NEET PG Pathology Sample Paper-4

Duration: 20 Minutes **Maximum Marks: 100**

Instructions

- This paper contains **25** Multiple Choice Questions.
- Each correct answer carries **+4** mark. Incorrect answer: **−1** marks. Only **one** correct option.
- Unattempted questions carry **0** marks.
- Use of mobile phones, smartwatches, or any electronic gadgets is strictly prohibited.

Q1. A 47-year-old male presenting with a persistent cough and hemoptysis undergoes a lung biopsy. Microscopic evaluation reveals a distinct, localized area of cellular architecture loss, where the outlines of dead cells are preserved as eosinophilic, "ghost-like" structures without nuclei. This pattern of tissue necrosis is primarily driven by which of the following mechanisms?

(A) Rapid enzymatic digestion by lysosomal hydrolases from neutrophils

(B) Structural protein denaturation and inactivation of proteolytic enzymes

(C) Anaerobic bacterial infection leading to heterolytic digestion

(D) Granulomatous inflammation driven by cell-mediated immunity

Q2. A 28-year-old female presents with marked pallor, fatigue, and mild splenomegaly. Her complete blood count reveals a hemoglobin of 8.2 g/dL, an elevated reticulocyte count, and an increased mean corpuscular hemoglobin concentration (MCHC). A peripheral blood smear demonstrates numerous spherocytes. This condition is primarily caused by a molecular defect in which of the following erythrocyte components?

(A) Alpha-globin or beta-globin polypeptide chains

(B) Membrane-anchoring proteins like ankyrin or spectrin

(C) Enzymes regulating the hexose monophosphate shunt

(D) Glycosylphosphatidylinositol (GPI) anchor proteins

Q3. A 62-year-old male with a 40 pack-year smoking history undergoes a routine screening colonoscopy. A 2 cm sessile polyp is discovered in the sigmoid colon and excised. Histopathological examination shows crowded, elongated, hyperchromatic nuclei arranged in a stratified pattern within branching glands, along with a complete loss of goblet cells, though the basement membrane remains entirely intact. Which of the following terms best characterizes this lesion?

(A) Squamous metaplasia

(B) Mucinous adenocarcinoma

(C) High-grade epithelial dysplasia

(D) Carcinoma in situ

Q4. During an experimental study on acute inflammation, endothelial cells are observed to undergo rapid cytoskeletal reorganization, creating intercellular gaps immediately after exposure to histamine. This specific mechanism of vascular permeability characteristically occurs in which segment of the microvasculature?

(A) Arterioles

(B) Capillaries

(C) Postcapillary venules

(D) Large muscular arteries

Q5. A 54-year-old patient diagnosed with poorly differentiated gastric adenocarcinoma undergoes a staging workup. A biopsy of a enlarged left supraclavicular lymph node reveals metastatic signet-ring cells. Which of the following cell adhesion molecules is most frequently downregulated or functionally lost to facilitate this specific tumor cell dissociation and metastasis?

(A) E-cadherin

(B) Integrin $\alpha_v\beta_3$

(C) CD44 homing receptor

(D) P-selectin

Q6. A bone marrow biopsy from a 68-year-old female with unexplained pancytopenia, hepatosplenomegaly, and bone pain reveals hypercellular marrow replaced by atypical, dysplastic megakaryocytes and dense collagen bundles. Silver staining confirms a significant increase in reticulin fibers. Which of the following cytokines, secreted abnormally by clonal megakaryocytes, is the principal driver of this stromal fibroblastic proliferation?

(A) Interleukin-1 (IL-1)

(B) Tumor Necrosis Factor-alpha (TNF-α)

(C) Transforming Growth Factor-beta (TGF-β)

(D) Interferon-gamma (IFN-γ)

Q7. A 35-year-old male presents with sudden onset of gross hematuria and flank pain. A renal biopsy reveals diffuse crescentic formation within Bowman's space involving 65% of the glomeruli. Immunofluorescence microscopy displays a smooth, linear, continuous pattern of IgG deposition along the glomerular basement membrane. This pathological process is best illustrated by the following schematic mechanism of antibody-mediated injury:

Continuous linear autoantibody deposition against fixed intrinsic antigens

Which of the following clinical conditions corresponds to this finding?

(A) Post-streptococcal glomerulonephritis

(B) Granulomatosis with polyangiitis

(C) Goodpasture syndrome

(D) Lupus nephritis Class IV

Q8. A 19-year-old male presents with persistent epistaxis, gingival bleeding, and multiple ecchymoses. Laboratory studies reveal a prolonged bleeding time

and a prolonged activated partial thromboplastin time (aPTT), while the prothrombin time (PT) and platelet count are entirely within normal limits. Platelet aggregation studies show a complete lack of response to ristocetin, which is fully corrected upon the addition of normal plasma. What is the primary underlying molecular pathogenesis?

(A) Deficiency of platelet glycoprotein IIb/IIIa receptors

(B) Autoimmune destruction of platelets by anti-GP Ib-IX antibodies

(C) Quantitative or qualitative deficiency of von Willebrand factor

(D) Defective synthesis of vitamin K-dependent clotting factors

Q9. A 24-year-old male presenting with a painless testicular mass undergoes a radical orchiectomy. Pathological examination shows a soft, lobulated, yellowish-white tumor without areas of hemorrhage or necrosis. Microscopic analysis reveals uniform sheets of large, polygonal cells with clear, glycogen-rich cytoplasm, distinct cell membranes, and prominent nucleoli, separated by thin fibrous septa containing a dense lymphocytic infiltrate. Which of the following serum biomarkers is typically normal or only minimally elevated in a pure form of this neoplasm?

