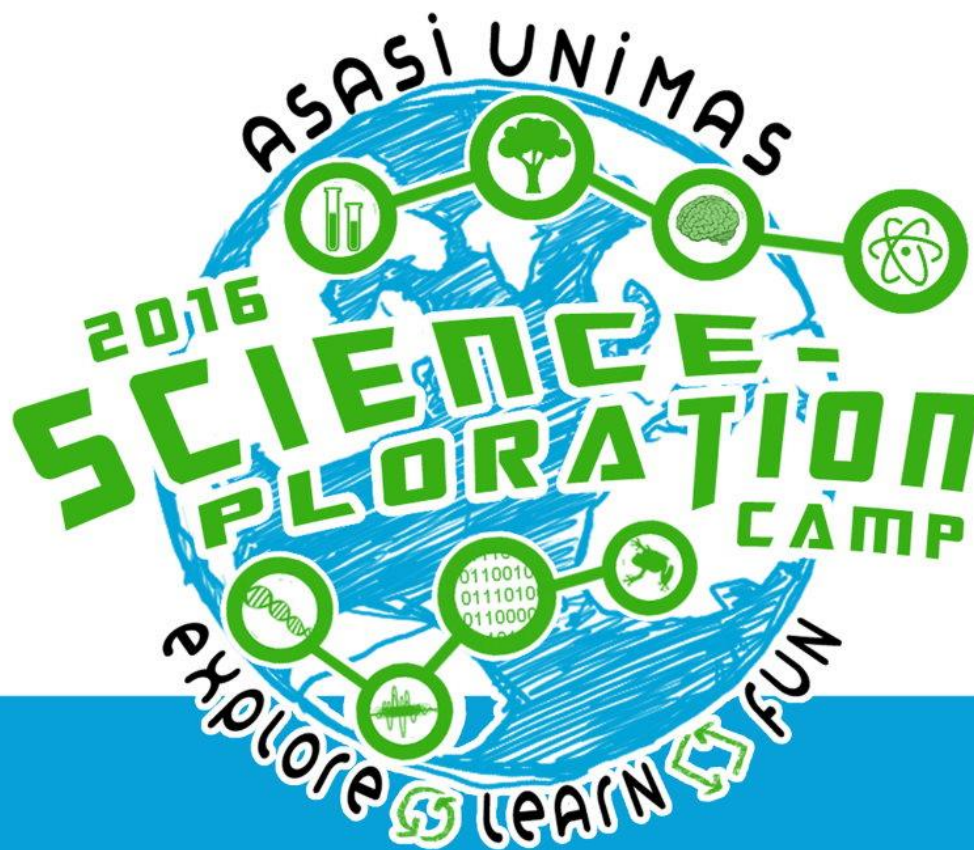
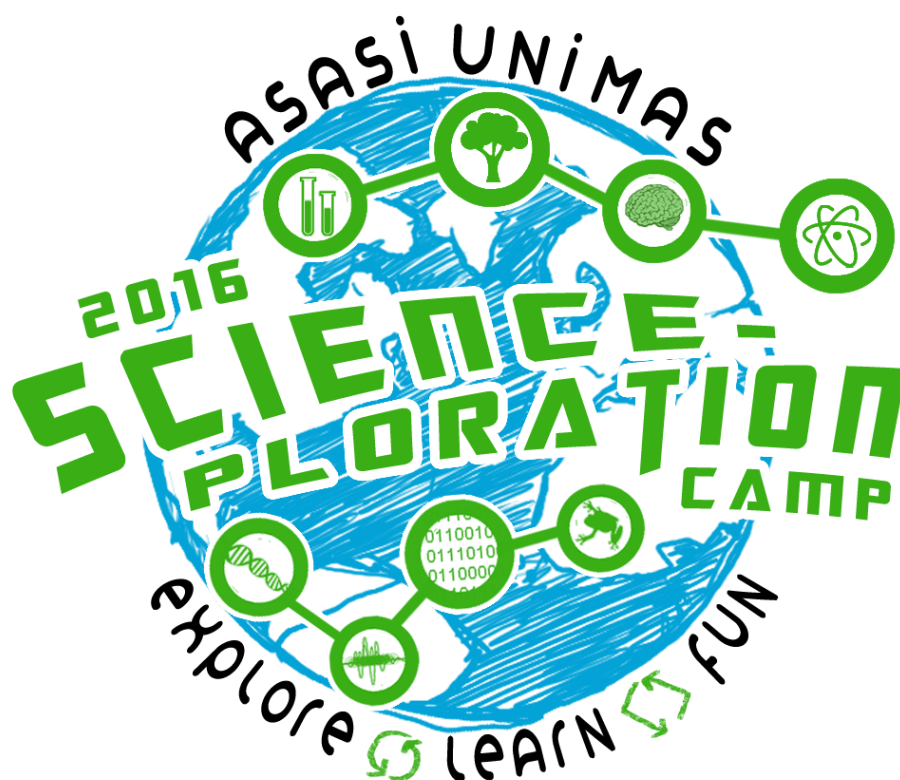


