



RACP
Specialists. Together

RACP Written Examination February 2018

Adult Medicine

Medical Sciences questions 101–170

101. Treatment of oestrogen-receptor positive breast cancer with tamoxifen causes cells to accumulate in which cell cycle phase?

- A. G₀
- B. G₁
- C. G₂
- D. M
- E. S

102. A 68-year-old man with rheumatoid arthritis for 15 years has the following bone densitometry results obtained on a dual energy x-ray absorptiometry scan:

	<i>T</i> score	<i>Z</i> score
Lumbar spine	+1.3	+2.0
Femoral neck	-2.4	-1.7

What is the most likely explanation for the discrepancy between the femoral neck and lumbar spine readings?

- A. Metastatic bone disease.
- B. Osteonecrosis of the hip.
- C. Osteophyte formation in the lumbar spine.
- D. Paget disease in the lumbar spine.
- E. Synovitis in the hip.

103. Which drug of addiction stimulates gamma-aminobutyric acid A (GABA-A) receptors?

- A. Alcohol.
- B. Cocaine.
- C. Heroin.
- D. Methamphetamine.
- E. Nicotine.

104. For a standard oxygen dissociation curve, decrease in which factor will cause a right shift in the curve?

- A. 2,3-diphosphoglyceric acid.
- B. CO₂.
- C. Haemoglobin.
- D. pH.
- E. Temperature.

105. In the evaluation of a patient with suspected kidney disease, the use of a urinary dipstick (Multi-stick) may fail to detect significant quantities of which of the following?

- A. Albumin.
- B. Erythrocytes.
- C. Leucocytes.
- D. Nitrites.
- E. Non-albumin protein.

106. The in vitro gamma interferon release assay Quantiferon TB Gold™ is commonly used in patients with suspected *Mycobacterium tuberculosis* (MTB).

What is the main role of the Quantiferon Gold test?

- A. Detect exposure to MTB.
- B. Determine extent of MTB disease.
- C. Determine response to MTB therapy.
- D. Predict active MTB.
- E. Rule out MTB.

107. Initiation of inflammation in acute gout is critically dependent upon which cytokine?

- A. Interferon gamma.
- B. Interleukin 1 beta.
- C. Interleukin 13.
- D. Interleukin 17.
- E. Tumour necrosis factor.

108. Obstructive sleep apnoea is associated with an increased prevalence of systemic hypertension. What is the predominant mechanism for this?

- A. Increased cardiac output.
- B. Increased sympathetic tone.
- C. Resetting of renal pressure-natriuresis.
- D. Upregulation of carotid chemoreceptor sensitivity.
- E. Vasoconstriction secondary to intermittent hypercapnia.

109. Which of the following is a minor criterion for the diagnosis of acute rheumatic fever?

- A. Carditis.
- B. Polyarthritis.
- C. Prolonged PR interval.
- D. Proteinuria.
- E. Subcutaneous nodules.

110. In a randomised controlled trial, the time from recruitment to the first cardiovascular event is measured.

What is the best term to express the result?

- A. Hazard ratio.
- B. Incidence rate.
- C. Odds ratio.
- D. Relative risk.
- E. Risk difference.

111. BCL-2 inhibitors have recently shown to have therapeutic efficacy in blood cancers.

What is the function of BCL-2 protein?

- A. Activates cell death receptors.
- B. Activates cell survival proteins.
- C. Activates effector caspases.
- D. Inhibits cell apoptotic proteins.
- E. Inhibits cell survival proteins.

112. By which mechanism does dobutamine predominantly increase cardiac output?

- A. Activation of cell surface dopamine receptors.
- B. Inhibition of alpha-adrenoceptors.
- C. Reduction in breakdown of cyclic AMP.
- D. Relaxation of vascular smooth muscle.
- E. Stimulation of beta-adrenoceptors.

113. N-methyl-D-aspartate (NMDA) receptors are activated by which one of the following?

- A. Dopamine.
- B. Glutamate.
- C. Melatonin.
- D. Noradrenalin.
- E. Serotonin.

