Human Circulatory System : Introduction

Course on Human Physiology: Body Fluids & Circulation

Dr Amit Gupta • Lesson 5 • Sept 11, 2021

Table 18.1 Blood Groups and Donor Compatibility

Blood Group	Antigens on RBCs	Antibodies in Plasma	Donor's Group
A	A	anti-B	A, O
B	B	anti-A	B, O
AB	A, B	nil	AB, A, B, O
O	nil	anti-A, B	O

Blood Groups

- Antigen of blood groups is present in the surface of RBC also called as **agglutinogen.**
- Antibody for blood group antigen is present in serum (plasma) called **agglutinin**.
- Blood grouping Antigen & Antibody are special type of glycoproteins.
- Blood groups are of 4 type A,B, AB, O.
- A, B, O discovered by Landsteiner. (Father of blood grouping)

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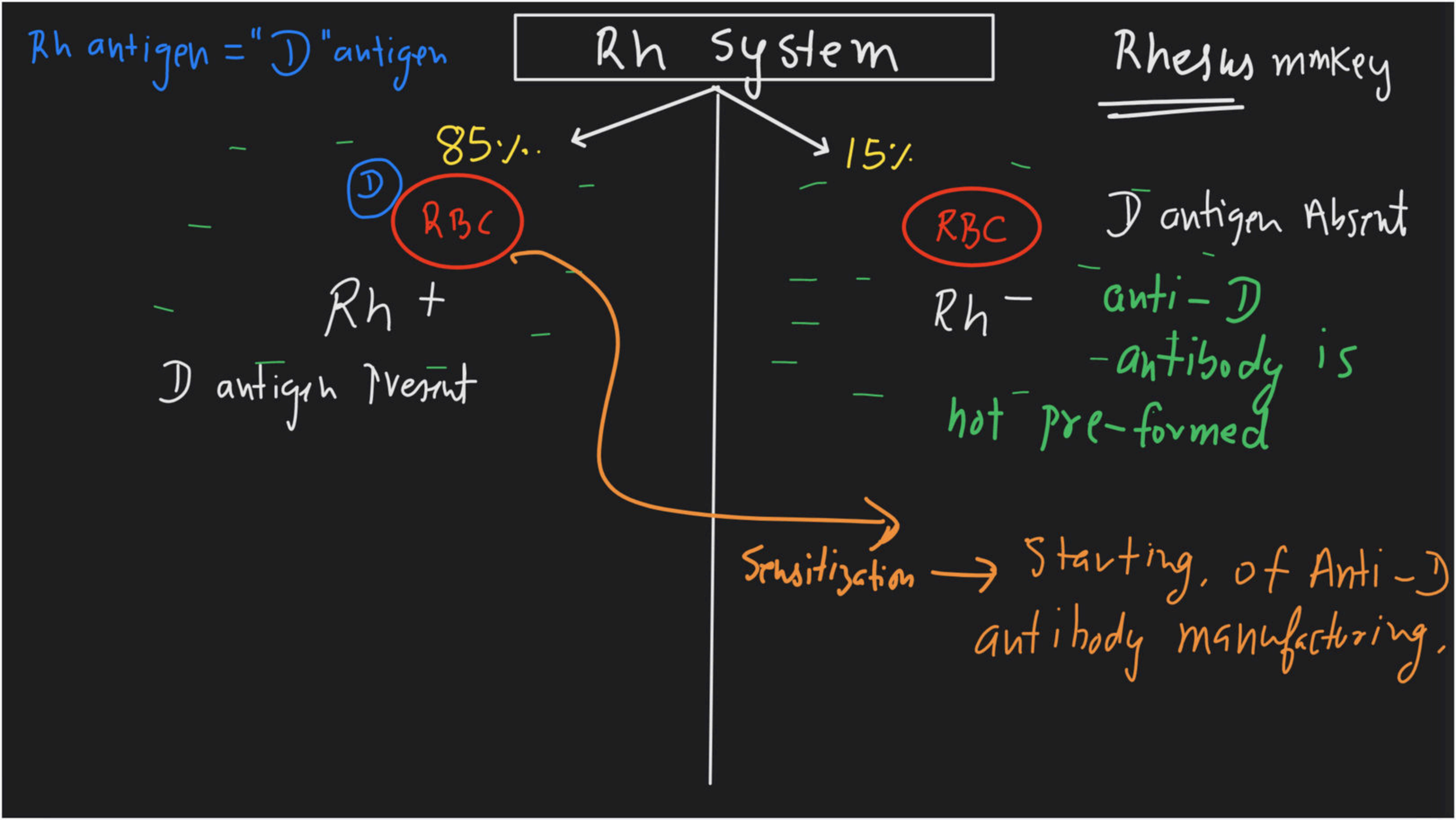
- Blood group O is **universal donar** & Blood group is AB is **universal acceptor**.


Rh antigen = "D" antigen
Rh system
Rhesus monkey
85%
15%
D
RBC
RBC
Rh +
D antigen present
Rh −
D antigen Absent
anti-D
-antibody is
not pre-formed
Sensitization
Starting of Anti-D
antibody manufacturing.

