NEET PG Pathology Sample Paper-8

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 45-year-old male with chronic hepatitis B undergoes a liver biopsy. Histopathological analysis reveals hepatocytes with a glassy, uniform, eosinophilic cytoplasmic appearance ("ground-glass hepatocytes"). This specific morphologic alteration is primarily driven by the massive accumulation of viral surface antigens within which organelle subcompartment?

(A) Smooth endoplasmic reticulum

(B) Rough endoplasmic reticulum

(C) Trans-Golgi network

(D) Lysosomal residual bodies

Q2. During a research experiment on ischemic-reperfusion injury in myocardial tissue, cells demonstrate a rapid influx of calcium ions into the cytosol. This activates calpains and phospholipases, leading to irreversible membrane damage. Which of the following mitochondrial transitions marks the point of no return for this cell?

(A) Induction of the permeability transition pore

(B) Upregulation of Bcl-xL expression

(C) Dissociation of hexokinase from VDAC

(D) Efflux of cytochrome c via Bax monomers

Q3. A biopsy of a subcutaneous mass from a patient with long-standing rheumatoid arthritis reveals an area of central necrobiotic collagen surrounded by a palisade of macrophages. This classic granulomatous architecture is primarily coordinated by which cytokine profile?

(A) IL-4 and IL-13

(B) IFN-γ and TNF-α

(C) IL-10 and TGF-β

(D) IL-17 and IL-23

Q4. An infant presenting with severe recurrent bacterial infections is found to have a genetic mutation that renders leukocyte integrins non-functional. Specifically, the Mac-1 (CD11b/CD18) complex is absent. Which phase of the leukocyte adhesion cascade is completely disrupted in this patient?

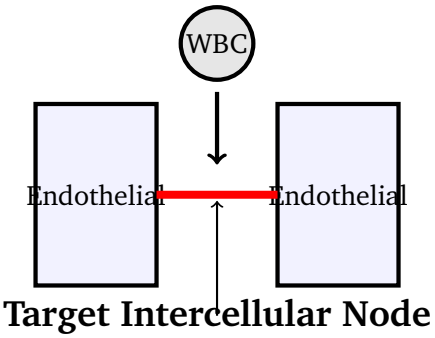
(A) Rolling and tethering

(B) Firm adhesion and stable arrest

(C) Paracellular transmigration

(D) Intravascular crawling

Q5. A 28-year-old male presents with acute appendicitis. A high-magnification histologic evaluation of the tissue microenvironment shows active leukocytic emigration. Identify the specific cellular transendothelial junctional molecule represented by the **Target Intercellular Node** in the schematic below that mediates homophilic binding during leukocyte diapedesis:



(A) CD31 (PECAM-1)

(B) CD62E (E-selectin)

(C) CD106 (VCAM-1)

(D) CD54 (ICAM-1)

Q6. A 62-year-old systemic amyloidosis patient presents with nephrotic syndrome. Congo red staining shows apple-green birefringence under polarized light. Biochemically, these fibrillar deposits are arranged in a specific secondary structural conformation that renders them resistant to physiologic proteolysis. Name this conformation.

(A) Amphipathic α-helix

(B) Anti-parallel β-pleated sheet

(C) Parallel α-coiled coil

(D) Triple-stranded collagen helix

Q7. A 54-year-old female undergoes a screening colonoscopy, and a 1.5 cm sessile polyp is excised. Histopathology confirms a tubular adenoma with high-grade dysplasia. Molecular analysis shows a loss of heterozygosity at chromosome 5q21. Which cellular process is primarily dysregulated by this initiation driver mutation?

(A) Mismatch repair machinery

(B) β-catenin degradation

(C) Tyrosine kinase signaling

(D) Telomere maintenance

Q8. A patient undergoing chemotherapy develops profound acute tumor lysis syndrome. Cells are undergoing programmed death displaying chromatin condensation and cytoplasmic blebbing without inciting an inflammatory response. Which initiator caspase is directly activated by the apoptosome complex formed in this intrinsic pathway?

(A) Caspase-8

(B) Caspase-9

(C) Caspase-3

(D) Caspase-1

Q9. A 34-year-old female presents with severe fatigue, jaundice, and dark urine. Her peripheral blood smear shows numerous spherocytes, and the direct antiglobulin test (DAT) is strongly positive for IgG but negative for C3d. Which mechanism best explains the destruction of red blood cells in this clinical scenario?