(A) Lactate dehydrogenase (LDH)

(B) Alpha-fetoprotein (AFP)

(C) Human chorionic gonadotropin (hCG)

(D) Placental alkaline phosphatase (PLAP)

Q10. A 48-year-old female presents with severe generalized pruritus, skin hyperpigmentation, and xanthelasma. Serum biochemistry reveals an isolated, markedly elevated alkaline phosphatase (ALP) level. A liver biopsy shows a chronic, destructive, granulomatous inflammation centered around the interlobular bile ducts, accompanied by a heavy portal tract infiltrate of lymphocytes and plasma cells. Which of the following serological markers is highly specific and diagnostic for this disease?

(A) Anti-smooth muscle antibody (ASMA)

(B) Anti-mitochondrial antibody (AMA)

(C) Anti-liver kidney microsomal-1 (anti-LKM1) antibody

(D) Anti-neutrophil cytoplasmic antibody (p-ANCA)

Q11. An autopsy of a 72-year-old female with a long history of severe, poorly controlled hypertension reveals symmetric, markedly shrunken kidneys with a finely granular, "grain-leather" external cortical surface. Microscopic examination of the renal vasculature demonstrates homogenous, glassy, pink thickening of the walls of the afferent arterioles with luminal narrowing. This vascular alteration is primarily composed of which of the following?

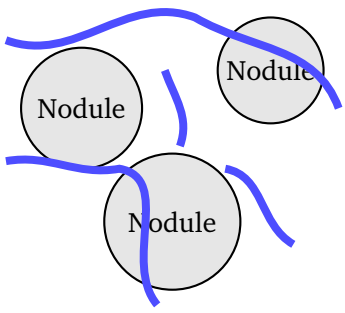
(A) Proliferated smooth muscle cells in a concentric "onion-skin" pattern

(B) Plasma protein leakage across damaged endothelium and increased matrix synthesis

(C) Transmural necrotizing inflammation with fibrinoid deposits and neutrophils

(D) Cholesterol crystal clefts surrounded by foreign-body giant cells

Q12. A 60-year-old male with chronic hepatitis C virus infection presents with abdominal distension and shifting dullness. Paracentesis confirms ascites. A liver biopsy is performed to evaluate the stage of liver disease. The structural architecture of the hepatic parenchyma is assessed using a special histochemical stain, which shows a dense network of bridging fibrous bands encircling regenerative nodules of hepatocytes. This tissue remodeling process can be schematically represented as follows:



Fibrous Septa

Which of the following special stains is ideal for highlighting these fibrous septa over the background parenchyma?

(A) Periodic acid-Schiff (PAS) stain

(B) Masson trichrome stain

(C) Prussian blue stain

(D) Congo red stain

Q13. A 9-year-old boy presents with a rapidly expanding mass involving the right mandible. A biopsy reveals a diffuse proliferation of intermediate-sized, uniform B-lymphocytes exhibiting high mitotic activity and a high apoptotic rate. Interspersed benign macrophages containing cellular debris create a prominent "starry-sky" pattern. Cytogenetic analysis reveals a $t(8;14)$ chromosomal translocation. Which of the following genes is overexpressed as a direct consequence of this translocation?

(A) BCL2

(B) BCL6

(C) MYC

(D) CCND1

Q14. A 38-year-old female presents with deep vein thrombosis of the left lower extremity. This is her third documented episode of venous thromboembolism within the past four years. She has no history of immobilization, malignancy, or surgery. Coagulation profiles reveal a normal PT and a normal aPTT. However, when her plasma is mixed with activated protein C (APC), the aPTT fails to prolong significantly compared to a control sample. What is the most likely genetic mutation responsible for this clinical presentation?

(A) G20210A mutation in the prothrombin gene

(B) Missense mutation in the factor V gene preventing its cleavage by APC

(C) Deletion mutation causing a quantitative deficiency of antithrombin III

(D) Inactivating mutation in the protein S gene

Q15. A 67-year-old male smoker presents with significant weight loss, a persistent dry cough, and a newly detected right hilar mass on a chest radiograph.

Serum chemistry reveals a sodium level of 118 mEq/L, consistent with the syndrome of inappropriate antidiuretic hormone secretion (SIADH). Bronchoscopic biopsy of the mass shows sheets of small, round-to-oval cells with scant cytoplasm, finely granular nuclear chromatin ("salt-and-pepper" pattern), and extensive areas of necrosis. Which of the following immunohistochemical markers is most useful for confirming the lineage of this tumor?

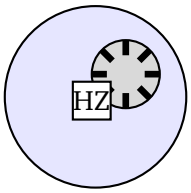
(A) Cytokeratin 5/6

(B) Synaptophysin

(C) p63

(D) Thyroid transcription factor-1 (TTF-1) negative and Calretinin positive

Q16. A 55-year-old male presents with severe back pain and fatigue. Laboratory investigations reveal a hemoglobin of 9.5 g/dL, serum creatinine of 2.1 mg/dL, and hypercalcemia. Serum protein electrophoresis demonstrates a sharp spike in the gamma-globulin region. A bone marrow biopsy reveals a sheet-like proliferation of abnormal cells. The structural configuration of these characteristic cells can be depicted as follows:



Eccentric nucleus with "clock-face" chromatin, perinuclear halo

Which of the following cellular features or products confirms the monoclonal nature of this condition?

(A) Co-expression of CD19 and CD20 surface markers

(B) Restricted cytoplasmic expression of either kappa (κ) or lambda (λ) light chains

(C) Presence of standard Auer rods within the clear cytoplasm

(D) Surface expression of CD3 and CD4 T-cell receptors

Q17. A 42-year-old female presents with symmetrical swelling and morning stiffness in her proximal interphalangeal and metacarpophalangeal joints lasting

over three months. A biopsy of the synovial tissue from an affected joint reveals marked synovial hypertrophy with villous projections, a dense perivascular infiltrate of lymphocytes and plasma cells, and an exuberant layer of vascularized granulation tissue covering the articular cartilage. What is the designated term for this destructive intra-articular granulation tissue fibrovascular mass?