Rh+ × Rh−

Father — Mother

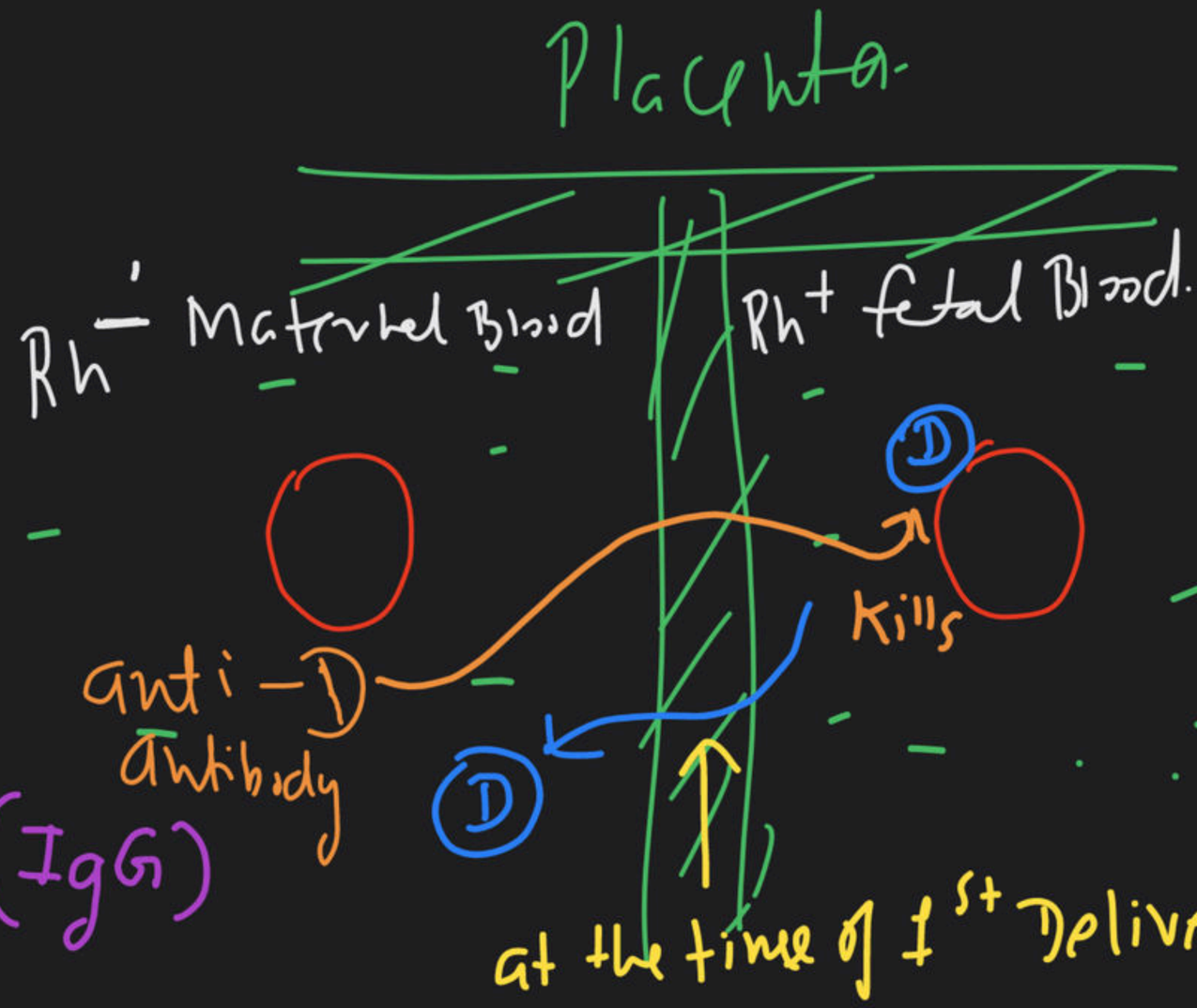
Rh+

Progeny

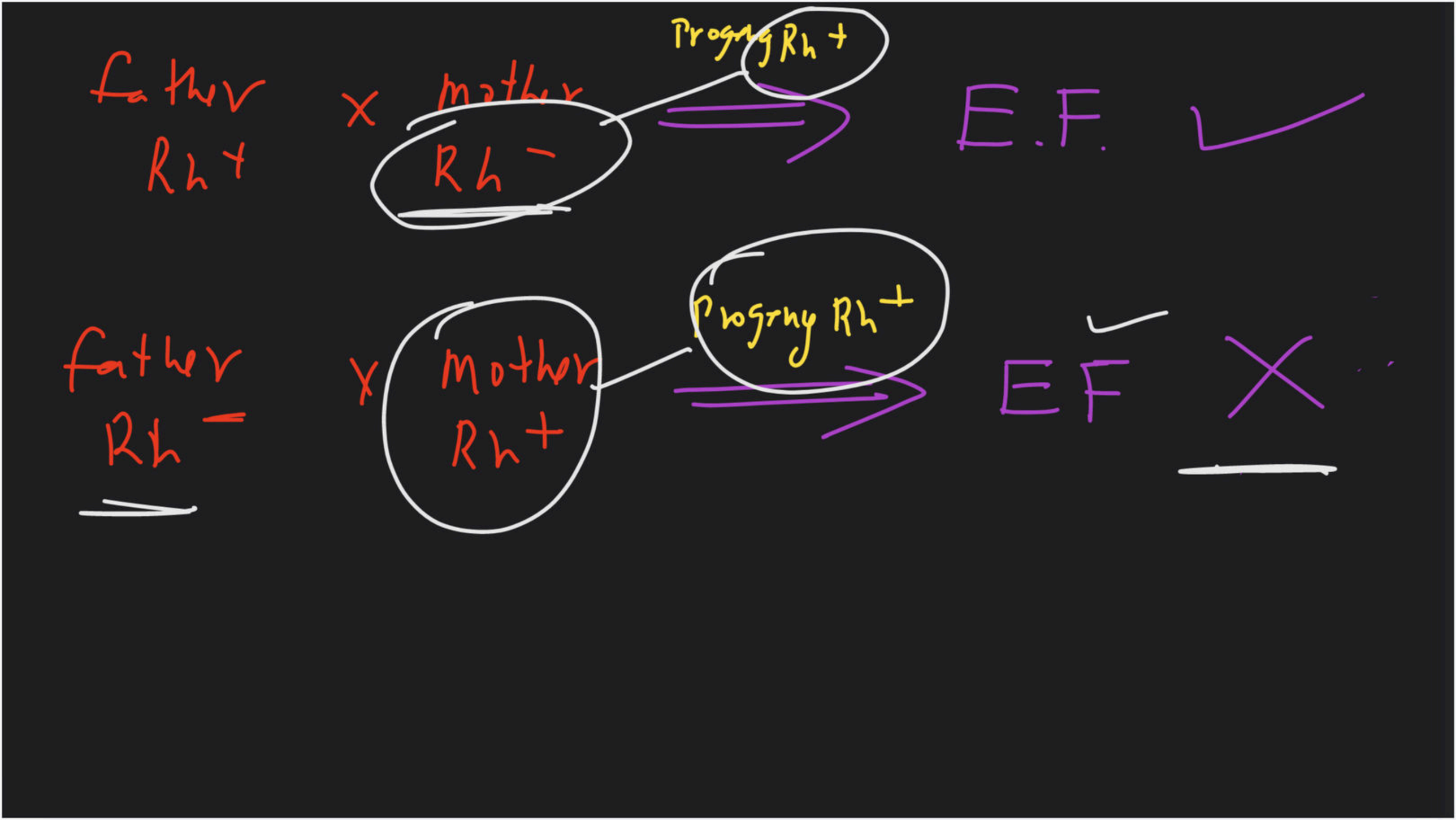
- Smallest in size ← (IgG)
- Can Cross Placenta.

