

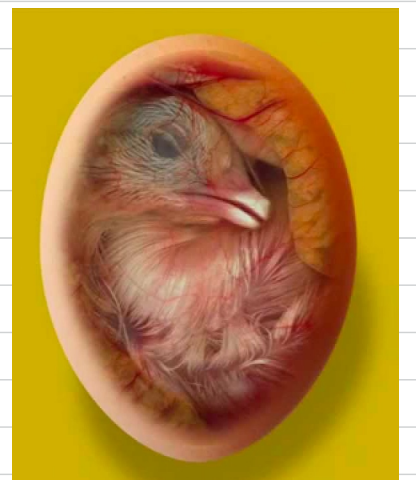
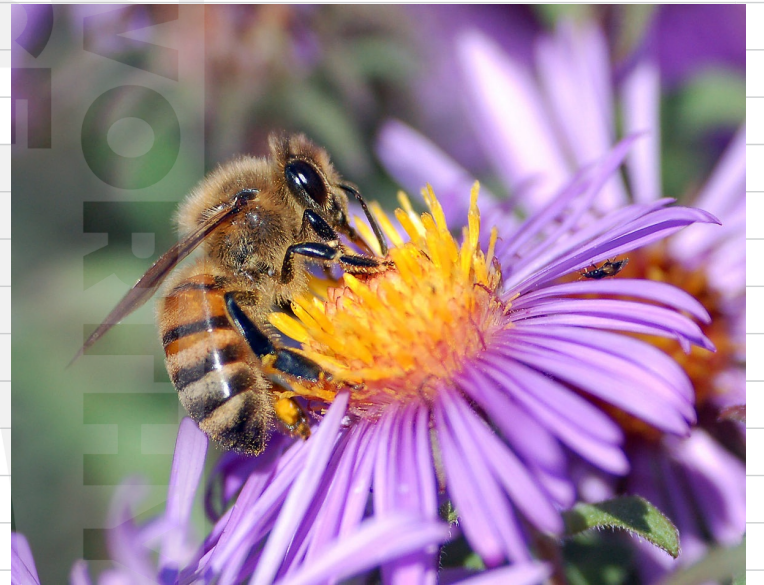
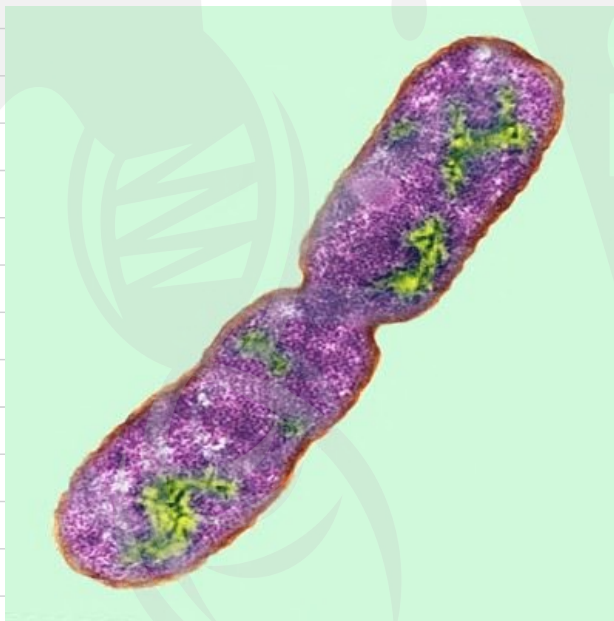
Asexual vs Sexual Reproduction

Learning outcomes

- ✓ describe the features and types of asexual reproduction
- ✓ explain how some features of asexual reproduction can be advantageous or disadvantageous
- ✓ describe the features and stages of sexual reproduction
- ✓ explain how some features of sexual reproduction can be advantageous or disadvantageous

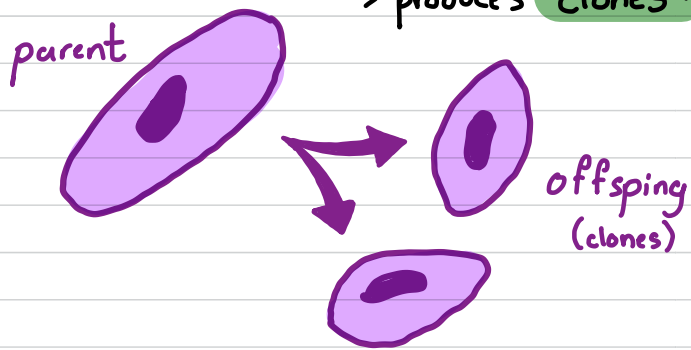
Key terms

- asexual reproduction
- clones
- binary fission
- budding
- fragmentation
- parthenogenesis
- vegetative reproduction
- sexual reproduction
- gametes
- fertilization
- internal fertilization
- external fertilization
- vivipary
- ovipary



