**1. What are the 2 stains that can be used to illustrate the reticulocytes?**

* Brilliant crystal blue
* New methylene blue

**2. Give two techniques used in ESR and units of expression?**

* Wintrobe's Method - mm/h (M = 4.9, F= 5.45)
* Westergreen Method - mm/h (M= 0.5, F= 0.20)

**3. Give two sites in the body where bone marrow aspiration is done on:**

a. Neonates - Tibial tuberosity

b. 2 year old - Iliac crest and post iliac spine

c. 15 year old - same as above

d. 56 year old - (17 years and above) - Iliacspine, Manubrium of Sternum

**4. Name the stain for iron preparation in tissue i.e bone marrow.**

prussian blue stain - pearls prussian blue

**5. Name the two commonly used instruments for taking bone marrow aspirate.**

Trephine needles - jamshidi and islam

Bone marrow needles -- Salah and Klima

6. What is Jamshidi used for?

Jamshidi is used for trephine biopsy

7. Name two test that differentiate CML from leukamoid reaction.

Neutriphil alkaline phosphatase - Increases in leukemia

Leukocyte alkaline phophatase - reduces in CML

Presence of Dohle bodies in leukamoid reaction

8. **Name two features to identify Myeloblasts and lymphoblasts.**

|  |  |
| --- | --- |
| **Myeloblast** | **Lymphoblast** |
| 1. Increase nucleoli | 1. Reduced nucleoli |
| 2. Nuclear chromatin - less condensed | 2. nuclear chromatin - increased condensation |
| 3. Cytoplasmic granule are present | 3. Cytoplasmic granules are absent |

9. **What is ITP? Give two features of blood and Bone marrow.**

ITP is idiopathic thrombocytic purpura - a disorder that can lead to easy or excessive bruising and bleeding in which there is:

Increase in megakaryocytes and reduced platelets

Megathrombocytes on PBS

Xts: easy bruising, menorrhagia, purpura, petechial hemorrhage, epistaxis, mucosal bleeding.

**10. Give two tests for VonWillebrands Disease.**

Two tests are:

 APTT - activated partial thromboplastin time

BT(bleeding time)

1. **Features seen in histology**
	1. **Hodgkins lymphoma** Reed sternberd cells
	2. **Burkitts lymphoma** Starry sky pattern of macrophages
2. **WBC 1.9x109/L RBC 1.3 x109/L Platelets 15 x109/L**

BM failure / suppression

1. **WBC 8x109/L RBC 5.5 x109/L Platelets 13 x109/L**

Thrombocytopenia due to BM failure

DIC

1. **WBC 4.9x109/L RBC 5.6 x109/L Platelets 156 x109/L**

**N: 2%, L 86%, M6%, E6%**

Lymphocytosis and neutropenia (leukemia)

1. **Name the ways the patient test results can be expressed?**

Pt (sec)

Pt index

Pt ratio

INR

1. **Name one drug assed by the following**
	1. **PT** Warfarin
	2. **APTT/KCCT** Heparin, Aspirin
2. **Name the contents of blood donor bag**

Anticoagulant CPDA 63ml

Whole blood 437 ml

1. **3 major components of compatibility test**

Blood grouping

Cross matching

Ab screening

1. **Give temp range used to store whole blood at KNH**

2-6 degrees centigrade

1. **Name 3 mandatory test on donor blood in Kenya**

Blood grouping

Cross matching

Syphilis

HIV 1&2

Hep B

Malaria

1. **Name four features of hemat department**

Cellular/ routine

Special tests

Hemostasis

BT

1. **Name the part of NBTS which links donor to recipient**

BTU

1. **Stain used at KNH for hematological blood film and BMA prep**

May Grinwald Giemsa

Leishman

1. **Which tests is used at KNH for investigation in SCD**

Sickling test

PBF

Hb electrophoresis

1. **3 clinical features that patients with aplastic anemia will present with**

Fatigue

Bleeding gums

Irregular heart rate

1. **Mode of action of anticoagulants**
	1. **NA citrate** Chelate Ca
	2. **EDTA** Chelate Ca
	3. **Heparin** Chelate Ca
	4. **Oxaloacetate** Prevents RBC glycolytic activity
2. **Application of PT**