PPPU
Pusat Pengajian Pra-Universiti
Universiti Malaysia Sarawak



Dhana Jay Raja Gopal | George Tan Geok Shim
Rohaiza Daud

Centre for Pre-University Studies
Universiti Malaysia Sarawak, Kota Samarahan, Sarawak



EDITORS

Dhana Jay Raja Gopal, George Tan Geok Shim, Rohaiza Daud, Mohd Razif Othman, Mohd Fhaizal Mohd Bukhori, Mohd Aminudin Mustafa, Roberta Chaya Tawie Tingga, Christharina S Gintoron, Mohd Ridwan Abd Rahman, Muhamad Ikhwan Idris, Sharifah Mona Abdul Aziz Abdullah, Wan Roslina Wan Yusof, Mohd Alhafiizh Zailani, Abdul Al-Hafiz Ismail, Dr. Melody Kimi, Wan Sharifatun Handayani Wan Zullkiplee, Abang Mohammad Hudzaifah Abang Shakawi, Ahmad Alif Kamal, Nor Hayati Jaya, Norni Hidayawati Mat Daud, Noor Azie Azura Mohd Arif, Nor Amalina Ahmad, Chong Chee Jiun, Sinarwati Mohd Suhaili

Centre for Pre-University Studies,
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Foreword

The Scienceploration Camp is an initiative of the Centre for Pre-University Studies, UNIMAS, aimed to increase the interest in science among secondary school students and SPM leavers. The camp has two main objectives; to provide various fun scientific activities and to increase the visibility of the Centre for Pre-University Studies as one of the best option for post secondary education.

The activities are designed to provide hands-on experiences to the participants, combining learning with fun-filled experiments.

It is hoped that the activities would deepen the participants' interest in science, particularly after they have completed their secondary school education and in preparation to embark onto their tertiary education.

Associate Professor Dr. Ramlah binti Zainudin
Dean
Centre for Pre-University Studies
UNIMAS

Note for Participants

The activities outlined for this Camp are to be carried out with close supervision from the experts, within the allocated venues. Engage your interests, ask questions, and relate what you have learned to your experiences.

Learning can be both fun and rewarding.

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Asasi UNIMAS
Scienceploration Camp

Activity 1: Human Blood Type

OBJECTIVE

To determine the human blood type using ABO blood typing and rhesus typing.

INTRODUCTION

ABO Blood Typing

Our body carries around four to six liters (7 to 10.5 pints) of blood which contains red blood cells, white blood cells and platelets in a liquid called the plasma. Plasma is about 90% water, but also contains proteins, nutrients, hormones and waste products. Blood is made up of about 55% plasma and 45% blood cells (Figure 1.1). Each type of blood cell has a specific role to play as shown in Table 1.1.