Asexual Reproduction

asexual reproduction: production of offspring without fertilization (no need for a mate)
→ produces **clones** - offspring genetically identical to their parents

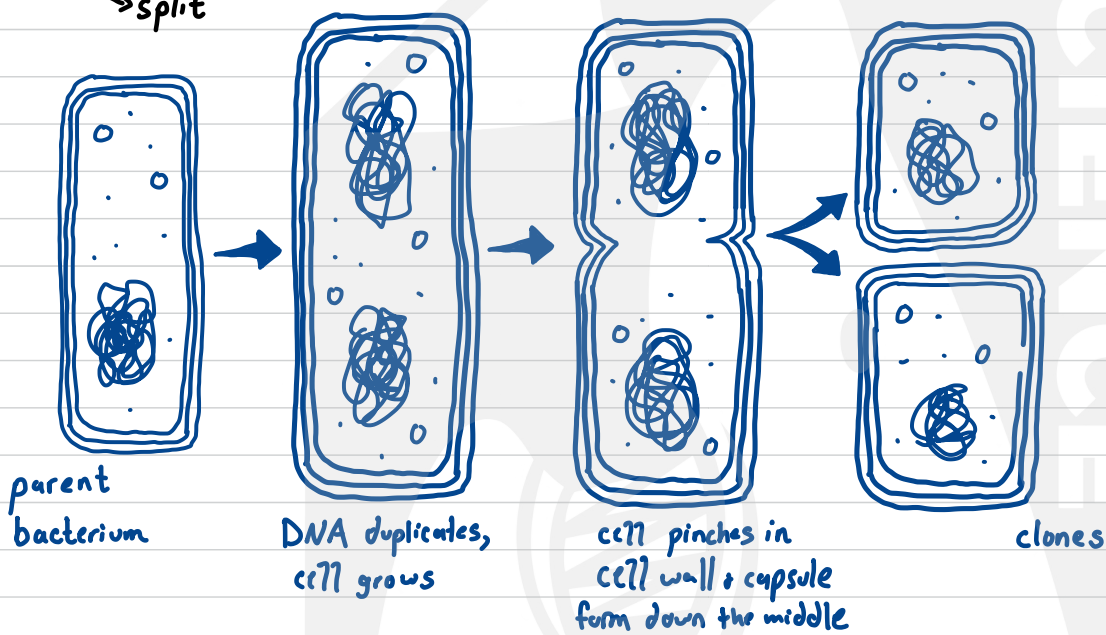


Asexual reproduction exists in both unicellular and multicellular organisms

Unicellular method of asexual reproduction:

Binary Fission: the process of duplicating genetic material and splitting into two clones