Oral and anticoagulant therapy monitoring

1. **Vit K dependent factors**

2,7,9,10

1. **2 components that affect BT**

Elasticity of BV

VWF

Functional integrity of platelets

1. **2 roles of BV in hemostasis**

Antithrombotic activity prevents contact between platelets and coagulant factors

Secretes prostacyclin and inhibit platelet aggregation

Transient vasoconstrictor after vascular injury

**1. Describe the Organization of BT services and function of BTU.**

National Blood transfusion center - Regional BTC - Blood bank - Hospital transfusion unit

NBTC - formulates and issues national guidelines for BT. Provides policies regarding blood donors, blood banking, blood utilization, blood screenig, donor evaluation, quality assurance, research and teaching.

Form policies on how to protect public, who will be a donor, blood handling, blood utilization.

Blood screening for transmissible infections.

RBTC - Donor system that involves: Getting blood donor, examining blood donor, taking blood from donor, transport blood to BB, Ensure name and address of donor, storage.

BB - Processing, storing and dispensing of blood and blood products.

 It is responsible for quality assurance schemes and research on aspects of B.T.

Must screen blood for: hep B,C, HIV1&2, syphilis

BTU - Links donor to recipient.

Compatibility testing -principle, agglutination, hemolysis

It encompases - blood grouping, antibody testing and cross matching***.***

**2. Name all the products that can be obtained from whole blood.**

1. platelet concentrate - at room temperature in a agitator, 5 days invitro and 7-10 days in vivo(plt shelflife)
2. FFP = -18- -30 degree for 1 year
3. Packed RBC - 2-8degrees for 35days: with saline glucose mannitol 42days
4. WBC concentrate
5. Cryoppt - -20degrees for 1 year
6. Fraction FFP - albumin, immunoglobulin

3. **Units that make a hematology lab**

* Hemostasis
* BT
* Cellular hematology
* Special - BM technique, sickling test

4. **3 functions of record dept in a lab.**

* Receive specimen and request form
* Record date from request form e.g disease, test required
* Sorting of specimen to areas of specificity
* Reports results obtained
* storing information
* dispatch results

5. **With a diagram describe the procedure of a requested test.**

6**. State two stains used in BMA**

* Jenners stain
* Leishmann
* May grunwald
* Perls prussian blue

7. **Stains used to identify iron in BMA**

prussian blue

8**. 2 instruments used in BMA**

Trephine needle - jamshidi/ islam needle

Aspirate needle - Salah/ Klima needle

9. **Sites for obtaining a BMA**

Neonate - tibial tuberosity

2 year old - iliac crest and psis

17years and above - iliac spine, manubrium sternum

**10. 2 application of ESR**

* Screening of acute or chronic inflamatory diseases
* Monitor response to therapy
* monitor progression of chronic disease e.g TB
* Disease severity
* Diagnosis of multiple myelome, SLE, Temporal arteritis, arthritis, neoplasm

**11. Conditions in which ESR increase and decrease.**

* Increase of ESR - Inflammation, neoplastic cdts, CT disorder, leukemias and all anemias except SCD, TB, HIV, SLE, Infectious mononucleosis, PID
* Reduction of ESR - SCD, CHF, Spherocytosis, polycythemia, DIC, cholera

12. **2 methods of ESR**

Wintrobes method

westergreen method

**13. 2 stains to identify reticulocytes**

new methylene blue

brilliant cresyl blue

**14. What is a reticulocyte?**

Juvenile/immature RBC with RNA and ribosome remnants in cytoplasm.

retic counts measures activity of B.M

**15. 2 test done for BT?**

* Compatibility - ABO and RH
* Screening of blood - HIV 1&2, hep b,c, syphilis
1. **3 tests done on blood sample during compatibility tests**

Blood grouping

Cross matching (ABO & RH)

Ab screening (IgM & IgG)

1. **4 ways in which PT can be expressed**

PT in secs

PT ratio (test/control)

PT Index ({control/test}x1000) = %

INR (international Normalized ratio)

1. **Agents used in APTT and PT**
	1. **APTT**

Kaolin

Cephalin

Cacl2

Platelet poor plasma

Alternates for Kaolin- silica, celite

* 1. **PT**

Thromboplasmin (tissue)

