SECOND YEAR BSc MLT

HEMATOLOGY - II & CLINICAL PATHOLOGY

INFECTIOUS MONONUCLEOSIS

Essay

1. Describe Infectious mononucleosis. Explain in details about the LE Cell demonstration with diagram
   - Description of Infectious mononucleosis
   - Define LE cell
   - LE cell preparation and demonstration with diagram

Short Notes

1. Atypical lymphocytes**
   - Key: downey cell, reactive lymphocytes. vary in morphological details and surface marker
   - Characteristics showing that they comprise a heterogenous mixture of cell types.
   - Cause-result of a polyclonal immune response to antigenic stimulation.
   - Conditions-EBV. CMV infection, drugs, immunization, radiation, autoimmune disease etc. .
   - Features-cell size increase, abundant cytoplasm, and vacuoles, scalloped apperence. nucleus distinctive, lobulated, oval/round/placed excentrically.
   - Diagnosis- peripheral smear, bone marrow examination, staining with giemsa, etc. .

2. Infectious mononucleosis**
   - Key: heterophile positive infectious mononucleosis, monoglandular fever, filatov's disease, acute
   - EBV infection, characterized by fever, sore throat, lymphadenopathy, and atypical
   - Lymphocytosis, associated with several tumors and autoimmune diseases, most common in early childhood, 2nd peak-late adolescence,
   - Transmission-contact with oral secretons, close contact, kissing disease, blood and bone marrow transplantation

- Clinical manifestations fever, sorethroat, splenomegaly, lymphadenopathy, tonsillitis, pharyngitis, rash,
- Complications-immune hemolytic anemia, splenic rupture, myocarditis, pneumonia.
- Lab diagnosis-count-hb –normal, plt-n/increased/decreased, wbc-increased
- Peripheral smear-rbc-normocytic normochromic, wbc-atypical lymphocytes, monocytoid cells, plasmacytoid cells, blastoid cells.
- Bone marrow examination-atypical lympocytosis, cytochemistry-acid phosphataseincreases, biochemical-G6PD decreases, dihydrofolate reductase increases, LFT-abnormal in
- >90% cases, serum bilirubin increases.
- Other test-heterophile ab test, monospot, enzyme immunoassay. treatment-glucocorticoid therapy, supportive care.

3. Paul bunnell test
   - Key: For EBV causing infectious mononucleosis.
   - Principle-sheep rbc agglutinate in the presence of heterophile abs presence of sheep
   - Aggliutinins in the patients serum who are absorbed by OX red cells but not by guinea pig kidney extract.
   - Procedure - simple titration of sheep cell agglutinins, serial dilutions of patient serum, add sheep RBCs, positive indicates presence of heterophile Abs,
   - Not specific for IM, screening test only

ANSWER BRIEFLY

- Peripheral smear examination in IM
- Lab diagnosis of IM
- Monospot slide test

SYSTEMIC LUPUS ERYTHEMATOSUS

SHORT NOTES

1. LE Cells ***.
   - Key:It is a neutrophil or macrophage that has engulfed the denatured nuclear material of another cell. The denatured material is an absorbed hematoxylin body(also called an LE body). Characteristics of Lupus Erythematosus, but also found in similar connective tissue disorders. Description, staining, diagram, etc.

2. LE Cell preparation and interpretation.
   - Key:Definition. Principle, specimen, procedure, observation & interpretation-(i) Test is considered positive when 2%-30% cells seen on the slide in neutrophil count are LE cell, (ii) smear is considered positive when 10 or more characteristic LE cells are seen during a 15 minute search, (iii) presence of LE cell indicate lupus, etc. Diagram.

3. SLE.
   - Key: Systemic Lupus Erythematosus. It's an autoimmune disease characterized by acute and chronic inflammatory lesions widely scattered in the body and there in presence of various nuclear and cytoplasmic autoantibodies in the plasma. Causes, Clinical features, LE cell demonstration- principle, procedure, observation, interpretation and diagram.

4. LE phenomenon
   - Key: Lupus Erythematosus Cell, Definition, Diagram.

5. Demonstration of LE cell and explain principle
   - Key: Definition.
   - Principle- The leucocytes are traumatized by rotating anticoagulated blood with glass beads. The patient serum containing LE factor is then directed towards the nuclear material of leucocytes. The nuclear material is then transformed into an LE body which attracts the neutrophils and then ingested by one of them. This is LE cell. Procedure, observation (LE cell appear as a neutrophil containing a large spherical body in its cytoplasm. The LE body does not show nuclear structure and stains as a pale purple homogeneous mass), interpretation and diagram.

MULTIPLE MYELOMA

SHORT NOTES

1. Multiple myeloma**
   - Key: Monoclonal B cell disorder, malignant clonal proliferation of plasma cells in bone marrow, increased in single immunoglobulin. Clinical features – lytic bone lesions, hypercalcemia, kidney failure, pyelonephritis, radiculopathy, nephropathy, coagulation abnormalities, plasmacytoma.
   - Incidence-common in old age, 40-60yrs.