114. In patients undergoing acute rejection of the renal allograft, biopsy specimens are likely to show predominant infiltration of the graft by which one of the following?

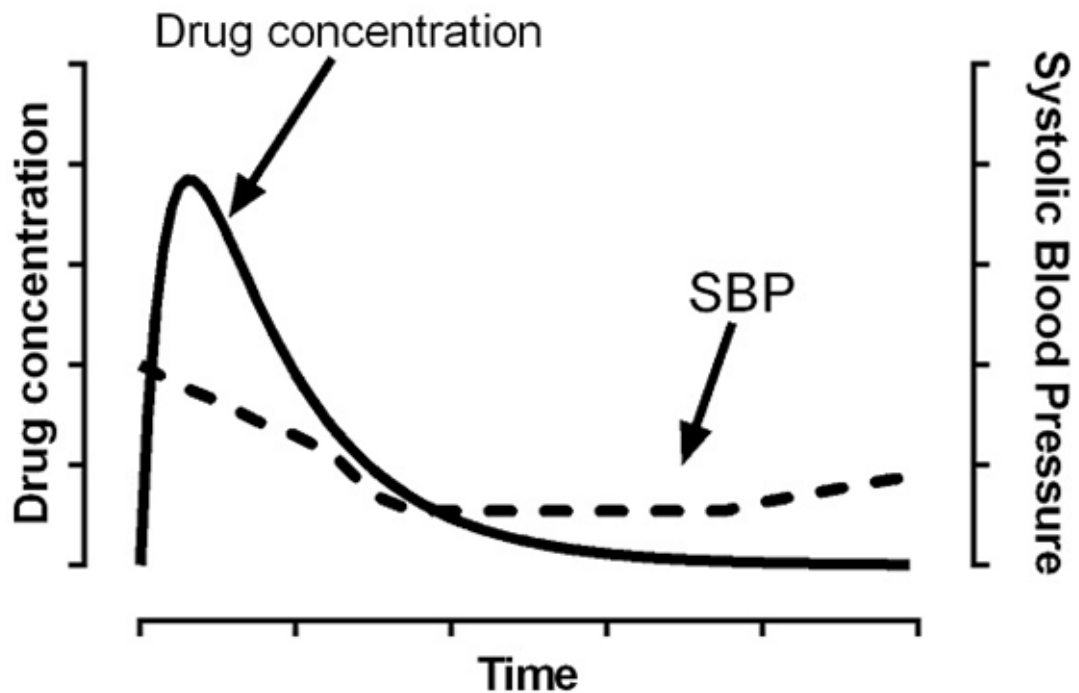
- A. B-cells.
- B. Dendritic cells.
- C. Macrophages.
- D. T-cells.
- E. Natural killer (NK) cells.

115. Which investigation is most specific for confirming a diagnosis of complement-mediated haemolysis?

- A. Direct antiglobulin (Coombs).
- B. Free haemoglobin.
- C. Haptoglobin.
- D. Lactate dehydrogenase.
- E. Reticulocytes.

116. The graph below shows changes in the drug plasma concentration and systolic blood pressure (SBP) over 24 hours following administration of a single dose.

Relationship between drug concentration and systolic blood pressure (SBP)



What is the best explanation for this pharmacokinetic-pharmacodynamic relationship?

- A. An active metabolite.
- B. Rapid absorption.
- C. Receptor upregulation.
- D. Short elimination half-life.
- E. Tachyphylaxis.

117. Molecular mimicry may account for the development of carditis in acute rheumatic fever. The streptococcal M protein and *N*-acetyl-beta-D-glucosamine share epitopes with which component of cardiac tissue?

- A. Actin.
- B. Desmosomes.
- C. Myosin.
- D. T-tubules.
- E. Troponin.

118. Which antioxidant is required for the conversion of the paracetamol metabolite *N*-acetyl-*p*-benzoquinone imine (NAPQI) to non-toxic substances?