Anticoagulised blood sample

Cacl2

Phospholipid (platelet factor)

1. **Confirmatory tests for Fe deficiency anemia**

BM pearls preussian blue

TIBC, Ferritin

PBF – microcytic hypochromic

1. **Machines for cellular counting**

Cell dyn 1800 or 3200

Symex MF 8000

Coulter STK5

Coulter T880

ABK pentra 120

FTC

1. **Components of romanowsky stain (dry preps)**

Giemsa

May grunwald

Fosin Υ

Wrights

Jenners stain

Fields stain

Leishmaan

Azure B

1. **Different obtains used in BM sample**

Romanowsky – hematopoietic cells

H&E stain cellularity and pattern

Perals Prussian blue –ion deposits

Reticulin silver stain - reticulin

1. **Needle used in trephine biopsy**

Jamshidi

Islam needle

1. **Reagents used in thrombin clotting time**

Citrated plasma

Thrombin reagent

Anticoagulant Na citrate

1. **Indications and uses of trephine biopsy**

Cases where aspiration gives a dry tap e.g. aplastic anemia

Cases of splenomegaly or pyrexia of undetermined cause

Polycythemia vera

Myelofibrosis and other myeloproliferative disorders

Malignant lymphoma

Secondary carcinoma

1. **Indicate the drugs used in the following coagulation tests**
	1. **PT** Warfarin
	2. **APTT** Heparin and Aspirin
2. **Who links donor to patient**

BTU

1. **State the contents of a blood bag for BT**

Anticoagulant 63 ml Na citrate, na citrate and dextrose, CPDA

Whole blood (437 ml)

Total = 500ml

1. **State causes of prolongation of**
	1. **PT**

Liver disease

Malabsorption syndrome

Vit K deficiency

Obstructive jaundice

DIC

Prolonged parenteral nutrition

Anticoagulant therapy (warfarin)

* 1. **KCCT/APTT**

Massive transfusion of plasma

Heparin therapy

Defect in factor VIII, IX, XI,XII, HMWK

Pre-kallikrein

* 1. **TT**

Hypofibrinogenemia

Dysfibringogenemia

Presence of inhibitors

Heparin or heparin like anticoagulants

Altered states of fibrinogen to clot in fibrinolytic tissues

1. **What would differentiate between CML and leukamoid reaction**

|  |  |  |
| --- | --- | --- |
| **Feature** | **CML** | **Leukamoid** |
| **Age** | >40 years | Any age |
| **leukocytosis** | >100,000 | 30,000-50,000 |
| **Absolute basophilia** | Present | May not |
| **Splenomegaly** | Prominent | May not |
| **Philadelphia chromosome** | Present | Absent |
| **LAP/NAP** | Decreased | Increased |
| **Transform to acute leukemia** | Yes | No |
| **Differential** | Main myelocytes and segmented | Mainly bands |
| **Morphology** | Hypogranular | Toxic |
| **BCR/ABL** | Positive | Negative |
| **Onset** | Chronic | Acute dolite bodies seen |

1. **Characteristics of ITP**

Easy bruising

Menorrhagia

Purpura

Petechial hemorrhage

Epistaxis

Mucosal bleeding

1. **Tests for VWF deficiency**

APTT

BT

31. **Prominent Features of AML.**

* Arise from hemopoietic stem cells, infiltration by abnormal cells, reduced erythroid cells, myeloid cells and megakaryocytes
* Chromosomal abnormalities in 30-50% patients
* Presence of auer rods in myeloblasts, myelocytes and monoblasts.
* Clinical feature: enlarged splees only, no lymphadenopathy/liver/ testis involvement
* Common in males than females and has x5 more incidence than ALL
* Blast cells form more than 30% and maybe even up to 90%

**32. Prominent cells in hodgkins disease.**

Reed sternberg cells

**33. Sites of blood formation.**

* 0-2months = Yolk sac
* 2-7months = Liver and spleen
* 7-9months = Bone marrow
* Neonates = All Bone marrow
* Adults = flat bones and proximal shaft of long bone

**34. Name the hemoglobin before and after birth.**

* Hb Gower I - 2 zeta and 2 epsilon
* HB gower II - 2 alpha and 2 epsilon
* HB portland - 2 zeta and 2 beta
* HbF - 2 alpha and 2 gamma
* AFTER Birth - HbA1 - 2 alpha, 2 beta

