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BS MLT
16161

PAPER: HEMATOLOGHY

- **NAME:**
- **ID:**
- **DEP:**
- **SECTION:**
- **UNIVERSITY:**

- **SUBHANULLAH**
- **16161**
- **BS MLT**
- **B**
- **IQRQ NATIONAL UNIVERSITY.**

SECTION : A

- **Question: 1 ANSWER: (E) NONE OF THEM**
- **QUESTION:2 ANSWER:(E) NONE OF THEM**
- **QUESTION: 3 ANSWER:(E) ALL OF THE ABOVE**
- **QUESTION: 4 ANSWER:(A) 4.7 TO 6.1** million cell per (m/L)
- **QUESTION: 5 ANSWER:(A) Thrombocytopenia**
- **QUESTION: 6 ANSWER:(A) RED BONE MARROW**
- **QUESTION:7 ANSWER:(D) MYELOID TISSUE**
- **QUESTION:8 ANSWER:(B) POLYCYTHEMIA**
- **QUESTION:9 ANSWER:(c) BOTH A AND B**
- **QUESTION:10 ANSWER:(D) NONE OF THEM**

SECTION: B

QUESTION: 1

ANSWER:

CHARACTERISTICES OF BLOOD:

- 1 Blood is a fluid conective tissue.

  *Formed elements.i e blood cells

  _RBC

  _WBC

  _PLATELETS

  *PLASMA=Nonliving fluide matrix

  _water

  _Dissolved materials , e g, gases, nutrients,protiens and harmane

2:more dence then water
3:five time more viscous then water.
4:slightly alkaline.
5:normal Ph is 7.35-7.45.
6:temperature 100.4 degrees F.
7:8% of the body weight.
8:volume is aboyt 5-6L in males and
4-5L in females.
9:at any one time 25% of the blood is being filtered in the kidney.
10:blood provide to body cell oxygen and remove carbon dioxide.
11: blood regulate body temperature.
12:platelets clot blood at sites of inury.

Etc

QUESTION: 2

ANSWER :

HEMATOPOIESIS:

DEFINITION:

- The process of formation of blood cells i.e. RBC'S, WBC'S and platelets is called as haematopoiesis and the sites where it occurs are known as hemopoietic tissues or organs (bone marrow, liver, spleen)
- Cells responsible to do function of hemopoiesis are first seen in yolk sac of embryo in third week of embryonic development and these cells are known as hematopoietic stem cells

EXPLENATION:

