

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

United States Medical Licensing Step 1

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**QUESTION 1**

A 73-year-old man is brought to his primary care physician by his wife who is concerned about her husband's progressive memory problems over the past year. She notes that he originally began forgetting to do his normal household chores, and then started routinely misplacing things around the house; he has also forgotten to close or lock doors or turn off the oven and has left the car running in the garage. He is having trouble remembering the driving routes to familiar places and names of longtime friends and acquaintances. The patient's neurological examination reveals disorientation to place and time, inability to recall three objects, and difficulty following a threestage command. Based on this information, which of the following best explains the pathogenesis of his condition?

- A. cortical atrophy with neuronal cytoskeletal abnormalities and abnormal filamentous protein aggregation
- B. gray matter damage to mammillary bodies and hemorrhage associated with nutritional deficiency
- C. infiltrative mass of pleomorphic cells with areas of pseudopalisading, necrosis, and endothelial cell proliferation
- D. injury of oligodendroglial cells with focal areas of demyelination, mononuclear infiltrate, and patchy gliosis
- E. selective neuronal loss secondary to excitotoxicity associated with excessive glutamate levels

Correct Answer: A

Section: Pathology and Path physiology This patient's symptoms are very consistent with a diagnosis of AD, the most common cause of dementia in patients over 55. Over the course of this disease, patients suffer progressive impairment in higher cognitive functioning, including memory loss, spatial disorientation, language deficits, and mood and behavior changes. In end-stage AD, patients become rigid, mute, and bedridden. Definitive diagnosis of AD requires histological examination of the brain; however, with proficient clinical evaluation postmortem findings agree with clinical diagnosis in approximately 90% of cases. Grossly, brains affected by AD demonstrate cortical atrophy with widening of the sulci; changes are usually most pronounced in the frontal, temporal, and parietal lobes. With advanced disease, parenchymal atrophy results in compensatory dilation of the ventricles (hydrocephalus ex vacuo). The most severe pathology is found in the hippocampus and the nucleus basalis of Meynert of the anterior forebrain, which represent the main source of cholinergic input to the cerebral cortex. The characteristic microscopic lesions in AD are neuritic plaques and NFTs. Plaques consist of focal, spherical deposits of aggregated amyloid beta (A) fibrils surrounded by degenerating neuronal processes (dystrophic neuritis), reactive astrocytes and microglia; A plays a major role in the pathogenesis of AD. NFTs represent twisted bundles of filaments within neuronal cell bodies that extend into dendrites. Their chief constituent is a hyperphosphorylated tau protein, an axonal microtubule-associated protein important for proper assembly and stability of microtubules, which are involved in the transport of essential molecules through the neuron. NFTs are also seen in neurodegenerative diseases other than AD. They are well demonstrated with silver stain and particularly affect pyramidal neurons (e.g., frontal cortex, hippocampus, amygdala) where they often have an elongated, flame-shaped appearance. Choice B refers to injury caused by thiamine deficiency in alcoholism; choice C describes the morphological appearance of a glioblastoma; choice D reflects changes seen in multiple sclerosis, and choice E describes biochemical changes that occur in cerebral ischemia.

**QUESTION 2**

Which of the following agents used in treating testicular cancer, requires hydration and diuresis to prevent renal toxicity?

- A. bleomycin
- B. cisplatin
- C. cyclophosphamide

D. 5-fluorouracil

E. paclitaxel

Correct Answer: B

Section: Pharmacology Cisplatin binds to DNA where it forms intra- and interstrand crosslinks. Cisplatin is particularly effective in testicular and ovarian cancers in combination with other antitumor agents. Cisplatin exerts a renal toxicity that may be prevented by the infusion of saline to maintain a high urine flow. Ototoxicity involving high-frequency hearing loss is an effect that is not prevented by hydration. The natural product bleomycin (choice A) binds to DNA and causes single- and double-strand breaks, leading to cytotoxicity. The drug is particularly useful against Hodgkin lymphoma and testicular tumors. Bleomycin has the serious toxicity of pulmonary fibrosis. Cyclophosphamide (choice C) is widely used in combination regimens. Nausea and vomiting are the most common toxicities. Hemorrhagic cystitis may be minimized by hydration and use of the drug mesna. Note that this toxicity is not at the level of the kidney. The pyrimidine analog 5-fluorouracil (5-FU) (choice D) is used to treat a wide variety of carcinomas. Toxicity from 5-FU is expressed as GI disturbances (anorexia, nausea, stomatitis, and diarrhea) and myelosuppression. Paclitaxel (choice E) is particularly useful in treating metastatic breast and ovarian cancer. The primary toxicity of paclitaxel is bone marrow suppression.

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### QUESTION 3

A suburban housewife was pricked by a thorn while pruning her roses. Four days later, a pustule that changed to an ulcer developed in the lesion area. Then three nodules formed along the local lymphatic drainage. The most likely agent is which of the following?