- A. Catalase.
- B. Catechol-*O*-methyltransferase.
- C. Glutathione.
- D. Lipoic acid.
- E. Superoxide dismutase.

119. Neurofibrillary tangles are typically seen in what type of dementia?

- A. Alzheimer disease.
- B. Dementia with Lewy bodies.
- C. Frontotemporal dementia.
- D. Parkinson disease dementia.
- E. Vascular dementia.

120. A 28-year-old Caucasian woman has a diagnosis of phenylketonuria, an autosomal recessive disorder of amino acid metabolism. She is planning a future pregnancy with her husband, who is also Caucasian, but does not have phenylketonuria. The incidence of phenylketonuria in the Caucasian population is 1 in 10,000 births.

What is the risk that their first child will be affected with phenylketonuria?

- A. 1 in 10
- B. 1 in 50
- C. 1 in 100
- D. 1 in 1000
- E. 1 in 100,000

121. Which of the following is a relative contraindication to the use of adenosine in supraventricular tachycardia?

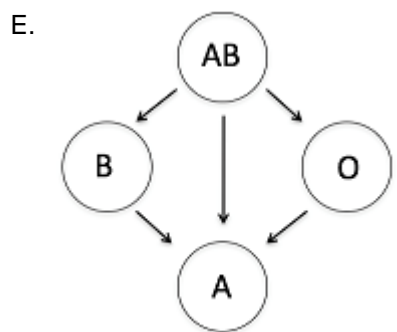
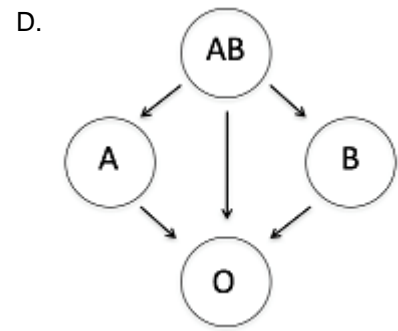
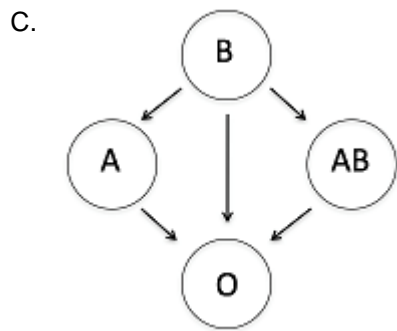
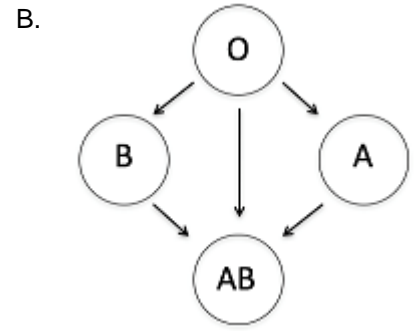
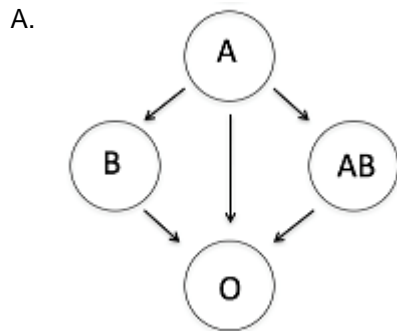
- A. Child–Pugh class C cirrhosis.
- B. End-stage chronic kidney disease.
- C. Poorly-controlled hypertension.
- D. Severe asthma.
- E. Third trimester pregnancy.

122. In the setting of chronic glucocorticoid use, what is the primary mechanism of glucocorticoid-induced osteoporosis?

- A. Adrenal suppression.
- B. Increased osteoclast-mediated bone resorption.
- C. Increased urinary calcium and decreased intestinal calcium absorption.
- D. Reduced serum oestrogen and androgens.
- E. Suppression of osteoblast proliferation and differentiation.

123. The circles represent blood groups. The arrows represent the direction of donor to recipient.

Which diagram is correct for transfusion of plasma products (for example, fresh frozen plasma)?



