

2023 Bi H2 Q15

Section: Sustainability and Interdependence

Topic: Plant and Animal Breeding

Question Summary

You are asked to write notes on plant and animal breeding under two subheadings: (i) Inbreeding (ii) Crossbreeding. This question tests your understanding of how selective breeding is used to improve desirable traits in plants and animals, and the genetic consequences of different breeding methods.

Worked Solution

Inbreeding

- Inbreeding involves breeding closely related individuals for several generations.
- It is used to maintain desirable characteristics in a line of plants or animals.
- Over many generations, inbreeding leads to inbreeding depression, where harmful recessive alleles become more common.
- Inbred organisms may show reduced fertility, vigour, or resistance to disease.
- Plant breeders can maintain pure lines for desirable features such as high yield or disease resistance.

Crossbreeding

- Crossbreeding involves mating individuals from different breeds or varieties.
- It introduces new combinations of alleles, increasing genetic diversity.
- The offspring often show hybrid vigour (heterosis) — being stronger, healthier, or more productive than either parent line.
- Crossbreeding is common in livestock improvement, such as producing hybrid cattle or pigs with desirable meat and growth qualities.
- In plants, it can combine useful features such as disease resistance and high yield from different strains.

Final Answer

- Inbreeding preserves desirable traits but may cause inbreeding depression.
- Crossbreeding restores vigour and improves productivity through hybrid vigour.

Revision Tips

- Selective breeding aims to increase the frequency of desirable alleles in a population.
- Inbreeding = maintains traits but increases harmful recessives.
- Crossbreeding = restores diversity and vigour.
- Examples: Inbreeding → pure lines of wheat or pedigree dogs; Crossbreeding → hybrid maize or beef cattle improvement.
- Diagrams can show gene pools narrowing or widening across

generations.