fibers).

Source: Giordano J, Board Review 2005

384. Answer: B (1 & 3)

Explanation: Opioids (endorphins and enkephalins) released from opioid neurons of the PAG act at mu and delta receptors to hyperpolarize tonically inhibitory GABAergic interneurons that reduce/ suppress firing of monoaminergic descending noxious inhibitory control systems of the brainstem. Such disinhibition increases bulbospinal modulation of noxious afferent input and is a fundamental component of centrifugal analgesia.

Source: Giordano J, Board Review 2006

385. Answer: C (2 & 4)

Explanation:

Application of a brief noxious stimulus will initially be experienced as a brief, sharp pain (first pain).

A more prolonged, dull sensation (second pain) follows after a short lull. Application of pressure will block first pain.

1. Application of local anesthetics will block second pain.
2. First pain is preferentially blocked by pressure.
3. First pain is mediated by the A-delta mechanothermal nociceptor.

4. First pain can occur in response to a thermal stimulus.

Source: Kahn and Desio

386. Answer: B (1 & 3)

Explanation:

There are two types of A-delta fibers: Those that subtend high threshold tensile and/or compressive mechanical stimuli and those that transduce noxious cold (< 24°C and > 45°C). A third population the mixed mechanothermal nociceptor is capable of responding to both types of noxious input.

Medium threshold mechanical input is subserved by A-beta fibers.

Polymodal/ chemical high threshold input is subserved by C-fibers.

Source: Giordano J, Board Review 2005

387. Answer: D (4 Only)

Explanation:

The term spondylolisthesis occurs when the cephalad vertebral body slip forward with respect to the inferior vertebral body. This slip can be graded in terms of percentage or grade (grade 1 <25%, grade 2 26-50%, grade 3 51-75%, and grade 4 >76%). Etiologies include a bilateral pars defect (spondylolysis), degenerative changes in the facet joint, disc incompetence, cancer, infection, post-surgical (wide decompression). Nonetheless, spondylolisthesis refers to the slip and not the etiology. Not all cases of bilateral pars defects will go on to develop spondylolisthesis.

Unilateral pars defects are unlikely to lead to slip.

Retrolisthesis, which can occur with disc incompetence and segmental instability, refers to posterior slippage of the superior vertebral body with respect to the inferior vertebral body. Segmental instability represents a condition where a functional spinal unit (2 VBs and the intervertebral disc) are hyper-mobile. At L5-S1, this represents >11-15 degrees of motion compared to other segment or >5 mm of anterior translation.

Source: Shah RV, Board Review 2006

388. Answer: A (1, 2, & 3)

Explanation:

Criteria for proving that a substance is a neurotransmitter for a primary afferent nociceptor are:

- (1) presence of the substance in the dorsal horn synapse of the primary afferent,
 - (2) release of the substance on noxious stimulation,
 - (3) the same effect by release of the substance and stimulation of the primary afferent, and
- Blockade of the effect of both the substance and the primary afferent by administration of an antagonist.

Source: Kahn and Desio

389. Answer: A (1, 2, & 3)

Explanation:

Reference:

Bonica's Management of Pain, Third Edition, Chapter 3, Peripheral Pain Mechanisms and Nociceptor Plasticity. pp. 37-38

In many respects, the anatomy, physiology and biochemistry of cranial nociception is homologous to pain pathways in the rest of the body. Transmission of pain in the anterior two thirds of the head occurs primarily through the trigeminal system. The trigeminal ganglion houses the cell bodies of pseudounipolar A-delta and C-fiber axons which exit the ganglion and innervate the anterior head, traveling outward within the three divisions of the trigeminal system: the ophthalmic (V1), maxillary (V2) and mandibular (V3) nerves.

1. The central processes of these axons exit the ganglion and travel into the subnucleus caudalis portion of the trigeminothalamic nucleus (spinal nucleus V) where they synapse with interneurons.
 2. The cell bodies of the nociceptive afferent fibers transmitting her pain reside in the trigeminal ganglion.
 3. V2 is most likely involved in pain transmission.
 4. Pain sensation in the posterior upper neck and occipital region is transmitted by the upper cervical nerve roots especially C2.
 - The C2 dorsal root ganglion contains the cell bodies of nociceptive afferents, the central processes of which synapse in the subnucleus caudalis on the same interneuron pool as the trigeminal nociceptive fibers.
 - This explains why anterior face pain transmitted via the trigeminal system can cause occipital referred pain and also why posterior neck pain can sometimes be referred to the face.
 Source: Schultz D, Board Review 2004
- 390. Answer: C (2 & 4)**
- 391. Answer: E (All)**
 Explanation:
 G-protein receptors are a large (> 100) family of membrane spanning receptors that undergo a conformational change with drug-receptor binding which in turn causes activation of "G-Proteins" [di- or triphospho-guanosine-binding proteins (G-GDP, G-GTP)]. All cells contain G-protein receptors, but the brain has the highest concentration and the gut is especially rich. G-proteins produce pharmacological effects through their control or regulation of membrane-bound, second messenger systems such as ion channels, cyclic AMP, or phospholipases (the phosphoinositol turnover system) and protein kinases.
 Source: Boswell MV, Board Review 2004
- 392. Answer: E (All)**
 Explanation:
 Reference
 Lecture notes. Sympathetically mediated pain may be difficult to evaluate based solely upon results of single technologic diagnostic tests. Characteristically, thermal metric evaluation is coupled with quantitative sensory testing, axon reflex evaluation, Doppler, flowmetry and correlated with patient narrative, history and physical exam. The need for narrative/history emphasizes the discrepant characteristics of qualitative (subjective) aspects of SMP and quantitative variables.
 Source: Giordano J, Board Review 2005
- 393. Answer: B (1 & 3)**
 Explanation:
 Reference:
 Bonica's Management of Pain, 3rd Ed: Ch 3. Peripheral pain mechanisms and nociceptive plasticity. Initial tissue insult can induce the arachidonic acid cascade, to produce cyclooxygenase derived prostaglandin E2 that activates peripheral C-fibers via effects at a prostenoid receptor on C-fiber terminals. The activation of C-fibers can cause antidromic release of Substance P which acts as a potent vasodilator thereby inducing extravasation of pro-nocicepted mediators and subsequent reactivation/sensitization of C-fibers. Prolonged C-fiber activation/sensitization can produce primary hyperalgesia. Continued C-fiber-evoked activation of second order spinal afferents can produce central (secondary) hyperalgesia.
 Source: Giordano J, Board Review 2005
- 394. Answer: B (1 & 3)**
- 395. Answer: A (1, 2, & 3)**
 Source: Rozen. Pain Practice: SEP 2001
- 396. Answer: A (1, 2, & 3)**
 Source: Nader and Candido Pain Practice. June 2001
- 397. Answer: A (1, 2, & 3)**
 Source: Lou Etal. Pain Practice: march 2001
- 398. Answer: D (4 Only)**
 Source: Rozen. Pain Practice: SEP 2001
- 399. Answer: E (All)**
 Explanation:
 Pain following peripheral nerve damage has long been recognized as having a sympathetic component.
 1. It is clear that sympathetic afferents can transmit information of a nociceptive nature.
 2. One of the characteristics of this pain is that is accompanied by sympathetic efferent overactivity. This may be reflected in alterations in the control of blood flow to the skin, muscles, and bone in the affected area and alterations in piloerection, sweating, and possibly cutaneous nociceptive sensitivity.
 Source: Kahn and Desio
- 400. Answer: B (1 & 3)**