- Lab diagnosis-count, peripheral smear-plasma cells –increases, B. M examination hypercellular, myeloma cells, flame cells, Russell bodies, immunochemistry, biochemical examination, cytogenetics-FISH, electrophoresis Treatment

2. Plasma cells*
   - Key: Terminally differentiated B cells
   - Not normally found in peripheral blood
   - Account for less than 3. 5 % of nucleated cells in bone marrow
   - Oval cells with low N:C ratio. Abundant cytoplasm-basophilic blue, nucleus-eccentrically cartwheel like, prominent perinuclear halo clear golgi zone.
   - Abnormality seen in-M. M

3. Lab diagnosis of multiple myeloma*
   - Key: Count-hb decreased, TLC, DLC-normal, ESR, B. T, CRP- increased
   - Peripheral smear examination-RBC- normocytic normochromic, platelet-normal/few cells, plasma cells increased Bone marrow examination-hypercellular, plasma cells increased->30%, myeloma cells, plasmablastic myeloma cells , flame cells, russel bodies, mot cells
   - Immunochemistry-CD 56, CD 138+
   - Biochemical examination-serum beta 2 microglobulin, LDH, Ca, serum CRP, uric acidincreased, ALP-normal, total protein-increases
   - Serum light chain assay
   - Cytogenetics-FISH, electrophoresis, imaging technique.

4. Draw the structure of normal and abnormal plasma cells.
   - Key: Normal plasma cell
   - Abnormal plasma cell-large size, ragged cytoplasm, fine nucleus with prominent
   - Nucleoli, multinucleated, more cytoplasm but lighter with perinuclear halo, vacuoles, Russell bodies, mott cells, flame cells
   - Seen in, M. M, plasma cell neoplasm
   - Diagnosed by-bone marrow examination, peripheral smear, etc. .

ANSWER BRIEFLY

1. Russel cells

- Key: Eosinophilic, large, homogenous immunoglobulin containing inclusions usually found in plasma cell undergoing excessive synthesis of immunoglobulin
- In pasma cell dyscrasia, m. m
- Diagnosis-bone marrow examination.

2. Mott cells
   - Key: Plasma cells crowded with Russell bodies
   - In reactive plasmacytosis, autoimmune disease like-R. A
   - Diagnosis- stains used-PAs, bone marrow examination

CYTOCHEMISTRY

SHORT NOTES

1. Sudan black stain*
   - Key: SB STAIN- to differentiate between AML and monocytic leukemia from lymphocytic Leukemia.
   - Principle- SBB is a lipophilic and slightly basic dye. so it combines with acidic group of lipid present in azurophilic and secondary granules of myelocytic cells
   - Procedure- reagent , fixative, counter stain and steps
   - Interpretation- fats, lipids-blue black. nuclei –red
   - Myelocytes +ve
   - Lymphoid cells –ve

2. Myeloperoxidase staining***
   - Key: MYELOPEROXIDASE STAINING- to differentiate between myelogenous and monocytic leukemia from ALL peroxidase
   - Principle- H2O2 + Diaminobenzidine insoluble red brown ppt
   - Procedure- also mention reagents, fixative, counter stain
   - Interpretation- reaction product brown granular, nuclei-blue
   - Neutrophilic and eosinophilic granules stain strongly- red brown
   - Monocyte – fine granular staining
   - Lymphoblast, basophils, plasma cells, -ve

3. Cytochemical stains in leukemia*
   - Key: myeloperoxidase, esterase, phosphatase, SBB, PAS, Perls stain, toluidine blue

- Principle, procedure, result and interpretation of each stain.

4. Perl's staining and its significance**
   - Key: For demonstrating ferric(Fe3+)iron in tissues
   - When tissue is treated with an acid ferrocyanide solution , it will result in unmasking of ferric iron in hemosiderin, and this ferric iron then react with potassium ferrocyanide solution to produce a insoluble blue compound ferric ferrocyanide.
   - Procedure-also mention reagents
   - Result-iron pigment- bright blue
   - Nuclei- red , Cytoplasm- pink-rose
   - Significance-in IDA the iron stores are completely depleted while in side roblastis anemia prominent increase in no. of iron granules is observed. Also to demonstrate iron especially in tissues such as BM, spleen , liver etc. .

5. Perl's staining

6. Periodic acid-Schiff staining (PAS)**
   - Key: differentiate between AML(diffuse positivity) & ALL (block positivity)
   - Principle-periodic acid is an oxidizing agent they convert OH groups adjacent carbon atoms to COOH groups resulting dialdehyde combine with shiff reagent to give red colour. Reagent, fixative, periodic acid, shiffs procedure, Interpretation ALL –block positivity, AML- Diffuse positivity.

7. Esterase
   - Key: Group of enzymes that hydrolyse acyl and chloroacyl esters alpha naphtol
   - Principle-esterase enzyme present in leucocyte hydrolyse the substrate esters and the product formed react with diazonium salt and form bright coloured compound
   - Procedure-also mention reagents and requirements
   - Naphthol AS-D chloroacetate esterase –result-bright red, interpretation-neutrophil series and mast cells +ve, +vity in myeloblast rare but mature stages stains strongly
   - Alpha naphthyl butyrate esterase-result-brown granular, interpretation monocytes stains strongly, plt and granulocytes –ve
   - Alpha naphthyl acetate esterase- result- diffuse red or brown, interpretation- leukemic and nomal monocyte stains strongly, normal granuocyte –ve

8. LAP

- Key: LEUKOCYTE ALKALINE PHOSPHATASE
- To differentiate leukemoid reaction and CML
- Principle, Procedure- reagents and requirements
- Result-blue granular
- Interpretation-LAP score elevated in- leukemoid reaction, M. M. decreased in- CML, PNH

9. Significance of cytochemical stain
   - Key: Enumerate cytochemial stains, also write about each stains aim, principle and interpretation and use of each stains in detail.

