

## **USMLE-STEP-1**<sup>Q&As</sup>

United States Medical Licensing Step 1

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#### **QUESTION 1**

A 62-year-old patient diagnosed with prostate carcinoma complains of a right-sided headache worsening over 4 days and displays a drooping right upper eyelid. Examination reveals a right third nerve palsy. An MRI reveals a single metastasis of the prostatic carcinoma in the right side of the midbrain, causing Benedikt\\'s syndrome. Which of the following signs would also be seen in this patient?

- A. complete paralysis of facial expression musculature on the left side
- B. deviation of the tongue to the right
- C. intention tremor in the left upper and lower extremity
- D. ipsilateral hemiplegia
- E. vertical gaze palsy

Correct Answer: C

Section: Anatomy Benedikt\\'s syndrome results from a lesion situated in the tegmentum of the midbrain, at the level of the third cranial nerve (oculomotor) nucleus and its associated tracts, as exemplified by ptosis and third nerve palsy in this patient. The red nucleus is also affected at this level giving rise to motor impairment displayed by the intention tremor. Since the rubrospinal tract crosses at the level of the midbrain to project to the opposite side of the body, the tremor will manifest itself contralateral to the side to the lesion. The seventh cranial nerve (facial) nucleus is located in the pons, and the facial musculature (choice A) in this patient would not be affected. Likewise, the twelfth cranial nerve (hypoglossal) nucleus is located in the medulla, and the innervation of the tongue (choice B) would be spared in this patient. A lesion causing a pure Benedikt\\'s syndrome would be confined to the midbrain tegmentum and not affect the corticospinal tract. Ipsilateral hemiplegia (choice D) would not be present in this patient. Finally, vertical gaze palsy (choice E) results from a lesion or compression of the midbrain tectum and not of the tegmentum.

#### **QUESTION 2**

In a quantitative serological test, the results shown below were obtained (+ = antibody detected, 0 = no antibody detected). Which of the following courses of action should be taken?

	SERUM DILUTION					
	1:10	1:20	1:40	1:80	1:160	1:320
Test Result	+	+	+	+	+	+

A. choose another test mechanism to measure the antibody

B. perform testing on additional dilutions until an end point is reached

- C. repeat the test because this pattern is impossible
- D. report "negative" for antibody E) report "positive" for antibody

Correct Answer: B

Section: Microbiology/Immunology Quantitative serological tests are being replaced by newer testing procedures, such



as ELISA, which is not quantitative. Understanding how quantitative data is used diagnostically is still important clinically. For best results for interpretation, an acute and convalescent serum from thepatient should be tested at the same time. If a 4-fold (1:2 dilutions) or 100-fold (1:10 dilutions) increase in Ab titer is found, that would be a positive diagnostic result. Often, as in this case, only a single serum sample was tested. Positive results through the highest dilution of serum could represent a very high Ab level or some problem with the test procedure, giving a false-positive interpretation. The most effective way to solve this problem is to dilute the serum further and repeat the test (choice B). Once an end-point is reached, this information may confirm or deny a possible diagnosis. An alternative test mechanism (choice A) may be available, but one must remember not to use results from two test mechanisms as a direct comparison for diagnostic purposes. This pattern is not uncommon (choice C) because high antibody titers may exist in some infections (EBV, for example). Negative (choice D) or positive (choice E) would be inappropriate reports without repeating the test as described above.

#### **QUESTION 3**

The parents bring a 5-month-old baby to the emergency room. It is their first child and they are insecure. The boy vomits frequently, seems to be constantly constipated, and has difficulties in defecation. A barium enema study reveals a region in the bowel that is collapsed and an enlarged colon above this area. Abiopsy from the part of the bowel 1 in above the anus is sent to the laboratory and histological analysis reveals the absence of ganglia in this tissue. What is the most likely diagnosis?

- A. cholecystitis
- B. gastroesophageal reflux disease
- C. hirschsprung disease
- D. polymyositis
- E. temporary problem with no treatment required
- Correct Answer: C

Section: Physiology Hirschsprung disease is a genetic disorder caused by the absence of enteric nerve cells in the wall of the sigmoid colon and/or rectum. The portion of the bowel wall without nerve ganglia (aganglionic) cannot relax in response to bowel content so that the stool builds up behind the obstruction. In some children the problems begin shortly after birth, other infants are not acutely ill, but develop chronic symptoms such as constipation or anemia. Cholecystitis (choice A), caused by inflammation of the gallbladder, gastroesophageal reflux disease GERD (choice B), and polymyositis (choice D), a disorder affecting esophageal skeletal muscle, do not affect the neuronal regulation of the large intestine. Hirschsprung disease is almost always treated by surgical removal of the affected bowel segment and then joining the healthy bowel segments (choice E). A GI motility disorder might improve on its own due to the ability of the enteric nervous system in healthy GI tract portions to learn new motility patterns. However, it takes a very long time and the success is not certain.

#### **QUESTION 4**

During development, the upper limb buds appear by day 27 and the lower limb buds by day 29. An apical ectodermal ridge at the tip of each limb bud promotes growth. This multilayered epithelial structure interacts with which of the following to direct the growth of the limb?

A. ectoderm

B. endoderm



- C. mesenchyme
- D. notochord
- E. sclerotome
- Correct Answer: C

Section: Anatomy The apical ectodermal ridge secretes fibroblast growth factors, which act on mesenchymal cells in the zone of polarizing activity at the posterior margin of the limb bud. Activation of the zone of polarizing activity causes expression of the sonic hedgehog gene. Proteins expressed by the sonic hedgehog gene control the anteroposterior developmental pattern of the limb. The apical ectodermal ridge is contained within the ectoderm (choice A) and has no interaction with the endoderm (choice B). The notochord (choice D) and sclerotome (choice E) are structures involved in the development of the axial skeleton and not the limbs.

#### **QUESTION 5**

The structure indicated by arrow 1 in following figure is innervated by which of the following?

- A. anterior ethmoidal nerve
- B. greater palatine nerve
- C. lesser palatine nerve
- D. middle superior alveolar nerve
- E. nasopalatine nerve

Correct Answer: D

Section: Anatomy Arrow 1 points to the maxillary sinus, which is innervated by the posterior, middle, and anterior superior alveolar nerves. The latter are branches from the infraorbital nerve arising from the maxillary division (V2) of the trigeminal (fifth cranial) nerve. The anterior ethmoidal nerve (choice A) is a branch of the nasociliary nerve from the ophthalmic division (V1) of the trigeminal nerve. The greater palatine nerve (choice B) and lesser palatine nerve (choice C) are branches of the maxillary division of the trigeminal nerve supplying the hard and soft palate, respectively. The nasopalatine nerve (choice E) is derived from the maxillary division of the trigeminal nerve and supplies the nasal septum.

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