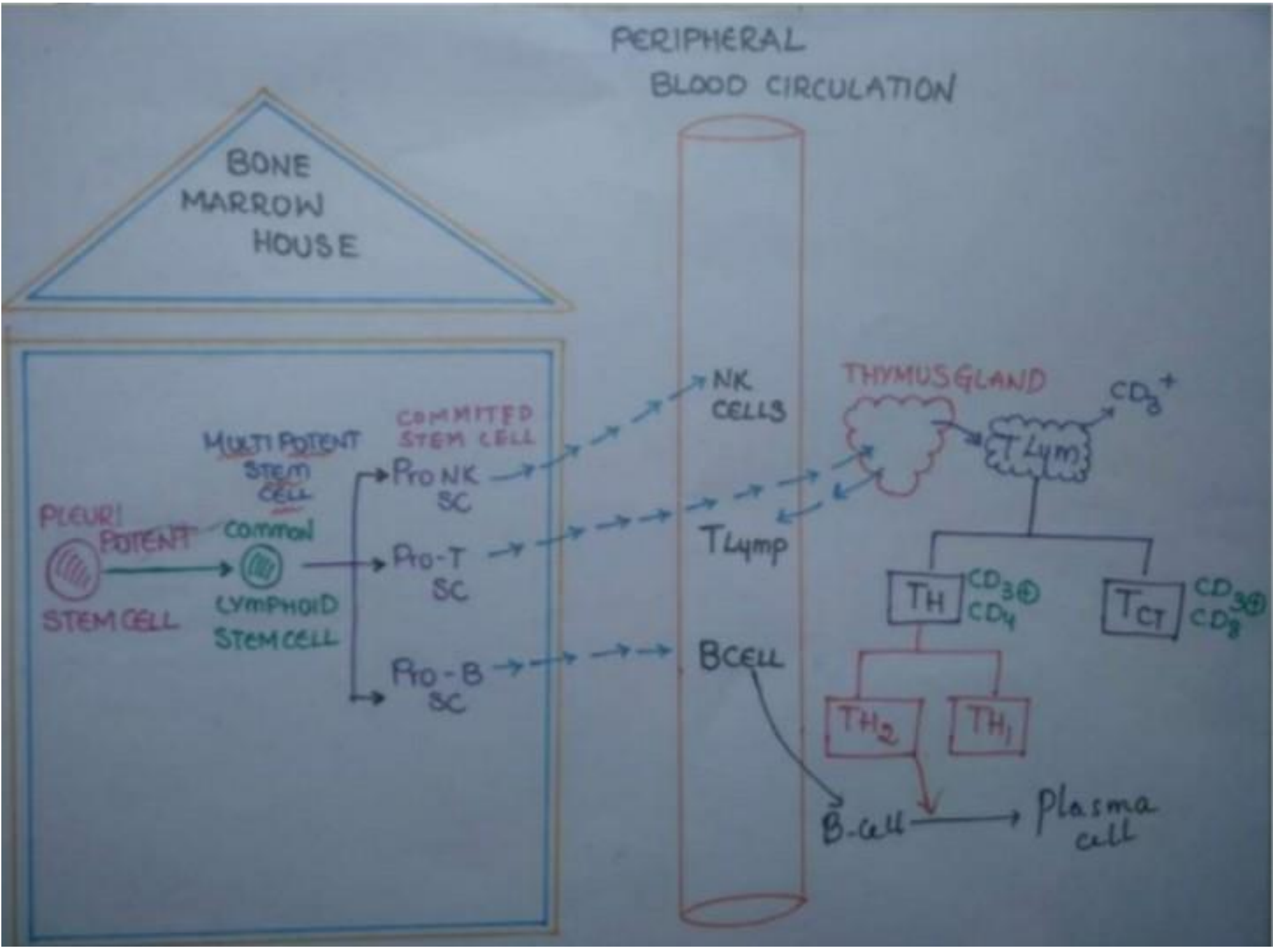
- Hematopoietic stem cells also take origin in mesoderm of aorta, mesoderm of gonads and mesoderm of meso-nephrons
- Hematopoietic stem cells present in yolk sac migrate to other parts like liver, spleen and bone marrow
- The hematopoietic stem cells present in yolk sac at third week of embryo migrate to liver at around third month of foetal life
- So, around third month of embryo the liver gets populated with these stem cells and become a major organ for haematopoiesis-DOMINANT MIGRATION
- Some hematopoietic stem cells also migrate to lymph nodes, spleen –MINOR MIGRATION
- Liver , lymph nodes and spleen continue as hematopoietic organs until birth
- After birth, liver stops its hematopoietic activity because around 4 th month of foetal life migration of stem cells from liver, lymph nodes and spleen takes place to bone marrow

- **DEFINITION OF STEM CELL**
- Cells capable of asymmetrically dividing, one group of cell is responsible for production of well differentiated products and another group of cell is responsible to maintain the original population if stem cell and shows a character called as self-renewal