ANSWER BRIEFLY

- SBB
- MPO
- PAS
- Interpretation of LAP
- Perl's staining

IDENTIFICATION OF PARASITES IN BLOOD AND BONE MARROW FILMS

SHORT NOTES

1. Examination of blood for parasites*
   - Key: Blood parasites microfilaria, malaria, babesia, leishmania, trypanosomes, toxoplasma
   - Examination-wet mount, stained smears, concentration methods-sedimentation tech. membrane filtration tech., microhaematocrit tube method, buffy coat blood film, diethylcarbamazine provocation test for microfilaria. Other methods-culture, xenodiagnoses, skin test, imaging tech., serodiagnosis, molecular diagnosis.

2. Identification of parasites in blood and bone marrow films*
   - Refer above question.

3. Morphology of malarial parasite in blood smear**
   - Types-p. vivax, p. falciparum, p. malariae, p. ovale

Species Differentiation on Thin Films

Feature	*P. falciparum*	*P. vivax*	*P. ovale*	*P. malariae*
Enlarged infected RBC		+	+	
Infected RBC shape	round	round, distorted	oval, fimbriated	round
Stippling infected RBC	Mauer clefts	Schuffner spots	Schuffner spots	none
Trophozoite shape	small ring, appliqu	large ring, amoeboid	large ring, compact	small ring, compact
Chromatin dot	often double	single	large	single
Mature schizont	rare, 12-30 merozoites	12-24 merozoites	4-12 merozoites	6-12 merzoites
Gametocyte	crescent shape	large, round	large, round	compact, round

4. Types of filarial parasite in blood and its identification*
   - Key: Types-W. bancrofti, B. malayi. B. timori, loa loa, m. ozzardi, m. perstans
   - Identification- wet mount, stained smears, concentration methods-sedimentation tech. membrane filtration tech., microhaematocrit tube method, buffy coat blood film, diethylcarbamazine provocation test for microfilaria. other methods-, skin test, imaging tech., serodiagnosis, molecular diagnosis.

5. Detection of parasites in blood*
   - Refer above question

6. Enumerate the types of malarial parasites seen in blood. Draw and label types. *
   - Refer

7. Different types of microfilaria in blood*
   - REFER

8. List the blood parasites. Add a note on identification of each*
   - Refer

9. With the help of diagrams explain the morphology of malarial parasites*
   - Refer

10. L D bodies **

- Key: Leishman Donovan bodies, typically intracellular, non flagellated, leishmanial form, seen in macrophages, reticuloendothelial cells
- Small, round/oval, cell memb. delicate
- Demonstration by giemsa stain-nucleus-red, axoneme-arises from kinetoplast, kinetoplast-deep
- Purplecytoplasmic memb. -pale blue

Answer briefly

- **Name four Haemoparasites. How are they detected.**
- **Name three methods of detecting malarial parasites**
- **Different types of microfilaria in blood**
-

BONE MARROW TRANSPLANTATION TECHNIQUES

SHORT NOTES

1. Bone marrow transplantation?
   - Key: BMT-Definition, sources of stem cells, types of BMT, indications

2. Enumerate the test done before bone marrow transplantation?
   - Key: Define BM transplantation, steps, test blood test, B. T, C. T, screening test, cross matching, IgG level detect

3. Types of stem cell transplantations?
   - Key: Definition of BMT, Types of BMT:-syngenic, allogenic, autologous, in detail procedure of allogenic BM

COAGULATION FACTORS, MECHANISM, FIBRINOLYTIC SYSTEM, DISORDERS OF COAGULATIONS, LABORATORY METHODS, PLATELET DISORDERS

ESSAY

1. Mention various coagulation tests? Explain methodology of 3 basic coagulation test.
   - Key: Name the tests
     - Screening test
   - Test for 1° Hemostasis- Bleeding time, platelets count, blood smear, tourniquet test
   - Test for 2° Hemostasis- Clotting time, PT, APTT, TT
     - Specific test- platelets function test, test for Fibrinolysis, coagulation Factor assay
   - *Explain 3 basic coagulation test- PT, APTT, TT-- principle, reagents, procedure, normal range, cause of prolongation, uses

2. Enumerate the coagulation disorders. Describe briefly the diagnosis of the most Common hereditary coagulation disorders?
   - Key: Classify coagulation dissoder-
     - Inherited- Haemophila A&B, VWD
     - Acquired- DIC, vitamin k deficiency, liver disease
   - Brief description of all disease
   - Diagnosis of Haemophila A& B

3. Explain thrombocytopenia? Enumerate the causes of thrombocytopenia. Describe peripheral smear and bone marrow findings to ITP? **
   - Key: Definition, Types, causes, clinical features- bleeding, Lab diagnosis- Peripheral smear, bone marrow finding

4. Describe normal Haemostasis. Name the lab investigation performed to diagnose haemophilia. Describe the clinical features in haemophilia.

