For this journey, you will be miniaturized and injected into the external iliac artery and will be guided by a fluorescent monitor into the bone marrow of the iliac bone. You will observe and report events of blood cell formation, also called ___1__, seen there; then you will move out of the bone into the circulation to initiate and observe the process of blood clotting, also called ___2__. Once in the bone marrow, you watch as several large dark-nucleated stem cells, or ___3__, begin to divide and produce daughter cells. To your right, the daughter cells eventually formed have tiny cytoplasmic granules and very peculiarly shaped nuclei that look like small masses of nuclear material connected by thin strands of nucleoplasm. You have just witnessed the formation of a type of white blood cell called the ___4__. You describe its appearance and make a mental note to try to observe its activity later. Meanwhile you can tentatively report that this cell type functions as a ___5__ to protect the body.

At another site, daughter cells arising from the division of a stem cell are difficult to identify initially. As you continue to observe the cells, you see that they, in turn, divide. Eventually some of their daughter cells eject their nuclei and flatten out to assume a disk shape. You assume that the kidneys must have released ___6__ because those cells are ___7__. That dark material filling their interior must be ___8__ because those cells function to transport ___9__ in the blood.

Now you turn your attention to the daughter cells being formed by the division of another stem cell. They are small round cells with relatively large round nuclei. In fact, their cytoplasm is very sparse. You record your observation of the formation of ___10__. They do not remain in the marrow very long after formation but seem to enter the circulation almost as soon as they are produced. Some of those cells produce ___11__ or act in other ways in the immune response. At this point, although you have yet to see the formation of ___12__, ___13__, ___14__, or ___15__, you decide to proceed into the circulation to make the blood-clotting observations.

You maneuver yourself into a small venule to enter the general circulation. Once inside, you quickly make a slash in the vessel lining, or ___16__. Almost immediately, what appear to be hundreds of jagged cell fragments swoop into the area and plaster themselves over the freshly made incision. You record that ___17__ have just adhered to the damaged site. As you are writing, your chemical monitor flashes the message, “vasoconstrictor substance released.” You record that ___18__ has been released based on your observation that the vessel wall seems to be closing in. Peering out at the damaged site, you see that long rope like strands are being formed at a rapid rate and are clinging to the site. You report that the ___19__ mesh is forming and is beginning to trap RBCs to form basis of the ___20__. Even though you do not have the equipment to monitor the intermediate steps of this process, you know that the interaction of platelet PF3 and other clotting factors must have generated ___21__, which then converted ___22__ to ___23__. This second
enzyme then joined the soluble molecules together to form the network of strands you can see.

You carefully back away from the newly formed clot. You do not want to disturb the area because you realize that if the clot detaches, it might become a life-threatening threat. Your mission here is completed, and you return to the entrance site.

**WORD BANK**

A. Thrombin  
B. Embolus  
C. Red blood cells  
D. Erythropoietin  
E. Hematopoiesis  
F. Clot  
G. Platelets  
H. Fibrin  
I. Hemostasis  
J. Oxygen  
K. Prothrombin  
L. Hemoglobin  
M. Fibrinogen  
N. Neutrophil  
O. Serotonin  
P. Hemocytoblasts  
Q. Basophils, eosinophils, monocytes, platelets (in any order)  
R. Prothrombin activator  
S. Phagocyte  
T. Antibodies  
U. Endothelium  
V. Lymphocytes

**SOLUTION**

1. ______  
2. ______  
3. ______  
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25. ______

![Bone Marrow Produces](image-url)