BLOOD MODULE

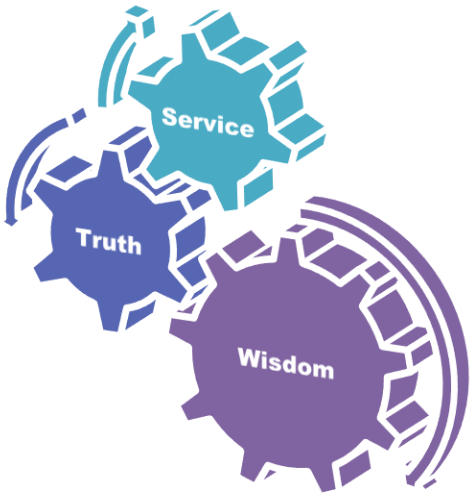
SKILL LAB /Physiology PRACTICAL

FIRST YEAR MBBS BATCH 50

Dr. USMAN

Date:30th March2023

Motto



Vision; The Dream/Tomorrow

- To impart evidence based research oriented medical education
- To provide best possible patient care
- To inculcate the values of mutual respect and ethical practice of medicine

Determination of Hematocrit (HCT)

Dr. Usman

LEARNING OBJECTIVE

At the end of presentation , students must be able to:

- Determine the hematocrit
- Describe clinical importance of hematocrit
- Correlate between hematocrit and anemia

INTRODUCTION

- Hematocrit is defined The percentage by volume of packed red blood cells in a given sample of blood after centrifugation.
- The hematocrit may also be referred to as Packed Cell Volume (PCV) or erythrocyte volume fraction (EVF).