SHORT NOTES

1. Coagulation factors
   - Key: Name 13 coagulation Factor, site of synthesis, significant features, Classification of coagulation Factor - Fibrinogen group, Vitamin K dependent, contact group

2. Mechanism of blood coagulation,
   - Key: Coagulation pathways- Extrinsic, intrinsic & common pathways- explain each pathways

3. Fibrinolytic system
   - Key: Definition, Formation of FDD, inhibition of Fibrinolysis

4. Disorders of coagulations
   - Key: 2Types- Inherited & acquired
   - Inherited- Haemophila A&B, VWD
   - Acquired- DIC, vitamin k deficiency, Liver disease - pathogenesis, clinical features, lab diagnosis

5. Define disseminated intravascular coagulation (DIC)? Write the laboratory diagnosis of DIC?
   - Key: Definition, mechanism of DIC, Causes, lab diagnosis- (PT, APTT, TT - Increased, FDP-+ve, Fragmented RBC etc)

6. BT? **
   - Key: Bleeding time- It is the time taken for standardised skin wound to stop bleeding,
   - 3 methods- Ivy's, Duke's, Template method,
   - Principle, requirements, procedure, normal value of each method

7. PTT? **
   - Key: Partial thromboplastine time time(PTT) - Measure overall efficiency of intrinsic pathway& Common pathway- Principle, reagents, procedure, Causes of prolongation, Uses,

     Normal range-30-40sec

8. PT? **
   - Key: Prothrombin time(PT) - It indicate overall efficiency of extrinsic & common pathway Principle, reagents, requirement, procedure, causes of prolongation, Uses, Normal range-11-16sec.

9. PT- INR?

- Key: INR- International normalised ratio - is calculated from a PT result and is used to monitor how well the blood-thinning medication (anticoagulant) warfarin is working to prevent blood , Equation, Normal range, increased & decreased conditions

10. Enumerate the tests for bleeding?
    - Key: Bleeding time- Definition,
    - 3 methods- Ivy's, Duke's, Template method,
    - Principle, requirements, procedure, normal value of each method

11. Enumerate tests For Coagulation?
    - Key: Name the tests
    - A- Screening test
        - Test for 1° Hemostasis- Bleeding time, platelets count, blood smear, tourniquet test
        - Test for 2° Hemostasis- Clotting time, PT, APTT, TT
    - Specific test- platelets function test, test for Fibrinolysis, coagulation Factor assay
    - Principle &normal range of each test

12. Thromboplastin generation time
    - Key: Thromboplastine generation time- Principle, reagents, procedure, report

13. Prothrombin consumption time
    - Key: Prothrombin consumption time- it is detect the level of consumption of prothrombin during coagulation,
    - Principle, reagents, Procedure, reporting

14. Thrombin time.
    - Key: Thrombine time- assess final stage of coagulation, principle, reagents, procedure, normal range-3sec, causes of prolongation

15. Test for fibrinogen degradation product.
    - Key: FDP- Definition, Detection by using latex agglutination- Principle, Reagents, Method, interpretation, normal range

16. Assay of plasma fibrinogen.

- Key: Fibrinogen, normal range, purpose of fibrinogen assay, Type of fibrinogen assay- Clauss assay, immunological assay, clottable protein assay, PT based assay,

17. Test for Fibrinolysis? **
    - Key: FDP definition, Detection of FDP using latex agglutination- Principle, Reagents, Method, interpretation, normal range

18. What is hemophilia? Write the laboratory findings in hemophilia?
    - Key: Definition- Inherited, coagulation disorder, Type -Haemophila A&B, lab diagonosis -B. T, C. T, APTT, etc

19. Thrombocythaemia
    - Key: Definition- Thrombocythemia is a disease in which your bone marrow makes too many platelets.
    - Causes, clinical symptoms, lab diagonosis, manegment

20. Platelet disorders
    - Key: Thrombocytopenia- Definition, pathogenesis of Thrombocytopenia, idiopathic thrombocytopenia purpura- definition, types acute& chronic, pathogenesis, clinical features,
    - Lab diagnosis- Haematological, Bone marrow, - Management

21. Bernard Soulier disease
    - Key: Definition-Bernard-Soulier syndrome is a bleeding disorder associated with abnormal platelets, which are blood cells involved in blood clotting.
    - Sign& symptoms, causes, diagnosis, treatment

22. Glanzmann’s thrombasthenia
    - Key: Definition-Glanzmann's thrombasthenia is an abnormality of the platelets. In which the platelets contain defective or low levels of glycoprotein IIb/IIIa (GpIIb/IIIa), which is a receptor for fibrinogen.
    - Causes, symptoms, diagnosis, treatment

23. Platelet release and storage pool defects
    - Key: Storage pool deficiencies are a group of bleeding disorders caused by problems with platelet granules.

- Type of granules-granules-dense & alpha
- Causes, symptoms, diagnosis, treatment

24. Thrombocytopenia with absent radius (TAR) syndrome
    - Key: Definition-Thrombocytopenia-absent radius (TAR) syndrome is characterized by the absence of a bone called the radius in each forearm and a shortage (deficiency) of blood cells involved in clotting (platelets)
    - Sign& symptoms, causes, diagnosis, treatment

25. Thrombotic thrombocytopenic purpura (TTP)
    - Key: Definition, pathogenesis of Thrombocytopenia, idiopathic
    - Thrombocytopenia purpura- definition, types acute& chronic, pathogenesis, clinical features, lab diagnosis- Haematological, Bone marrow, - Management

26. Platelet function test.
    - Key: Function of platelets- Adhesion, activation, granular release, aggregation
    - *Methods for PFT- adhesion test, aggregation test, assessment of granular content VWF, assessment of release reaction, investigation of prostaglandin pathway& test for coagulation activity
    - *Principal, procedure, Normal value of aggregation test & Assessment of VWF

