Vendor:USMLE

Exam Code:USMLE-STEP-1

Exam Name: United States Medical Licensing Step 1

Version: Demo

QUESTION 1

A 64-year-old alcoholic man has fever, chills, cough, and pleuritic pain. His sputum is a dark brown color, and upon cultivation on blood agar produces alpha hemolytic colonies, composed of gram- positive, optochin-positive cocci. The microbes are which of the following?

A. E. faecalis

B. N. meningitides

C. S. aureus

D. S. pneumonia

E. S. pyogenes

Correct Answer: D

Section: Microbiology/Immunology The main symptoms of pneumonia caused by S. pneumoniae are fever, chills, and cough that produce a dark brown sputum. Alcoholism predisposes an individual to pneumonia because it reduces phagocytic activity, and promotes aspiration of microbes. In addition to S. pneumoniae (choice D), S. pyogenes (choice E), S. aureus (choice C), and N. meningitidis (choice B) can cause pneumonia. However, these other microbes do not produce alpha hemolysis and are not sensitive to optochin.

QUESTION 2

A 76-year-old woman suffers a massive myocardial infarct and dies in cardiogenic shock 20 hours after its onset. Microscopic examination of her infarcted myocardium would be expected to demonstrate which of the following?

A. abundant neutrophils and monocytes

B. coagulative necrosis with few neutrophils

C. fibrosis and collagen deposition

D. monocytes and neovascularization

E. plasma cells and caseous necrosis

Correct Answer: B

Section: Pathology and Path physiology A 20-hour-old ischemic infarct of the myocardium should demonstrate coagulative necrosis without much of an inflammatory response. Abundant neutrophils and monocytes (choice A) typically are seen about 24 days after an infarction. Fibrosis and collagen deposition (choice C) are late healing phenomena that do not begin until at least 1 week after the infarct has occurred. Monocytic infiltration and neovascularization (choice D) usually occur about 36 days after an infarction. Plasma cells and caseous necrosis (choice E) are not seen with ischemic myocardial damage. Plasma cells are typically seen in areas of chronic inflammation and caseous necrosis is found in granulomas produced in response to tuberculosis and certain fungal infections.

QUESTION 3

A 57-year-old female patient has suffered a major stroke and as a result is in a coma. The attending neurologist is very concerned because the patient is developing ataxic breathing. The pneumotaxic center and apneustic centers of the brain are located in which of the following?

A. diencephalon

B. midbrain

C. pons

D. spinal cord

E. telencephalon

Correct Answer: C

Section: Anatomy

The pneumotaxic center is located in the upper one-third of the pons, whereas the apneustic center is in

the lower two-thirds. The apneustic center promotes inspiration and the pneumotaxic center, expiration.

The telencephalon (choice E), diencephalon (choice A), midbrain (choice B), and spinal cord (choice D)

are not known to contain pneumotaxic or apneustic centers.

QUESTION 4

What would be the appearance of invasives C. albicans in a Gram-stained abnormal vaginal smear?

A. arthrospores-alternating filled and empty

B. branching mycelia

C. budding yeast cells and hyphae

D. endosporulating spherules

E. single yeast cells

Correct Answer: C

Section: Microbiology/Immunology Candida species are considered to be opportunistic microorganisms. They are normal or usual members of the skin, mucus membranes, and the GI tract. The risk of endogenous opportunistic infection is ever-present. In culture or tissue, candida species grow as oval, budding yeast cells (36 m) which stain blue in the Gram-stain procedure. They also form pseudohyphae when the buds grow, but fail to detach. C. albicans is dimorphic, being also able to produce true hyphae. Diagnostically, C. albicans will begin to form true hyphae (germ tubes) in serum at 37°C in the la boratory. With these characteristics in mind, choice C is correct. Alternating filled and empty arthrospores (choice A) is characteristic of coccidioides. Branching mycelia (choice B) is a general characteristic seen in any mold colony on agar and is not specific for candida. Endosporulating spherules (choice D) are also seen in tissue with coccidioides. Single yeast cells (choice E) may be occasionally seen with candida, but most candida spores will be associated with buds and pseudohyphae.