two ← split

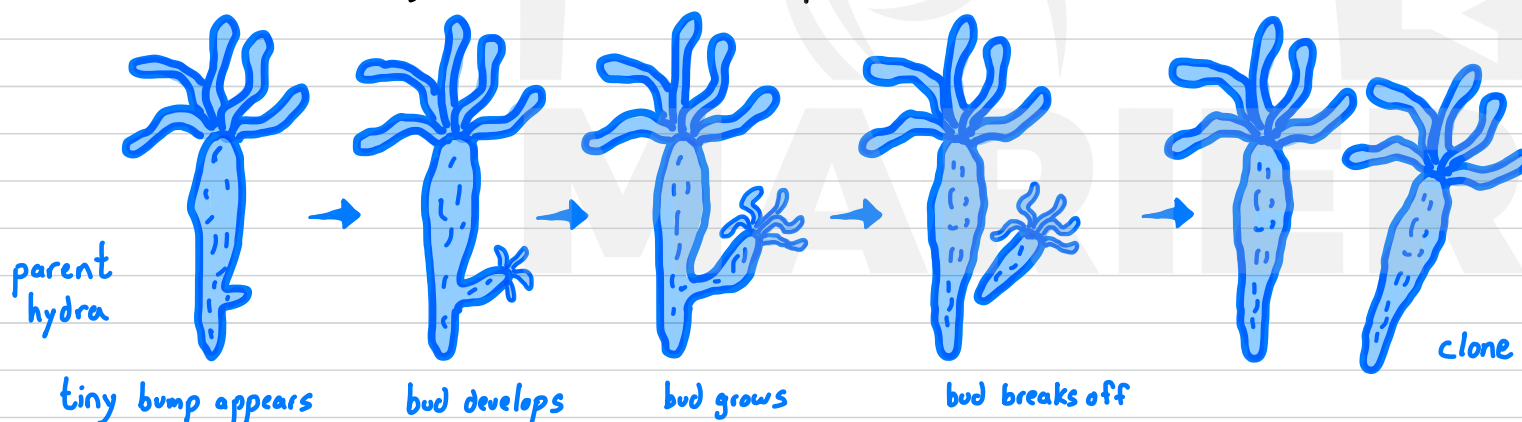


most prokaryotes reproduce using this method (ex: bacteria)
→ very fast (as fast as 30 min)

Some eukaryotes also can reproduce this way (ex: paramecium, amoeba)
→ fast but not as fast as prokaryotes as nucleus and many ultrastructures need to divide

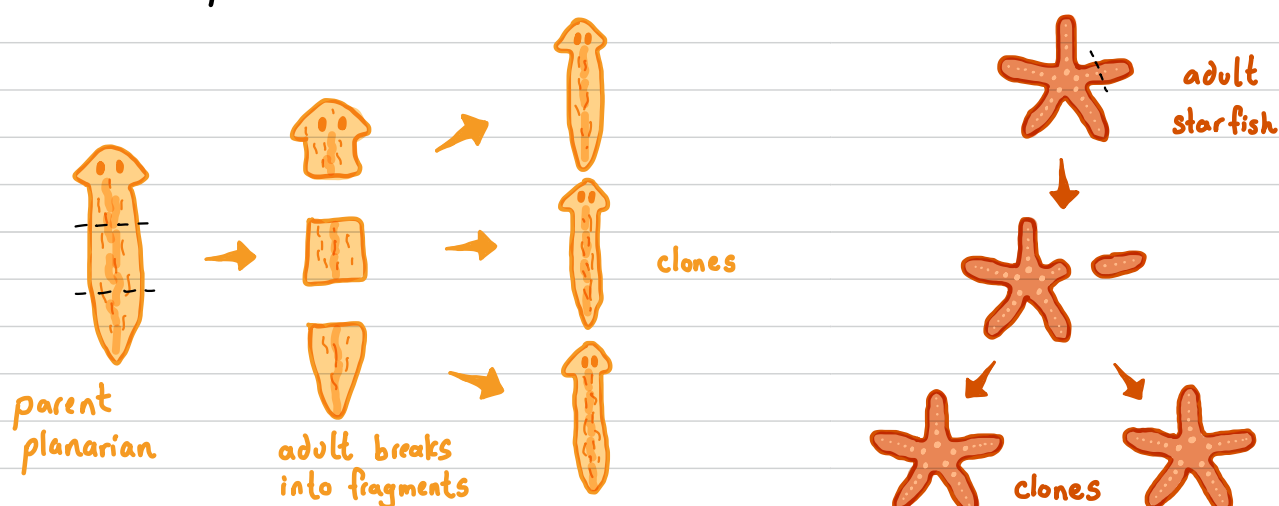
Multicellular methods of asexual reproduction:

Budding: offspring develop from an outgrowth (bud) due to cell division at one specific site
unlike binary fission, division is unequal



many organisms reproduce via budding:
- some fungi (yeast)
- some plants
- some animals (corals, jellyfish, hydras, sea anemones)

Fragmentation: part of an organism breaks off into 2 or more parts which each grow into separate organisms