ANSWER BRIEFLY

1. What is prothrombin time. List two Causes of prolonged PT
2. Fibrin degradation product
3. Define thrombocytopenia. List three causes of thrombocytopenia
4. What is Haemophilia. write the laboratory findings in haemophilia
5. Name the pathways of coagulation and tests to assess their function
6. Define thrombocytosis. List two causes of thrombocytosis
7. Define DIC. Name two causes od DIC
8. Enumerate test for coagulation

AUTOMATION AND RECENT ADVANCES IN HAEMATOLOGICAL TECHNIQUES

ESSAY

1. Mention the role of automation in clinical pathology laboratory. Describe the principle of automated blood cell Counter. Enumerate the various parameters obtained from the blood cell Counter?
   - Key:*Define Automation,
   - Define the role /advantages in automation.
   - *Describe the 5 Principles of automation briefly.
     - Electrical Impulse.
     - Light Scattering.
     - Flourescence.
     - Light Absorption.
     - Electrical Conductivity
   - *Describe the parameters obtained from each blood cell counters.
   - Also from Calculation.

SHORT NOTES

1. Automation in hematology?
   - Key:*Define Automation
   - *Role of Automation in Heamatology lab.
   - *Working Principles(Electrical Impedance, Light scattering etc)
   - *Parameters obtained from each counters
   - *Main manufacturing companies of blood cell counters
   - Advantage and disadvantages of automation

2. Automated Cell counter?
   - Key:*Working principle of all cell counter
   - 3 part, 5part & 7part
   - *Parameters obtained from 3 part, 5 part& 7 part analysers.

3. Five Part cell counter?
   - Key:*Working Principle of 5 Part Analysers.
   - *Advantages of 5 part Analyser over 3 Part Analysers (Differential Count of WBCs)

- *Parameters obtained from 5 part Analysers.

4. Principles of blood cell counter?
   - Key:*Describe the 5 Principles of automation briefly.
     - Electrical Impulse.
     - Light Scattering.
     - Flourescence.
     - Light Absorption.
     - Electrical Conductivity
   - *Neatly drawn diagrams regarding the working Principles.
   - *Describe the parameters obtained from blood cell counters.

URINE

ESSAY

1. List the abnormal constituents of urine. Explain the principle and procedure of one test for the detection of each of them.
   - Key:- Abnormal constituents of urine: protein, glucose, cast, Crystals, pus cells, RBCs & WBCs.
   - Explain one test for the detection of each of them: principle, reagents, procedure & interpretation

2. What are the normal constituents of urine, write in detail about the chemical examination of urine?
   - Key:- urine consists of solids & water. Solids contain organic & inorganic constituents, enumerate them.
   - Chemical examination of urine: explain one test for the detection of protein, glucose, blood, ketone bodies, bile derivatives (principle, reagents, procedure, interpretation, normal value).

3. Define urine. Explain methods used for detection of chemical constituents of urine. Discuss significance of chemical analysis.
   - Definition of urine
   - Methods used for detection.

- Explain chemical methods.
- Significance of urine chemical analysis.

4. Name the abnormal constituents on urine microscopic examination. Describe them and name the clinical conditions associated with them
   - Introduction
   - Cast and crystals – explain with diagram & Clinical condition
   - Name the abnormal constituents in urine and the test performed to detect them. Discuss the chemical analysis of urine

SHORT NOTES

1. Detection of inorganic and organic constituents in normal urine (***)
   - Key:- Name the organic &inorganic constituents of urine. Explain the detection methods for each of them: principle, procedure, interpretation.

2. Test for detection of ketone bodies in urine
   - Key:- introduction. Test: Rotheras test, Nitroprusside test, Gerhardt test, Hart's test, dip stick method: principle, procedure, interpretation, normal value.
   - Explain any one test.

3. Hay's test(*)
   - Key:- Introduction. Done for bile salt detection. Principle, procedure, interpretation.

4. Rothera's test and it's significance (**)
   - Key:- Done for ketone body detection in urine.
   - Principle, procedure, interpretation. Significance of test.

5. Urinary findings in jaundice
   - Key:- Write about jaundice classification of jaundice. Write about bile pigments, type of bilirubin, urobilinogen & colour of urine in each type of jaundice. Explain one test for bile salt, urobilinogen, bilirubin.

6. Fouchet's test(*)
   - Key:- test for bilirubin. Principle, procedure, interpretation, normal value.

7. Test to detect organic constituents in normal urine

- Key:- name the organic constituents in normal urine. Write detection methods for each of them: principle, procedure, interpretation.

8. Foam test(**)
   - Key:- Test for bilirubin. Principle, procedure , interpretation , advantage of test.

9. Specific gravity of urine (**)
   - Key:- introduction. Normal range, factors influencing specific gravity, increasing & decreasing conditions. Detection methods: urinometer, refractometer.

10. Normal organic constituents of urine
    - Key:- normal organic constituents of urine include urea, uric acid, creatinine, urobilinogen, hippuric acid, indican, ethereal sulphate.
    - Normal range , increasing & decreasing conditions, detection methods.

11. Urinary casts
    - Key:- introduction. Write various types of cast, explain each cast.

12. Macroscopic examination of urine
    - Key:- colour, appearance, odour, pH, specific gravity. Explain them.

13. Microscopic examination of urine
    - Key:- explain the procedure. Classify the sediment into organized and unorganized sediments: explain each with one or two points.