Haemolytic Disease of Newborn

II Pregnancy



Erythroblastosis fetalis


father
Rh+
x
mother
Rh−
Progny Rh+
E.F.
father
Rh−
x
mother
Rh+
Progny Rh+
EF
X

To tackle E.F. ⟹ After 1st Delivery/Abortion

⇓

Defective Anti-D injection

$Rh^+ \times Rh^+$

↓

Rh^+

$Rh^+ \times Rh^-$

↓

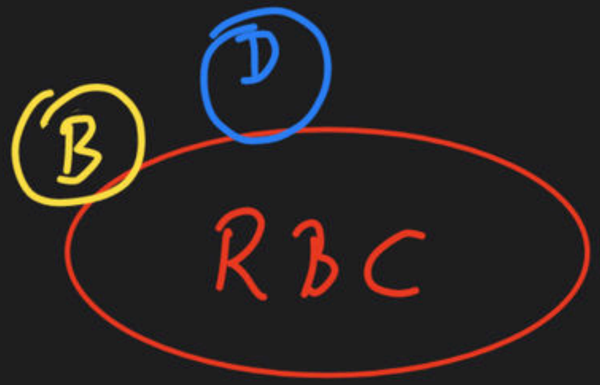
Rh^+

$Rh^- \times Rh^-$

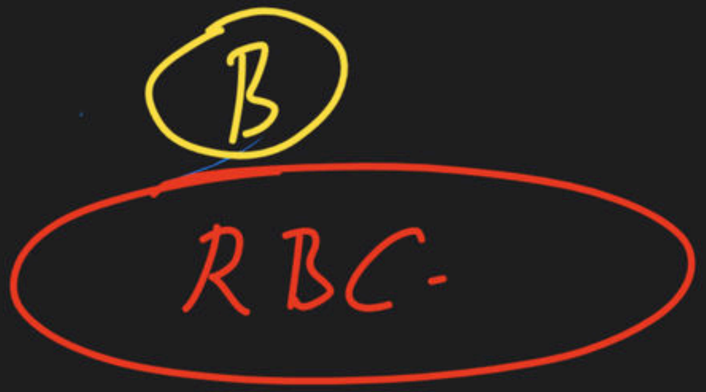
↓

Rh^-

ABO System & Rh System

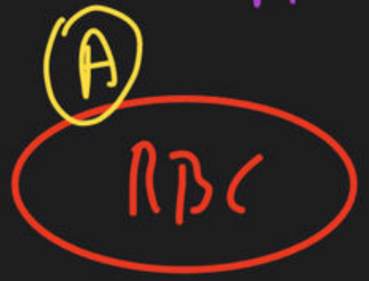


B^+



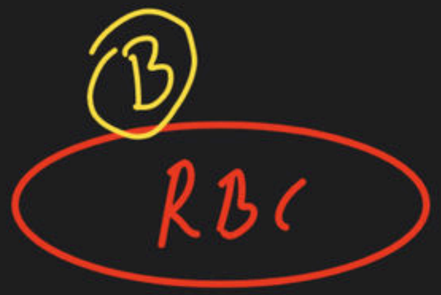
B^-

1) A−



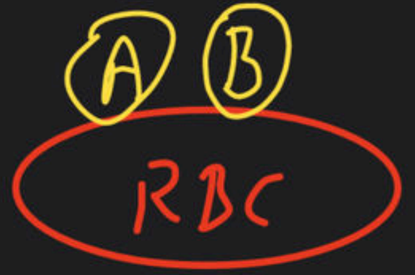
anti-B

2) B−



anti-A

3) AB−



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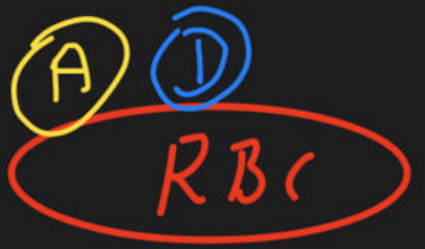
4) A+



anti-B

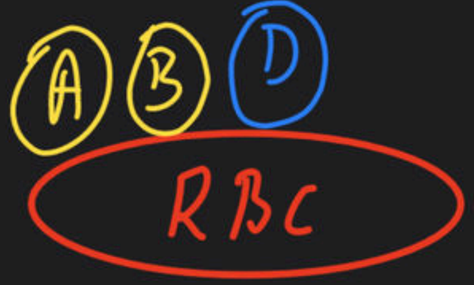
5) B+

anti-A

6) O+

anti-A
anti-B

7) AB+



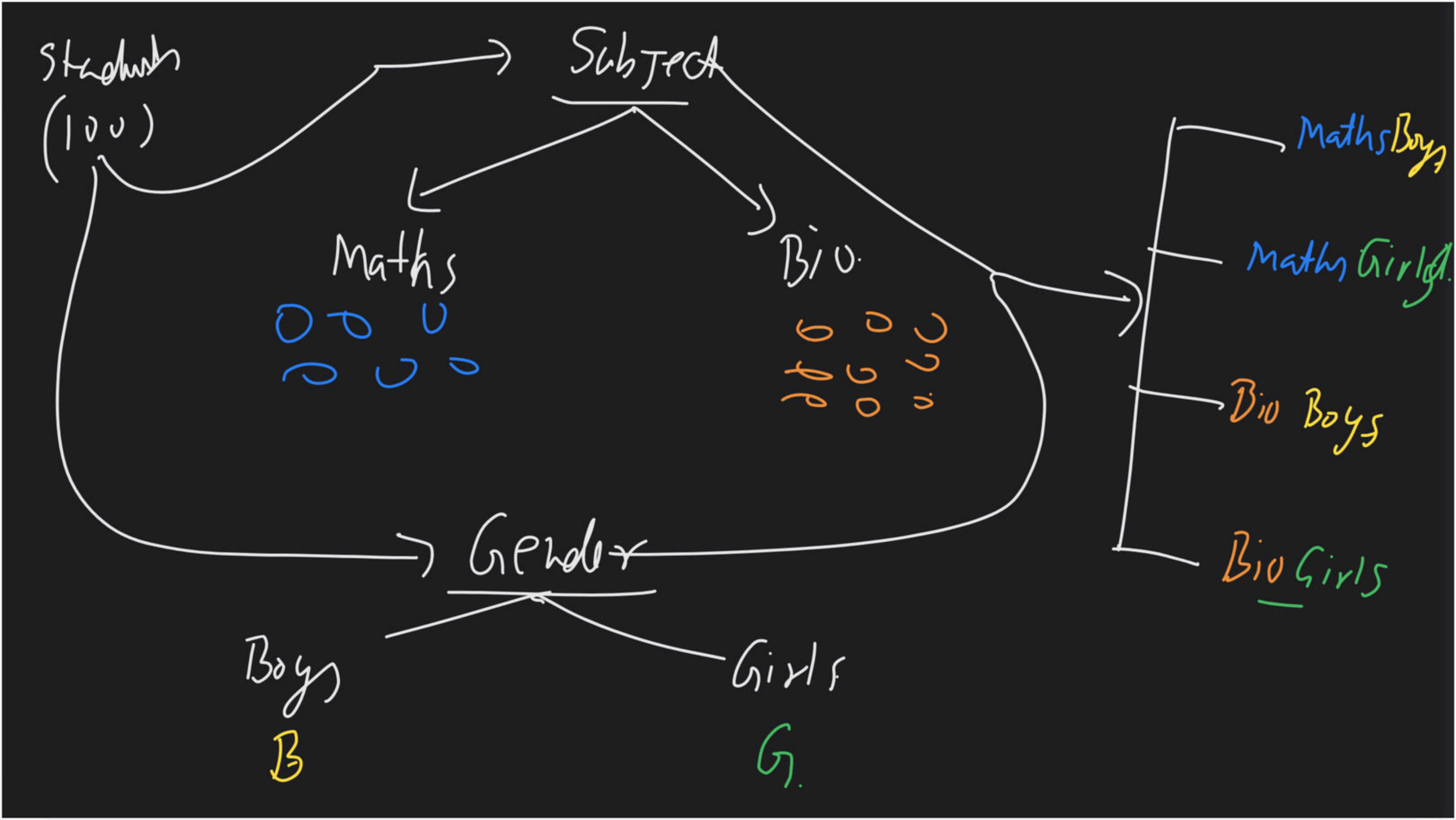
—

Universal Recipient.

8) O−

Universal Donor

anti-A
anti-B


Students
(100)
Subject
Maths
Bio.
Gender
Boys
B
Girls
G.
Maths Boys
Maths Girls
Bio Boys
Bio Girls

ABO incompatibility

Blood Groups

I^A , I^B , I^O

'A' 'B' "O"

$I^A I^A$ = Homozygous.

$I^A I^B$ = Heterozygous.

"A" & "B" are Dominant over "O"

