

15 Multiple choice questions

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What pattern of inheritance determines human ABO blood types?

- ☐ X-linked – A and B are linked to the X chromosome, O is autosomal recessive.
- ☐ Recessive – A and B are recessive, O is dominant.
- ☐ Dominance – A is dominant, B and O are recessive.
- ☐ Codominance – A and B alleles are codominant (both expressed when present together), and O is recessive.

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Which blood types can type O donate to?

- ☐ A, B, AB, and O (universal donor).
- ☐ Only AB.
- ☐ B and O.
- ☐ Only A and B.

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Write the genotype: Type AB.

- ☐ (I^A I^B).
- ☐ (i i).
- ☐ (I^A i) (must be heterozygous because O parent = (i)).
- ☐ : (I^B I^B).

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blood types can type AB receive from?

- ☐ Only O (universal donor).
- ☐ Only A and B.
- ☐ B and O.
- ☐ A, B, AB, and O (universal receiver).

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Parents: mother type A, baby type B. Which potential fathers from this list could NOT be the father? Mailman type O; Butcher type AB; Waiter type A; Cable guy type B.

- ☐ No – it's impossible for an (ii) mother to have AB child with any father. (State decision to remove baby could be based on that impossibility.)
- ☐ The Mailman (O) cannot be father (no B allele). The Waiter (A) cannot be father (no B allele). Butcher (AB) and Cable guy (B) could be fathers.
- ☐ If a parent with phenotype A or B produces an O child, that parent must be heterozygous (carrying (i)).
- ☐ No – baby genotype (I^B i) is possible from that cross (50% B). So not switched on blood-type evidence alone.

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Genotypes that produce blood type A (phenotype A).

- ☐ $(I^B I^B)$ or $(I^B i)$.
- ☐ $(I^A I^B)$.
- ☐ $(I^A I^A)$ or $(I^A i)$.
- ☐ $(I^A i)$.

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Define codominance.

- ☐ Codominance – A and B alleles are codominant (both expressed when present together), and O is recessive.
- ☐ Codominance: both alleles are expressed equally in the heterozygote (e.g., blood type AB or black+white feathers = speckled/erminette pattern).
- ☐ B and O.
- ☐ Incomplete dominance: heterozygote phenotype is intermediate between the two homozygotes (e.g., red × white → pink).

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Genotype that produces blood type AB (phenotype AB).

- ☐ $(I^A I^B)$.
- ☐ $(I^B I^B)$.
- ☐ $(I^B I^B)$ or $(I^B i)$.
- ☐ $(I^A i)$.

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Write the genotype: Heterozygous for the "A" allele.

- ☐ $(I^A i)$ (must be heterozygous because O parent = (i)).
- ☐ $(i i)$.
- ☐ $(I^A i)$.
- ☐ $(I^A I^B)$.

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How to prove a parent is NOT heterozygous from a pedigree? (rule)

- ☐ Yes – $(I^B i)$ is possible (50% B).
- ☐ A and O (i.e., $(I^A I^A)$ / $(I^A i)$ recipients can accept (I^A) and (i)).
- ☐ Codominance: both alleles are expressed equally in the heterozygote (e.g., blood type AB or black+white feathers = speckled/erminette pattern).
- ☐ You cannot be certain a parent is not heterozygous unless you know all children and their genotypes rule it out (absence of O children is not proof).

If two parents are (i i) (O) $\times$ ($I^A I^B$) (AB) could they have a B child?

- ☐ Yes – ($I^B i$) is possible (50% B).
- ☐ Yes – ($I^A i$) is possible (25% B).
- ☐ No – ($I^B I^B$) is not possible.
- ☐ No – ($I^A I^A$) is the only Possibility.

Mother type O, baby type AB – is that possible?

- ☐ No – it's impossible for an (ii) mother to have AB child with any father. (State decision to remove baby could be based on that impossibility.)
- ☐ The Mailman (O) cannot be father (no B allele). The Waiter (A) cannot be father (no B allele). Butcher (AB) and Cable guy (B) could be fathers.
- ☐ No. A mother with genotype (ii) can only give an i allele and cannot contribute A or B; therefore a child AB (requires (I^A) and (I^B)) is impossible if mother is truly type O.
- ☐ If a parent with phenotype A or B produces an O child, that parent must be heterozygous (carrying (i)).

Write the genotype: Can only get blood from a type O donor.

- ☐ Type O recipient, genotype (i i).
- ☐ Type B recipient, genotype ($I^B I^B$).
- ☐ Type AB recipient, genotype ($I^A I^B$).
- ☐ Type A recipient, genotype ($I^A I^A$).

Amy (mother) type A; Linville (father) type B; baby is AB. Could they be the parents? (give parental genotypes that allow this)

- ☐ Codominance – A and B alleles are codominant (both expressed when present together), and O is recessive.
- ☐ Yes – ($I^B i$) is possible (50% B).
- ☐ Gametes: mother i,i; father (I^A, I^B). Cross $\rightarrow$ ($I^A i$), ($I^B i$) (two squares, both appear twice in 4-box format = 50/50).
- ☐ Yes – if mother = ($I^A i$) and father = ($I^B i$) (both heterozygous). Cross ($I^A i$) $\times$ ($I^B i$) can produce ($I^A I^B$) (AB).

Punnett square: mother type O ((i i)), father AB (($I^A I^B$)). What are the possible offspring blood types and percentages?

- ☐ No – baby genotype ($I^B i$) is possible from that cross (50% B). So not switched on blood-type evidence alone.
- ☐ No – it's impossible for an (ii) mother to have AB child with any father. (State decision to remove baby could be based on that impossibility.)
- ☐ Offspring genotypes: ($I^A i$) (50% $\rightarrow$ type A) and ($I^B i$) (50% $\rightarrow$ type B). So 50% A, 50% B.
- ☐ If a parent with phenotype A or B produces an O child, that parent must be heterozygous (carrying (i)).