

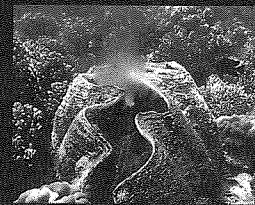
**R 2**

# Sexual Reproduction

All types of sexual reproduction involve the production of **gametes** (sex cells), produced by special sex organs called **gonads**. Female gametes (**eggs**) and male gametes (**sperm**) come together in **fertilisation**. Animal sexual reproduction follows one of three main patterns, determined by the location of fertilisation and embryonic development. These patterns are: external fertilisation and development; internal fertilisation followed by external development; internal fertilisation and development. **External fertilisation** is found in many aquatic invertebrates and most fish, where eggs and sperm are released into the surrounding water. Male and female parents usually release their gametes (spawn) at the same time and place in

order to increase the chances of successful fertilisation. In other invertebrates, reptiles, sharks, birds, and mammals, sperm is transferred by **copulation** – direct transfer of sperm from the male to inside the female. This **internal fertilisation** increases the chance that the gametes will meet successfully. In birds and most reptiles, one adaptation to life on land has been the evolution of the **amniote egg**: a structure that enables the embryo to complete its development outside the parent surrounded by a protective shell and nourished by a yolk sac. The pattern of internal development in mammals provides the most advantages for the embryo in terms of nourishment and protection during development.

## The Mating Game: Achieving Fertilisation



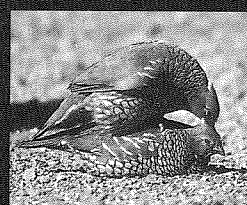
Many marine invertebrates release gametes into the sea. Fertilisation and development are external to the parent.  
*Example: giant clam*



Insects often have elaborate courtship rituals. fertilisation is internal, but the eggs are laid and develop externally.  
*Example: dipteran flies*



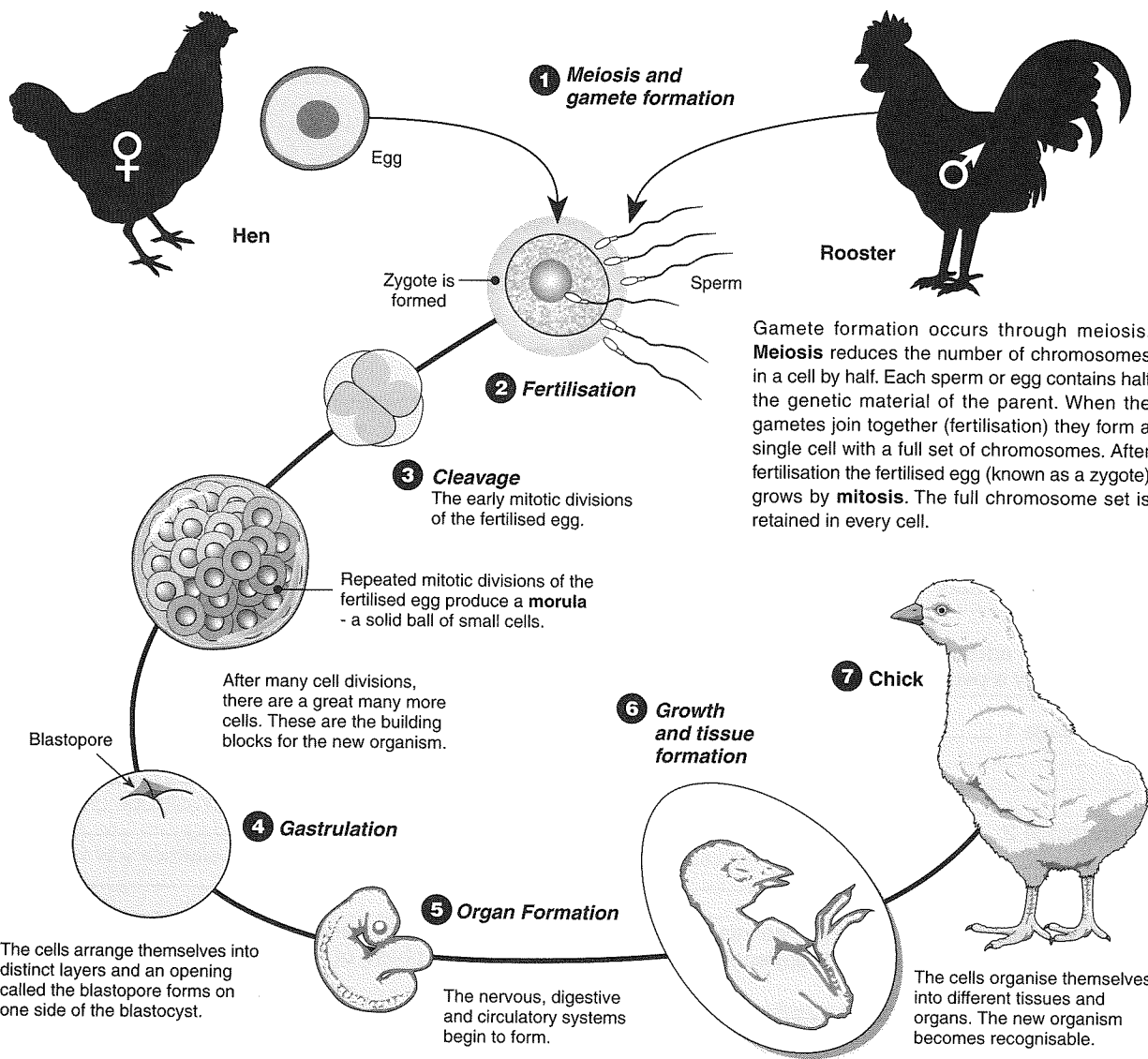
In amphibians, a prolonged coupling, called amplexus, precedes gamete release and external fertilisation.  
*Example: frogs*