(A) Tophus

(B) Pannus

(C) Osteophyte

(D) sequestrum

Q18. A 3-year-old male child is evaluated for recurrent, severe bacterial infections, including soft tissue abscesses and periodontitis. Laboratory tests reveal a markedly elevated peripheral neutrophil count, even when no active infection is present. Flow cytometric analysis of the patient's leukocytes demonstrates a complete absence of CD18 expression. This presentation is highly characteristic of which of the following immunodeficiency disorders?

(A) Chronic granulomatous disease

(B) Chédiak-Higashi syndrome

(C) Leukocyte adhesion deficiency type 1

(D) Myeloperoxidase deficiency

Q19. A 58-year-old female presents with progressive shortness of breath. A high-resolution CT scan of the chest demonstrates bilateral subpleural, basal-predominant interstitial fibrosis with a honeycomb appearance. A surgical lung biopsy reveals spatial and temporal heterogeneity, showing dense collagenous scar tissue alternating with normal lung parenchyma and active fibroblastic foci. What is the most likely diagnosis?

(A) Desquamative interstitial pneumonia (DIP)

(B) Non-specific interstitial pneumonia (NSIP)

(C) Idiopathic pulmonary fibrosis / Usual interstitial pneumonia (UIP)

(D) Sarcoidosis

Q20. A 30-year-old male presents with a painless lump in his left cervical lymph node chain. A lymph node biopsy reveals total effacement of the normal architecture by a polymorphic infiltrate containing lymphocytes, plasma cells, eosinophils, and histiocytes. Scattered within this background are very large, binucleated cells featuring prominent, inclusion-like, eosinophilic nucleoli surrounded by a clear halo, creating an "owl-eye" appearance. These large cells demonstrate strong immunophenotypic positivity for which of the following pairs of markers?

(A) CD3 and CD5

(B) CD15 and CD30

(C) CD20 and CD45

(D) CD19 and CD79a

Q21. A 34-year-old male presenting with severe episodic hypertension, palpitations, and diaphoresis is found to have a 5 cm circumscribed mass in the right adrenal medulla. Histopathological examination of the resected mass shows nests of polygonal cells with abundant granular, basophilic cytoplasm separated by a rich vascular network, forming a classic "Zellballen" architecture. Which of the following stains or markers is most reliable to confirm the sustentacular cell network outlining these cell nests?

(A) Chromogranin A

(B) Synaptophysin

(C) S100 protein

(D) Vimentin

Q22. A 62-year-old female presents with persistent hematuria. A cystoscopy reveals a large, exophytic, papillary mass arising from the lateral wall of the urinary bladder. A transurethral resection is performed. Microscopic examination displays multilayered, atypical transitional epithelium covering delicate fibrovascular cores, with cytological atypia, hyperchromatic nuclei,

and frequent mitoses extending into the upper layers of the epithelium. The tumor cells are noted to invade deeply into the detrusor muscle layer. Which of the following parameters is the most critical determinant of this patient's long-term prognosis and clinical staging?

(A) The degree of cytological nuclear pleomorphism (grading)

(B) The specific architectural pattern (papillary versus flat)

(C) The depth of invasion into the muscularis propria (staging)

(D) The presence of associated squamous metaplasia

Q23. A 26-year-old male presents with profound generalized weakness, anorexia, and a weight loss of 8 kg over 2 months. Physical examination reveals generalized lymphadenopathy and splenomegaly. His CBC shows a total leukocyte count (TLC) of 145,000/μL. The differential leukocyte count reveals a full spectrum of granulocytic cells, including neutrophils, metamyelocytes, myelocytes, promyelocytes, and 3% blasts, along with a prominent absolute basophilia. The leukocyte alkaline phosphatase (LAP) score is extremely low. Which of the following cytogenetic alterations is uniquely associated with the pathogenesis of this disorder?

(A) $t(15;17)$

(B) $t(9;22)$

(C) $t(11;14)$

(D) $t(14;18)$

Q24. A 48-year-old female presents with a painless, firm, slow-growing nodule in the right lobe of the thyroid gland. A fine-needle aspiration biopsy is performed. Microscopic examination displays sheets and follicular arrangements of cells with crowded, oval nuclei showing a ground-glass appearance, fine longitudinal grooves across the nuclear membrane, and occasional round intranuclear cytoplasmic invaginations (pseudoinclusions). Psammoma bodies are noted within the fibrovascular stroma. Which of the following features is considered the absolute diagnostic hallmark of this specific type of thyroid neoplasm?

(A) The high rate of capsular and vascular invasion

(B) The presence of dense stromal amyloid deposits

(C) The characteristic nuclear optical clarity and membrane alterations

(D) The formation of well-defined, colloid-filled neoplastic follicles

Q25. A 52-year-old male with a long-standing history of gastroesophageal reflux disease (GERD) undergoes an upper gastrointestinal endoscopy. The endoscoper visualizes salmon-pink, velvety tongues of mucosa extending upwards from the gastroesophageal junction into the distal esophagus. A biopsy from this altered mucosal region reveals a complete replacement of the stratified squamous epithelium by columnar epithelium containing distinct goblet cells filled with acidic mucins. What represents the most critical clinical implication of this diagnosed condition?

(A) High risk of progression to squamous cell carcinoma of the esophagus

(B) Increased propensity for developing esophageal varices and hemorrhage

(C) Precursor lesion with an elevated risk of transformation into adenocarcinoma

(D) Spontaneous regression following short-term antacid therapy

Detailed Solutions

Q1.

Solution

Concept:

Cellular injury resulting in cell death manifests in distinct morphological patterns depending on the nature of the tissue damage, structural integrity preservation, and enzymatic balance. Coagulative necrosis is typical of hypoxic or ischemic injury in all solid organs except the brain.

Solution:

(a) The biopsy demonstrates a localized area where cellular outlines remain preserved as eosinophilic ghost-like structures lacking nuclei, which is the pathognomonic microscopic presentation of coagulative necrosis.

(b) In coagulative necrosis, the primary underlying mechanism involves structural protein denaturation combined with the simultaneous inactivation of proteolytic lysosomal enzymes.