QUESTION 5

The protein encoded by the APC gene is a tumor suppressor the role of which is to regulate the activity of cellular signaling induced by the Wnt growth factor. Therefore, loss of APC activity is associated with unrestrained cellular proliferation. Which of the following signaling molecules is the target for APC interaction?

A. beta-catenin

B. MYC

C. p53

D. pRB

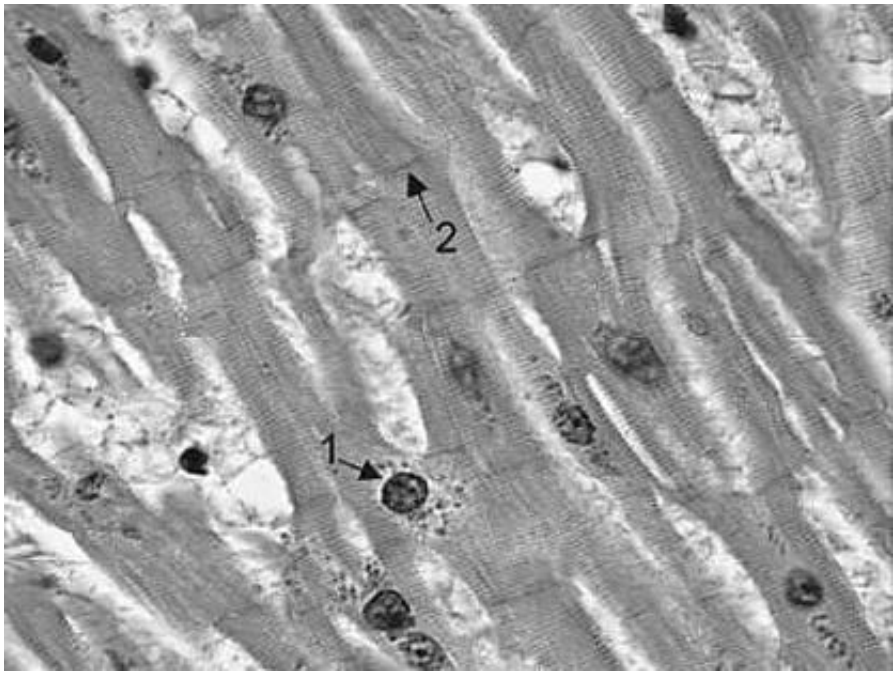
E. von Hippel-Lindau protein (pVHL)

Correct Answer: A

Section: Biochemistry The protein of the Wnt signaling cascade, to which APC associates, is beta-catenin. Using antibodies specific for the NH2-terminus of APC, it was possible to coprecipitate additional PCassociated proteins leading to the identification that one of these APC-associated proteins was beta-catenin. The catenins are a family of proteins that interact with the cytoplasmic portion of the cadherins (cell-cell adhesion family of proteins), thus linking the cadherins to the actin cytoskeleton. Catenins are equally important in the signaling cascade initiated by the Wnt family of proteins that are involved in embryonic patterning, development of the nervous system. The Wnt proteins are secreted factors that interact with cell-surface receptors. Wntreceptor interaction induces the activity of the cytoplasmic phosphoprotein dishevelled. Activated dishevelled inhibits the serine/ threonine kinase glycogen synthase kinase-3-beta (GSK-3). When GSK-3-beta is inhibited, beta-catenin becomes hypophosphorylated. The hypophosphorylated form of beta-catenin migrates to the nucleus and interacts with transcription factors, thereby, inducing expression of various genes. The role of APC in this pathway is to bind phosphorylated beta-catenin. The APC-beta-catenin complex stimulates the breakdown of beta-catenin. Therefore, mutations that lead to a loss of APC, or to a loss of the portion of the APC protein that interacts with beta-catenin, would lead to constitutive activation of several genes that could then promote the transformed phenotype. None of the other proteins (choices BE) are known to interact with APC.

QUESTION 6

Referring to following figure, arrow 2 indicates which of the following structures?