A & B together are equally Dominant

| A | A ⟹ A

| A | O ⟹ A

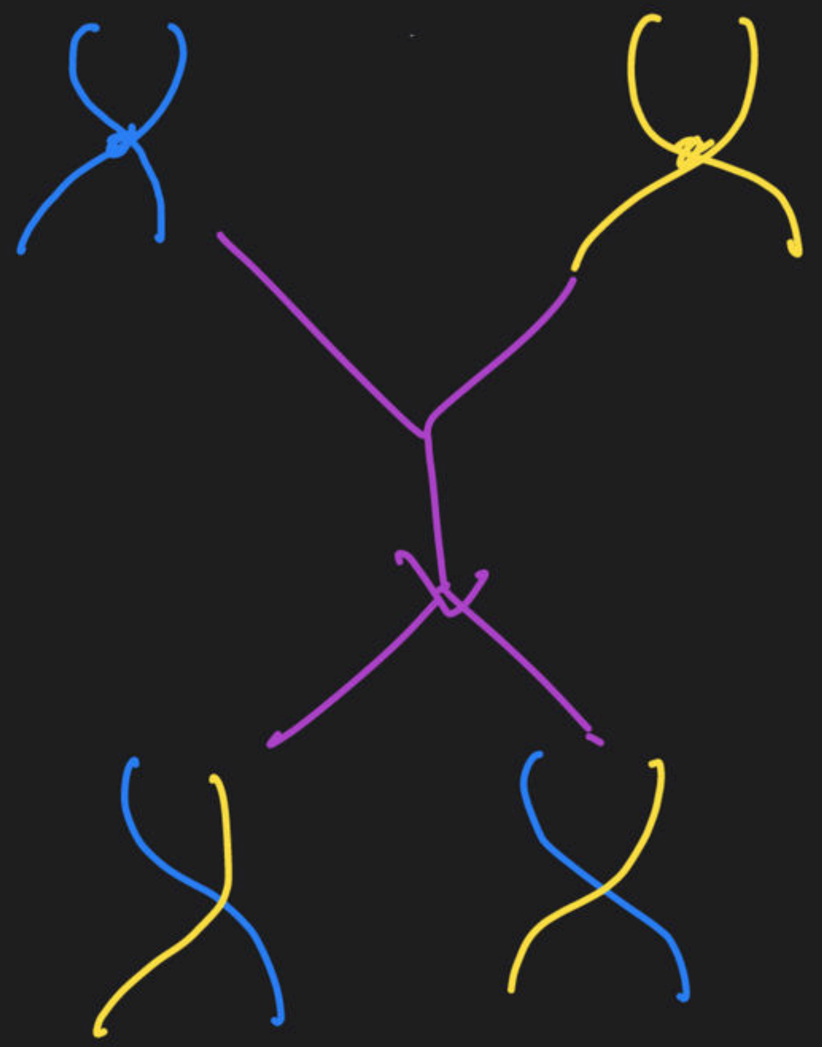
| B | B ⟹ B

| B | O ⟹ B

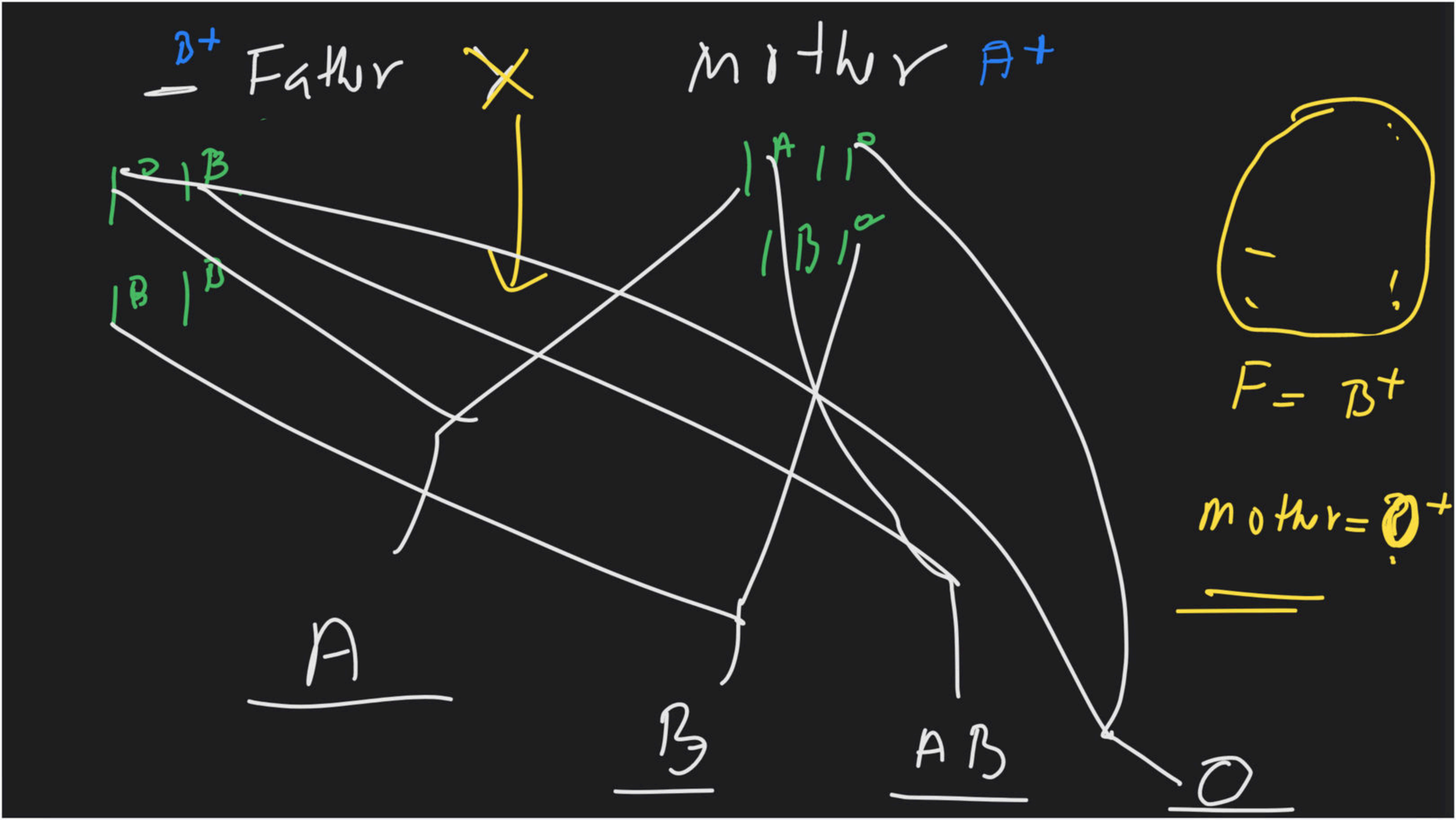
| A | B ⟹ AB

| O | O ⟹ O

Father × Mother



Progeny


B+
Father
X
mother
A+
A
B
AB
O
F = B+
mother = O+

(AB) Father × Mother (O)