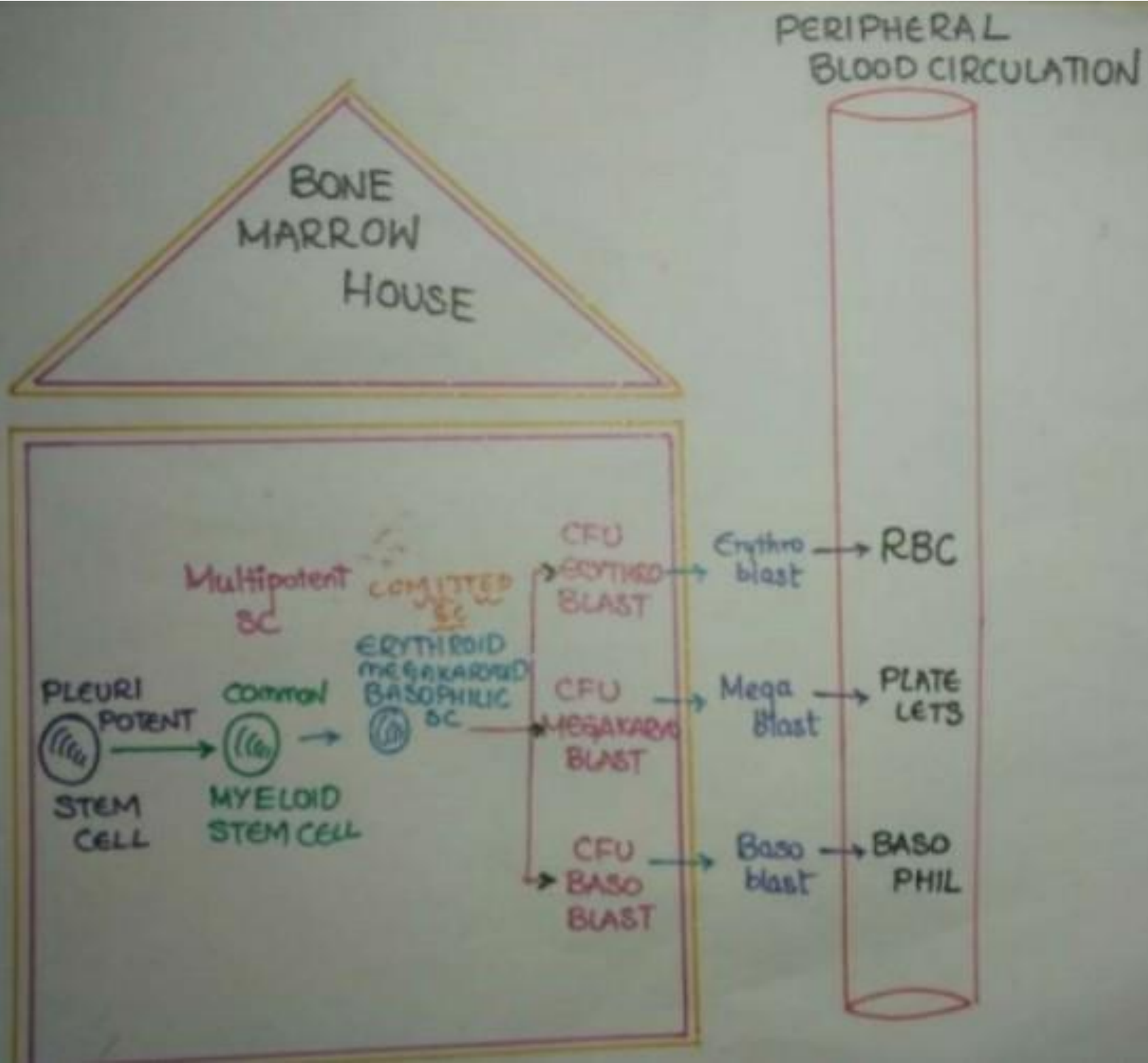
- In new born, if hematopoiesis is going on outside of bone marrow i.e. in liver, spleen and lymph nodes it is called as **EXTRA MEDULLARY HEMATOPOIESIS**
- If there is need of excessive hematopoietic activity, yellow bone marrow has a capacity is to be reactivated and converted into red bone marrow (seen in severe hemolysis)
- When there is excessive hematopoiesis, red bone marrow expands too much into outer bone table o skull and in x-ray outer bone table is not visible and only picules are visible and this condition is known as **HAIR ON END APPEARANCE**
- Bone marrow has **reserve function**—when in need it can increase erythropoietic activity

- So at time of fourth month of foetal life, hemopoiesis takes place in bone marrow
- Bone marrow is permanent residence for hematopoietic stem cells
- At time of birth, all hematopoietic stem cells are limited to bone marrow and bone marrow will be active
- Active bone marrow is called as **RED BONE MARROW** and inactive bone marrow is called as **YELLOW BONE MARROW**
- Yellow bone marrow is accumulated with fat cells, so it is yellow in colour and red bone marrow is highly vascular and rich in hematopoietic stem cells
- For new born baby, all bone marrow are red and as age increases red bone marrow is active only in membranous bones
- Up to puberty , all most all bone marrow is red and at age of puberty and after puberty hematopoiesis stops in large bones and is limited to axial skeleton, proximal ends of

- **1) COMMON LYMPHOID STEM CELLS**
- Multipotent stem cells
- Further divided into three types of committed lymphoid stem cells:
- **A) PRO-NK CELLS:** which multiply and differentiate, when enter into blood circulation called as Natural killer Cells
- These are not B or T lymphocytes
- **B) PRO-T CELLS:** which multiply and differentiate and pre mature cells which are derivatives of pro-T cells enter into peripheral circulation and through circulation enters into thymus gland where maturity takes place and after maturation come back to peripheral circulation as **T-Lymphocytes**
- T-lymphocytes are called as CD-3 positive cells
- T-Lymphocytes are divided into 2 types: > cells which are CD-3 and CD-4 positive are called as **T-HELPER CELLS** and are again divided into 2 types **T-H1 and T-H2**


