Inside a Blood Sample

Use lab observations to connect blood components with homeostasis.

HS-AP8-1 "Perform an investigation to identify the composition and function of whole blood components, and the role they play in maintaining homeostasis."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline evidence from the tube or smear that identifies each of the four blood components. Circle each component's name, then number one of its functions that helps keep body conditions stable.

What a Blood Sample Reveals

1. At a clinic, a technician collects a small blood sample in a tube that prevents clotting. A centrifuge spins the tube, separating the sample by density. The top, pale yellow layer is plasma, usually a little more than half the volume. The dense bottom layer contains red blood cells and makes up much of the rest. Between them lies a thin, light-colored buffy coat containing white blood cells and platelets, together less than one percent of blood volume. The technician also spreads a drop on a slide and stains it so the different formed components can be examined under a microscope.

2. Plasma is mostly water, with dissolved salts and proteins, including proteins needed for clotting. It carries nutrients, hormones, and wastes around the body. Its water helps maintain blood volume, while dissolved substances help keep the fluid surrounding cells within a useful range. Red blood cells, which lack nuclei when mature, contain hemoglobin. This protein binds oxygen in the lungs and releases it to tissues, where cells need oxygen to make usable energy. The cells also carry some carbon dioxide away from tissues. In a blood smear, red blood cells greatly outnumber the other formed components.

3. The buffy coat is thin, but its components handle different threats. White blood cells are complete cells with nuclei; several types detect or attack microbes and coordinate immune responses. Platelets are tiny cell fragments, not complete cells. At a damaged vessel, they stick to the injury and help form a plug. Clotting proteins in plasma then help build a stronger clot, limiting blood loss. Under the microscope, white blood cells look larger than red blood cells, while platelets appear as small fragments. A spun tube shows the layers' relative volumes; the stained smear helps distinguish the components crowded into the buffy coat.

2 ANSWER WITH EVIDENCE

Use the passage

1. A technician finds that the top layer takes up a little more than half the tube. Identify it, then explain how its composition helps maintain blood volume.

2. Which component fills the dense bottom layer and greatly outnumbers other formed components on a smear? Explain how its contents help tissues function.

3. The buffy coat contains two components. How could a technician distinguish them on a stained smear, and how does each help maintain homeostasis?

4. A vessel is damaged. Explain how a component from the buffy coat works with something in the top layer to limit blood loss.

3 YOUR TURN

Your own words

A patient has a small cut and a mild infection. In six sentences, describe what you would look for in a spun tube and a stained smear, explain how three different blood components help keep the patient stable, and state one limit of these observations.

ANSWER KEY

Inside a Blood Sample

HIGH SCHOOL · HS-AP8-1

PART 1 · READ AND MARK

Underline evidence from the tube or smear that identifies each of the four blood components. Circle each component's name, then number one of its functions that helps keep body conditions stable. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	A technician finds that the top layer takes up a little more than half the tube. Identify it, then explain how its composition helps maintain blood volume.	**The top layer is plasma. It is mostly water, which helps maintain blood volume.**
2	Which component fills the dense bottom layer and greatly outnumbers other formed components on a smear? Explain how its contents help tissues function.	**Red blood cells fill the bottom layer. Their hemoglobin carries oxygen to tissues for making usable energy.**
3	The buffy coat contains two components. How could a technician distinguish them on a stained smear, and how does each help maintain homeostasis?	**White blood cells are larger than red blood cells and help defend against microbes. Platelets appear as small fragments and help form a plug that limits blood loss.**
4	A vessel is damaged. Explain how a component from the buffy coat works with something in the top layer to limit blood loss.	**Platelets from the buffy coat form a plug at the injury. Clotting proteins in plasma help build a stronger clot.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would spin a blood sample that cannot clot to locate its plasma, red cell layer, and buffy coat. I would stain a smear to distinguish white blood cells from tiny platelets. At the cut, platelets would form a plug that limits blood loss. Clotting proteins in plasma would help strengthen the clot. White blood cells would help fight microbes involved in the infection. These observations cannot identify the microbe causing the infection without additional tests.

Accept accurate observations of the spun layers and smear that support identification of the components. The open response should connect three distinct components to stability and give a valid limit of the observations.