$I^A I^B$ $I^O I^O$

↓

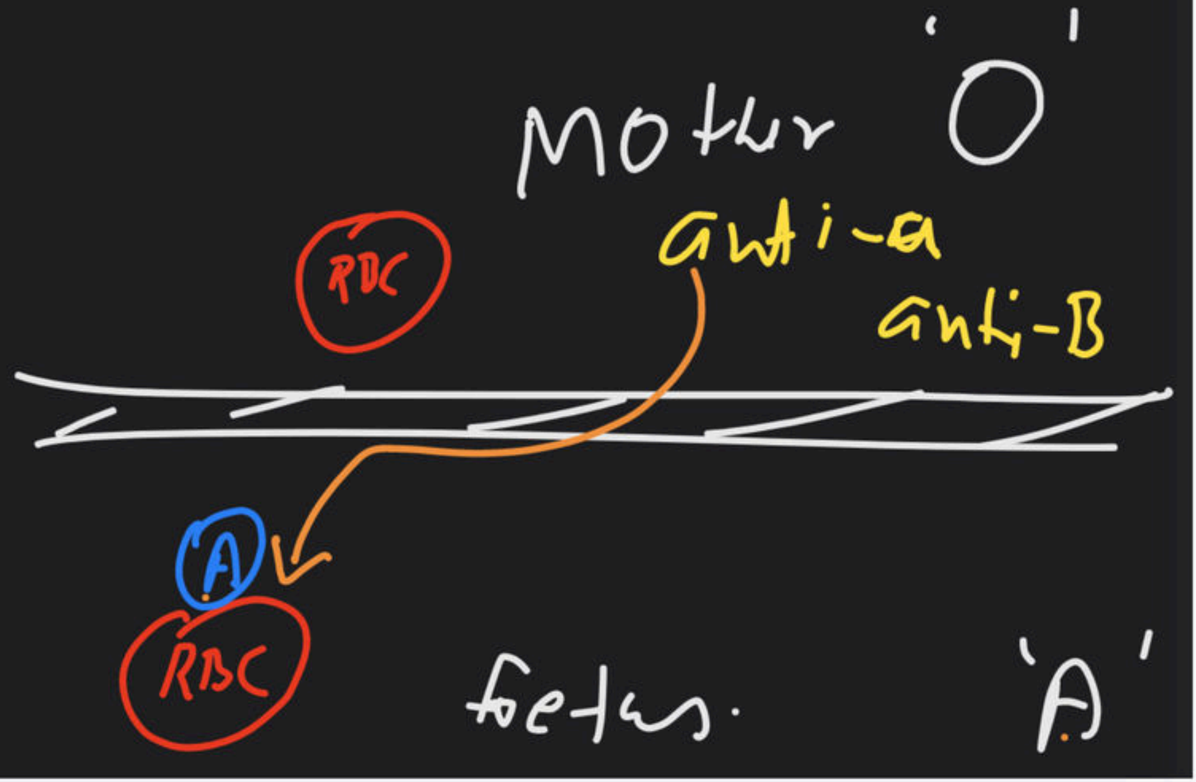
Progeny

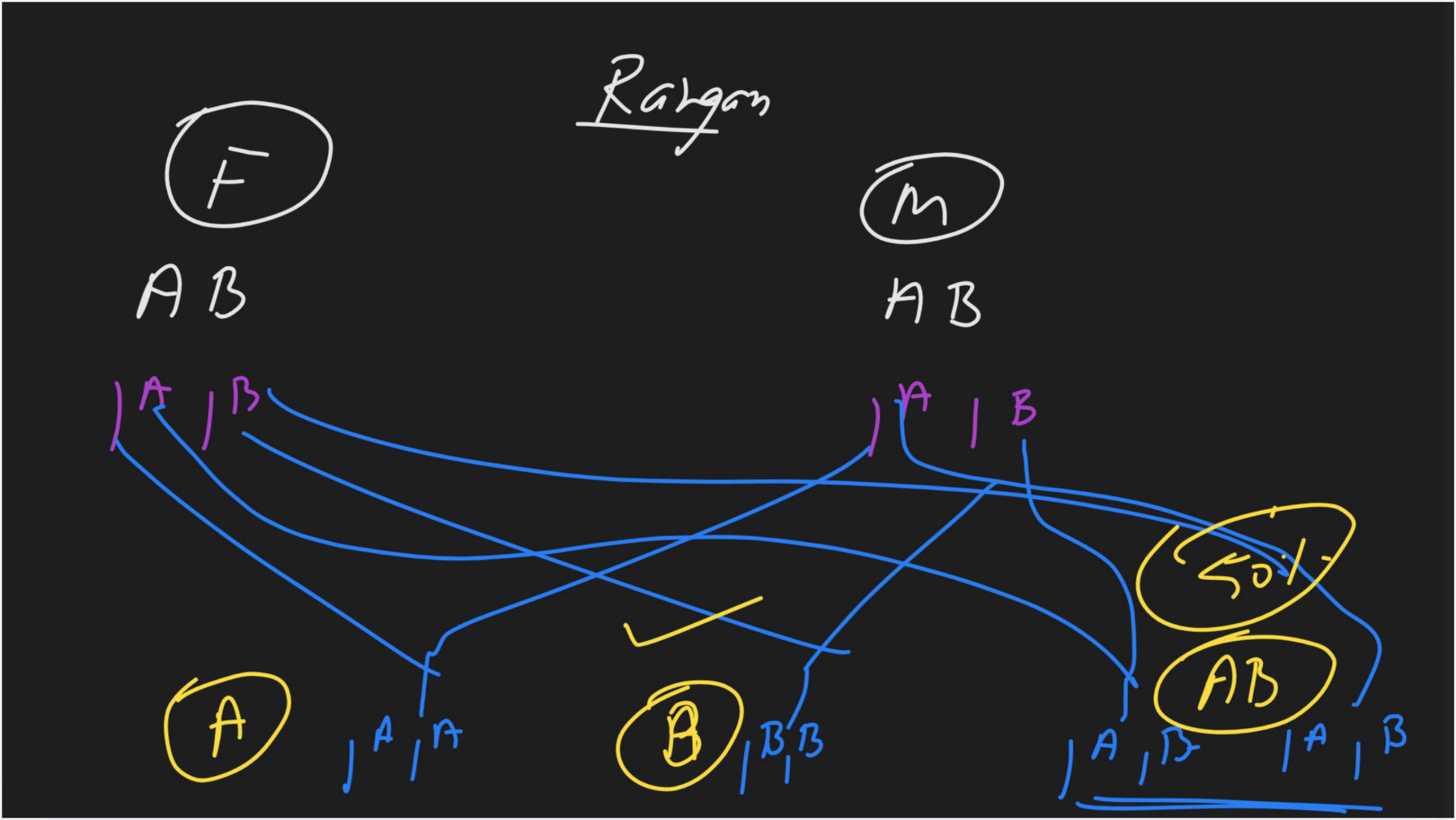
A or B

anti-A & anti B

are

IgM (Can not cross placenta)




Rangan
F
A B
M
A B
A
B
A
B
A
B
Sol:
A
A
A
B
B
B
AB
A
B
A
B

RH FACTOR

- Discoverd by **Landsteiner & weiner** in Rhesus monkey.
- Rh antigen is due to dominant gene. So if one of the gamete possess gene of Rh factor, its off Spring will be Rh + Ve.
- If antigen is present then Rh^+.
- If antigen is absent then Rh^-.

In India % ratio of Rh is –

Rh^+ – 97%

Rh^- – 3%

In World –

- Rh^+ – 80%
- Rh^- – 20%
- In Rh^+ antibody is absent for this antigen.
- Rh antibody is also absent in Rh^- blood.

But

1. If Rh^+ blood is transfused to Rh^- then 1^{st} blood transfusion is complete successfully but during I^{st} blood transfusion Rh antibodies are formed in receiver's blood so in next blood transfusion, agglutination (Clumping) of blood takes place.

O^- $\longrightarrow$ universal donor.

AB^+ $\longrightarrow$ universal acceptor.

2. If mother is Rh^- & father is Rh^+ then offspring may be Rh^+. In this case 1^{st} pregnancy is completely successful but during at the time of 1^{st} delivery Rh antibody is formed in mother's blood due to damaged blood vessel so in next pregnancy death of foetus will occur in the earlier stage due to agglutination of blood called **erythroblastosis foetalis**.

Rh antibodies are given to mother with 72 hrs to destroy foetal RBC which prevent Rh-antibodies formation in mother.