PERIPHERAL
BLOOD CIRCULATION
BONE
MARROW
HOUSE
PLEURI
POTENT
STEM CELL
MULTI POTENT
STEM
CELL
common
LYMPHOID
STEM CELL
COMMITED
STEM CELL
Pro NK
SC
Pro-T
SC
Pro-B
SC
NK
CELLS
TLymp
BCELL
THYMUS GLAND
TLym
CD3+
TH
CD3⊕
CD4
TCT
CD3⊕
CD8
TH2
TH1
B-cell
Plasma
cell

- It starts with first generation stem cell called as Pleuripotent stem cell and the term **pleuripotent stem cell** refers that they have a potency to convert into many different types of tissues
- Pleuripotent stem cells divides into two different types of **multipotent stem cells**
- Multipotent stem cells are cells that have a capacity to self renew by dividing and to develop into multiple specialised cell types present in a specific tissue or organ
- The two types of multipotent stem cells are: 1) cells related to lymphoid system are known as **Common Lymphoid Stem Cells** and 2) the cells related to myeloid system are known as **Common Myeloid Stem Cells**
- Myeloid system refers to all blood cells other than lymphoid cells(lymphocytes)


PERIPHERAL
BLOOD CIRCULATION
BONE
MARROW
HOUSE
Multipotent
SC
COMMITTED
SC
ERYTHROID
MEGAKARYOID
BASOPHILIC
SC
CFU
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MEGAKARYO
BLAST
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Erythro
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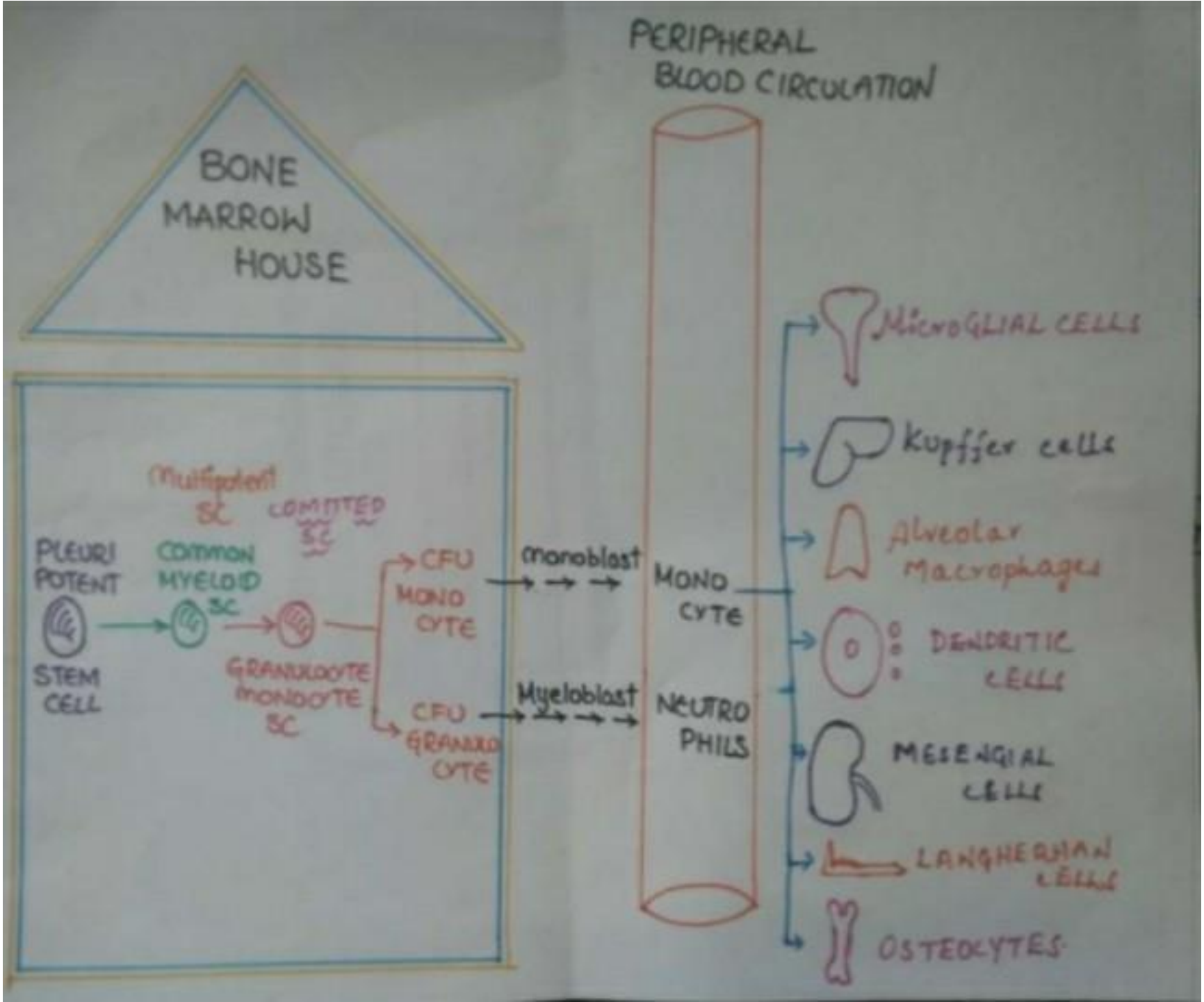
RBC
Mega
blast
PLATE
LETS
Baso
blast
BASO
PHIL
PLEURI
POTENT
STEM
CELL
common
MYELOID
STEM CELL