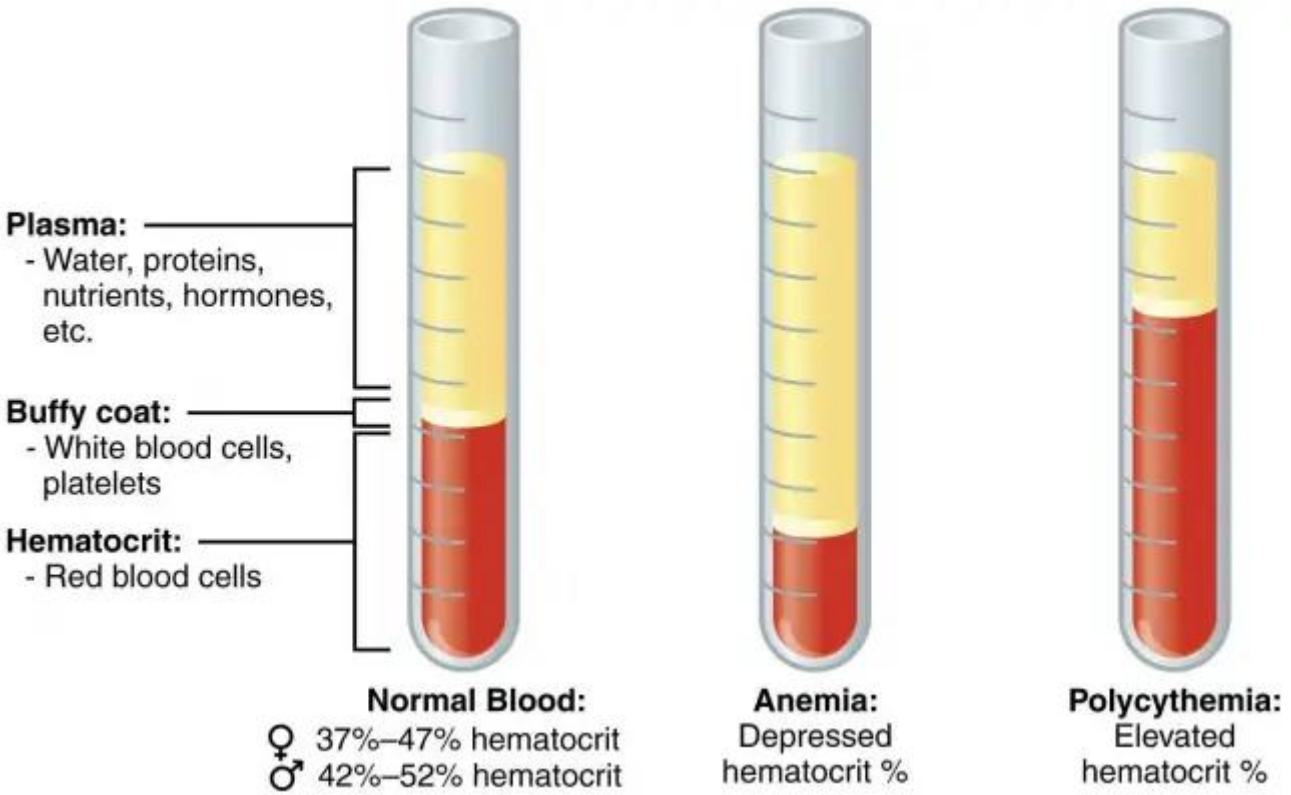
NORMAL RANGE OF HEMATOCRIT

- Normal levels of haematocrit for men range from 41% to 50%. Normal level for women is 36% to 48%.

CLINICAL IMPORTANCE OF HAEMATOCRIT

- Clinically, HCT is **used to identify anaemia and polycythaemia along with other parameters** (e.g., RBC count, Hb concentration). In anaemia, where there are fewer RBCs in the circulating blood relative to the total volume of the blood, the HCT decreases.

CLINICAL IMPORTANCE OF HAEMATOCRIT



METHODS OF DETERMINATION OF HAEMATOCRIT

Two methods:

- Microhematocrit
- Electronic cell counting

DETERMINATION OF HAEMATOCRIT BY MICROHAEMATOCRIT CENTRIFUGE

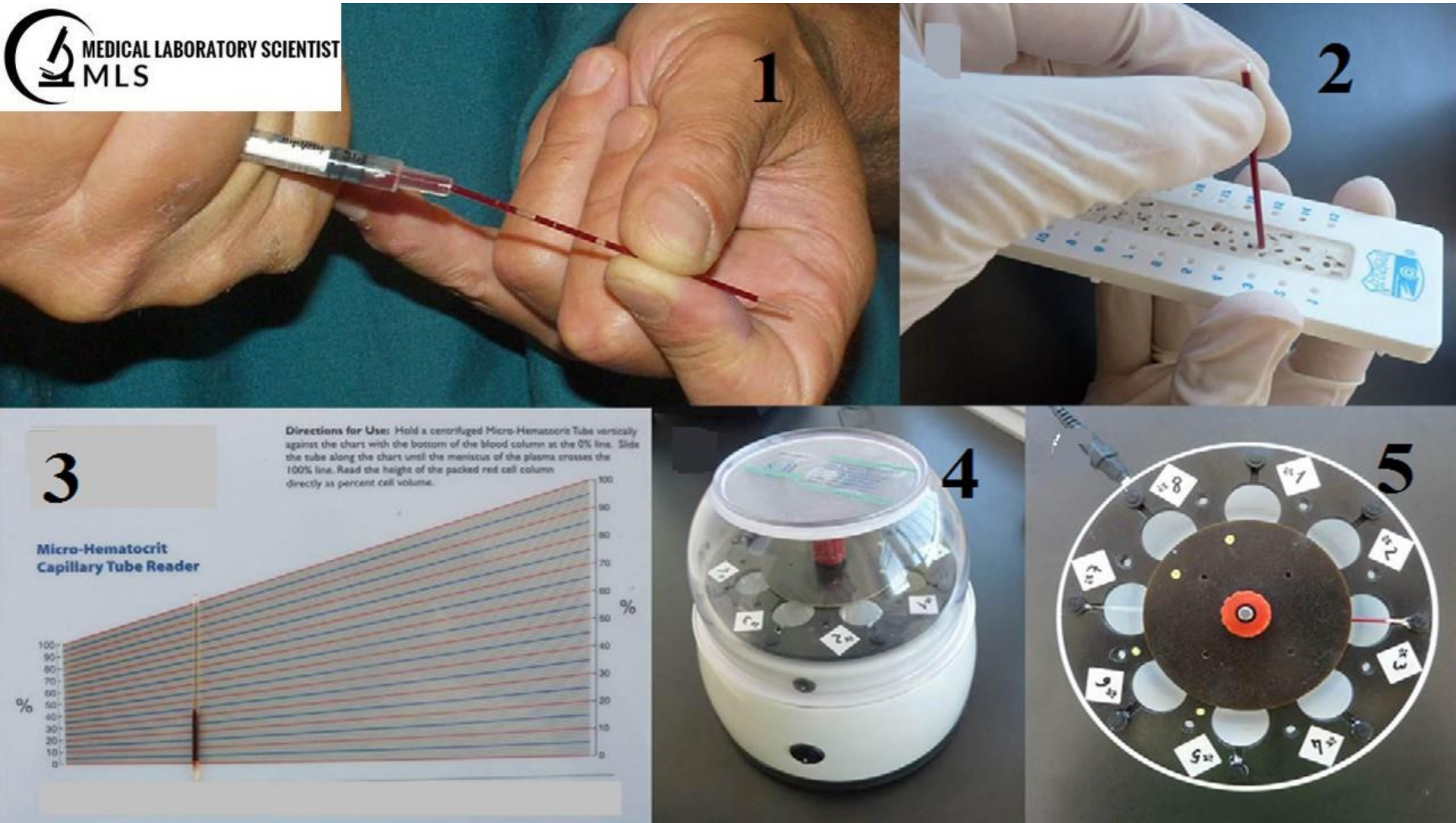
- Microhematocrit centrifuges are used for determination of volume fractions of erythrocytes (red blood cells) in blood and for separation of micro volumes of blood and solutions.