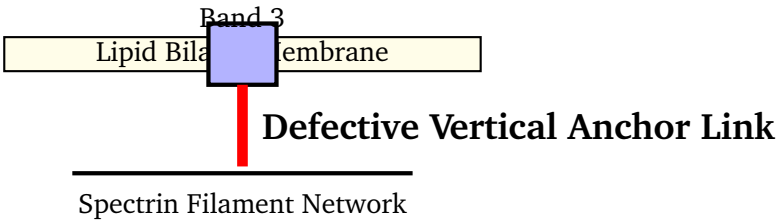
(A) Intravascular complement-mediated lysis

(B) Splenic macrophage-mediated partial phagocytosis

(C) Intravascular mechanical shear stress

(D) Hepatic Kupffer cell erythro phagocytosis

Q10. A 24-year-old male with lifelong mild anemia and splenomegaly is evaluated. The osmotic fragility test is markedly abnormal. Review the structural protein arrangement schematic of the erythrocyte membrane skeleton shown below. Identify the mutated skeletal anchor protein labeled as the **Defective Vertical Anchor Link** that is most commonly responsible for this clinical presentation:



(A) Ankyrin

(B) α-Spectrin

(C) β-Spectrin

(D) Protein 4.1

Q11. A bone marrow biopsy from a 68-year-old male presenting with pancytopenia reveals hypercellular marrow with dyserythropoiesis, ring sideroblasts ($>$ 15%), and isolated deletion of chromosome 5q. What is the most definitive

primary cytogenetic or molecular profile associated with the pathogenesis of this specific variant of myelodysplastic syndrome?

(A) *SF3B1* mutation

(B) *JAK2* V617F mutation

(C) *CALR* frameshift mutation

(D) *RUNX1* translocation

Q12. A 9-year-old boy presents with rapid-onset cervical lymphadenopathy and a large anterior mediastinal mass causing superior vena cava syndrome. Flow cytometry of the cells reveals positivity for TdT, CD2, CD3, and CD7, while negative for CD1a and surface mIg. What is the molecular hallmark driving this neoplasm?

(A) *NOTCH1* activating mutations

(B) *MYC* reciprocal translocation

(C) *BCL2* overexpression

(D) *PML-RARA* fusion gene

Q13. A 55-year-old male with a history of deep vein thrombosis is found to have normal PT, prolonged aPTT, and a normal thrombin time. Mixing studies with normal plasma fail to correct the prolonged aPTT. A dilute Russell Viper Venom Time (dRVVT) is prolonged and corrects upon the addition of excess phospholipids. What is the most accurate diagnostic interpretation?

(A) Factor VIII deficiency

(B) Lupus anticoagulant positive

(C) Factor V Leiden mutation

(D) Antithrombin III deficiency

Q14. A peripheral blood film from a 42-year-old female displaying heavy menstrual bleeding shows marked microcytic, hypochromic anemia. A key physiological adaptation in iron deficiency is the systemic down-regulation of which hepatic

peptide hormone, which serves as the principal regulator of systemic iron homeostasis?

(A) Ferroportin

(B) Hepcidin

(C) Transferrin

(D) Erythroferrone

Q15. A 62-year-old male smoker dies suddenly 5 days following an acute transmural anteroseptal myocardial infarction. Autopsy reveals hemopericardium secondary to rupture of the left ventricular free wall. Histopathological evaluation of the infarcted edge at this specific temporal stage will most prominently demonstrate which feature?

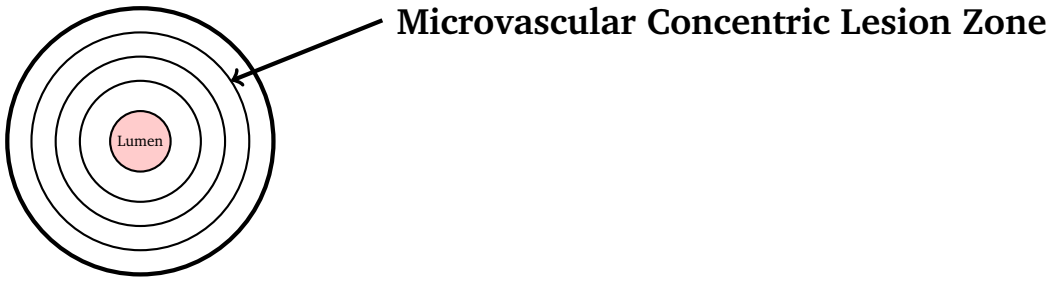
(A) Hypercontracted sarcomeres with dense neutrophilic infiltrates

(B) Abundant granulation tissue with active capillary sprouting

(C) Dissolution of myocytes with dense macrophage phagocytic debris

(D) Dense collagen deposition and early scar organization

Q16. A 40-year-old female with long-standing poorly controlled hypertension presents with acute hematuria and rapidly declining renal function. A renal biopsy is performed. Examine the schematic representation of the microvascular lesion zone below. Identify the characteristic morphological lesion labeled as the **Microvascular Concentric Lesion Zone** that is indicative of malignant nephrosclerosis:



(A) Hyaline arteriolosclerosis

(B) Hyperplastic arteriolitis (onion-skinning)

(C) Fibrinoid necrotizing angiitis

(D) Monckeberg medial calcific sclerosis

Q17. A 58-year-old lifelong heavy smoker presents with an irregular, central hila lung mass tracking down the main bronchus. Sputum cytology identifies atypical large polygonal cells with abundant cytoplasm, hyperchromatic nuclei, and intercellular bridges. Which immunohistochemical profile is most definitive for verifying this tumor type?