(c) Because the intracellular enzymes are denatured alongside the structural framework, automatic autolysis and heterolysis are transiently blocked, freezing the architecture in place.

(d) Conversely, rapid enzymatic digestion by lysosomal hydrolases is characteristic of liquefactive necrosis, commonly observed in central nervous system infarcts or bacterial abscesses.

(e) Anaerobic bacterial infection with heterolytic digestion causes wet gangrene, while cell-mediated granulomatous reactions produce caseous necrosis, seen as amorphous granular debris.

Final Answer: Structural protein denaturation and inactivation of proteolytic enzymes

Answer: (B)

Go Back to Question 1

Q2.

Solution

Concept:

Hereditary spherocytosis is an autosomal dominant inherited disorder characterized by intrinsic defects in the erythrocyte membrane skeleton. It leads to the formation of small, spherical red blood cells that are prone to splenic sequestration and premature destruction.

Solution:

(a) The clinical presentation of anemia, reticulocytosis, splenomegaly, and prominent spherocytes associated with an elevated mean corpuscular hemoglobin concentration (MCHC) confirms hereditary spherocytosis.

(b) The molecular pathogenesis relies on quantitative or qualitative defects in membrane-anchoring skeletal proteins, most commonly ankyrin, band 3, spectrin, or protein 4.2.

(c) These defects disrupt the mechanical coupling between the lipid bilayer and the cytoskeleton, causing progressive loss of membrane lipid microvesicles.

(d) The surface area-to-volume ratio decreases, forcing the normally flexible biconcave erythrocyte into a rigid, fragile spherical configuration.

(e) Defective globin chains characterize thalassemias or hemoglobinopathies, hexose monophosphate shunt defects signify G6PD deficiency, and GPI anchor deficiencies lead to paroxysmal nocturnal hemoglobinuria.

Final Answer: Membrane-anchoring proteins like ankyrin or spectrin

Answer: (B)

Go Back to Question 2

Q3.

Solution

Concept:

Epithelial dysplasia represents an atypical neoplastic proliferation restricted entirely within the epithelial basement membrane boundaries. It serves as a precursor to invasive malignant lesions and exhibits distinct cellular and architectural disorientation.

Solution:

(a) The histopathological description shows crowded, elongated, hyperchromatic, stratified nuclei extending into the upper layers of branching colonic glands along with goblet cell depletion.

(b) The key finding stating that the basement membrane remains entirely intact excludes invasive adenocarcinoma, confirming that the atypical cellular changes are strictly intraepithelial.

(c) High-grade epithelial dysplasia involves severe nuclear stratification, architectural distortion, and cellular atypia without extending beyond the epithelium.

(d) While carcinoma in situ represents the extreme end of the dysplastic spectrum, the architectural preservation within branching adenomatous colonic glandular structures defines epithelial dysplasia.

(e) Squamous metaplasia is the substitution of one differentiated cell type for another, which is unrelated to these complex neoplastic colonic alterations.

Final Answer: High-grade epithelial dysplasia

Answer: (C)

Go Back to Question 3

Q4.

Solution

Concept:

Vascular leakage or increased permeability is a fundamental hallmark of acute inflammation. It facilitates the exudation of protein-rich fluid and leukocytes from the microvasculature into the surrounding interstitial tissue.

Solution:

(a) Endothelial cell contraction triggered by chemical mediators like histamine, bradykinin, and leukotrienes is the most common mechanism inducing immediate transient vascular permeability.

(b) This specific cellular signaling pathway causes phosphorylation and reorganization of cytoskeletal filaments, leading to active cell contraction and intercellular gap formation.

(c) This immediate transient response occurs exclusively in the postcapillary venules because these segments possess a higher density of histamine receptors.

(d) Arterioles are involved primarily in upstream vasodilation and hyperemia rather than primary mediator-driven endothelial contraction or structural fluid filtration.

(e) Capillaries can develop leaks through direct endothelial damage but do not participate in this rapid, reversible histamine-dependent cytoskeletal retraction process.

Final Answer: Postcapillary venules

Answer: (C)

Go Back to Question 4

Q5.

Solution

Concept:

Intercellular adhesion molecules regulate tissue architecture and cellular cohesion. In malignant epithelial tumors, the down-regulation of these anchoring elements represents a critical step in the epithelial-to-mesenchymal transition and metastatic cascade.

Solution:

(a) The patient has poorly differentiated gastric adenocarcinoma presenting with metastatic signet-ring cells in the left supraclavicular lymph node, which is known classically as Virchow's node.

(b) Signet-ring cells are characterized by a complete lack of cohesive architectural bonds, enabling individual cells to detach, migrate, and infiltrate distant tissues independently.

(c) E-cadherin is the principal transmembrane glycoprotein responsible for calcium-dependent homophilic cell-to-cell adhesion in normal well-differentiated epithelial tissues.

(d) The loss or functional mutation of the CDH1 gene encoding E-cadherin disrupts these cell junctions, directly promoting individual tumor cell discohesion and diffuse invasion.

(e) Integrins manage cellular adhesion to the extracellular matrix components, CD44 coordinates leukocyte homing and tumor cell migration, and selectins direct rolling endothelial cell interactions.

Final Answer: E-cadherin

Answer: (A)

Go Back to Question 5

Q6.

Solution

Concept:

Primary myelofibrosis is a clonal myeloproliferative neoplasm characterized by a prominent proliferation of atypical megakaryocytes and progressive, non-clonal deposition of reactive fibrous matrix in the bone marrow cavity.

Solution:

(a) The bone marrow biopsy demonstrating hypercellularity with clusters of dysplastic, atypical megakaryocytes and extensive reticulin fiber deposition is indicative of primary myelofibrosis.

(b) The reactive fibrotic deposition is not an intrinsic defect of the fibroblasts but is driven by humoral factor hypersecretion from clonal megakaryocytes.

