# USMLE-STEP-1 Q&As

United States Medical Licensing Step 1

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**QUESTION 1**

The initial reaction of the de novo synthesis pathway for pyrimidine nucleotides begins with glutamine and C and is complete with the formation of uridine monophosphate. Which of the following

represents the ratelimiting enzyme in this pathway?

A. aspartate transcarbamoylase

B. orotate monophosphate decarboxylase

C. phosphoribosylpyrophosphate (PRPP) amido transferase

D. PRPP synthetase

E. ribonucleotide reductase

Correct Answer: A

Section: Biochemistry The first reaction of de novo pyrimidine biosynthesis is catalyzed by ATC. This reaction is also the rate-limiting step in this pathway. OMP decarboxylase (choice B) catalyzes the decarboxylation of OMP, yielding UMP. PRPP amido transferase (choice C) is an enzyme of the de novo purine biosynthesis pathway. PRPP synthetase (choice D) catalyzes the production of PRPP (used in the synthesis of purines and pyrimidines) from ribose-5-phosphate and ATP. Ribonucleotide reductase (choice E) is required for the reduction of ribonucleotides to deoxyribonucleotides.

**QUESTION 2**

A 23-year-old woman is admitted to the hospital suffering from palpitations and syncopal episodes (fainting spells). She is found to be hypotensive and her ECG shows a very rapid AV nodal reentrant tachycardia. Which of the following drugs provides appropriate acute treatment for this condition?

A. adenosine

B. bethanechol

C. isoproterenol

D. metoprolol

E. procainamide

Correct Answer: A

Section: Pharmacology The current drug of choice for acute AV nodal reentrant tachycardia (a supraventricular tachycardia [SVT]) is the nucleoside adenosine. This agent, when given as a bolus, causes marked hyperpolarization of AV node tissue and transiently blocks conduction of AV node action potentials. This abolishes the reentrant impulse and allows normal sinus rhythm to be reestablished. The half-life of adenosine is about 3 seconds and the duration of action of the dose used is about 15 seconds, so toxicities from this therapy are minimal. Calcium channel blockers such as verapamil and diltiazem are also effective in SVT. Bethanechol (choice B) is a muscarinic agonist and produces

hypotension and other muscarinic effects. It is ineffective in SVT. Isoproterenol (choice C) is a beta-selective adrenoreceptor agonist that causes hypotension and reflex sympathetic discharge to the heart, along with direct stimulation. It is more likely to cause than to abolish arrhythmias. Metoprolol (choice D) slows AV conduction and might abolish the AV reentrant rhythm. However, beta blockers are not very effective in converting preexisting SVT. Procainamide (choice E) and related group 1A antiarrhythmic drugs are not as effective as adenosine in converting SVT to normal sinus rhythm and much more toxic.

**QUESTION 3**

A 26-year-old man presents with a 3-week history of increasing pain just below his right knee. He does not recall sustaining any trauma to his leg and is not experiencing pain elsewhere; he states that he is otherwise healthy. Examination reveals only tenderness to palpation in the area. An x-ray of his right knee demonstrates a small lytic lesion in the tibial medial condyle surrounded by a focus of sclerosis. Based on this information, what is the most likely diagnosis?

A. gout

B. osteochondroma

C. osteomyelitis

D. osteosarcoma

E. rheumatoid arthritis

Correct Answer: C

Section: Pathology and Path physiology Bacteria are the principle cause of osteomyelitis, infecting bone either by direct penetration (e.g., puncture), extension from a surrounding area (e.g., cellulitis), or via hematogenous spread of an overt infection (e.g., sinusitis, pneumonia) or an occult bacteremia (e.g., mouth, intestinal flora); the leading causative pathogen is S. aureus. Long bone metaphyses are commonly infected in children, whereas long bone epiphyses and vertebrae are more typically affected in adults. Presentation may be limited to pain, with or without fever. The classic x-ray findings include lytic changes caused by necrotic bone (sequestrum) and sclerosis due to the ingrowth of fibrous tissue as new bone growth (involucrum) forms around the devitalized bone. Gout (choice A) is associated with hyperuricemia, leading to acute synovial inflammation and deposition of urate crystals in joint spaces; similarly, rheumatoid arthritis (choice E) is an autoimmune disorder affecting the synovial lining of various joints (chronic synovitis). Osteosarcomas (choice D) are typically large, bulky malignancies most commonly originating in long bone metaphyses, often with secondary spread into epiphyseal regions. Osteochondromas (choice B) are benign tumors arising near the growth plate in endochrondrally derived long bones which form bony, pedunculated, cartilage-capped lesions.

**QUESTION 4**

In the central auditory pathways, second-order neurons are located in which of the following?

A. cochlear (spiral) ganglion

B. cochlear nuclei

C. inferior colliculi

D. nuclei of lateral lemniscus

E. superior olivary nuclei

Correct Answer: B

Section: Anatomy Second-order neurons in the central auditory pathways are located in the dorsal and ventral cochlear nuclei. They receive afferents from the first-order neurons located in the cochlear (spiral) ganglion (choice A). Secondorder fibers from the cochlear nuclei project in turn to the inferior colliculi (choice C), nuclei of lateral lemniscus (choice D), and superior olivary nuclei (choice E).

**QUESTION 5**

A 70-year-old man presents with Parkinson\\'s disease in an early stage. Which of the following drugs acts directly on dopamine receptors to reduce the signs and symptoms of Parkinson\\'s disease?

A. amantadine

B. carbidopa

C. entacapone

D. orphenadrine

E. pramipexole

Correct Answer: E

Section: Pharmacology Pramipexole is a dopamine receptor agonist unrelated to levodopa or ergot derivatives such as bromocriptine and pergolide (which are also useful dopamine agonists). Amantadine (choice A) acts to facilitate the release or slow the reuptake of dopamine, but does not act on the dopamine receptor. Carbidopa (choice B) blocks the peripheral conversion of levodopa to dopamine, it does not act on dopamine receptors. Entacapone (choice C) blocks the peripheral metabolism of levodopa by catechol- Omethyltransferase. Orphenadrine (choice D) is a centrally acting anticholinergic agent that is sometimes used in Parkinson\\'s disease.