(A) p40 and Cytokeratin 5/6 positive

(B) TTF-1 and Napsin A positive

(C) Chromogranin and Synaptophysin positive

(D) Calretinin and WT1 positive

Q18. A 35-year-old male presents with chronic productive cough, hemoptysis, and recurrent sinusitis. High-resolution CT of the chest demonstrates saccular bronchiectatic changes confined predominantly to the upper lobes, along with tree-in-bud opacities. A genetic assay reveals a mutation in the CFTR gene. What is the underlying physical state of the endobronchial secretions driving this disease process?

(A) Dehydrated, hyperviscous mucus secondary to defective chloride secretion

(B) Alkaline, low-viscosity fluid due to excessive bicarbonate transport

(C) Highly fluidic secretions depleted of sodium content

(D) Hypocelluar serous exudate secondary to hyperactive sodium absorption

Q19. A 48-year-old woman presenting with chronic dyspepsia undergoes an upper gastrointestinal endoscopy, which reveals a well-demarcated, punched-out mucosal ulceration in the first part of the duodenum. Gastric antral biopsy confirms severe active chronic gastritis. What is the fundamental pathogenic mechanism by which *Helicobacter pylori* induces this proximal duodenal ulceration?

(A) Direct cytotoxic mucosal destruction via CagA toxin delivery in duodenal cells

(B) Antral D-cell destruction leading to hypergastrinemia and high gastric acid load

(C) Hypersecretion of protective bicarbonate from Brunner glands

(D) Systemic autoantibodies targeting gastric parietal cell H^+/K^+-ATPase

Q20. A 42-year-old male with a 15-year history of ulcerative colitis undergoes a screening surveillance colonoscopy. Multiple biopsies are obtained from flat mucosal areas. The pathologist identifies widespread high-grade epithelial dysplasia. What molecular event distinguishes colitis-associated colorectal carcinogenesis from the classic sporadic adenoma-carcinoma pathway?

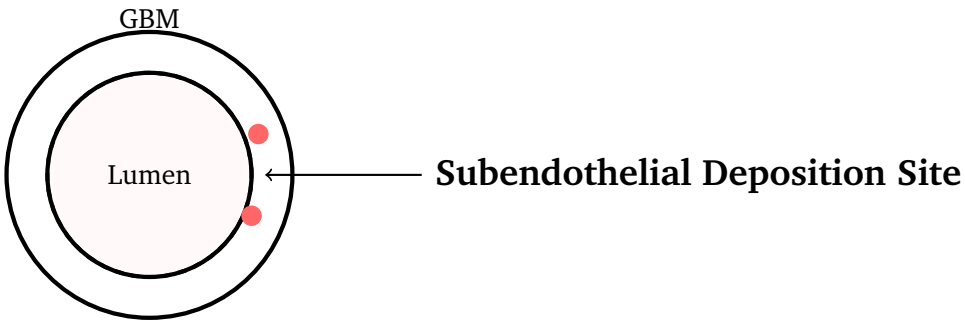
(A) Early *TP53* mutation preceding *APC* loss

(B) Early *APC* mutation followed by late *KRAS* activation

(C) Initial *BRAF* V600E mutation leading to CIMP status

(D) Late silencing of mismatch repair genes via hypermethylation

Q21. A 30-year-old female presents with subacute renal failure, malar rash, and generalized joint pains. A renal biopsy demonstrates a diffuse proliferative glomerulonephritis (Class IV Lupus Nephritis). Examine the stylized layout of the single glomerular capillary loop shown below. Identify the exact deposition zone labeled as the **Subendothelial Deposition Site** corresponding to the classic wire-loop lesion:



(A) Subendothelial space

(B) Subepithelial space

(C) Intramembranous layer

(D) Mesangial matrix interspace

Q22. A 15-year-old boy presents with an enlarging, painful mass in the diaphysis of his right femur. Radiography shows a lytic destructive lesion with a prominent periosteal "onion-skin" reaction. Biopsy reveals uniform sheets of small, round blue cells with scanty cytoplasm rich in glycogen. Cytogenetic testing detects a characteristic $t(11;22)(q24;q12)$ translocation. What is the gene fusion product generated?

(A) *EWS-FLI1*

(B) *BCR-ABL1*

(C) *SS18-SSX1*

(D) *COL1A1-PDGFB*

Q23. A 38-year-old female presents with an asymptomatic thyroid nodule. Fine needle aspiration biopsy reveals clusters of follicular cells showing nuclear enlargement, overlapping, prominent nuclear grooves, and clear intranuclear inclusions ("Orphan Annie eye" nuclei). Psammoma bodies are noted. What molecular pathway change is most commonly found in this tumor?

(A) *RET/PTC* rearrangement or *BRAF* mutation

(B) *PAX8-PPAR*γ1 fusion or *RAS* mutation

(C) *MEN2* related *RET* point mutations

(D) *CTNNB1* activating mutations

Q24. A 65-year-old postmenopausal female presents with abnormal vaginal bleeding. An endometrial biopsy demonstrates a high-grade endometrial carcinoma with solid sheets of atypical cells showing high mitotic activity, severe nuclear atypia, and localized areas of necrosis. Immunohistochemistry shows a complete loss of p53 expression. What is the most likely molecular category of this carcinoma?