14. Crystals in alkaline urine
    - Key:- mention the types. Explain each Crystals.

15. Pigments in urine
    - Key:- mainly urochrome- explain in detail. Name the bile pigments and its detection in urine.

16. Test for blood in urine
    - Key:- mention the name of tests, conditions in which blood is seen. Explain one or two methods: principle, procedure, interpretation.

17. Urine sediment examination

- Key:- procedure of urine microscopic examination. Name the organized and unorganized sediments. Explain with one or two points.

18. Organic composition of normal urine
    - Key:- urea, sodium chloride. Nitrogenous compounds (uric acid, creatinine, amino acid, ammonia, enzyme) explain these.

19. Physical examination of urine
    - Key:- volume, colour, appearance, sediment formation, reaction, odour, pH, specific gravity.

20. Test for protein in urine(*)
    - Key:- name the qualitative and quantitative test for protein. Explain one test from each with principle, procedure, interpretation.

21. Bence jones protein (**)
    - Key:- introduction, increasing and decreasing conditions, precipitation property.

22. Explain the method used to detect urine specific gravity and reaction
    - Key:- normal range, urinometer, refractometer. Explain them.

23. Glucose examination in urine
    - Key:- introduction, clinical conditions. Explain qualitative and quantitative methods; Benedict test, Fehlings test, clinitest tablet test, dip stick method. Explain one of them.

24. Routine examination of urine
    - Key:- appearance, albumin concentration. Prepare the sample, microscopic examination (RBCs, yeast cells, pus cells, cast, epithelial cells, Crystals) .

25. Estimation of bile pigment in urine
    - Key:- Mention the various methods. Explain one of them; principle, procedure, interpretation.

26. Estimation of urobilinogen in urine and interpretations
    - Key:- introduction. Ehrlich's aldehyde test; principle, procedure, observation, results, interpretation.

27. Benedict’s test (**)
    - Key:- introduction, principle, procedure, observation, result.

ANSWER BRIEFLY

1. Test for bile salt in urine
2. 24hr urine sampling (**)
3. Hematuria (*)
4. Difference between hematuria and hemoglobinuria
5. Ehrlich's aldehyde test
6. Urine cast
7. Bence Jones protein
8. Preservatives of urine
9. Detection of bile salts in urine
10. Specific gravity of urine
11. Sediments in urine
12. Physical examination of urine
13. Haemoglobinuria
14. Name two methods of measuring 24 hr urine protein. What is its clinical significance
15. What are the causes of positive benzidine test and false positive benzidine test
16. What is glycosuriya. Name two causes.
17. Define pyuria . Mention its significance and how it is detected
18. List the parasites seen in urine. Mention their identifying features
19. BJP. How it is detected
20. Explain chyluria . How it is detected
21. Explain Haemoglobinuria. How it is detected
22. Name two methods of measuring 24hr urinary protein what is its clinical significance

SEMEN ANALYSIS

ESSAY

1. Describe semen analysis? discuss the importance in case of infertility?
   - Key: seminal fluid is a milky liquid emitted from the male genital tract. Specimen collection, indications
     - PROPERTY NORMAL RANGE
     - VOLUME 3-3. 5 millions+/- 0. 84 ml
     - COUNT 60-130 millions /ml
     - MOTILITY More than 40% motile in the first one hour
     - MORPHOLOGY >60% normal forms
     - WBC <1 million / ml
     - PH 7.2-8
     - Macroscopic and microscopic analysis, motility, sperm viability, sperm count , morphology, abnormal morphology, defects in head tail and neck. Immunological analysis, biochemical analysis, NORMAL VALE

SHORT NOTES

1. Morphological abnormalities of spermatozoa?
   - Key: Morphology- head, neck, tail. Stained with WRIGHT, GIEMSA, PAP, EOSIN etc, 80-85% abnormal morphology, 0. 5-2% normal spermatogenic cells. Abnormal morphology defects in head, neck & tail with picture.

2. Sperm count?
   - Key: Sperm count – diluting fluid, procedure, normal value, clinical significance

3. 3. Macroscopic & microscopic examination of semen?
   - Key: Macroscopic examination – volume, visual appearance, viscosity. Microscopic examination- motility, sperm viability, sperm count, immunological examination, biochemical examination and interpretation

SPUTUM

ESSAY QUESTIONS

1. Define sputum analysis, write detail about collection, preservation & examination of sputum.
   - Introduction , importances of sputum analysis
   - Collection & preservation of sputum
   - Normal and abnormal condition of sputum
   - Method of examination of sputum

SHORT NOTES

1. Sputum AFB
   - Introduction & collection of sputum
   - Method and interpretation of AFB test

2. Sputum examination
   - Introduction
   - Physical, Chemical & Microscopic examination

ANSWER BRIEFLY

- Sputum AFB
- Methods of collection of Sputum**
- Storage of sputum

CEREBROSPINAL FLUID

ESSAY QUESTIONS

1. Define CSF. Collection, examination and interpretation of total and differential count of CSF
   - Definition & collection of CSF
   - Normal characteristics of CSF
   - Examination and interpretation of CSF

2. Mention the collection and preservation of CSF. Describe the staining, examination and interpretation of CSF.
   - Collection of CSF , Sites (2)

- Preservation of CSF, Temperatures(2)
- Staining, stains used, method, (2)
- Examination, normal elements, cells (2)
- Interpretation, cells, calculations, abnormal conditions (2)

SHORT NOTES

1. The examination and interpretation of total and differential count of CSF
   - Definition & collection of CSF
   - Examination and interpretation of CSF

