USMLE-STEP-1 Q&As

United States Medical Licensing Step 1

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QUESTION 1

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?

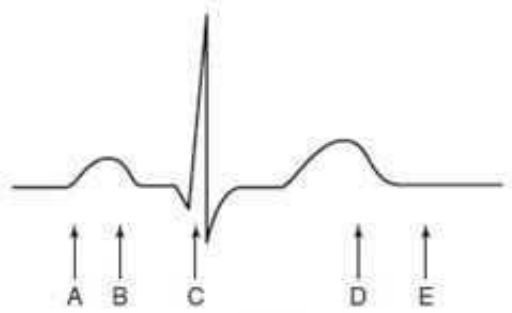

FIG. 2-5

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.

QUESTION 2

A 7-year-old boy experienced respiratory tract inflammation, sore throat, and fever. Labored breathing soon followed the development of a gray membrane in the tonsil area, and diphtheria was diagnosed. Which of the following represents the most immediate course of action by his physician?

A. acid-fast stain of a throat specimen

B. culture of a throat specimen on blood agar

C. injection of diphtheria antitoxin

D. oral administration of sulfonamides

E. performance of a spinal tap

Correct Answer: C

Section: Microbiology/Immunology A physician is justified in giving antitoxin on clinical evidence, or suspicion of diphtheria, without waiting for laboratory confirmation. The antitoxin dosage should be adjusted according to the weight of the patient and the severity of the infection. The antitoxin is given to neutralize free diphtheria exotoxin in the body fluids and timeliness is of extreme importance. Once the exotoxin has been bound by the body cells and exerted its influence, diphtheria antitoxin is of little value. C. diphtheria localizes in the throat, and thus spinal taps are useless (choice E). Tellurite agar, not blood agar, is used for the isolation of C. diphtheriae from throat swabs, because it is a selective medium for this germ, inhibiting the growth of other bacteria present in throat swabs (choice B). C. diphtheriae is not an acid-fast microbe. Methylene blue is used to stain smears for the bacteriological diagnosis of diphtheria (choice A). This initial treatment of choice for diphtheria is antitoxin. Treatment with penicillin G or erythromycin, but not sulfonamides, may be used.

Penicillin G or erythromycin are not substitutes for diphtheria antitoxin (choice D).

QUESTION 3

A patient with AIDS has bacterial meningitis and is being treated with an antimicrobial agent cleared by both hepatic metabolism and renal excretion. The volume of distribution is 10 L and the half-life for elimination is 7 hours in this patient. If the renal contribution to the plasma clearance of the drug is 8.3 mL/ min, approximately what percentage of the drug\\'s elimination can be attributed to hepatic metabolism?

A. 10%

B. 25%

C. 50%

D. 75%

E. 90%

Correct Answer: C

QUESTION 4

The patient is a 43-year-old male. He is anemic, with a hemoglobin level of 12.2 g/dL (normal is 15.5 g/dL). The erythrocytes are microcytic (MCV = 70 fL, with normal MCV = 80100 fL). Which of the following would most likely be present in this patient?

A. acute bleeding

B. folate deficiency

C. iron deficiency

D. vitamin deficiency

E. vitamin K deficiency

Correct Answer: C

QUESTION 5

The ability of rod cells in the eye to respond to light and transmit that response to the optic nerve requires that the 11-cis form of vitamin A be attached to which of the following proteins?

A. cGMP phosphodiesterase

B. Na+ channel

C. rhodopsin

D. scotopsin

E. transducin

Correct Answer: D

Section: Biochemistry Both rod and cone cells contain a photoreceptor pigment in their membranes. The photosensitive compound (photoreceptor) of most mammalian eyes is a complex of protein and an aldehyde form of vitamin A. The protein component is a member of the opsin family called scotopsin. The photoreceptor of rod cells is specifically called rhodopsin (choice C) or visual purple, which is a complex between the protein scotopsin and the 11-cis-retinal form of vitamin A. Intracellularly, rhodopsin is coupled to a specific G- protein called transducin (choice E). When the rhodopsin is exposed to light it is bleached releasing the 11- cis-retinal from opsin. Absorption of photons by 11-cis-retinal triggers a series of conformational changes on the way to conversion all-trans-retinal. The release of opsin results in a conformational change in the photoreceptor. This conformational change activates transducin, leading to an increased GTP-binding by the alpha-subunit of transducin. Binding of GTP releases the alpha- subunit from the inhibitory beta- and gamma-subunits. The GTPactivated alpha-subunit in turn activates an associated phosphodiesterase (choice A), an enzyme that hydrolyzes cyclic-GMP (cGMP) to GMP. Cyclic GMP is required to maintain the Na+ channels (choice B) of the rod cell in the open conformation. The drop in cGMP concentration results in complete closure of the Na+ channels.