ADDITIONAL INFORMATION

1. Packed cell volume (PCV) :- % volume Total number of blood corpuscles in blood.
2. Haematocrit volume :- % volume or only number of RBC in blood.
3. PCV ≈ HV

   because 99% of packed cell volume is contributed by RBC & in rest 1% WBC & Plaletets are present.
4. In RBC carbonic anhydrase enzyme is present which increases rate of formation & dissociation of carbonic acid by 5000 times. (Fastest catalyst (with zinc))
5. 1 gm Hb carries 1.34 mL O_2.
6. 100 ml blood contain 15 gm Hb.
7. 100 ml blood transport 20 mL O_2.
8. **Size of RBC**

   Largest RBC – Amphiuma 75-80 μ (Class Amphibia)'

   Smallest RBC – Musk Deer 2.5μ. (Class : Mammalia)

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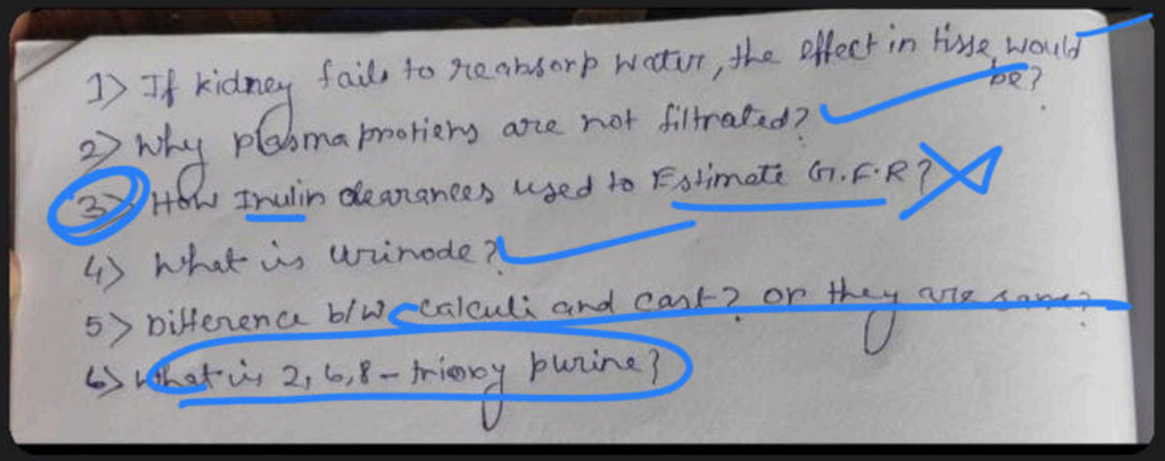
▲ 48 • Asked by Sayan

Please help me with this doubt



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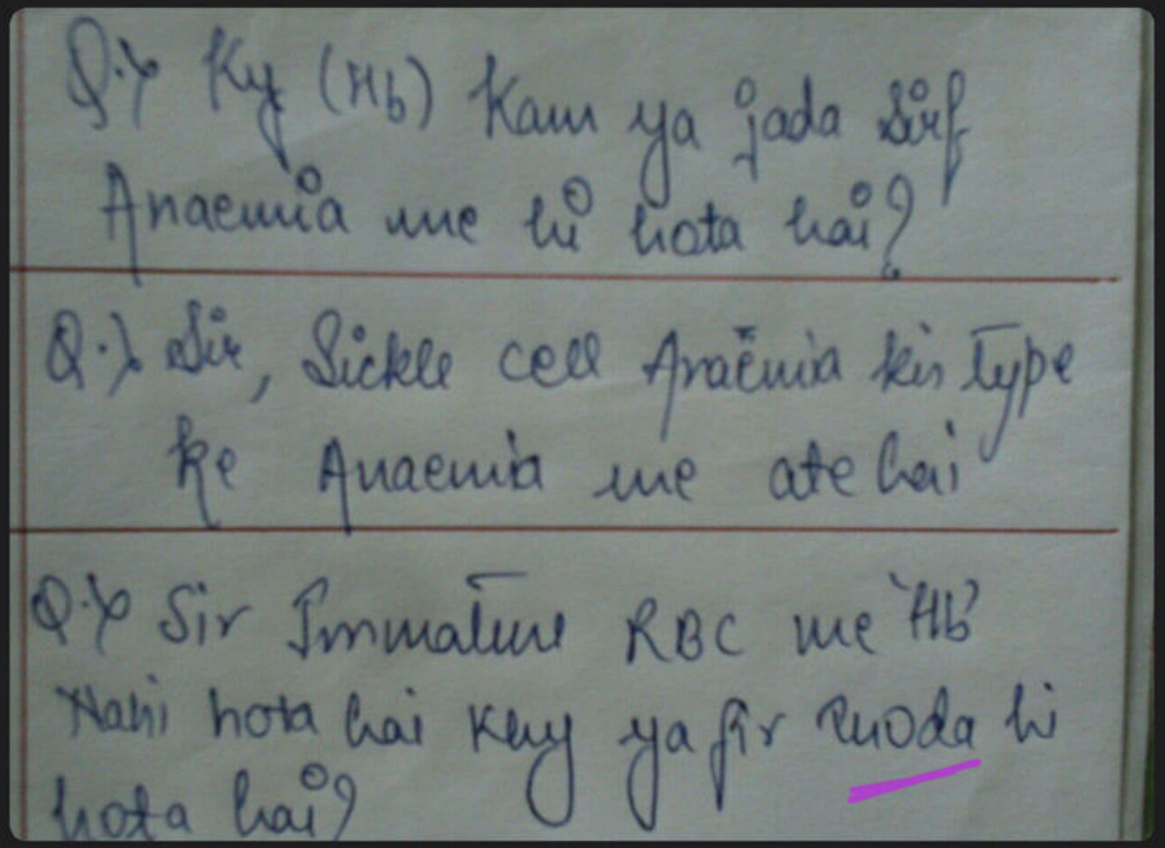
▲ 28 • Asked by Shubhangi

Please help me with this doubt



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▲ 53 • Asked by Sayani

Tabiyat theek to h na sir????

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▲ 35 • Asked by Sarang

Telegram group ka link dijiye na sir plz .

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▲ 22 • Asked by Adkushwaha

Sirrrrrr appppppp online study wala session kbb lenegeee

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▲ 18 • Asked by Guruvar

Weekly test me kya kya aayega

New students

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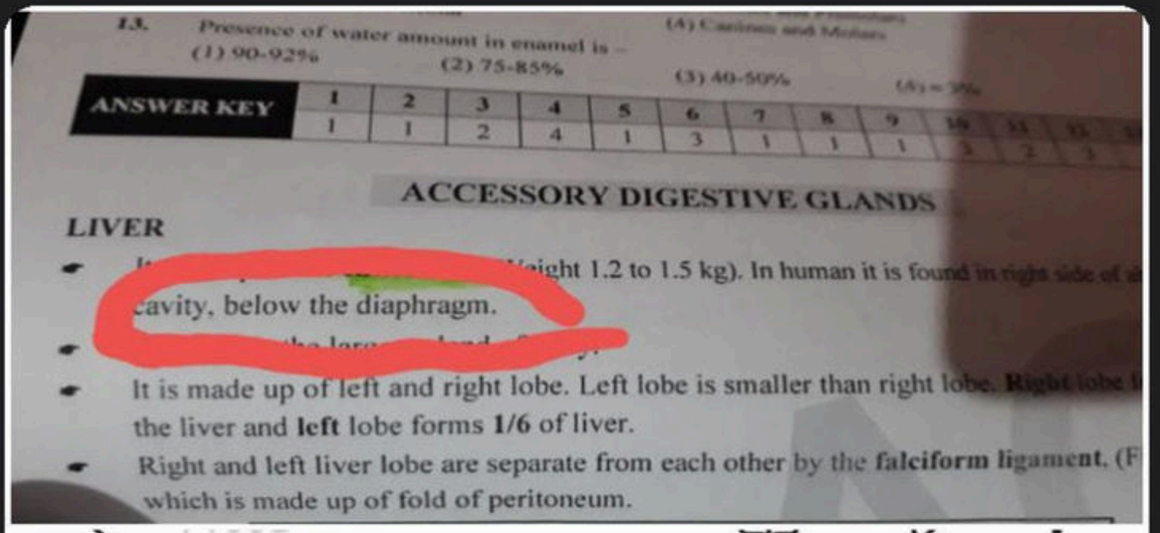
▲ 18 • Asked by Lavesh

Please help me with this doubt



13. Presence of water amount in enamel is –
(1) 90-92% (2) 75-85% (3) 40-50% (4) Canines and Molars

ANSWER KEY	1	2	3	4	5	6	7	8	9	10	11	12	13
	1	1	2	4	1	3	1	1	1	3	2	3	

ACCESSORY DIGESTIVE GLANDS

LIVER

- ight 1.2 to 1.5 kg). In human it is found in right side of a
  avity, below the diaphragm.
- It is made up of left and right lobe. Left lobe is smaller than right lobe. Right lobe
  the liver and **left** lobe forms **1/6** of liver.
- Right and left liver lobe are separate from each other by the **falciform ligament.** (F
  which is made up of fold of peritoneum.