- Major function of T-H1 is that they produces gamma-interpherons, TNF(tumour necrotic factor) and they act on monocytes which in presence of T-H1 converted into active macrophages, epithelioid cells and giant cells
- Major function of T-H2 is that they stimulate B-Cells to get converted into **PLASMA CELLS** by the cytokines, IL-4 and IL-5 produced by it
- IL-4 work as B cell growth factor and IL-5 work as B cell differentiation factor-----these help B cell to convert into plasma cells which produce antibodies
- T-H1 help in cellular immunity and T-H2 help in humoral immunity
- > Cells which are CD-3 and CD-8 positive cells called as **T-CYTOTOXIC CELLS** which also take an active part in cellular immunity
- **C) PRO-B CELLS:** which get multiplied and differentiated into B-CELLS which get converted into plasma cells in action of TH-2 cells to produce anti bodies

- **> CFU BASOPHILS SYSTEM**
- Gets converted into basoblast which passes on different stages and enter peripheral circulation as basophils
- On surface of basophils there are surface receptors for IgE antibodies
- Pleuripotent cells are also responsible for production of **MAST CELLS** and have receptors for IgE anti-bodies and play a major role in type-1 hypersensitivity
- This is morphologically recognisable precursor cells for basophils

- **2) COMMON MYLOID STEM CELL**
- Multipotent stem cells
- Divided into types of committed stem cells:
- **A) ERYTHROID MEGAKARYOID BASOPHILIC STEM CELL**
- Has a potential to go into morphologically recognisable precursors of **3 types:**
- **> CFU ERYTHROID SYSTEM**
- Gets converted into erythroblast and passes to different stages to form reticuloblast which later on produces Mature RBC
- This is a morphologically recognisable precursor cell for erythropoiesis
- **> CFU MEGAKARYOID SYSTEM**
- Gets converted into megakaryoblast which passes on different stages and enter into blood circulation as PLATELETS
- Morphologically recognisable precursor cell for megakaryopoesis


PERIPHERAL
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CELL
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GRANULOCYTE
MONOCYTE
SC
CFU
MONO
CYTE
CFU
GRANU
CYTE
monoblast
Myeloblast
MONO
CYTE
NEUTRO
PHILS
MICROGLIAL CELLS
Kupffer cells
Alveolar
Macrophages
DENDRITIC
CELLS
MESENGIAL
CELLS
LANGHERHAN
CELLS
OSTEOCYTES

- **>CFU FOR MONOCYTE:** convert into Monoblast after series of divisions and enters into peripheral circulation as Monocytes
- Monocytes also have granules but these are agranulocytes
- Monocytes when shifted to tissue where inflammation occurs are called as inflammatory macrophages
- Monocytes when shifted to CNS during early phase of development are called as Microglial cells
- Monocytes when shifted to liver are called as Kupfer cells
- Monocytes when shifted to lung are called as Alveolar Macrophages
- When monocytes shifted to spleen and lymph nodes are called as Dendritic cells or Histiocytes
- Monocytes when shifted to kidney are called as Mesengial cells
- Monocytes under skin are called as Langerhan cells
- Monocytes that are shifted to bone Osteocytes