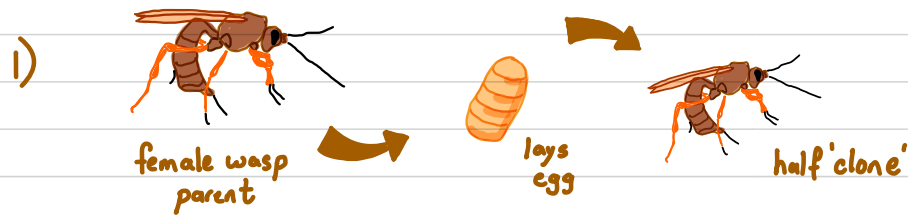
adults develop areas that can easily break off and develop

organisms such as starfish, molds, sponges, planaria, lichens

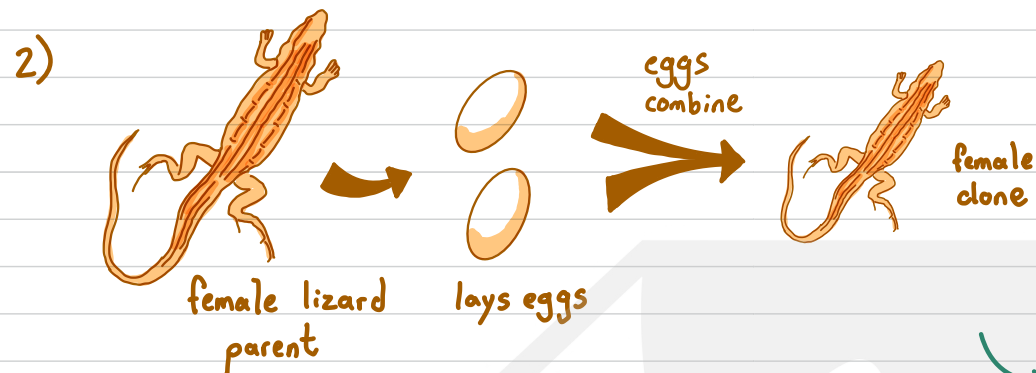
Asexual Reproduction

Parthenogenesis: reproduction where an egg can develop into an embryo without being fertilized

↳ the parents are always female. There are many types, here are some:



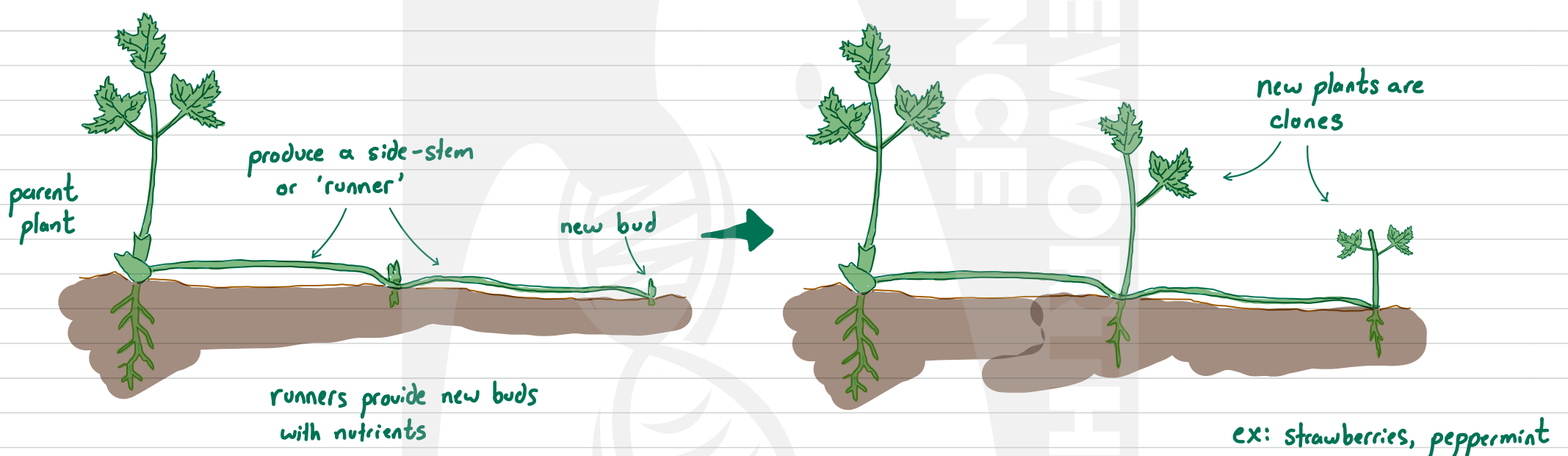
- bees also use this
- eggs and clones have half genetic material
- * eggs can either develop into half clones or be fertilized by sperm (sexual reproduction)



- sharks also use this
- * eggs can either combine to form clones or be fertilized by sperm (sexual reproduction)

↳ most parthenogenic species can reproduce sexually or asexually - depending on the circumstances

Vegetative reproduction: occurs in plants where a clone is formed from a fragment or additional structure - runner