(c) Transforming Growth Factor-beta (TGF-β) is the primary profibrotic cytokine released in excess from these dysplastic cells, stimulating marrow fibroblasts.

(d) TGF-β upregulation induces fibroblasts to proliferate and synthesize high quantities of collagen and reticulin, leading to extensive marrow space replacement.

(e) Interleukin-1 and Tumor Necrosis Factor-alpha function primarily as classical pro-inflammatory mediators, while Interferon-gamma downregulates collagen deposition and acts antagonistically to fibrogenesis.

Final Answer: Transforming Growth Factor-beta (TGF-β)

Answer: (C)

Go Back to Question 6

Q7.

Solution

Concept:

Rapidly progressive glomerulonephritis (RPGN) is clinically defined by rapid loss of renal function and morphologically by the prominent formation of epithelial crescents within Bowman's space.

Solution:

(a) The clinical presentation highlights sudden hematuria, extensive crescentic glomerulonephritis, and a continuous linear immunofluorescence deposition of IgG along the glomerular basement membrane.

(b) The provided TikZ schematic illustrates autoantibodies binding uniformly to fixed intrinsic antigens along the basement membrane structural matrix without creating discrete isolated aggregates.

(c) This specific linear configuration matches anti-GBM antibody-mediated disease, which is clinically known as Goodpasture syndrome when lung hemorrhage co-exists.

(d) Post-streptococcal glomerulonephritis and lupus nephritis present with discontinuous, granular subepithelial or subendothelial immune complex deposits due to circulating aggregates.

(e) Granulomatosis with polyangiitis is categorized as a pauci-immune crescentic glomerulonephritis, characterized by an absence of significant antibody deposition on immunofluorescence.

Final Answer: Goodpasture syndrome

Answer: (C)

Go Back to Question 7

Q8.

Solution

Concept:

Von Willebrand disease is an inherited bleeding disorder caused by quantitative deficiencies or structural defects in von Willebrand factor (vWF), which is a key multimeric plasma glycoprotein.

Solution:

(a) The combination of prolonged bleeding time (mucosal bleeding) and prolonged aPTT, with normal prothrombin time and platelet count, suggests a defect affecting both platelet function and the intrinsic pathway.

(b) vWF acts as a primary bridging molecule for platelet adhesion to subendothelial collagen via Glycoprotein Ib-IX receptors and serves as a protective carrier protein for coagulation Factor VIII.

(c) Ristocetin induces platelet agglutination by activating vWF binding; a complete lack of response that corrects with normal plasma confirms a missing plasma factor rather than a platelet receptor defect.

(d) Bernard-Soulier syndrome features a deficiency of the GP Ib-IX receptor, but its ristocetin defect fails to correct upon adding normal plasma.

(e) Glanzmann thrombasthenia involves defective GP IIb/IIIa and exhibits normal ristocetin aggregation, while vitamin K deficiencies affect prothrombin time without altering bleeding times.

Final Answer: Quantitative or qualitative deficiency of von Willebrand factor

Answer: (C)

Go Back to Question 8

Q9.

Solution

Concept:

Testicular germ cell tumors are divided into seminomatous and non-seminomatous lineages. Seminoma is the most common pure germ cell tumor of the testis, possessing a highly distinctive, uniform histopathological presentation.

Solution:

(a) The microscopic description reveals sheets of uniform, large, polygonal cells with clear, glycogen-rich cytoplasm, prominent nucleoli, and distinct cell boundaries divided by fibrous septa with lymphocytic infiltrates, confirming a classic seminoma.

(b) Pure seminomas are typically characterized by normal serum levels of alpha-fetoprotein (AFP); any elevation of AFP indicates a non-seminomatous component like a yolk sac tumor.

(c) Lactate dehydrogenase (LDH) is regularly elevated in seminomas due to tumor burden, and placental alkaline phosphatase (PLAP) serves as a classic membrane marker.

(d) Human chorionic gonadotropin (hCG) can be minimally elevated in a small percentage of pure seminomas containing syncytiotrophoblastic giant cells without altering the core diagnosis.

Final Answer: Alpha-fetoprotein (AFP)

Answer: (B)

Go Back to Question 9

Q10.

Solution

Concept:

Primary biliary cholangitis is a chronic, progressive, autoimmune cholestatic liver disease characterized by the immune-mediated destruction of small and medium-sized intrahepatic interlobular bile ducts.

Solution:

(a) The patient exhibits classic clinical hallmarks of chronic cholestasis, including pruritus, skin hyperpigmentation, xanthelasma, and a significantly elevated serum alkaline phosphatase level.

(b) The histopathological description reveals destructive, granulomatous inflammation centered on interlobular bile ducts, known as the florid duct lesion of primary biliary cholangitis.

(c) Anti-mitochondrial antibody (AMA) targeting the E2 subunit of the pyruvate dehydrogenase complex is highly specific and is detected in over 95

(d) Anti-smooth muscle antibodies and anti-LKM1 antibodies are serological markers primarily identifying distinct variants of autoimmune hepatitis.

(e) Perinuclear anti-neutrophil cytoplasmic antibodies (p-ANCA) are associated with primary sclerosing cholangitis, which characteristically targets extrahepatic and large intrahepatic ducts with concentric "onion-skin" fibrosis.

Final Answer: Anti-mitochondrial antibody (AMA)

Answer: (B)

Go Back to Question 10

Q11.

Solution

Concept:

Chronic systemic hypertension causes progressive structural adaptations within the renal vasculature to protect the downstream capillary beds from hydrostatic injury. Benign nephrosclerosis represents the renal pathology associated with long-standing, moderate hypertension.

Solution:

(a) The post-mortem presentation of symmetric, shrunken kidneys with a granular grain-leather surface describes renal parenchymal atrophy secondary to chronic ischemia induced by arteriolosclerosis.

(b) Microscopic visualization of homogenous, glassy, pink thickening within the afferent arterioles corresponds to hyaline arteriolosclerosis, which causes significant luminal narrowing and reduced perfusion.