(A) Serous carcinoma (Type II endometrioid pathway)

(B) Well-differentiated endometrioid adenocarcinoma (Type I)

(C) Mucinous endometrial adenocarcinoma

(D) Stromal sarcoma with smooth muscle differentiation

Q25. A 32-year-old male presents with a painless testicular mass. Serum tumor markers reveal elevated β-hCG but normal alpha-fetoprotein (AFP). Orchiectomy reveals a lobulated, fleshy, white-gray tumor without hemorrhage or necrosis. Histopathology shows large uniform cells with clear cytoplasm and distinct cell borders separated by fibrous septa containing a prominent lymphocytic infiltrate. What is the definitive diagnosis?

(A) Seminoma

(B) Yolk sac tumor

(C) Embryonal carcinoma

(D) Choriocarcinoma

Detailed Solutions

Q1.

Solution

Concept: Ground-glass hepatocytes are a distinct morphologic feature of chronic Hepatitis B Virus (HBV) infection, visible on light microscopy as cells filled with dull, granular, eosinophilic cytoplasm.

Solution:

Let's analyze the subcellular events in chronic HBV infection:

(a) During chronic HBV infection, the host cell synthesizes massive quantities of Hepatitis B surface antigen (HBsAg) that far exceed the amount needed to assemble mature virions.

(b) These excess envelope glycoproteins fail to export efficiently and accumulate as filament-like, branch-like aggregates within the cisternal spaces of the **Smooth Endoplasmic Reticulum (SER)**.

(c) This massive physiological distension of the SER pushes normal cytoplasmic organelles to the periphery, creating the classic uniform "ground-glass" look under light microscopy.

Final Answer: Smooth endoplasmic reticulum

Answer: (A)

Go Back to Question 1

Q2.

Solution

Concept: During cellular ischemia-reperfusion injury, a massive influx of cytosolic calcium and high oxidative stress damage vulnerable intracellular systems, targeting the mitochondria to cross the line from reversible damage to cell death.

Solution:

Let's isolate the mitochondrial event that represents irreversible injury:

(a) High levels of cytosolic calcium and reactive oxygen species (ROS) disrupt mitochondrial function.

(b) These factors trigger the **Induction of the mitochondrial permeability transition pore (mPTP)** within the inner mitochondrial membrane.

(c) Opening this high-conductance megachannel causes a sudden loss of the mitochondrial membrane potential ($\Delta\Psi_m$), completely halting ATP synthesis. This represents the bioenergetic point of no return for the cell, committing it to necrosis or apoptosis.

Final Answer: Induction of the permeability transition pore

Answer: (A)

Go Back to Question 2

Q3.

Solution

Concept: Rheumatoid nodules are pathognomonic extra-articular manifestations of severe rheumatoid arthritis. Their histological setup follows a specialized Type IV (delayed-type) hypersensitivity immune architecture.

Solution:

Let's examine the cytokine patterns driving this granulomatous architecture:

(a) Rheumatoid nodules feature a central zone of fibrinoid necrosis (necrobiotic collagen) surrounded by a border of palisading macrophages and histiocytes, bordered by outer layers of lymphocytes.

(b) This specific structural layout is coordinated by a **Type 1 helper T-lymphocyte (T_H1) response**, which drives chronic macrophage activation.

(c) **Interferon-gamma (IFN-γ)** released by T_H1 cells activates macrophages, while **Tumor Necrosis Factor-alpha (TNF-α)** promotes their consolidation and structural palisading around the necrotic focus.

Final Answer: IFN-γ and TNF-α

Answer: (B)

Go Back to Question 3

Q4.

Solution

Concept: Leukocyte Adhesion Deficiency Type 1 (LAD-1) is an autosomal recessive immunodeficiency caused by mutations in the *ITGB2* gene, which encodes the β_2 integrin subunit (CD18).

Solution:

Let's review the step-by-step leukocyte recruitment cascade:

(a) Selectins coordinate the early, low-affinity *rolling and tethering* steps of leukocyte migration along the vessel wall.

(b) Next, chemokines activate leukocyte integrins, transforming them into high-affinity configurations that bind to ligands like ICAM-1 and VCAM-1 on the activated endothelial cell surface.

(c) The absence of functional Mac-1 (CD11b/CD18) and LFA-1 (CD11a/CD18) complexes means leukocytes cannot bind tightly to these surface receptors. This completely disrupts **Firm adhesion and stable arrest**, leaving the leukocytes unable to stick to the vessel wall or migrate into infected tissues.

Final Answer: Firm adhesion and stable arrest

Answer: (B)

Go Back to Question 4

Q5.

Solution

Concept: Leukocyte diapedesis (transmigration) is the stage of the leukocyte recruitment cascade where white blood cells crawl across the vascular endothelial cell barrier to enter inflamed tissues.