- It provides haematocrit (HCT) values.

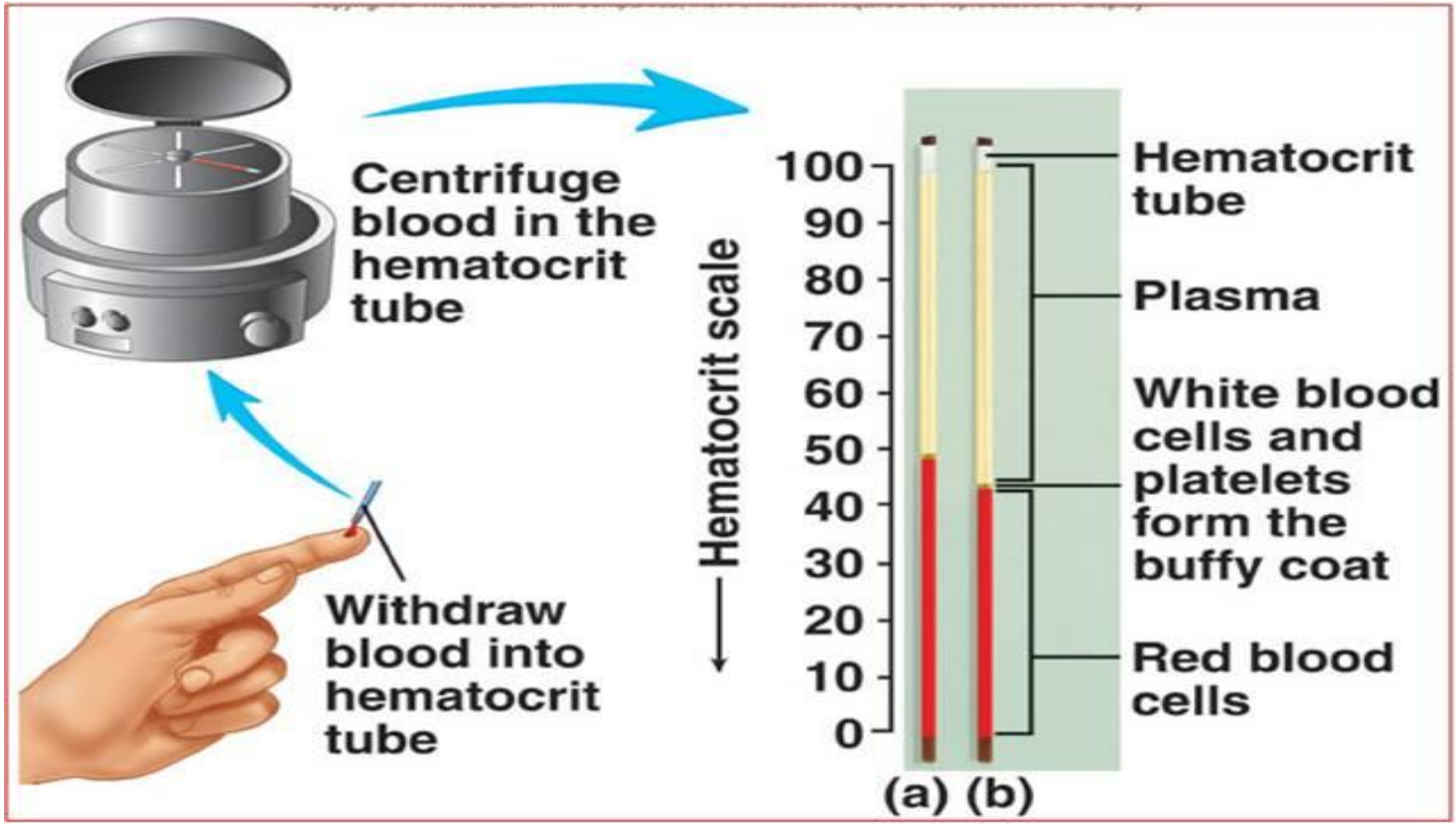
MATERIAL AND INSTRUMENTS

I. Microhematocrit tube (capillary tube) 75mm in length and 1mm in diameter which contains heparin and show a red ring at the end of the tube.
II. Microhematocrit centrifuge device.
III. Plastic seal to seal one end of Microhematocrit capillary tube.
IV. Microhematocrit reader.

MATERIAL AND INSTRUMENTS



MATERIAL AND INSTRUMENTS



PROCEDURE

PROCEDURE

1. Clean your finger with 70% alcohol and let dry.

2. Prick finger with lancet, near the tip but not too close to the nail. Prick so that blood flows freely. Try squeezing up from your wrist if blood does not flow after pricking finger.

3. Place the tip of a capillary tube onto a drop of blood on your finger.

PROCEDURE (continued)

4. Call your instructor to seal the tube.

5. The instructor will spin the tubes in a centrifuge (5 minutes at 10000 rpm).