A. intercalated disk

B. motor end-plate

C. sarcoplasmic reticulum

D. tendinous junction

E. transverse tubule or T tubule

Correct Answer: A

Section: Anatomy The intercalated disks are specialized junctional complexes found only in cardiac muscle and they appear as dark lines between the muscle fibers. The motor end-plate (choice B) is a specialized group of synapses between the axon terminals of a motor neuron and the sarcolemma of a skeletal muscle fiber. It is not seen in cardiac muscle. The sarcoplasmic reticulum (choice C) is a specialized modification of the smooth endoplasmic reticulum for sequestering calcium ions. The transverse tubule or T tubule (choice E) is an invagination of the sarcolemma, which penetrates the muscle fiber and overlies the surface of the myofibrils. The sarcoplasmic reticulum and T tubule can only be seen in electron micrographs. There is no tendinous junction (choice D) in cardiac muscle.

QUESTION 7

A 67-year-old retiree was employed for many years in the plastics industry where he was exposed to vinyl chloride. This industrial exposure has increased his likelihood of developing which of the following?

A. focal nodular hyperplasia

B. hepatic adenoma

C. hepatic angiosarcoma

D. hepatic fibroma

E. hepatocellular carcinoma

Correct Answer: C

Section: Pathology and Path physiology Environmental exposure to vinyl chloride is associated with the later development of hepatic angiosarcoma. Focal nodular hyperplasia (choice A) and hepatic fibroma (choice D) do not at present have well-defined antecedent environmental exposure histories. Hepatic adenomas (choice B) occur sporadically in the setting of exogenous steroid hormone usage. Hepatocellular carcinoma (choice E) is associated with cirrhosis, chronic viral hepatitis, and aflatoxin exposure.

QUESTION 8

Acetyl-CoA enhances the rate of gluconeogenesis by acting as an allosteric activator of which of the following enzymes?

A. ACC

B. PEP-carboxykinase

C. pyruvate carboxylase

D. PDH

E. pyruvate kinase

Correct Answer: C

Section: Biochemistry The major substrates of gluconeogenesis are pyruvate and lactate. During gluconeogenesis lactate is oxidized to pyruvate. For pyruvate to be converted back to glucose, it must first be carboxylated to oxaloacetate, since a reversal of the PK reaction of glycolysis cannot occur to convert the pyruvate to phosphoenolpyruvate. The carboxylation of pyruvate is catalyzed by the mitochondrial enzyme pyruvate carboxylase. The activity of pyruvate carboxylase is absolutely dependent on the presence of acetyl-CoA, which allosterically activates the enzyme. Of the enzymes listed, only pyruvate carboxylase and PEPCK (choice B) are involved in gluconeogenesis. ACC (choice A) is involved in fatty acid synthesis and is not regulated by acetyl-CoA. PDH (choice D) is the entry point for pyruvate into the TCA cycle. It is also inhibited by acetyl- CoAvia the acetyl-CoA-mediated activation of PDH kinase, an enzyme that phosphorylatesand inactivates PDH. PK (choice E) is a glycolytic enzyme and is inhibited by acetyl-CoA, not activated by it.

QUESTION 9

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 10

A 38-year-old sexually-active woman developed symptoms of lower abdominal pain with adjacent tenderness. No gram-negative cocci were observed or isolated. The obligate intracellular organism causing the infection is unable to perform which of the following metabolic functions?