2. Discuss CSF analysis and interpretation in meningitis
   - Definition
   - Methods of CSF analysis
   - Pathogenesis & clinical significances of CSF in meningitis

3. What are the characteristics of normal CSF?
   - Definition & collection
   - Function & Importance of CSF
   - Each examination & interpretation of CSF

4. Describe the abnormal findings seen in CSF in TB meningitis*
   - Definition
   - Methods of CSF analysis
   - Pathogenesis, clinical significances & abnormal findings of CSF in meningitis

ANSWER BRIEFLY

- CSF cell count**
- Examination of CSF*
- Normal Function of CSF
- Collection & storage of CSF in laboratory

BODY FLUID

ESSAY QUESTIONS

1. Define body fluids, write collection and examination of pleural fluid, peritoneal fluid, pericardial fluid & synovial fluid.
   - Introduction of body fluid
   - Collection of each body fluids
   - Write physical examination, chemical examination & cell count of each body fluids

SHORT NOTES

1. Examination of synovial fluid
   - Collection and physical examination
   - Chemical examination
   - Clinical significance

2. Name the body fluids and enumerate the examination of body fluid
   - Definition of body fluids
   - Introduction of each body fluid
   - Examination of body fluids

3. Examination of pleural fluid*
   - Introduction of pleural fluid
   - Write each examination of pleural fluid

4. What are the differences between exudate and transudate? Give example for each
   - Define transudate & exudate
   - Differentiate transudate & exudate with example

ANSWER BRIEFLY

1. Examination of pleural fluid*

2. Examination of synovial fluid

3. Examination of pericardial fluid

4. Examination of peritoneal fluid

5. Examination of body fluid

6. Transudate & Exudate **

FAECES

ESSAY QUESTIONS

1. Define stool examination, write physical, chemical & microscopic examination
   - Definition
   - Method of collection
   - Write each examination in detail

SHORT NOTES

1. Stool concentration methods
   - Physical and chemical examination of stool
   - Different concentration methods of stool with diagram

2. The differences in stool examination in amoebic and bacillary dysentery
   - Define stool examination
   - Different method of stool examination
   - Differences between amoebic and bacillary dysentery(physical & microscopic)

ANSWER BRIEFLY

1. Occult blood in stool.

2. Examination of stool for ova**

3. Different types of ova in stool

4. Preservatives of stool

ANEMIA

ESSAY QUESTIONS

1. Define anaemia. Classify anaemia based on etiology. Describe In detail the lab diagnosis of IDA. Describe the peripheral smear findings.

- Definition of anaemia
- Classification
- Lab diagnosis of IDA
- Peripheral smear findings

2. Discuss on morphology of red cells in health and diseases. Add a note on abnormal red cells with a neat labelled diagram.
   - General introduction to red blood cells
   - Description of Normal red cells with diagram
   - Abnormal forms and clinical significance(RBC inclusions)

3. Define and classify anaemia. Describe the peripheral smear findings and bone marrow findings in iron deficiency anaemia.
   - Definition of anaemia
   - Classification of anaemia
   - Peripheral blood picture in IDA
   - Bone Marrow findings in IDA

4. Classify nutritional anaemia. Describe the lab diagnosis of IDA. Draw the blood picture in IDA
   - Definition of anaemia
   - Classification of nutritional anaemia
   - Lab diagnosis of IDA with blood picture

5. Classify anaemia. Describe the lab diagnosis, blood and bone marrow findings in megaloblastic anaemia.
   - Definition of anaemia
   - Description of blood smear findings in Megaloblastic anaemia
   - Bone marrow findings in Megaloblastic anaemia

6. Define and classify Anaemia. Explain the blood and bone marrow findings in IDA.
   - Definition of anaemia
   - Classification in detail
   - IDA general introduction
   - Blood and bone marrow findings.

7. Define anaemia. Describe in detail about nutritional anaemia. Add a note on schilling test
   - Definition of anaemia
   - Classification and brief description of nutritional anaemias in importance with lab diagnosis
   - Schillings test

8. Discuss haemolytic anaemia. Describe its classification and laboratory diagnosis
   - Definition of haemolytic anaemia
   - Classification
   - Blood picture
   - Bone marrow findings

9. What is PNH(Paroxysmal Nocturnal Haemoglobinuria). Describe the principle, method and significance of Ham's test
   - Description of PNH
   - Principle of Ham's test
   - Procedure and significance
   - Modified Ham's test($Mgcl_2$)

10. Define anemia. Classify anemia based on etiology. Describe in detail the laboratory diagnosis of Iron deficiency anemia. Describe the peripheral smear findings.
   - Definition of anaemia
   - Classification of anaemia based on etiology
   - Laboratory diagnosis of IDA , draw a peripheral blood picture

11. Define and classify haemolytic anaemia. Enumerate the tests used in the diagnosis of haemolytic anaemia. Describe briefly the blood picture in a haemolytic anaemia
   - Definition of haemolytic anaemia
   - Classification of haemolytic anaemia
   - Different tests used for the diagnosis
   - Draw a blood picture

SHORT NOTES

1. Lab diagnosis of IDA**

- Definition of IDA
- Peripheral and bone marrow finding with diagram

2. Blood picture in haemolytic anaemia
   - Definition of haemolytic anaemia
   - Classification
   - Blood picture

3. Classification of anaemia**
   - Definition of anaemia
   - Classification with brief description

4. Sickle Cell Anaemia***
   - Definition of anaemia
   - Classification and Sickle cell–characteristics
   - Sickle cell anaemia – lab diagnosis