- 124.** When performing nerve conduction studies, abnormal findings on repetitive nerve stimulation indicate dysfunction of which structure?
- A. Microtubule.
 - B. Muscle spindle.
 - C. Neuromuscular junction.
 - D. Node of Ranvier.
 - E. Sarcoplasmic reticulum.
- 125.** If a patient has strong positive anti-dsDNA antibodies (> 100 IU/mL) and a negative screen for extractable nuclear antigens (ENA), what is the most likely pattern on antinuclear antibody (ANA) testing?
- A. Centromere.
 - B. Homogeneous.
 - C. Negative (no pattern seen).
 - D. Nucleolar.
 - E. Speckled.
- 126.** Metoprolol is avoided as the first-line antihypertensive in patients with pheochromocytoma because it antagonises the effects of which adrenoceptor?
- A. Alpha-1.
 - B. Alpha-2.
 - C. Beta-1.
 - D. Beta-2.
 - E. Beta-3.

127. What is the expected effect of optic nerve demyelination on visual evoked potentials?

- A. Decreased amplitude.
- B. Decreased latency.
- C. Increased amplitude.
- D. Increased latency.
- E. No change.

128. Rheumatoid factor antibodies are directed against which antigenic component?

- A. Citrullinated peptides.
- B. Deoxyribonucleic acid (DNA).
- C. Extractable nuclear proteins.
- D. Neutrophil cytoplasmic antigens.
- E. The Fc portion of immunoglobulin G.

129. What is the most prevalent neuropsychiatric complication of systemic lupus erythematosus?

- A. Anxiety disorder.
- B. Cognitive dysfunction.
- C. Major depression.
- D. Mania.
- E. Psychosis.

130. What is the main purpose of somatic hypermutation in B cells?

- A. Deletion of autoreactive B cells.
- B. Expression of class II MHC.
- C. Generation of receptor diversity.
- D. Induction of anergy.
- E. Selection of high affinity B cells.

131. The pharmacokinetic properties of which analogue insulin are largely determined by binding to and dissociation from serum albumin?

- A. Aspart.
- B. Detemir.
- C. Glargine.
- D. Glulisine.
- E. Lispro.

132. In which of the following groups is the benefit of BRCA1/2 genetic testing most established?

- A. Men \leq 60 years of age with prostate cancer.
- B. Men with breast cancer irrespective of age.
- C. Women with breast cancer who have two relatives with diagnosis of breast cancer.
- D. Women with epithelial ovarian cancer irrespective of grade.
- E. Women \leq 50 years of age with triple negative breast cancer.

133. Hepatic proprotein convertase subtilisin/kexin type 9 (PCSK9) impacts lipid metabolism.

Which plasma lipid component is increased by PCSK9?

- A. Chylomicrons.
- B. High density lipoprotein.
- C. Intermediate density lipoprotein.
- D. Low density lipoprotein.
- E. Very low density lipoprotein.

134. What is the most common pattern of interstitial lung disease in rheumatoid arthritis?

- A. Acute interstitial pneumonia.
- B. Desquamative interstitial pneumonia.
- C. Lymphocytic interstitial pneumonia.
- D. Organising pneumonia.
- E. Usual interstitial pneumonia.

135. Fabry disease is an X-linked condition causing hypertrophic cardiomyopathy, chronic kidney disease and an increased risk of stroke. Females may develop all manifestations of the disease, although often later in life and with less severity than in men.

What phenomenon explains this observation?

- A. Autosomal isodisomy.
- B. Germline mosaicism.
- C. Heteroplasmy.
- D. Lyonisation.
- E. Maternal imprinting.

136. What is the mechanism of action of inhaled mannitol in the treatment of cystic fibrosis?

- A. Augments action of aminoglycosides.
- B. Augments function of cystic fibrosis transmembrane conductance regulator.
- C. Directly toxic to Gram-negative bacteria.
- D. Increases hydration of airway surface liquid.
- E. Inhibition of the biofilm matrix.

