

# Biology IB11

## Genetics questions.

1. What is the difference between a locus and a gene?
2. What is the difference between a gene and an allele?
3. How do new alleles appear?
4. How do alleles disappear?
5. Explain how a single nucleotide mutation can cause a medical condition or a disease.
6. Describe a bacterial chromosome
7. Describe an eukaryotic chromosome
8. Do humans have circular DNA? Explain.
9. What is the name of a chromosome that is not involved in the sex determination?
10. What is a karyogram?
11. What is the cause of Down's syndrome?
12. Does DNA replicate before meiosis?
13. How many cells are the product of meiosis?
14. After meiosis, are the daughter cells diploid or haploid?
15. Is meiosis a cell division without a previous DNA replication?
16. In meiosis, do any of the daughter cells have any chromosome that is identical to any chromosome in the original cell?
17. What is the difference between genetic recombination and chromosomal crossover?
18. What is a bivalent?
19. In meiosis, what happens first, the separation of homologues or the separation of copies?
20. Narrate the whole meiosis process for a model cell (two pairs of chromosomes, large and small) paying attention to the crossover and the fate of homologues and copies. Make sure you mark the two parts of meiosis. (Long answer)
21. Explain why meiosis is so important in the genetic variation within a population.(Long answer)
22. What is the difference between a gamete and a zygote?
23. What does it mean that an allele  $A_1$  is dominant over  $A_2$  ?
24. what does it mean that an allele  $A_1$  is recessive over  $A_2$  ?
25. What does it mean that an allele  $A_1$  is codominant over  $A_2$  ?
26. What is the difference between codominance and intermediate dominance?
27. Is the AB0 blood group an example of intermediate dominance or codominance?
28. What is the chance for a father with genotype A0 and a mother with genotype B0 of having one baby with blood type 0?
29. And AB?
30. Name one medical condition that is caused by an autosomal recessive allele.
31. Name one medical condition that is caused by an autosomal dominant allele.
32. Name two medical conditions that are caused by a sex-linked gene.
33. What is the probability that a mother carrier of the hemophilia allele and a non-affected father have a baby that is affected?
  - a) If the sex of the baby is not known.
  - b) If the baby is male
  - c) If the baby is female
34. Name two known causes of mutation.
35. In agarose gel electrophoresis, DNA migrates towards which electrode?
36. In agarose gel electrophoresis, larger DNA molecules move less or more?
37. Why is PCR needed before analyzing DNA samples?
38. What is the name of the DNA fragments used to help DNA polymerase start working in PCR?
39. Briefly narrate the process of PCR amplification.
40. Why does DNA profiling not focus on parts of DNA that code for proteins?

41. What is a transgenic organism?
42. What is the difference between a transgenic organism and a genetically modified one?
43. Outline two possible advantages of genetically modified crops.
44. What is a clone (individual)?
45. What is the particularity of the sheep Dolly?
46. Explain the implication of the success in cloning Dolly (Polly).

Questions from IB exams:

- Discuss the role of genes and chromosomes in determining individual and shared character features of the members of a species. (7 points)
- Describe the polymerase chain reaction (PCR) including the role of Taq DNA polymerase. (4 points)
- Explain benefits and risks of using genetically modified crops for the environment and also for human health. (8 points)
- Using a punnet grid, explain how parents who do not show signs of a recessive condition can produce a child with it. (4 points)
- Explain how DNA is used to pass on genetic information to offspring accurately but also produce variation in species. (8 points)
- Using a named example of a genetically modified crop, discuss the specific ethical issues of its use. (6 points)
- Draw a labelled diagram of the formation of a chiasma by crossing over. (3 points)
- Explain the process of genetically modifying bacteria (8 points)
- Describe codominance and multiple alleles using inheritance of ABO blood groups as an example of them. (6 points)
- Discuss the ethical issues of therapeutic cloning in humans (8 points)
- Outline a technique used for gene transfer (5 points)
- Outline the processes that occur during the first division of meiosis. (6 points)
- Outline outcomes of the Human Genome Project. (4 points)

Unspecific questions:

- Using a punnet grid to explain the outcome of a single-locus crossing
- Reading a pedigree, assign genotypes and explain or predict the outcome of a mating.
- Direct question (no full Punnet grid needed) about a two locus crossing.