- **B) GRANULOCYTE MONOCYTE STEM CELLS**
- It is divided into 2 types of morphologically precursor cells:
- **> CFU FOR GRANULOCYTE:** after series of divisions myloblast is formed and enters into peripheral circulation as Neutrophils
- Neutrophils has granules of red and blue colour

QUESTION: 3

QUESTION: 3
ANSWER:

BONE MARROW:

- **DEFINITION:** The factury or maker of blood cells and nutrient rich spongy tissue located mainly in hollow portion of long flat bones .
- like the sternum, and bones of hips.
- At birth all bone marrow is red.
- with a passage of time more and more of marrow converts to yellow bone marrow.
- In aduls qbout of the bone marrow is red and half is yellow.

TYPES OF BONE MARROW:

1:RED BONE MARROW:

*also known is myeloid tissue

*all rsd blood cells and platelets in human adults are formed in red bone marrow.

*produces around 60-70% of lymphocytes (the rest begin life in the red bone marrow and become fully formed in lymphatic tissue, including thymes , spleen and lymph nodes)

* Red bone marrow also plays role in obliteration of old red blood cells, along with liver and spleen.

- **YELLOW BONE MARROW:**

*yellow bone marrow main purpose is to act as a store for fats , helping to provide substances and maintain correct environment for bone to function.

*However under particular condition such is severe blood loss or fever the yellow marrow may convert to red marrow.

*Yellow marrow tend to be located in central cavities of long bones, generally surrounded by a layer of red marrow with long trabeculae (beam like structures) within a sponge like reticular framework.

FUNCTION O BONE MARROW:

MESENCHYMAL STEM CELLS:

***The bone marrow stroma contains mesenchymal stem cells Mscs also known as marrow stromal cells.**

* These are multipotent stem cells that can differentiate into a variety of cell types.

*MSCs have been shown to differentiate, into osteoblasts, Chondrocytes, myocytes, adipocytes and beta-pancreatic islets cells.

BONE MARROW BARRIER:

* The blood vessels of the bone marrow contitute a barrier , inhibiting immature blood cells from leaving the marrow .
* Only mature blood cells contain the membrane proteins, such as aquaporin and glycophorin , that are required to attach to and pass the blood vessel endothelium.
* Hematopoietic stem cells may also cross the bone marrow barrier, and may thus be harvested from blood.

LYMPHATIC ROLE

* Red bone marrow is a key element of lymphatic system,

being one of the primary lymphoid organs that generate lymphocytes from immature hematopoietic

progenitor cells.

* Bone marrow and thymus constitute the primary

lymphoid tissues involved in the production and early selection of lymphocytes .

* Furthermore , bone marrow performs a valve-like function

to prevent the backflow of lymphatic fluid in the lymphatic system

QUESTION : 4

SITE OF HAEMOTOPOIESIS IN FETUS:

*0-2 months (yolk sac)

*2-7 months (liver,spleen)

*5-9 months (bone marrow)

*During notmal childhood and adult life the marrow is the only source of new blood cells.

*in certain ddiseases the liver and spleen can resume their fetal haemopoietic role.

*primary site of hematopoiesis in the fetus before midpregnancy is liver.
*The liver , to lesser extent , the spleen becom the major hematopietic organ by the midgestation in the fetus.
*Embryonic hematopoiasis begins in the yolk sac and changes to definitive hematopoiesis in the fetal liver.

SITES OF HEMATOPOIESIS IN INFANTS:

*BONE MARROW (praticularly in all bones)

*the developing cells are situated out side the bone marrow sinuses.

*mature cells are released in to the sinus space , the marrow microcirculation.and then go to the genral cir culation

* in infants hematopoiesis occure in all area of bones.

* infants also continue in the spleen and liver.

Sites of hematopoiesis in ADULTS:

***VERTEBRAE**

***RIBS**

***STERNUM**

***SKULL**

***SACRUM**

***PELVIS**

***ALL LONG BONES(like femur proximal end.)**

*in adults hematopoiesis of red blood cells and platelets occure primarily in the bones marrow.
*hematopoiesis occure in adult inside the bone marrow.
*like sternum , skull , ribes , and all long bones.

THE END