Solution:

Let's trace the molecular interactions within the intercellular junction depicted in the diagram:

(a) Selectins (like CD62E) control rolling, and integrin ligands (like ICAM-1 and VCAM-1) regulate firm adhesion across the broad surface of the endothelium.

(b) Transmigration through the tight intercellular spaces requires specific molecules localized directly at the endothelial cell-cell boundaries (the Target Intercellular Node).

(c) **CD31 (PECAM-1)** is highly concentrated at these endothelial junctions. It mediates the homophilic binding interactions (CD31 on the leukocyte binding to CD31 on the endothelial cell) required for the leukocyte to squeeze across the endothelial junction line.

Final Answer: CD31 (PECAM-1)

Answer: (A)

Go Back to Question 5

Q6.

Solution

Concept: Amyloidosis describes a group of metabolic diseases characterized by the extracellular deposition of insoluble, misfolded protein fibrils in various organs and tissues.

Solution:

Let's evaluate the structural features of amyloid proteins:

(a) Regardless of the specific precursor protein involved (e.g., AL light chains or AA reactant proteins), all amyloid proteins share a common misfolded configuration.

(b) These misfolded monomers line up to form an extensive **anti-parallel β-pleated sheet** secondary structure.

(c) This tightly packed cross-β structure makes the fibrils highly resistant to standard physiologic proteolysis. It also gives the deposits their characteristic structural affinity for the Congo red dye, producing apple-green birefringence under polarized light.

Final Answer: Anti-parallel β-pleated sheet

Answer: (B)

Go Back to Question 6

Q7.

Solution

Concept: The adenoma-carcinoma sequence outlines the step-by-step accumulation of genetic mutations that drives the transformation of normal colonic epithelium into invasive adenocarcinoma.

Solution:

Let's trace the initial mutation step in this classic tumor cascade:

(a) Chromosome 5q21 contains the **APC** (Adenomatous Polyposis Coli) tumor suppressor gene. Loss of heterozygosity at this locus is the classic initial driver mutation in both sporadic colorectal tumors and Familial Adenomatous Polyposis (FAP).

(b) The wild-type APC protein forms a critical part of a "destruction complex" that binds, phosphorylates, and breaks down cytosolic β-catenin.

(c) Loss of functional APC disrupts this breakdown process, leading to the accumulation of **β-catenin**. Unbound β-catenin translocates into the nucleus, binding TCF/LEF transcription factors to drive cellular proliferation and create dysplastic adenomatous polyps.

Final Answer: β-catenin degradation

Answer: (B)

Go Back to Question 7

Q8.

Solution

Concept: Acute tumor lysis syndrome triggers the intrinsic (mitochondrial) pathway of apoptosis due to intracellular metabolic stress and DNA damage within the rapidly dying tumor cells.

Solution:

Let's trace the caspase activation cascade of the intrinsic pathway:

(a) Intracellular stress signals induce mitochondrial outer membrane permeabilization, releasing Cytochrome c into the cytoplasm.

(b) Cytochrome c binds to Apaf-1 in the cytosol in an ATP-dependent manner, oligomerizing into a wheel-like heptameric protein complex known as the **apoptosome**.

(c) The apoptosome specifically binds and activates **Caspase-9**, the principal *initiator* caspase of the intrinsic pathway. Once active, Caspase-9 cleaves downstream executioner caspases (such as Caspase-3 and Caspase-7) to carry out cell death.

Final Answer: Caspase-9

Answer: (B)

Go Back to Question 8

Q9.

Solution

Concept: Warm Autoimmune Hemolytic Anemia (AIHA) is characterized by IgG autoantibodies targeting red blood cell surface antigens, driving extravascular hemolysis.

Solution:

Let's look at the mechanism of red blood cell destruction in warm AIHA:

(a) IgG autoantibodies coat the surface of red blood cells (RBCs). The Direct Antiglobulin Test (DAT) is positive for IgG, while the absence of C3d indicates that the complement cascade is not fully active.

(b) As these IgG-coated RBCs circulate through the cords of Billroth in the spleen, the Fc portions of the bound IgG antibodies are recognized by Fc receptors on **splenic macrophages**.

(c) Instead of engulfing the entire erythrocyte, these macrophages bite off sections of the antibody-coated cell membrane (**partial phagocytosis**). The remaining cell membrane seals up around its contents, forcing the cell into a spherical shape with no central pallor (spherocyte) that is eventually trapped and destroyed in the spleen.

Final Answer: Splenic macrophage-mediated partial phagocytosis

Answer: (B)

Go Back to Question 9

Q10.

Solution

Concept: Hereditary Spherocytosis (HS) is an inherited disorder of the red blood cell membrane skeleton that leads to a loss of membrane surface area, converting cells into fragile spherocytes.

Solution:

Let's trace the structural components of the erythrocyte membrane skeleton:

(a) The erythrocyte relies on a protein network to preserve its flexible, biconcave shape. This network consists of horizontal components (spectrin dimers and tetramers) tethered to the overlying lipid bilayer by vertical anchoring complexes.