Sir aapne btaya tha ki supine position me letne se liver lungs ko dabadeta hai thoda but sir liver toh diaphragm ke neeche hota h toh kse dabata hai??

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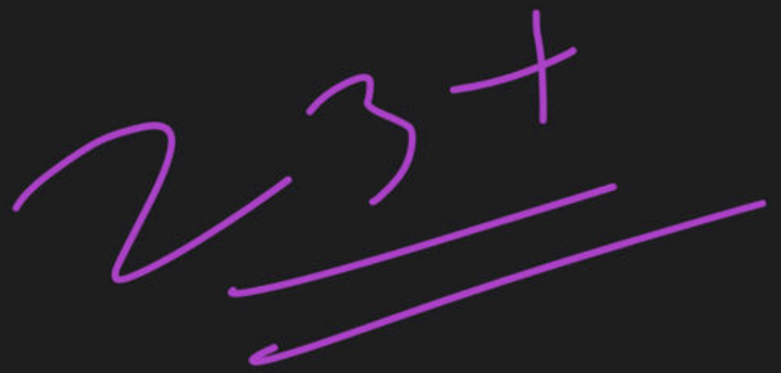
▲ 17 • Asked by Prishatiwa...

Sir, last molar aane ki age k
ya ha????



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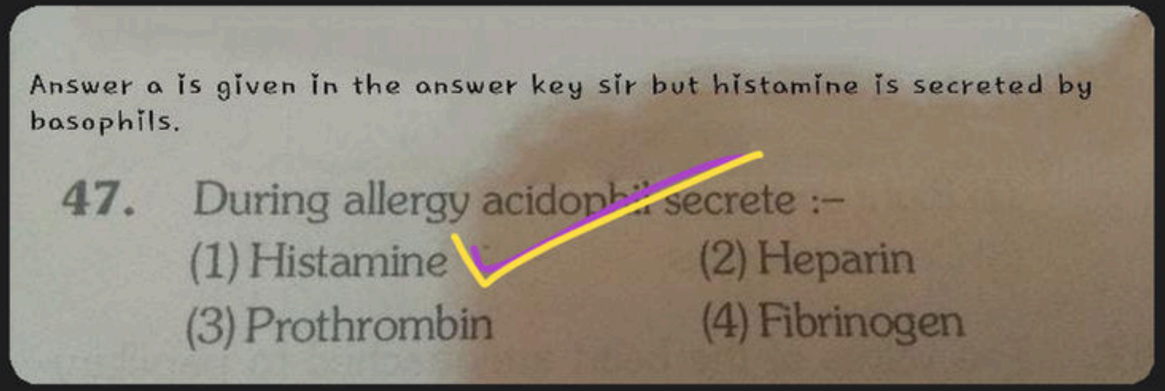
▲ 17 • Asked by Neha Mishr...

Please help me with this doubt



Answer a is given in the answer key sir but histamine is secreted by basophils.

47. During allergy acidophil secrete :–

(1) Histamine (2) Heparin

(3) Prothrombin (4) Fibrinogen

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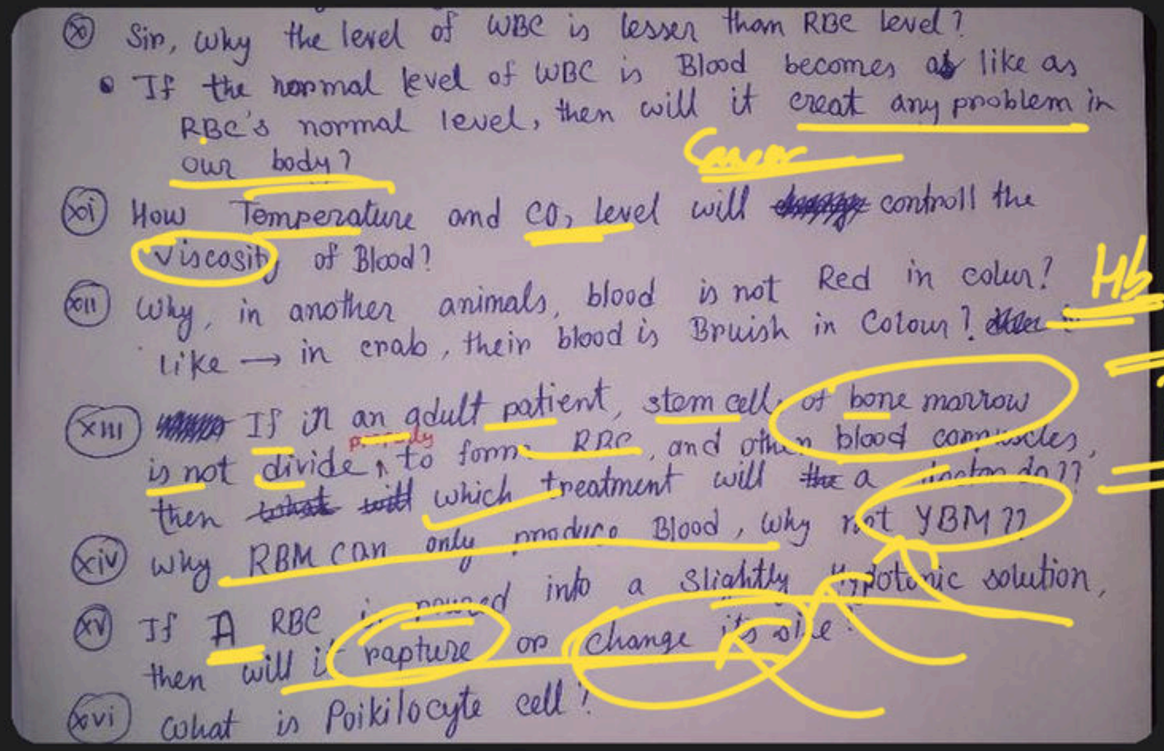
▲ 16 • Asked by Ankush

Please help me with this doubt



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▲ 16 • Asked by Pj Lakshay...

when will yiu take excretory system match

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▲ 15 • Asked by Shaurya

Sir if we remove fibrinogen from plasma then it will be called serum?

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▲ 13 • Asked by Krishankan...

Sir ab aapki tabiyat kesi h????