5. Hereditary spherocytosis*
   - Characteristics
   - Clinical features
   - Lab diagnosis

6. Megaloblastic anaemia*
   - Definition of anaemia
   - Clinical features
   - Lab diagnosis;peripheral blood picture and bone marrow findings

7. Aplastic anaemia
   - Definition
   - General features
   - Lab diagnosis in detail

8. Pancytopenia
   - Definition
   - General features
   - Lab diagnosis

9. Thalassemia
   - Definition and classification
   - Clinical features
   - Lab diagnosis

ANSWER BRIEFLY

1. Ham's test*****

2. Haemolytic anaemia and its classification

3. Enumerate the lab diagnosis of haemolytic anaemias

4. Megaloblastic anaemia

5. Sideroblastic anaemia

6. Define anemia. List the abnormalities in the red cell indices in iron deficiency anemia

7. Name three hematological investigations done to diagnose haemolytic anemia

LEUKEMIA

ESSAY QUESTIONS

1. Discuss on blood cell cytochemistry. Describe Peroxidase, PAS, LAP, Esterase in detail
   - General introduction to cytochemistry
   - Descriptions of each special stains

2. Define leukemia. Classify it according to the FAB . Explain the blood picture in ALL. Discuss cytochemistry in detail.
   - Definition and classification of leukemia
   - WHO and FAB classification-detail about FAB
   - ALL-blood picture and cytochemistry in detail with diagram

3. Define and classify leukaemia. Discuss the lab diagnosis of chronic myeloid leukaemia
   - Definition and classification of leukaemia
   - CML- Genetics, (Philadelphia chromosome with picture)
   - Different phases

- Peripheral blood and bone marrow findings in detail

4. Discuss myeloproliferative disorders. Explain detail about the CML. Add a note on Philadelphia chromosome
   - Definition of myeloproliferative disorders
   - Different myeloproliferative neoplasms
   - Lab diagnosis in CML
   - Philadelphia chromosome with diagram

5. Define acute leukemia. Classify acute leukemia. Describe the peripheral smear and bone marrow findings in AML. (1+4+5)
   - Definition of leukemia and acute leukemia
   - WHO and FAB Classification
   - Description of lab diagnosis in detail

6. Define leukaemia. Explain in detail about CLL(Chronic Lymphoblastic Leukaemia). Add a note on leukemoid blood reactions.
   - Definition
   - Classification
   - Lab diagnosis of CLL
   - Description of leukemoid reaction

7. Define leukaemia. Classify it according to the FAB classification. Explain the blood picture in acute Myelomonocytic leukaemia. Discuss the cytochemistry of AML.
   - Definition of Leukaemia (1)
   - Classification (2)
   - Blood picture in acute Myelomonocytic leukaemia (3)
   - Cytochemistry in AML

8. Define and classify acute leukaemia. Describe the peripheral smear and bone marrow findings in Acute lymphoblastic leukaemia.
   - Definition of leukemia (1)
   - Classification of leukemia (1)
   - Peripheral smear findings in ALL (3)
   - Bone Marrow findings in ALL (5)

9. Describe the classification of leukaemia. Discuss in detail about AML
   - Definition of leukaemia
   - Classification
   - Blood picture and BM findings in AML
   - Cytochemistry with diagram

SHORT NOTES

1. Myeloperoxidase staining
   - Principle
   - Procedure
   - Observation with diagram

2. Classification of AML
   - Definition of leukemia
   - AML- FAB and WHO classification in detail

3. ALL
   - Definition of leukaemia
   - Classification and detail about ALL

4. PAS staining
   - Definition
   - Principle, Procedure and Observation
   - Clinical significance

5. Leukemoid reaction
   - Definition
   - Characteristics and comparison with leukaemia

6. CML
   - Definition and synonyms
   - Different phases
   - Genetics
   - Lab diagnosis in detail

7. Difference between leukemoid reaction and CML

- Definition of leukemoid reaction & CML
- Features of leukemoid reaction & CML

8. Define leukemia. Discuss the lab diagnosis of acute leukemia
   - Definition
   - Lab diagnosis of acute leukemia

9. Explain leukocytosis. List six causes. Describe the blood picture in chronic lymphocytic leukemia
   - Definition and causes of leukocytosis
   - Peripheral smear examination of CLL

ANSWER BRIEFLY

1. Leukemoid reactions**
2. CLL
3. CML
4. ALL
5. AML
6. Auer rods***

PERIPHERAL SMEAR EXAMINATION

ESSAY QUESTIONS

1. Discuss on morphology of red cells in health and diseases. Add a note on abnormal red cells with a neat labelled diagram.
   - General introduction to red blood cells
   - Description of Normal red cells with diagram
   - Abnormal forms and clinical significance (RBC inclusions)

2. Describe in detail on peripheral smear examination and reporting. **
   - Systematic methods of examination of blood film
   - Description of each methods with diagrams

- Uses
- Reporting

SHORT NOTES

1. Peripheral smear examination and reporting
   - Systematic methods of examination of blood film
   - Uses
   - Reporting

ANSWER BRIEFLY

1. Agranulocytosis
2. Target cells
3. Neutrophilia
4. Basophilia
5. Leucopenia
6. Different types of microfilaria in blood
7. Write the qualities of an ideal peripheral smear