137. What is the primary action of vasopressin?

- A. Generation of aquaporins in the proximal tubule.
- B. Modification of water permeability in the collecting duct.
- C. Regulation of reabsorption in the ascending loop of Henle.
- D. Sodium handling in the distal convoluted tubule.
- E. Sodium sensing in the juxtaglomerular apparatus.

138. In patients with hepatic encephalopathy, lactulose may be beneficial by increasing the amount of non-absorbable ammonium (NH_4) formation in the colon.

Which indirect mechanism of lactulose within the colon likely mediates this effect?

- A. Decreases formation of acetic acid.
- B. Decreases nitrogen excretion.
- C. Decreases pH.
- D. Increases disaccharidase activity within enterocytes.
- E. Increases pH.

139. The corticospinal tract descends through which part of the internal capsule?

- A. Anterior limb.
- B. Anterolentiform.
- C. Genu.
- D. Posterior limb.
- E. Retrolentiform.

140. Which chromosome contains the gene for the Alzheimer amyloid precursor protein?

- A. 3
- B. 14
- C. 17
- D. 21
- E. X

141. Control of *Mycobacterium tuberculosis* (MTB) replication is dependent on a number of critical factors including TNF alpha production and IFN gamma response.

Which other immune effector plays a major role in controlling MTB replication?

- A. B cell.
- B. Complement.
- C. Natural killer cell.
- D. Neutrophil.
- E. T cell.

142. Cardiac relaxation is an active process. Which protein is the major component of active cardiac relaxation?

- A. Actin.
- B. Relaxin.
- C. Telethonin.
- D. Titin.
- E. Tropomyosin.

143. Tenofovir disoproxil fumarate is used in the management of HIV infection in combination with other antiretrovirals. What is the site of action of tenofovir in the HIV life cycle?

- A. HIV binding and entry of cells.
- B. HIV protease activity.
- C. HIV reverse transcriptase activity.
- D. HIV viral assembly.
- E. Integration of HIV DNA.

144. Where in the gastrointestinal tract are bile acids actively reabsorbed?

- A. Colon.
- B. Duodenum.
- C. Ileum.
- D. Jejunum.
- E. Rectum.

145. Kidney stones contain a variety of crystalline and non-crystalline material. Stone composition can influence urological intervention. Which crystalline material is associated with *Proteus mirabilis*, a urease-producing bacteria?

- A. Calcium oxalate.
- B. Calcium phosphate.
- C. Cystine.
- D. Struvite.
- E. Uric acid.

146. Defects in the interleukin 12-dependent interferon gamma pathways are most likely to lead to infection with which organism?

- A. *Candida albicans*.
- B. Herpes simplex.
- C. *Neisseria meningitidis*.
- D. Non-tuberculous *Mycobacterium*.
- E. *Staphylococcus aureus*.

147. Which class of medications is most consistently associated with falls?

- A. Benzodiazepines.
- B. Beta blockers.
- C. Calcium channel antagonists.
- D. Opioids.
- E. Statins.

148. What is the most common cause of reduced oxygen delivery despite normal arterial oxygen saturations?

- A. Anaemia.
- B. Carbon monoxide toxicity.
- C. Cigarette smoking.
- D. Drug toxicity.
- E. Haemoglobinopathy.

149. Type 4 renal tubular acidosis is most commonly seen in which condition?

- A. Diabetic nephropathy.
- B. Interstitial nephritis.
- C. Pseudohypoaldosteronism type 1.
- D. Sjögren's syndrome.
- E. Systemic lupus erythematosus.

150. Which acute-phase protein binds to phospholipid in foreign pathogens or damaged host cells?

- A. C-reactive protein.
- B. Ceruloplasmin.
- C. Fibrinogen.
- D. Mannose-binding lectin.
- E. Serum amyloid A.

151. Patients should be considered for investigation for secondary causes of osteoporosis if their z-score is less than -2.0 .