In birds and reptiles gamete fertilisation is internal but the eggs are laid (usually in nests) and develop externally.  
*Example: quail*



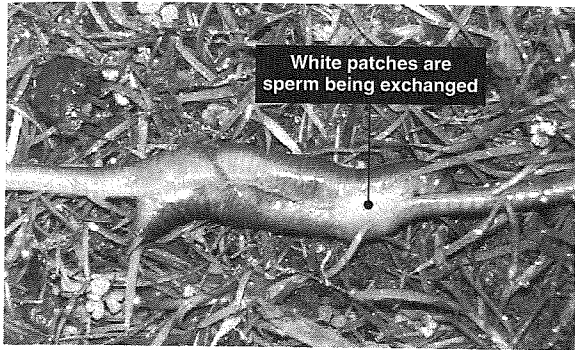
Mammals exhibit internal fertilisation, a long period of internal development, and often prolonged parental care.  
*Example: African lions*



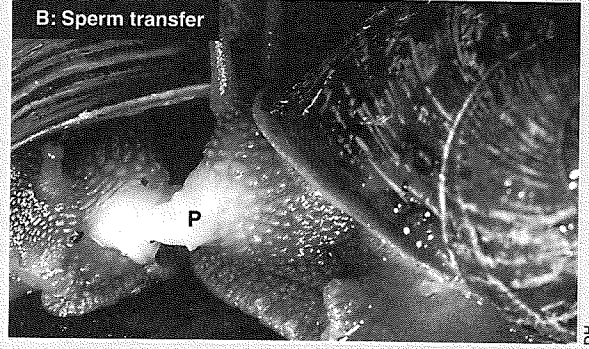
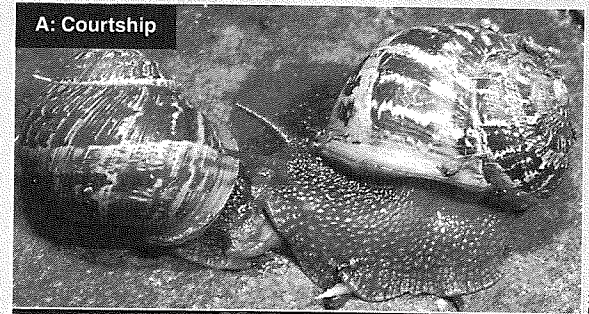
ANGLOIS

### Hermaphroditism

The great majority of animals have separate sexes (individuals are either male or female). However, in some animals both sperm and eggs can be produced in the same individual. Such animals are known as **hermaphrodites**. In earthworms (below), flatworms, and some molluscs (e.g. *Helix* right), both male and female organs are active in the same animal and there is typically a reciprocal transfer of sperm (each receives sperm from the other during copulation). In this type of hermaphroditism, there is no self fertilisation: a mate is necessary for any fertilisation to occur. However, some specialised hermaphroditic animals, such as the parasitic tapeworms, are capable of self-fertilisation.



The photo above shows two earthworms in a mating clasp. Each worm places its reproductive region (the clitellum) against the reproductive region of the other worm, and sperm is exchanged.



Courtship and mating in the land snail *Helix* (above). During an elaborate courtship (A), calcareous darts are fired from the genital opening (behind the tentacle) into the body of the partner. Mating (B) involves reciprocal transfer of sperm via a penis (P).

1. Describe ONE advantage of sexual reproduction: \_\_\_\_\_  
\_\_\_\_\_
2. Describe ONE potential disadvantage of sexual reproduction: \_\_\_\_\_  
\_\_\_\_\_
3. Suggest why hermaphroditism *usually* involves reciprocal sperm transfer (not self fertilisation): \_\_\_\_\_  
\_\_\_\_\_
4. Name one animal that reproduces sexually and has separate sexes: \_\_\_\_\_
5. (a) Define the term **external fertilisation**: \_\_\_\_\_  
(b) Name an animal that has external fertilisation: \_\_\_\_\_  
(c) Describe the features of external fertilisation: \_\_\_\_\_  
\_\_\_\_\_
6. (a) Define the term **internal fertilisation**: \_\_\_\_\_  
(b) Describe the features of internal fertilisation: \_\_\_\_\_  
\_\_\_\_\_  
(c) Name an animal group with internal fertilisation but external development: \_\_\_\_\_  
(d) Name an animal group with internal fertilisation and internal development: \_\_\_\_\_  
(e) Explain one benefit and one cost involved in providing for internal development of an embryo:  
Benefit: \_\_\_\_\_  
Cost: \_\_\_\_\_
7. Describe two features of the amniote egg (e.g. in birds) that make it an ideal adaptation to reproduction on land:  
(a) \_\_\_\_\_  
(b) \_\_\_\_\_