(b) The primary vertical anchor is **Ankyrin** (the Defective Vertical Anchor Link), which bridges the horizontal spectrin filaments to the transmembrane protein Band 3.

(c) Mutations in *ankyrin* are the most common genetic cause of Hereditary Spherocytosis (50% of cases). A defect here destabilizes the lipid bilayer, causing the cell to shed microvesicles. This reduces its surface-area-to-volume ratio, increases its osmotic fragility, and leads to splenic clearance.

Final Answer: Ankyrin

Answer: (A)

Go Back to Question 10

Q11.

Solution

Concept: Myelodysplastic Syndromes (MDS) with ring sideroblasts are highly associated with clonal somatic mutations in components of the intracellular RNA splicing machinery.

Solution:

Let's review the molecular associations of ring sideroblasts:

(a) Ring sideroblasts are erythroblasts containing abnormal accumulations of iron within their mitochondria, which form a ring around the nucleus. They can be visualized with a Prussian blue stain.

(b) Over 90% of MDS cases presenting with ring sideroblasts carry a somatic mutation in the **SF3B1** (Splicing Factor 3b Subunit 1) gene, which encodes a key component of the RNA spliceosome.

(c) Mutations in *SF3B1* disrupt the splicing of transcripts that regulate mitochondrial iron processing (such as *ABCB7*), leading to iron accumulation in the mitochondria and ineffective erythropoiesis.

Final Answer: $\boxed{SF3B1 mutation}$

Answer: (A)

Go Back to Question 11

Q12.

Solution

Concept: T-cell Acute Lymphoblastic Leukemia/Lymphoma (T-ALL) typically presents in adolescent males as a rapidly growing anterior mediastinal mass, often complicated by pleural effusions or Superior Vena Cava (SVC) syndrome.

Solution:

Let's look at the immunophenotypic and molecular markers of this tumor:

(a) The immunophenotype is classic for a immature T-cell lineage neoplasm: positive for Terminal Deoxynucleotidyl Transferase (**TdT**) along with pan-T-cell markers (**CD2, CD3, CD7**).

(b) At the molecular level, more than $50-60\%$ of T-ALL cases carry gain-of-function, **activating mutations in the NOTCH1 gene**.

(c) *NOTCH1* encodes a transmembrane receptor that acts as a transcription factor when cleaved. Activating mutations cause continuous, ligand-independent signaling that drives T-cell precursor proliferation and survival.

Final Answer: $\boxed{NOTCH1 activating mutations}$

Answer: (A)

Go Back to Question 12

Q13.

Solution

Concept: The lupus anticoagulant is an antiphospholipid autoantibody that paradoxically prolongs lipid-dependent coagulation assays *in vitro* while predisposing patients to thrombotic events *in vivo*.

Solution:

Let's analyze the coagulation test results step-by-step:

(a) The patient has a history of deep vein thrombosis and a prolonged basic baseline aPTT. A mixing study fails to correct this prolongation, which indicates the presence of a **coagulation inhibitor** rather than a simple clotting factor deficiency.

(b) The dilute Russell Viper Venom Time (dRVVT) activates Factor X directly, bypassing the upper intrinsic pathway. This test is prolonged because the lupus anticoagulant antibodies bind up the essential phospholipid reagents in the assay.

(c) The definitive diagnostic proof is that **the prolongation corrects when excess phospholipids are added**. This excess neutralizes the autoantibodies, confirming the presence of a phospholipid-dependent inhibitor: the **lupus anticoagulant**.

Final Answer: Lupus anticoagulant positive

Answer: (B)

Go Back to Question 13

Q14.

Solution

Concept: Systemic iron balance is maintained by regulating iron absorption in the gut and iron release from storage pools, a process controlled by a hepatic hormone system.

Solution:

Let's review the physiological feedback loop in iron deficiency:

(a) **Hepcidin** is a peptide hormone synthesized by hepatocytes that serves as the principal regulator of systemic iron homeostasis. It binds to ferroportin (the sole cellular iron exporter on enterocytes and macrophages), inducing its internalization and destruction.

(b) In iron deficiency anemia, the body needs to maximize iron entry into the plasma. This triggers a homeostatic **down-regulation of hepcidin** production in the liver.

(c) Low systemic hepcidin levels allow ferroportin channels to remain stable on basolateral membranes, increasing iron absorption from the duodenum and releasing stored iron from macrophages.

Final Answer: Hepcidin

Answer: (B)

Go Back to Question 14

Q15.

Solution

Concept: The histopathological evolution of a myocardial infarction follows a reliable timeline that explains the risk of structural mechanical complications, like free wall rupture.

Solution:

Let's place the autopsy findings on the myocardial infarction timeline:

(a) Left ventricular free wall rupture typically occurs **3 to 7 days** following a transmural myocardial infarction. At this stage, the mechanical integrity of the myocardium is at its weakest.

(b) By day 5, neutrophils have largely broken down, and there is an extensive **dissolution of dead myocytes handled by a massive macrophage infiltrate**.