Assuming normal distribution, what does a z-score of -2.0 indicate?

- A. A patient with this bone mineral density is in the lowest 1% of age-matched peers.
- B. A patient with this bone mineral density is in the lowest 2.5% of age-matched peers.
- C. A patient with this bone mineral density is in the lowest 5% for age-matched peers.
- D. A patient with this bone density is twice as likely to fracture than other women her age.
- E. A patient with this bone density is twice as likely to have a secondary cause of osteoporosis compared with a young female.

152. Where are chronic peptic ulcers associated with *Helicobacter pylori* infection most commonly located?

- A. Duodenum.
- B. Gastric antrum.
- C. Gastric body.
- D. Gastric fundus.
- E. Gastro-oesophageal junction.

153. What is the main neurotransmitter that mediates contraction of the detrusor muscle of the bladder?

- A. Acetylcholine.
- B. Dopamine.
- C. Gamma-aminobutyric acid.
- D. Noradrenaline.
- E. Serotonin.

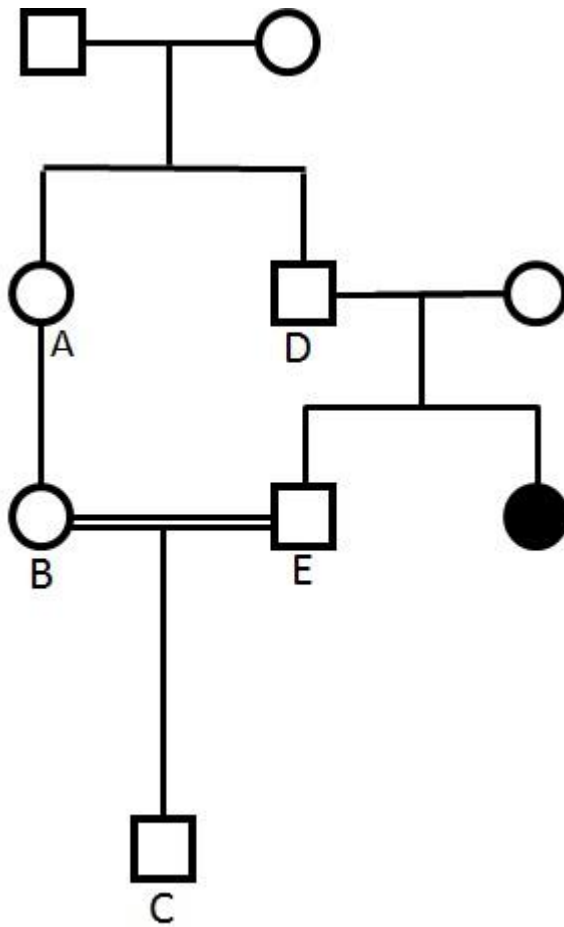
154. What is the mechanism of action of pregabalin in treating neuropathic pain?

- A. Binding to voltage-gated calcium channels.
- B. Depletion of substance P.
- C. Enhancement of gamma-aminobutyric acid (GABA) receptor function.
- D. Inhibition of cyclo-oxygenase.
- E. Partial agonism of mu-opioid receptors.

155. In cancer pathology what does Ki-67 expression reflect?

- A. Cell proliferation.
- B. Epithelial origin.
- C. Invasive potential.
- D. Mutational load.
- E. Tumour-infiltrating lymphocytes.

156. The individual indicated by a shaded symbol in the pedigree below is affected by an autosomal recessive disorder. The double lines indicate consanguinity.



Which of her relatives has the **lowest** chance of being a carrier?

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

157. The pathophysiology of chemotherapy-induced nausea and vomiting involves activation of neurotransmitter receptors in the brain.

What is the receptor for the neurotransmitter, substance P?

- A. 5-Hydroxytryptamine-3.
- B. Dopamine-2.
- C. Gamma-aminobutyric acid A.
- D. Histamine-1.
- E. Neurokinin-1.