A. *A. fumigatus*

B. *C. albicans*

C. *Cryptococcus neoformans*

D. *Sporothrix schenckii*

E. *Trichophyton rubrum*

Correct Answer: D

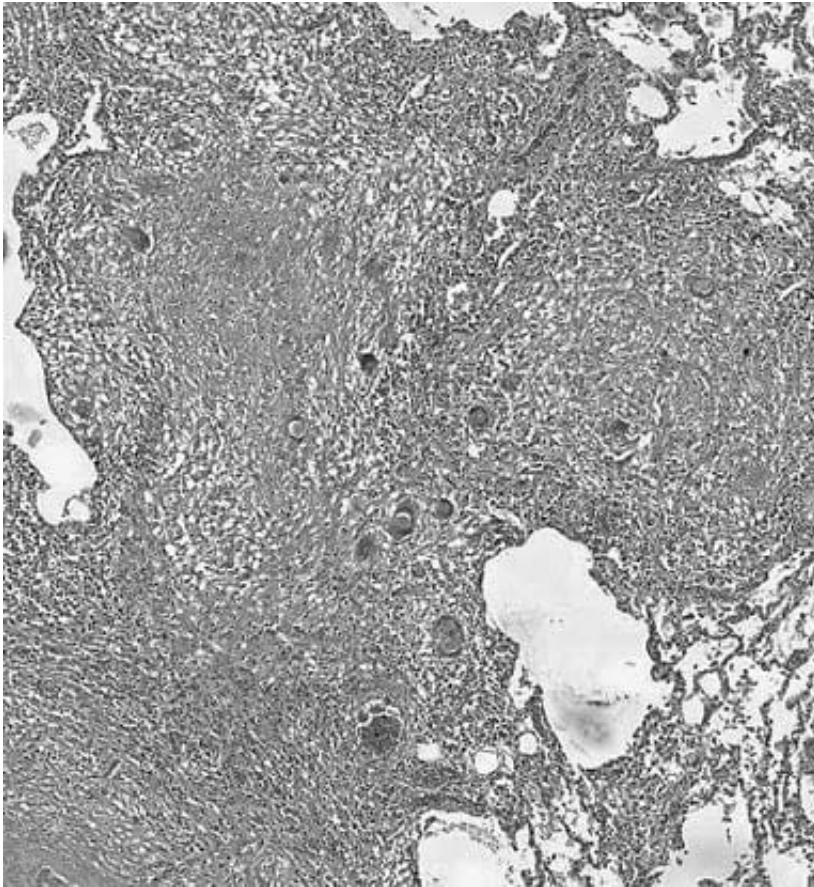
Section: Microbiology/Immunology

*S. schenckii* is found on thorns, and it is introduced into the skin of extremities through trauma. A regional lesion begins as a pustule, abscess, or ulcer, and then nodules and abscesses are formed along the lymphatics. The history and the symptoms described in this patient are consonant with a diagnosis of sporotrichosis. *A. fumigatus* (choice A) and *C. albicans* (choice B) are associated with deep opportunistic infections in immunocompromised patients such as AIDS patients. Aspergillosis is basically a pulmonary infection. Candidiasis can be associated with pathological conditions of the mucous membranes of the respiratory, genital, and gastrointestinal tract, where it is found as a normal inhabitant. *C. neoformans* (choice C) is the cause of meningitis. *T. rubrum* (choice E) is the cause of dermatophytosis ringworm of skin, scalp, and especially nails. The nails thicken and are discolored.

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### QUESTION 4

A 47-year-old man has been chronically ill for the past 18 months. He undergoes a lung biopsy and a section is shown in below figure. Which of the following is the most likely diagnosis?



- A. aspergillosis
- B. leprosy
- C. pneumocystosis
- D. sarcoidosis
- E. tuberculosis

Correct Answer: E

Section: Pathology and Path physiology Figure shows a microscopic section of lung in which there are a number of necrotizing granulomas containing giant cells. Aspergillosis (choice A) and pneumocystosis (choice C) are not associated with granuloma formation. Leprosy (choice B) does (in tuberculoid leprosy) form granulomas and may be found in the upper airways, but does not involve viscera such as the lung. Sarcoidosis (choice D) is a granulomatous disease of unknown etiology that can involve the lung and many other organs but the granulomas are non-necrotizing.

#### QUESTION 5

A 52-year-old man has a history of anginal pain that until recently was responsive to nitrates. He is now evaluated for possible angioplasty. The graph in below figure shows the ECG of this patient. Blood flow across the mitral valve is largest around which indicated point in this ECG tracing?

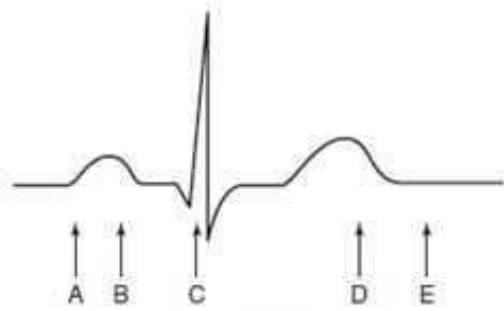


FIG. 2-5

- A. A
- B. B
- C. C
- D. D
- E. E

Correct Answer: E

Section: Physiology The most rapid filling of the ventricles occurs in early diastole, immediately after opening of the atrioventricular valves. This happens after the repolarization phase (T wave) and resulting relaxation of the cardiac ventricular muscle. Excitation of the atria (choice A) also results in increased blood flow into the ventricles, occurring around choice B. However, the flow at that time is less than during early diastole. Ventricular contraction begins with the QRS complex (choice C) and lasts until the end of the T wave (choice D). During this time, the mitral and tricuspid valves are closed.

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