 HbA2 - 2 alpha, 2 delta

**35. What are the lab features of IDA.**

IDA shows a microcytic hypochromic picture, therefore the following are lab features

1. PBF - Reduced Hb, Ht, MCV, MCHC, MCH, Increase in RDW
2. Serum Fe reduced to 10 - 15
3. Serum Transferrin saturation - reduced to <15%
4. TIBC - Increases to 350-450 from 310 to 340 ug/l
5. Serum transferring receptor assay increases
6. Red cell protoporphyrin increases to more than 200ug/dl
7. serum ferritin reduced to <15ug/L
8. Peripheral smear findings - RBC=microcytic hypochromic with anisocytosis and poikilocytosis
9. BM findings - Absent Iron stores, and hypercellular BM.

**36. Compare and contrast BMA and Trephine biopsy**

|  |  |  |
| --- | --- | --- |
|  | BMA | Trephine Biopsy |
| Site | PSISTibial tuberosity (neonates)Sternum (elderly) | PSIS |
| Stain | Romanoswky | H&E |
| Results available | 1-2 hours | 1 - 7 days |
| Main indication | Anemia, pancytopenia, thrombocytopenia, leukemia, myeloma, neutropenia | Polycythemia veraAplastic anemiaSecondary cancerLymphome |
| Special Indication | MicrobiologyCytogeneticsDNA and RNA Progenitor cultureBchem analogues | Immunological |

37. **Give examples of Anticoagulants and the Vaccutainers they are stored in.**

|  |  |  |  |
| --- | --- | --- | --- |
| CAP COLOR | ANTICOAGULANT | FUNCTION OF TUBE | SUITABLE USES |
| Green  | Lithium heparinSodium heparin | Does not alter the size of RBC and minimises lysis | Chemistry, osmotic fragility tests and emergency tests.Not used for: blood count, blood film or PCR because it causes leukocytes to clump |
| Blue Cap | Sodium Citrate  | Calcium chelation | For coagulation studies and B.Tranfusion (platelet function)Ratio: 9:1 in PT |
| Purple Cap | EDTA, found as diNA, diK, DiLi | Chelating Calcium in blood | CBC, PCR, PS and HbA/C |

**38. Effects of storage on blood count**

* HB, WBC and platelet count remain normal for upto 8 hours after collection
* Increase PCT, MCH, reduced ESR
* Increase in osmotic fragility

39. **What are the sites of BMA**

* Tibial tuberosity
* Sternum
* PSIS
* Iliac crest

**40. *Which products are obtained from whole blood.***

|  |  |  |  |
| --- | --- | --- | --- |
| Blood product | Temp. of Storage | Centrifuge Character | Uses |
| FFP | -18 to -30 | 2500rpm for 15mins at 4 degrees | 1.coagulation factor deficiency2. DIC3. Heparin/ warfarin toxicity4. Liver failure5. Pts who have lost large amounts of fluid6. Immunodeficiency |
| Cryoppt | -20 degrees | 2500rpm for 15 mins at 9 degrees | 1. deficiency of VIII - hemophilia A |
| Packed RBC | 2-8 degree | 2500rpm/15mins. 9 degrees | Hemorrhage and trauma |
| Platelet rich plasma | Room temperature | 1500rpm for 15 mins @room temp | ThrombocytopeniaMassive hemorrhage. |

***41. Classify Anemias based on morphology, geographic location, common causes, age, distribution and Red cell indices.***

1.Microcytic Hypochromic - HB is reduced, MCV <75fl, MCH< 27pg, MCHC< 30 g/dl

Causes: IDA, Thalassemia, Sideroblastic anemia, Lead poisoning, Anemia of chronic Disorders

2. Normocytic Normochromic - Above is all N

Causes: Acute blood loss, aplastic anemia, Chronic disorders, Renal disease, BM failure, Cancer and post chemotherapy.

3. Macrocytic Normochromic - Greater than Normal range

Causes: Megaloblastic - VIt. b12 and folate def.

 Non megaloblastic - Alcoholism, Liver disease, hypothroidism, Myelodysplasia, Pregnancy.