7. Using a special reading device(since the capillary tube is not

OBSERVATIONS AND RESULTS

- Note that the blood has been separated into 3 layers:

I. A tall upper layer of clear plasma—amber slightly yellow-colored. It should not be pink or red which would indicate hemolysis of red cells in the sample or within the body in hemolytic diseases.

OBSERVATIONS AND RESULTS

(continued)

II. A greyish-white, thin layer (about 1 mm thick) the so-called “buffy layer”, consisting of platelets (thrombocytes) above and leukocytes below it.

III. A tall bottom layer of red cells which have been closely packed together. A greyish red line separates red cell layer from the layer of leukocytes above it.

OBSERVATIONS AND RESULTS

(continued)

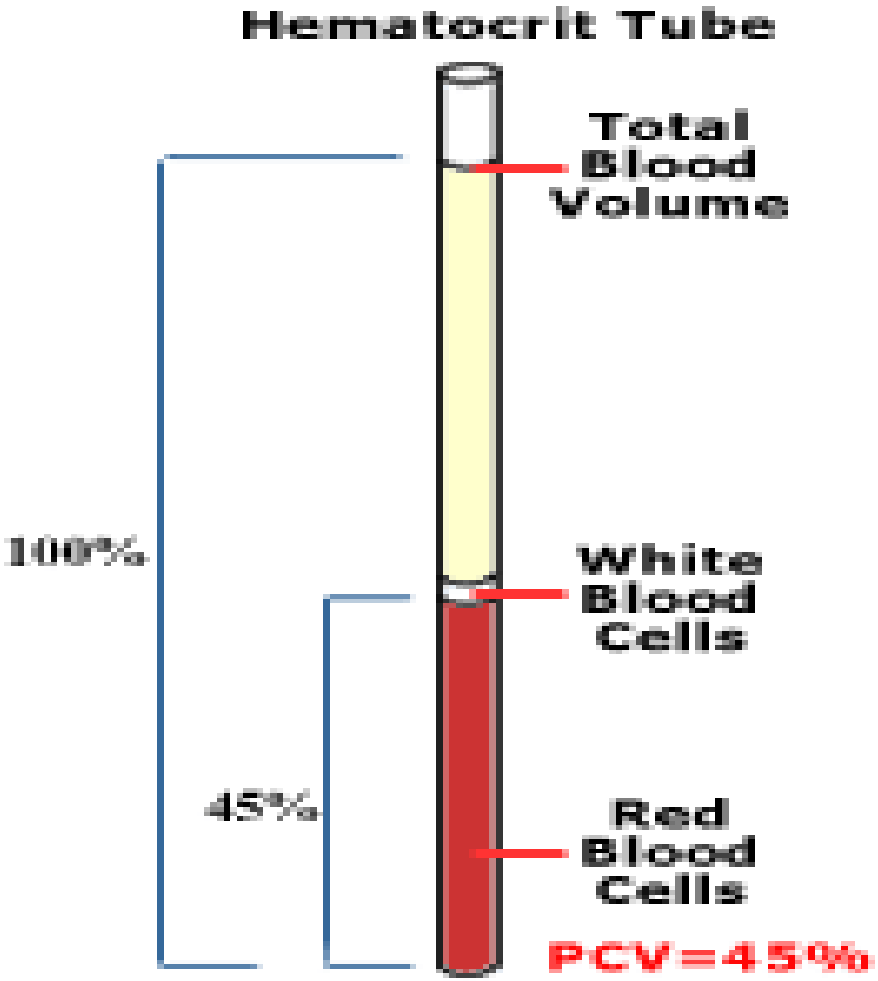
The percentage of the volume of blood occupied by the red cells constitutes hematocrit or packed cell volume.