(c) The macrophages remove the dead cellular debris via phagocytosis. Because granulation tissue and collagen matrix deposition have not yet had time to reinforce the area, the ventricular wall is soft and yellow (myomalacia cordis), leaving it vulnerable to rupture under high intraventricular pressures.

Final Answer: Dissolution of myocytes with dense macrophage phagocytic debris

Answer: (C)

Go Back to Question 15

Q16.

Solution

Concept: Malignant hypertension causes severe, rapid structural damage to the vasculature, characteristically presenting as malignant nephrosclerosis within renal arterioles.

Solution:

Let's analyze the structural lesions linked with accelerated vascular damage:

(a) Severe, acute elevations in blood pressure cause luminal endothelial stress and damage, causing plasma proteins to leak across the endothelium and triggering smooth muscle cell proliferation.

(b) The Microvascular Concentric Lesion Zone in the diagram depicts concentric, laminated layers of smooth muscle cells and basement membrane replication, which significantly narrows the vessel lumen.

(c) This specific structural change is known as **hyperplastic arteriolitis (onion-skinning)**. It is a hallmark of malignant nephrosclerosis, reflecting an aggressive vascular remodeling response to severe hypertension.

Final Answer: Hyperplastic arteriolitis (onion-skinning)

Answer: (B)

Go Back to Question 16

Q17.

Solution

Concept: Squamous Cell Carcinoma (SCC) of the lung typically presents as a central, hilar mass in smokers. Its diagnosis can be confirmed using specific cytomorphological and immunohistochemical criteria.

Solution:

Let's evaluate the diagnostic markers for lung carcinoma subtypes:

(a) The presence of large polygonal tumor cells with intercellular bridges and keratinization (sputum cytology) is highly specific for a squamous lineage.

(b) To definitively confirm SCC over other lineages (like adenocarcinoma), pathologists use an immunohistochemical panel. The definitive profile for squamous cell carcinoma is positivity for **p40 and Cytokeratin 5/6 (CK5/6)**.

(c) (Note: TTF-1 and Napsin A are diagnostic for lung adenocarcinoma, while chromogranin and synaptophysin identify neuroendocrine tumors like small cell carcinoma).

Final Answer: p40 and Cytokeratin 5/6 positive

Answer: (A)

Go Back to Question 17

Q18.

Solution

Concept: Cystic Fibrosis (CF) is an autosomal recessive disease caused by mutations in the *CFTR* gene, which functions as an ATP-gated epithelial chloride channel.

Solution:

Let's analyze the physical state of secretions in the CF bronchiectatic airway:

(a) A defect in the CFTR channel disrupts normal chloride ion transport across the apical membrane of respiratory epithelial cells into the bronchial lumen.

(b) This loss of luminal chloride secretion leads to a compensatory increase in sodium reabsorption via the epithelial sodium channel (ENAC). Water follows sodium out of the lumen and back into the epithelial cells.

(c) This extensive fluid loss results in **dehydrated, hyperviscous mucus** within the bronchi. This thick mucus plugs the airways, blocks ciliary clearance, and creates an environment prone to chronic bacterial infections and progressive upper-lobe bronchiectasis.

Final Answer: Dehydrated, hyperviscous mucus secondary to defective chloride secretion

Answer: (A)

Go Back to Question 18

Q19.

Solution

Concept: *Helicobacter pylori* infections can present with distinct regional patterns in the stomach, leading to different downstream clinical outcomes.

Solution:

Let's look at how an antral-predominant *H. pylori* infection causes duodenal ulcers:

(a) When an *H. pylori* infection is concentrated primarily within the gastric antrum, local inflammatory responses destroy or inhibit **antral D-cells**.

(b) Antral D-cells normally produce somatostatin, an inhibitory hormone that dampens gastrin release. The loss of somatostatin inhibition leads to unchecked **hypergastrinemia**.

(c) This high gastrin level travels through the bloodstream to stimulate parietal cells in the gastric fundus, triggering massive gastric acid production. This high acid load overwhelms the buffering capacity of the proximal duodenum, causing peptic duodenal ulcers.

Final Answer: Antral D-cell destruction leading to hypergastrinemia and high gastric acid load

Answer: (B)

Go Back to Question 19

Q20.

Solution

Concept: Colitis-associated colorectal cancer (CAC) arises within areas of long-standing chronic inflammation in patients with Inflammatory Bowel Disease (IBD). It develops through a different sequence of genetic mutations than sporadic colorectal cancer.

Solution:

Let's contrast the genetic progressions of these two pathways:

(a) The classic sporadic colon cancer pathway follows an "*APC*-first" model, where loss of the *APC* gene occurs early, followed much later by mutations in *KRAS* and *TP53*.

(b) The colitis-associated pathway flips this timeline. Chronic inflammatory oxidative stress causes an **early TP53 mutation** to occur within flat, non-adenomatous mucosal areas long before any loss of the *APC* gene.