158. Epidermal growth factor receptor (anti-EGFR) therapy (e.g. cetuximab) improves disease-free survival and overall survival in patients with which type of metastatic colorectal cancer?

- A. Both EGFR and KRAS mutant.
- B. EGFR mutant.
- C. EGFR wild-type.
- D. KRAS mutant.
- E. KRAS wild-type.

159. What is the name of the approach to ethical dilemmas that seeks the option that maximises non-moral good?

- A. Communitarianism.
- B. Deontology.
- C. Principalism.
- D. Utilitarianism.
- E. Virtue ethics.

160. In addition to glucagon, which hormones counterregulate hypoglycaemia?

- A. Adrenaline, cortisol, growth hormone.
- B. Adrenocorticotrophic hormone (ACTH), glucagon-like peptide-1 (GLP-1), renin.
- C. Aldosterone, vasopressin, triiodothyronine (T3).
- D. Noradrenaline, ghrelin, corticotropin-releasing hormone (CRH).
- E. Thyroid-stimulating hormone (TSH), ACTH, testosterone.

161. In a clinical trial, 4 out of 12 patients developed a complication in the control group compared to 2 out of 12 patients in the treated group.

To assess whether this is a statistically significant difference, what would be the most appropriate statistical test?

- A. Chi-squared.
- B. Fisher's exact.
- C. Mann–Whitney U.
- D. Student's *t*-test.
- E. Wilcoxon signed-rank test.

162. A fluid bolus given during resuscitation can increase blood pressure by an increase in which physiological parameter?

- A. Heart rate.
- B. Myocardial contractility.
- C. Oxygen binding capacity.
- D. Preload.
- E. Systemic vascular resistance.

163. Bisphosphonates primarily act on which cell?

- A. Macrophage.
- B. Osteoblast.
- C. Osteoclast.
- D. Osteocyte.
- E. Pericyte.

164. *Vibrio cholerae* causes diarrhoea primarily by what mechanism?

- A. Hypermotility.
- B. Inflammatory.
- C. Malabsorption.
- D. Osmotic.
- E. Secretory.

165. A mass lesion of the cerebellopontine angle is most likely to impair function of which cranial nerves?

- A. II and III.
- B. III, IV and VI.
- C. V, VI and VII.
- D. V, VII and VIII.
- E. IX, X and XI.

166. Which cancer is most associated with obesity?

- A. Bladder.
- B. Endometrial.
- C. Ovarian.
- D. Prostate.
- E. Testicular.

QUESTIONS 167 AND 168 REFER TO THE FOLLOWING INFORMATION

Correctly identify the hormone that matches with the description.

167. Which hormone released from intestinal L cells can lead to delayed gastric emptying, increased post-prandial insulin release and improved satiety?

- A. Cholecystokinin.
- B. Gastrin.
- C. Ghrelin.
- D. Glucagon.
- E. Glucagon-like peptide-1 (GLP-1).
- F. Histamine.
- G. Peptide YY.
- H. Secretin.

168. Which hormone binds a plasma membrane-bound G-protein coupled receptor, leading to increased glycogenolysis?

- A. Cholecystokinin.
- B. Gastrin.
- C. Ghrelin.
- D. Glucagon.
- E. Glucagon-like peptide-1 (GLP-1).
- F. Histamine.
- G. Peptide YY.
- H. Secretin.

QUESTIONS 169 AND 170 REFER TO THE FOLLOWING INFORMATION

Which antibiotic is most commonly associated with this adverse drug reaction?

169. Achilles tendonitis and rupture.

- A. Azithromycin.
- B. Cefaclor.
- C. Cefepime.
- D. Ciprofloxacin.
- E. Clindamycin.
- F. Flucloxacillin.
- G. Nitrofurantoin.
- H. Rifampicin.

170. Pulmonary fibrosis.

- A. Azithromycin.
- B. Cefaclor.
- C. Cefepime.
- D. Ciprofloxacin.
- E. Clindamycin.
- F. Flucloxacillin.
- G. Nitrofurantoin.
- H. Rifampicin.