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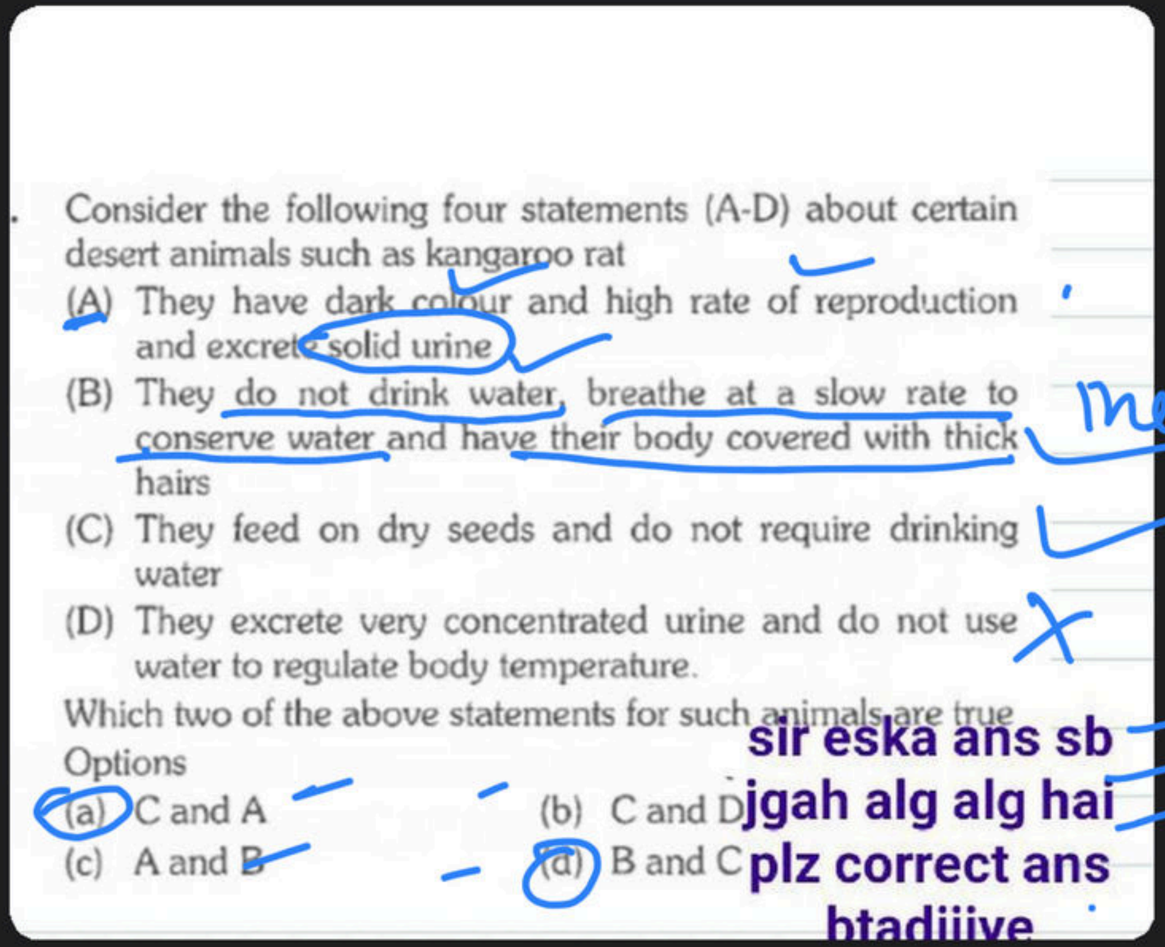
▲ 11 • Asked by Shrutibodk...

Please help me with this doubt



. Consider the following four statements (A-D) about certain desert animals such as kangaroo rat

(A) They have dark colour and high rate of reproduction and excrete solid urine

(B) They do not drink water, breathe at a slow rate to conserve water and have their body covered with thick hairs

(C) They feed on dry seeds and do not require drinking water

(D) They excrete very concentrated urine and do not use water to regulate body temperature.

Which two of the above statements for such animals are true

Options

(a) C and A (b) C and D

(c) A and B (d) B and C

Ambiguous Question

Metabolic water

↳ 90%

food → 10%

sir eska ans sb jgah alg alg hai plz correct ans btadiiive

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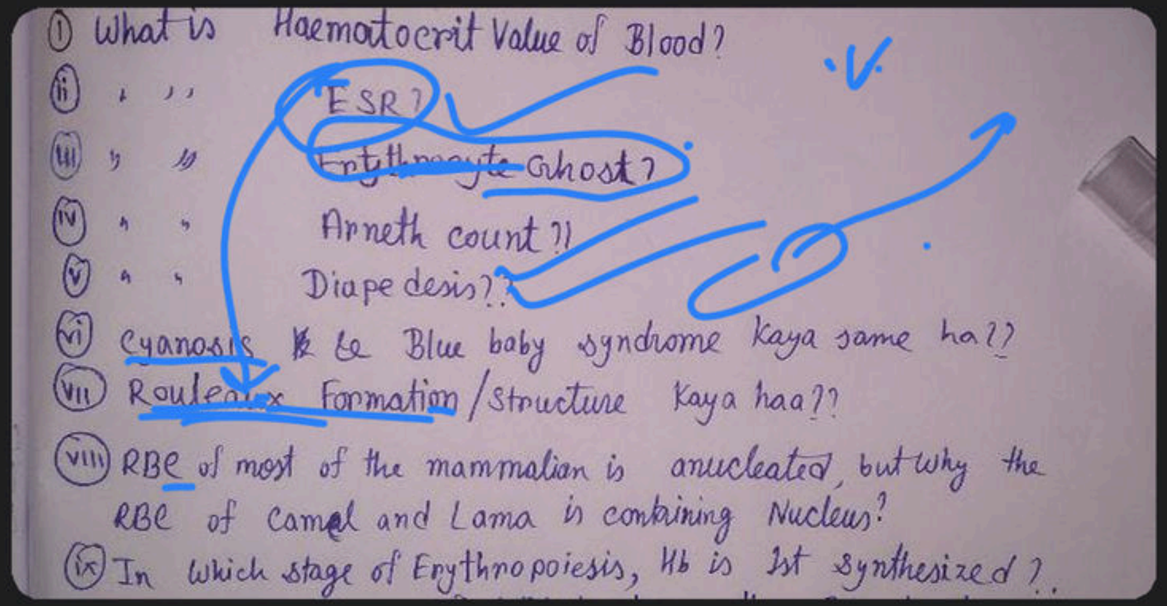
▲ 11 • Asked by Ankush

Please help me with this doubt



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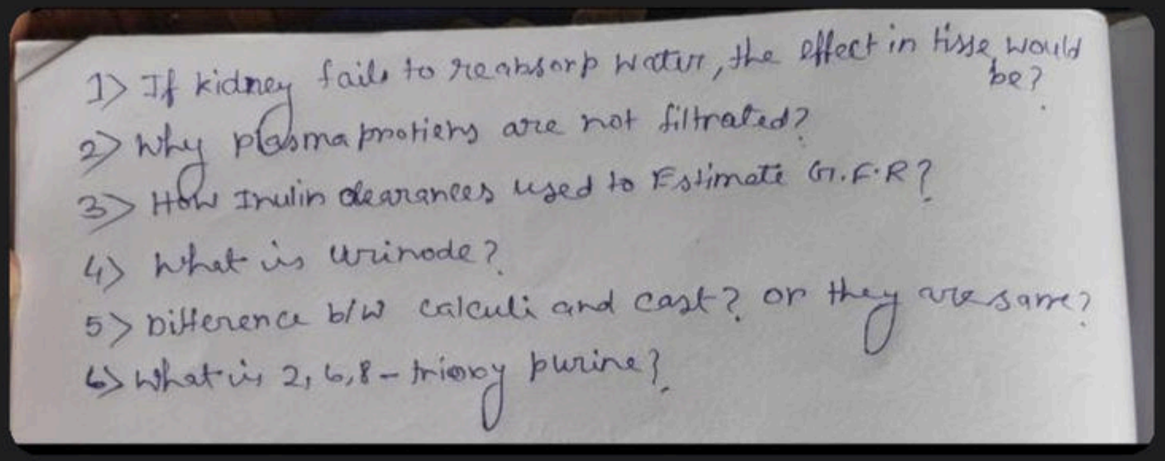
▲ 10 • Asked by Sayan

Please help me with this doubt



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▲ 9 • Asked by Preeti Kho...

Sir i somewhere read about "golden blood / null blood group. How is it null sir?

Rare Blood Groups

Golden

Lewis

Duffy

Bombay blood

12