(c) Additionally, colitis-associated tumors are more frequently high-grade, multifocal, and arise from flat dysplastic lesions rather than classic stalked polyps.

Final Answer: Early *TP53* mutation preceding *APC* loss

Answer: (A)

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Q21.

Solution

Concept: Class IV Lupus Nephritis (Diffuse Proliferative Glomerulonephritis) is driven by the deposition of circulating immune complexes within specific layers of the glomerular capillary wall.

Solution:

Let's locate the lesion site depicted in the single capillary loop schematic:

(a) The diagram maps out the layers of the glomerular filtration barrier: the inner fenestrated endothelial lining, the central thick Glomerular Basement Membrane (GBM), and the outer epithelial layer (podocytes).

(b) The Target Site Indicator highlights deposits situated between the fenestrated endothelial lining and the internal surface of the GBM. This is the **subendothelial space**.

(c) The accumulation of large immune complexes within this subendothelial compartment creates the classic "wire-loop" lesions visible on light microscopy. This distinguishes Class IV lupus nephritis from conditions with subepithelial deposits, such as membranous nephropathy.

Final Answer: Subendothelial space

Answer: (A)

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Q22.

Solution

Concept: Ewing Sarcoma is a highly malignant, small round blue cell bone tumor that typically develops within the diaphysis of long bones in children and adolescents.

Solution:

Let's evaluate the cytogenetic hallmark of Ewing Sarcoma:

(a) The clinical presentation (diaphyseal lytic lesion, periosteal "onion-skin" reaction) combined with histology showing uniform sheets of glycogen-rich small round blue cells points directly to Ewing Sarcoma.

(b) This tumor is characterized by a specific reciprocal chromosomal translocation, $**t(11;22)(q24;q12)**$.

(c) This translocation fuses the *EWS* (Ewing Sarcoma) gene on chromosome 22 with the *FLI1* (Friend Leukemia Integration 1) transcription factor gene on chromosome 11, generating the oncogenic $**EWS\text{-}FLI1**$ fusion gene. This hybrid product acts as a powerful, anomalous transcription factor that drives uninhibited cell survival and growth.

Final Answer: *EWS-FLI1*

Answer: (A)

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Q23.

Solution

Concept: Papillary Thyroid Carcinoma (PTC) is the most common form of thyroid malignancy, identified by highly specific nuclear features on fine needle aspiration biopsy.

Solution:

Let's connect the cytomorphology to the genetic profile of PTC:

(a) The presence of enlarged, overlapping nuclei with prominent grooves, clear intranuclear inclusions ("Orphan Annie eye" appearance), and lamellated calcifications (psammoma bodies) is pathognomonic for Papillary Thyroid Carcinoma.

(b) PTC is driven by genetic alterations that activate the MAP kinase signaling pathway.

(c) The most common genetic drivers are $**BRAF$ point mutations** (specifically V600E) or chromosomal translocations that produce $**RET/PTC$ rearrangements**. Both alterations lead to constitutive downstream activation of proliferation cascades.

Final Answer: *RET/PTC* rearrangement or *BRAF* mutation

Answer: (A)

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Q24.

Solution

Concept: Endometrial carcinomas are divided into two main biological categories: Type I (endometrioid) and Type II (non-endometrioid/serous), which develop through distinct molecular pathways.

Solution:

Let's analyze the histopathology and p53 profile of the tumor:

(a) The biopsy demonstrates a high-grade tumor with aggressive architecture (solid sheets, high mitotic index, necrosis) arising in a postmenopausal female.

(b) Immunohistochemistry shows an abnormal p53 profile (complete loss of expression or mutation-type overexpression), which indicates an underlying mutation in the *TP53* tumor suppressor gene.

(c) This genetic profile is the molecular hallmark of **Serous carcinoma (Type II endometrial pathway)**. These tumors typically arise in atrophic endometrium in older women, independent of estrogen stimulation, and carry a poor prognosis compared to PTEN-mutated Type I tumors.

Final Answer: Serous carcinoma (Type II endometrioid pathway)

Answer: (A)

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Q25.

Solution

Concept: Testicular germ cell tumors are categorized into seminomas and non-seminomatous germ cell tumors (NSGCTs), which exhibit different patterns of serum tumor markers and cellular morphology.

Solution:

Let's look at the clinicopathological presentation of this testicular mass:

(a) The tumor architecture is classic for a **Seminoma**: nests of large, uniform cells with clear cytoplasm and distinct cell borders separated by thin fibrous septa containing a prominent lymphocytic infiltrate.

(b) Grossly, seminomas are characterized as fleshy, lobulated, white-gray masses that lack the prominent zones of hemorrhage and necrosis typical of choriocarcinoma or embryonal carcinoma.

(c) Serologically, pure seminomas maintain a completely normal alpha-fetoprotein (AFP) level. While many seminomas show normal β-hCG, a subset can present with elevated β-hCG if syncytiotrophoblastic giant cells are present within the stroma, which does not alter the underlying diagnosis of a pure seminoma.

Final Answer: Seminoma

Answer: (A)

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Answer Key

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