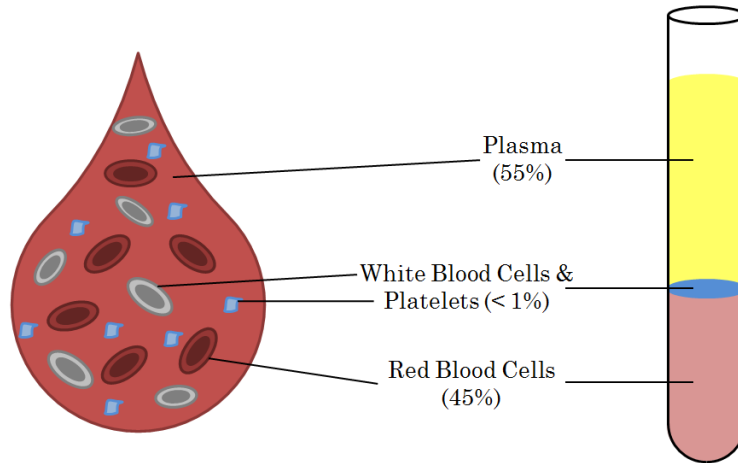


Figure 1.1: The Elements of Blood

Table 1.1: Component of Blood and Functions

Components	Function(s)
Red blood cells	Carry oxygen throughout the body and remove carbon dioxide and other waste products. Give blood its red colour.
White blood cells	Part of the immune system (the body's natural defence mechanism) to help fight infection
Platelets	Help the blood clot (thicken) to stop bleeding

Human beings have blood group patterns as distinctive and individual as fingerprints. There are four main blood groups (types of blood): A, B, AB and O. Our blood group is determined by the genes that we inherit from our parents and can be identified by the presence of antigens and antibodies in the blood. Antigens are protein molecules, namely A,

B and D (Rhesus) found on the surface of red blood cells. These proteins function as agglutinogens. Antibodies are proteins found in the plasma. They are part of our body's natural defences against foreign substances such as germs. Antibodies recognise anything foreign in the body and alert the immune system to destroy it. When conducting a blood transfusion, it is important to carefully match the donor and recipient blood types. If the donor blood cells have surface molecules that are different from those of the recipient, antibodies in the recipient's blood recognize the donor blood as foreign. Hence, there are very specific ways in which blood types must be matched for a safe transfusion (Figure 1.2).

		Donor							
		O-	O+	B-	B+	A-	A+	AB-	AB+
Receiver	AB+	●	●	●	●	●	●	●	●
	AB-	●		●		●		●	
	A+	●	●			●	●		
	A-	●				●			
	B+	●	●	●	●				
	B-	●		●					
	O+	●	●						
	O-	●							

● shows compatibility

Figure 1.2: Blood Group Compatibility

Antibodies present within the anti-A and anti-B sera will be used to determine the human ABO blood type. If the blood type is A, the blood will agglutinate (clump) with the anti-A serum. If the blood type is B, the blood will agglutinate with anti-B serum. If the blood type is AB, the blood will agglutinate with both anti-A and anti-B sera. If the blood type is O (absence of proteins A and B), neither anti-A nor anti-B sera will cause agglutination. Hence, there are eight main blood groups defined by the ABO system as shown in Table 1.2.

Rhesus Blood Typing

Human red blood cells (erythrocytes) are also classified according to the Rh factor, either Rh-positive (Rh⁺) or Rh-negative (Rh⁻), depending on whether the Rh antigen is present or absent. This antigen is called the D-antigen. Anti-D serum will be used to determine the presence or absence of the Rh protein. If you are rhesus positive (Rh⁺), it means that a protein (D antigen) is found on the surface of your red blood cells. If you do not have the D antigen, you will be rhesus negative (Rh⁻) (Table 1.2).