(c) This luminal wall alteration is primarily composed of plasma protein leakage across damaged endothelial cells combined with an increased smooth muscle extracellular matrix synthesis.

(d) Concomitant chronic hemodynamic stress forces plasma constituents to insudate into the arteriolar walls, structural proteins to deposit, and downstream glomeruli to undergo gradual sclerosis.

(e) Hyperplastic arteriolosclerosis, characterized by a laminated concentric onion-skin pattern of proliferated smooth muscle cells, occurs instead during acute malignant hypertensive crises.

Final Answer: Plasma protein leakage across damaged endothelium and increased matrix synthesis

Answer: (B)

Go Back to Question 11

Q12.

Solution

Concept:

Hepatic cirrhosis is defined histopathologically by diffuse parenchymal reorganization, regenerative hepatocyte nodules, and dense collagenous bridging fibrous septa. Identifying these components requires special connective tissue stains.

Solution:

(a) The clinical history of chronic hepatitis C virus infection presenting with ascites, parenchymal nodules, and intersecting fibrous bands describes established liver cirrhosis.

(b) To definitively evaluate the degree of architectural distortion or stage the extent of fibrosis, specific histochemical visualization of collagen fibers is necessary.

(c) The Masson trichrome stain is the ideal histochemical method because it stains collagen fibers a brilliant blue color while rendering hepatocytes pink or red.

(d) This stark color contrast allows pathologists to easily delineate delicate bridging fibrous bands encircling the parenchyma, as represented in the provided TikZ schematic.

(e) Periodic acid-Schiff highlighting glycogen, Prussian blue detecting iron in hemochromatosis, and Congo red visualizing apple-green birefringent amyloid deposits are unsuitable for highlighting collagenous septa.

Final Answer: Masson trichrome stain

Answer: (B)

Go Back to Question 12

Q13.

Solution

Concept:

Burkitt lymphoma is a highly aggressive B-cell neoplasm characterized by a deregulated oncogene driving exceptional cellular proliferation. It exhibits a classic histopathological appearance and highly specific chromosomal translocations.

Solution:

(a) The mandibular mass in a child showing a monomorphic sheet of B-lymphocytes with frequent apoptotic bodies inside tingible body macrophages creates the characteristic starry-sky microscopic pattern.

(b) The diagnostic cytogenetic feature of Burkitt lymphoma is the $t(8;14)(q24;q32)$ chromosomal translocation, which is present in approximately eighty-five percent of all clinical cases.

(c) This structural rearrangement places the MYC proto-oncogene from chromosome 8 under the control of the highly active immunoglobulin heavy chain promoter on chromosome 14.

(d) Consequently, constitutive transcriptional over-expression of the MYC protein occurs, functioning as a powerful transcription factor that accelerates cell cycle progression and metabolic reprogramming.

(e) BCL2 over-expression occurs in follicular lymphoma via $t(14;18)$, CCND1 is upregulated in mantle cell lymphoma through $t(11;14)$, and BCL6 rearrangements are typical of diffuse large B-cell lymphomas.

Final Answer: MYC

Answer: (C)

Go Back to Question 13

Q14.

Solution

Concept:

Inherited thrombophilias are genetic predispositions to recurrent thromboembolism resulting from mutations within natural anticoagulant pathways. Factor V Leiden represents the most frequent inherited hypercoagulable state.

Solution:

(a) The patient describes an initial presentation of recurrent unprovoked deep vein thrombosis in a young female with entirely normal baseline prothrombin and activated partial thromboplastin times.

(b) The diagnostic laboratory clue is the phenomenon of activated protein C resistance, where adding exogenous protein C fails to prolong the activated partial thromboplastin time.

(c) This specific resistance is caused by a single point mutation in the factor V gene, replacing arginine with glutamine at position 506.

(d) This amino acid substitution alters the cleavage site, rendering altered factor V resistant to degradation by activated protein C, keeping it active longer.

(e) Prothrombin G20210A mutations increase circulating prothrombin levels, while antithrombin III or protein S quantitative deficiencies alter standard anticoagulant plasma assays differently without generating specific resistance.

Final Answer: Missense mutation in the factor V gene preventing its cleavage by APC

Answer: (B)

Go Back to Question 14

Q15.

Solution

Concept:

Small cell lung carcinoma is a high-grade neuroendocrine tumor strongly linked to cigarette smoking. It is characterized by specific paraneoplastic syndromes and distinct immunohistochemical profiles.

Solution:

(a) The clinical description of a central hilar mass, significant weight loss, severe hyponatremia due to inappropriate antidiuretic hormone secretion, and small necrotizing cells establishes small cell carcinoma.

(b) Microscopic evaluation reveals sheets of small cells with high nuclear-to-cytoplasmic ratios, fine salt-and-pepper chromatin, and minimal cytoplasm, which reflect its neuroendocrine differentiation lineage.

(c) Synaptophysin is a highly reliable vesicle-associated membrane protein used as an immunohistochemical marker to confirm the neuroendocrine differentiation of this pulmonary neoplasm.

1. Chromogranin A and CD56 are also concurrently used to reinforce the diagnostic evaluation of these primitive neuroendocrine tumors.

2. Cytokeratin 5/6 and p63 confirm squamous differentiation, whereas calretinin serves as a diagnostic marker for mesotheliomas, which are entirely distinct from high-grade small cell carcinomas.

Final Answer: Synaptophysin

Answer: (B)

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Q4.

Solution

Concept:

Multiple myeloma is a malignant plasma cell dyscrasia characterized by the monoclonal proliferation of neoplastic plasma cells within the bone marrow, accompanied by systemic protein manifestations.

Solution:

(a) The patient exhibits classic clinical criteria of multiple myeloma, including bone pain, anemia, renal insufficiency, hypercalcemia, and a sharp gamma-globulin spike on electrophoresis.