A. form ATP

B. form the intracellular, metabolically active, reticulate body

C. produce polypeptides

D. reproduce by binary fission

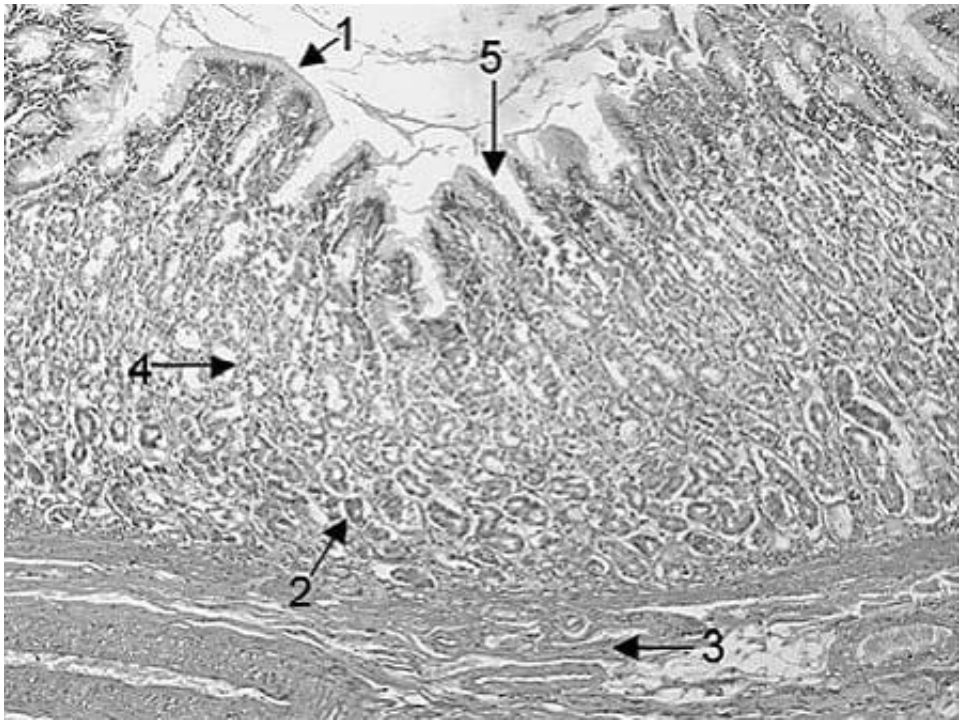
E. synthesize DNA gyrase

Correct Answer: A

Section: Microbiology/Immunology Chlamydae are obligate intracellular parasites because they cannot synthesize ATP. They are classified as bacteria because they divide by binary fission (choice D), form polypeptides (choice C), produce RNA, DNA, and DNA gyrase (choice E). Finally, they synthesize two unique morphological forms. That is, the extracellular infective, metabolically inert elementary body, and the intracellular, metabolically active reticulate body (choice B).

QUESTION 11

The chief or peptic (zymogenic) cells of the gastric glands secrete pepsinogen. The latter is converted to pepsin, a 35-kilodalton (kDa) proteolytic enzyme, when the pH in the stomach falls below 5.0. In Following figure, which of the following arrows point to the location of chief or peptic (zymogenic) cells?



A. 1

B. 2

C. 3

D. 4

E. 5

Correct Answer: B

Section: Anatomy Arrow 2 points to the base of the gastric glands where chief or peptic (zymogenic) cells tend to be clustered. Arrow 1 points to the luminal surface of the stomach where mucus-secreting cells are found. Arrow 3 points to the muscularis mucosae. Arrow 4 points to the middle of the gastric glands where parietal or oxyntic cells tend to be most numerous. Arrow 5 point to the side of a gastric pit where mucus-secreting cells are also found.

QUESTION 12

Acollege freshman exhibits symptoms of fever, malaise, sore throat, and fatigue. She also has enlarged lymph nodes and spleen and large, atypical T-lymphocytes. Which of the following tests can be used to confirm which virus is the etiologic agent?

A. antibody that reacts with Epstein-Barr virus (EBV)-associated nuclear antigen

B. antibody to hemagglutinin

C. antibody to neuraminidase (NA)

D. heterophile antibody that reacts with antigens on sheep erythrocytes

E. nucleic acid hybridization assays for the presence of Epstein-Barr viral nucleic acid

Correct Answer: E

Section: Microbiology/Immunology Infectious mononucleosis is caused by EBV, which is a member of the herpesviruses. Nucleic acid hybridization assays for EBV DNAare the most sensitive means of diagnosing infectious mononucleosis. Hemagglutinins (choice B) and NAs (choice C) are associated with orthomyxoviruses and paramyxoviruses. The majority of infectious mononucleosis patients develop what is known as an heterophile antibody, antibodies that cross-react with unrelated antigens, such as those found on sheep and horse erythrocytes. The heterophile antibody test (choice D) is used for the diagnosis of infectious mononucleosis, but since it is not a very specific test, it is not as good as the nucleic acid hybridization assays for the presence of Epstein-Barr viral nucleic acid. Important antigens that also may be used, but which are less sensitive for diagnostic purposes, include the viral capsid protein (VCA), the early proteins (EA), and the EBV-associated nuclear antigen (EBNA). Infectious mononucleosis patients develop antibody titers exceeding 1:320 and 1:20 against VCA and EA, respectively, during the acute phase of infectious mononucleosis. Antibodies to EBNA develop 12 months after acute infection (choice A).