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.

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 ($I^A i$).

○ : ($I^A i$).

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).

Genotype that produces blood type AB (phenotype AB).

○ ($I^A I^B$).

○ : ($I^B I^B$).

○ ($I^B I^B$) or ($I^B i$).

○ : ($I^A i$).

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

○ ($I^A i$) (must be heterozygous because O parent = (i)).

○ (i i).

○ : ($I^A i$).

○ ($I^A I^B$).

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) × (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 → (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) × (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% → type A) and (I^B i) (50% → 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)).