(b) The bone marrow biopsy demonstrates sheets of atypical plasma cells containing an eccentric nucleus, clumped clock-face chromatin, and a distinct perinuclear clearing or halo, as drawn schematically.

(c) Neoplastic processes are distinguished from reactive plasma cell proliferations by confirming cellular monoclonality using light chain restriction analysis on biopsy specimens.

(d) Monoclonal populations exhibit restricted cytoplasmic expression of either kappa or lambda immunoglobulin light chains, with an altered ratio shifting far from the normal balanced value.

(e) Normal plasma cells lose surface CD19 and CD20 expressions, Auer rods are restricted to myeloid blasts, and CD3 or CD4 markers identify T-cell lineage differentiations.

Final Answer: Restricted cytoplasmic expression of either kappa (κ) or lambda (λ) light chains

Answer: (B)

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Q5.

Solution

Concept:

Rheumatoid arthritis is a chronic, systemic autoimmune inflammatory disease targeting the synovial membranes of joints. It leads to progressive, symmetric structural destruction of articular cartilage and bone surfaces.

Solution:

(a) The clinical criteria of symmetric small joint involvement, prolonged morning stiffness, and specific histopathological alterations confirm a diagnostic impression of active rheumatoid arthritis.

(b) Chronic intra-articular inflammation stimulates massive synovial lining hyperplasia, angiogenesis, and a dense perivascular infiltrate of T-lymphocytes, plasma cells, and macrophages.

(c) The resulting hyperplastic, vascularized, inflammatory granulation tissue mass that forms over and erodes the underlying articular cartilage surface is designated as a pannus.

(d) The pannus releases destructive lysosomal collagenases, elastases, and stromal cytokines that actively digest the cartilaginous matrix, causing fibrous and bony ankylosis.

(e) A tophus represents a crystallized uric acid deposit in gout, osteophytes are reactive bony spurs characteristic of osteoarthritis, and a sequestrum is dead bone within osteomyelitis.

Final Answer: Pannus

Answer: (B)

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Q6.

Solution

Concept:

Leukocyte adhesion deficiency type 1 is an autosomal recessive immunodeficiency characterized by defective neutrophil emigration from the vasculature into peripheral tissues during inflammatory events.

Solution:

(a) The presentation of recurrent soft tissue infections without pus formation, combined with persistent, marked neutrophilia, is highly characteristic of leukocyte adhesion deficiency type 1.

(b) The molecular pathogenesis involves a genetic mutation in the ITGB2 gene, which encodes the beta-2 integrin subunit, also known structurally as CD18.

(c) A complete absence of CD18 prevents the formation of functional LFA-1 and Mac-1 integrin heterodimers on the surface membranes of circulating leukocytes.

(d) Without these integrins, neutrophils cannot bind firmly to endothelial adhesion molecules, preventing endothelial transmigration and causing them to accumulate in the bloodstream.

(e) Chronic granulomatous disease affects oxidative burst enzymes, Chédiak-Higashi syndrome alters lysosomal trafficking proteins, and myeloperoxidase deficiency selectively impairs the generation of hypochlorous acid during phagocytosis.

Final Answer: Leukocyte adhesion deficiency type 1

Answer: (C)

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Q7.

Solution

Concept:

Idiopathic pulmonary fibrosis is a progressive, fibrosing interstitial lung disease. It is defined pathologically by the morphological pattern of usual interstitial pneumonia.

Solution:

(a) The clinical findings of progressive dyspnea, subpleural basal interstitial fibrosis with honeycombing, and distinct spatial and temporal architectural heterogeneity confirm usual interstitial pneumonia.

(b) Spatial and temporal heterogeneity describes a microscopic landscape where dense collagenous scars and honeycomb spaces alternate directly with areas of entirely normal lung parenchyma.

(c) The diagnostic hallmark is the presence of active fibroblastic foci, which are convex subepithelial aggregations of proliferating fibroblasts and myofibroblasts embedded within extracellular matrix.

(d) These active foci represent areas of ongoing alveolar injury and dysregulated repair, driving the progressive loss of functional pulmonary volumes.

(e) Non-specific interstitial pneumonia displays uniform alveolar wall inflammation or fibrosis, desquamative interstitial pneumonia shows diffuse intra-alveolar macrophage accumulation, and sarcoidosis exhibits non-caseating granulomas.

Final Answer: Idiopathic pulmonary fibrosis / Usual interstitial pneumonia (UIP)

Answer: (C)

Go Back to Question 19

Q8.

Solution

Concept:

Classical Hodgkin lymphoma is a B-cell-derived neoplasm characterized by the presence of diagnostic Reed-Sternberg cells residing within an abundant, reactive, non-neoplastic inflammatory background.

Solution:

(a) The cervical lymph node biopsy showing a polymorphic inflammatory background of eosinophils and plasma cells surrounding large, binucleated cells with owl-eye nucleoli confirms classical Hodgkin lymphoma.

(b) These characteristic binucleated elements represent diagnostic Reed-Sternberg cells, which are clonal B-lineage cells that have lost their standard phenotypic marker expressions.

(c) In all classical variants of Hodgkin lymphoma, these malignant Reed-Sternberg cells demonstrate consistent, strong immunophenotypic positivity for both CD15 and CD30 markers.

(d) Identifying CD15 and CD30 expressions on these large cells helps differentiate classical Hodgkin lymphoma from non-Hodgkin lymphomas or nodular lymphocyte-predominant Hodgkin lymphoma.

(e) Common B-cell markers like CD19, CD20, and pan-leukocyte CD45 are typically negative or downregulated in classical Reed-Sternberg cells, while CD3 and CD5 identify T-lymphocytes.

Final Answer: CD15 and CD30

Answer: (B)

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Q9.

Solution

Concept:

Pheochromocytoma is a catecholamine-secreting neuroendocrine tumor derived from the chromaffin cells of the adrenal medulla. Morphologically, it displays a dual cellular composition containing nests of polygonal neuroendocrine cells surrounded by peripheral supportive tissue elements.