Hct % = {Height of RBCs (mm) / Height of RBCs and plasma (mm)} × 100

For example, if the height of packed red cells is 45 mm, then
= 45/ 100 × 100 = 45 percent.

OBSERVATIONS AND RESULTS

(continued)



OBSERVATIONS AND RESULTS

(Continued)

- It also means that out of 100 volumes (or parts) of blood 45 volumes (or parts) are red cells and 55 volumes (or parts) are plasma.

- Thus, out of 1 liter of blood, 450 ml are red cells and 550 ml are plasma.

PRECAUTIONS

(Continued)

1. An increased amount of anti-coagulant decreases the Hct reading as a result of erythrocyte shrinking.

2. Improper sealing of the capillary tube causes a decreased Hct reading as a result of loss of blood during centrifugation. a higher number of erythrocytes are lost in relation to the plasma.

PRECAUTIONS

(Continued)

3. The microhematocrit centrifuge should never be forced to stop by applying pressure to the metal cover plate. This will cause the RBC layer to “sling” forward and results in a falsely elevated value.

PRECAUTIONS

(Continued)

4. The buffy coat of the specimen should not be included in the Hct reading, because its inclusion falsely elevates the result.

5. A decrease or increase in the readings may be seen if the microhematocrit reader is not used properly.

PRECAUTIONS

(Continued)

6. If too much time elapses between when the centrifuge stops and the capillary tube is removed, the red cells can begin to settle out and cause a false reading of the hematocrit.

QUESTIONS

(Continued)

Q. No. 1: What is the importance of determining haematocrit?

Answer: It is a simple but accurate test for determining the presence of anaemia or polycythaemia, as it is more accurate than the red cell count or HB. It is also employed for determining various absolute, corpuscular values. Sometimes it is used for screening for anaemia.

QUESTIONS

(Continued)

Q. No. 2: What is the normal value of haemoglobin in an adult male??

Answer: Normal results for adults vary, but in general are: Male: 13.8 to 17.2 grams per deciliter (g/dL) or 138 to 172 grams per liter (g/L)

QUESTIONS

(Continued)

Q. No. 3: What is the effect of a high haemoglobin concentration?

Answer: Increase in haemoglobin concentration increases the viscosity of blood which leads to an increase in peripheral resistance, and thus the blood pressure.

QUESTIONS

Q. No. 4: What is the difference between the Packed Cell Volume (PCV) of arterial and venous bloods?

Answer: The Packed Cell Volume of venous blood is a little higher than that of arterial blood because the red cells gain a little water due to chloride shift.

MCQ's

A 63-year-old man comes to the physician because of an 8-month history of progressively worsening fatigue and shortness of breath on exertion. During this time, he has noticed blood in his stool on 5 separate occasions. Physical examination shows pale conjunctivae. His haemoglobin concentration is 8.9 g/dL and mean corpuscular volume is 65 μm^3. Further analysis of this patient's arterial blood is most likely to show which of the following sets of findings?

MCQ's (continued)

Options	%O_2 saturation	O_2 partial pressure	O_2 content	O_2-Hb dissociation curve
A	Normal	normal	normal	normal
B	Decreased	normal	decreased	left-shift
C	Normal	normal	increased	normal
D	Normal	normal	decreased	normal
E	Decreased	decreased	decreased	right-shift

MCQ's (continued)

2. An investigator is studying the effects of tissue hypoxia on skeletal muscles. Skeletal muscle hypoxia is induced

by decreasing oxygen delivery to peripheral tissues. Which of the following is most likely to achieve this desired effect?

MCQ's (continued)

A. Decrease the serum 2,3-bisphosphoglycerate concentration
B. Increase the serum hydrogen ion concentration
C. Decrease the proportion of foetal haemoglobin
D. Increase the arterial partial pressure of carbon dioxide

Learning Resources

- Practical physiology 2nd year MBBS by DR Saqib Sohail.
- Guyton and hall textbook of medical physiology 14th edition.
- Google images.

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