Table 1.2: Human Blood Type Based on ABO system and Rh system

Blood group	Rhesus	Blood type	Antigen(s) present on the red blood cells	Antibodies present in serum
A	RhD positive	A ⁺	A antigen & D antigen	Anti-B
	RhD negative	A ⁻	A antigen	Anti-B & Anti-D

B	RhD positive	B ⁺	B antigen & D antigen	Anti-A
	RhD negative	B ⁻	B antigen	Anti-A & Anti-D
AB	RhD positive	AB ⁺	A antigen, B antigen & D antigen	None
	RhD negative	AB ⁻	A antigen & B antigen	Anti D
O	RhD positive	O ⁺	D antigen	Anti-A & Anti-B
	RhD negative	O ⁻	None	Anti-A, Anti-B & Anti D

APPARATUS

White tiles
20 μ L micropipette and tips

MATERIALS

Anti-A serum Alcohol swab
Anti-B serum Sterile lancet
Anti-D serum Toothpick
Anti-AB serum

METHOD

I. ABO Blood Typing

- Place 1 drop of anti-A serum to the square on the column marked 'anti-A' on the tile.
- Place 1 drop of anti-B serum to the square on the column marked 'anti-B' on the tile.
- Place 1 drop of anti-AB serum to the square on the column marked 'anti-AB' on the tile
- Sterilize the tip of the middle finger with an alcohol swab and allow the alcohol to evaporate. Instantaneously shake the hand downwards and put a slight pressure at the end of the middle finger with the thumb.
- With a sterile lancet, make a fast pin-prick into the skin of about 1 to 2 mm deep.
- Wipe off the first drop of blood. Squeeze the end of the finger with the thumb to increase the blood flow. Then, allow a drop of blood onto the sides of each of the three squares. Quickly clean the pricked finger with an alcohol swab to prevent infection.
- Mix the blood and anti-serum in a smooth round circle using a toothpick. Rock the tiles gently for 1-2 minutes.
- Observe for agglutination of the red blood cells. Determine the blood type using the information given in Table 1.2.

II. Rhesus Blood Typing

- Place a drop of anti-D serum onto the square on the column marked 'anti-Rh(D)' on the tile.
- Place a drop of Rh control onto the square on the column marked 'Rh control'.
- Add 1 drop of test blood to each of these 2 squares (do not touch the antiserum).
- Mix the blood and the antiserum in a smooth round circle using a wooden applicator stick/ toothpick (use a new stick for each square). Rock the tile gently for about 3-4 minutes.

13. Observe the presence of haemagglutination and record your result.
14. Dispose off all lancets, cotton and toothpicks into the appropriate containers.
15. Observe for agglutination of the red blood cells. Determine the blood type using the information given in Table 1.2.

NOTES

- Do not use a lancet that has been used by another student.
- Drying up of the blood should not be confused as agglutination.
- Rh(D) typing is done using the similar method to that of the ABO grouping. However the anti-D antiserum is used to detect the D antigen on the red blood cells and may take longer time for agglutination to appear.

RESULTS

Table 1.3: Distribution of participants' blood type

Name	Anti-A	Anti-B	Anti-AB	Anti-D	Blood group
Example: Amin	Agglutinates	No agglutination	No agglutination	No agglutination	A-

DISCUSSIONS

1. What does the blood agglutination tells you?
 - A. The blood cells are floating freely
 - B. The blood has not reacted with the antibody
 - C. The donor and recipient blood types are compatible
 - D. The donor and recipient blood types are incompatible

2. What happen if the mismatch of blood transfusion were to occur in the recipient?
 - A. The blood of the donor will shrink
 - B. The blood of the recipient will lyse
 - C. The blood of the donor will agglutinate
 - D. The blood of the recipient will agglutinate

3. Why is the determination of Rh blood group important in pregnant women?

- A. To protect the mother's blood cells
- B. To protect the baby from infections
- C. To protect the mother from anaemia
- D. To protect the baby from the mother's antibody

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