Solution:

(a) The patient has a classic presentation of pheochromocytoma, featuring episodic severe hypertension, palpitations, diaphoresis, and an adrenal medullary mass arranged in characteristic nests.

(b) This nesting architectural pattern is termed the Zellballen configuration, which is composed of clusters of polygonal chromaffin cells surrounded by an intricate microvascular network.

(c) Delimiting these clusters are specialized supportive elements called sustentacular cells, which form a delicate lattice structure around the main neoplastic neuroendocrine nests.

(d) To highlight and confirm the presence of this peripheral sustentacular cell framework, immunohistochemical identification using the S100 protein is standard and highly reliable.

(e) While chromogranin A and synaptophysin confirm neuroendocrine differentiation within the core tumor cells, they do not stain the peripheral sustentacular meshwork.

Final Answer: S100 protein

Answer: (C)

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Q10.

Solution

Concept:

Urothelial carcinoma of the urinary bladder requires a multi-parametric histopathological assessment to guide therapeutic intervention and predict outcome. Clinical staging focuses primarily on the anatomical depth of tumor extension.

Solution:

(a) The description highlights an exophytic, papillary, high-grade urothelial carcinoma characterized by nuclear pleomorphism, hyperchromasia, structural disorganization, and atypical mitotic figures extending up the epithelium.

(b) The microscopic report establishes that these malignant urothelial cells have invaded deeply into the detrusor muscle layer, which is also called the muscularis propria.

(c) In oncology, tumor staging represents the anatomical distribution and depth of penetration, whereas tumor grading describes the degree of cytological differentiation and pleomorphism.

(d) For transitional cell carcinomas of the bladder, the depth of invasion into the muscularis propria remains the single most critical determinant for clinical staging and long-term prognosis.

(e) Muscle-invasive bladder cancer requires radical cystectomy and aggressive systemic therapy, making anatomical depth far more critical than architectural patterns or cytological grade alone.

Final Answer: The depth of invasion into the muscularis propria (staging)

Answer: (C)

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Q11.

Solution

Concept:

Chronic myeloid leukemia is a clonal myeloproliferative neoplasm originating from a pluripotent hematopoietic stem cell. It features uncontrolled granulocytic proliferation and a highly specific balanced reciprocal chromosomal translocation.

Solution:

(a) The patient presents with systemic symptoms, splenomegaly, a massive leukocytosis showing an entire spectrum of mature and immature granulocytes, and an absolute increase in basophils.

(b) A profoundly low leukocyte alkaline phosphatase (LAP) score helps differentiate this neoplastic process from a reactive leukemoid reaction, establishing a diagnosis of chronic myeloid leukemia.

(c) The structural pathogenesis depends on the Philadelphia chromosome, which is a balanced reciprocal translocation between long arms of chromosomes 9 and 22, written as $t(9;22)(q34;q11)$.

(d) This translocation fuses the ABL1 oncogene from chromosome 9 with the BCR gene on chromosome 22, creating a chimeric BCR-ABL1 fusion gene that encodes a constitutively active tyrosine kinase.

(e) The $t(15;17)$ translocation defines acute promyelocytic leukemia, $t(11;14)$ characterizes mantle cell lymphoma, and $t(14;18)$ drives follicular lymphoma via BCL2 deregulation.

Final Answer: $t(9;22)$

Answer: (B)

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Q12.

Solution

Concept:

Papillary thyroid carcinoma is the most common malignant neoplasm of the thyroid gland. Its definitive histopathological diagnosis relies entirely on distinct nuclear alterations rather than its architectural growth pattern.

Solution:

(a) The clinical description outlines a solitary, firm thyroid nodule whose fine-needle aspiration biopsy reveals specific diagnostic elements, including psammoma bodies and crowded nuclei.

(b) Under light microscopy, the tumor cell nuclei show an optically clear, ground-glass appearance called Orphan Annie eye nuclei, along with prominent longitudinal nuclear grooves and intranuclear pseudoinclusions.

(c) These specialized nuclear membrane alterations are the absolute diagnostic hallmark of papillary thyroid carcinoma and dictate the diagnosis regardless of follicular architecture.

(d) Even if a tumor grows in a purely follicular pattern, the presence of these nuclear features classifies it as a follicular variant of papillary thyroid carcinoma.

(e) Capsular and vascular invasion characterize follicular carcinomas, stromal amyloid deposits identify medullary carcinomas, and colloid-filled follicles are typical of benign adenomas.

Final Answer: The characteristic nuclear optical clarity and membrane alterations

Answer: (C)

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Q13.

Solution

Concept:

Barrett esophagus is a specialized metaplastic complication of chronic gastroesophageal reflux disease. It represents a protective adaptive cellular response to ongoing mucosal injury induced by acidic gastric contents.

Solution:

(a) Long-standing exposure to refluxed acid injures the distal esophageal lining, stimulating the replacement of normal stratified squamous epithelium with a specialized intestinal-type columnar epithelium.

(b) Histopathological identification of distinct, mucin-rich goblet cells within this columnar epithelium confirms a diagnostic impression of Barrett esophagus, matching the endoscopic salmon-pink velvety tongues.

(c) The critical clinical implication of this condition lies in its status as a direct premalignant precursor lesion for distal esophageal neoplasia.

(d) Patients with Barrett esophagus carry a significantly increased relative risk of developing high-grade epithelial dysplasia and progressing over time to invasive esophageal adenocarcinoma.

(e) It does not lead to squamous cell carcinoma, is unrelated to portal hypertensive esophageal varices, and does not undergo automatic spontaneous regression with short-term antacid therapies.

Final Answer: Precursor lesion with an elevated risk of transformation into adenocarcinoma

Answer: (C)

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Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	B	3	C	4	C	5	A
6	C	7	C	8	C	9	B	10	B
11	B	12	B	13	C	14	B	15	B
16	B	17	B	18	C	19	C	20	B
21	C	22	C	23	B	24	C	25	C