Asexual reproduction

Advantages

- ⊕ very fast
 - ↳ large populations form quickly
- ⊕ only need 1 individual
- ⊕ no need to produce sex cells (except parthenogenesis)
- ⊕ no need for dispersal
 - ↳ offspring can thrive in same conditions as parents

Disadvantages

- ⊖ no genetic variation (except rare mutations)
 - ↳ entire population can be wiped easily by bad conditions
- ⊖ many offspring close together
 - ↳ need to compete for resources
- ⊖ negative mutations are passed on

Sexual Reproduction

Sexual reproduction: production of offspring with fertilization of genetically unique gametes (sex cells)
→ produces genetically unique offspring - offspring are different from their parents

* very common in multicellular organisms but also exists in unicellular organisms (paramecium, yeast)

Stages in sexual reproduction:

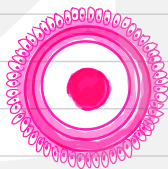
1) **Formation of gametes:** reproductive (sex cells) which are used in sexual reproduction. Gametes contain half of the organisms genetic material, haploid, and are genetically unique

in animals:

males produce sperm in testes



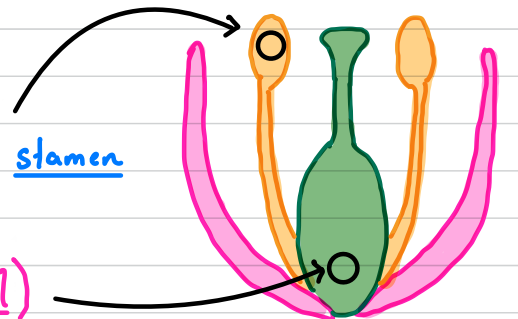
females produce ova in ovaries



in plants:

males produce pollen
(which contain sperm) in stamen

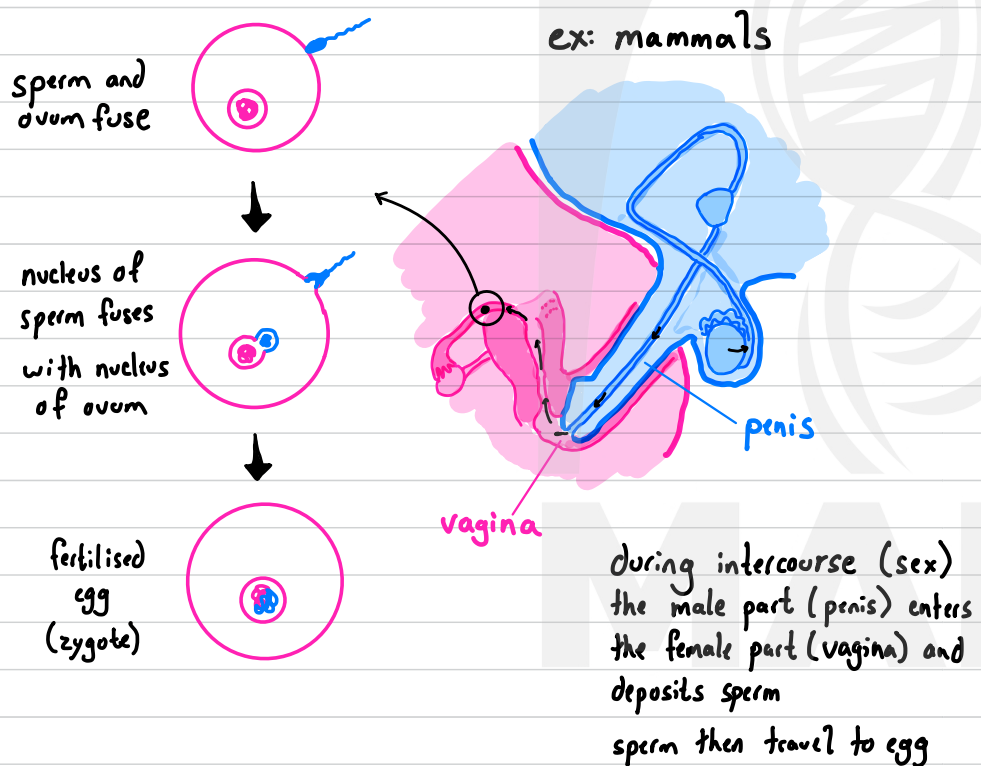
females produce ova
in ovaries (in pistil)



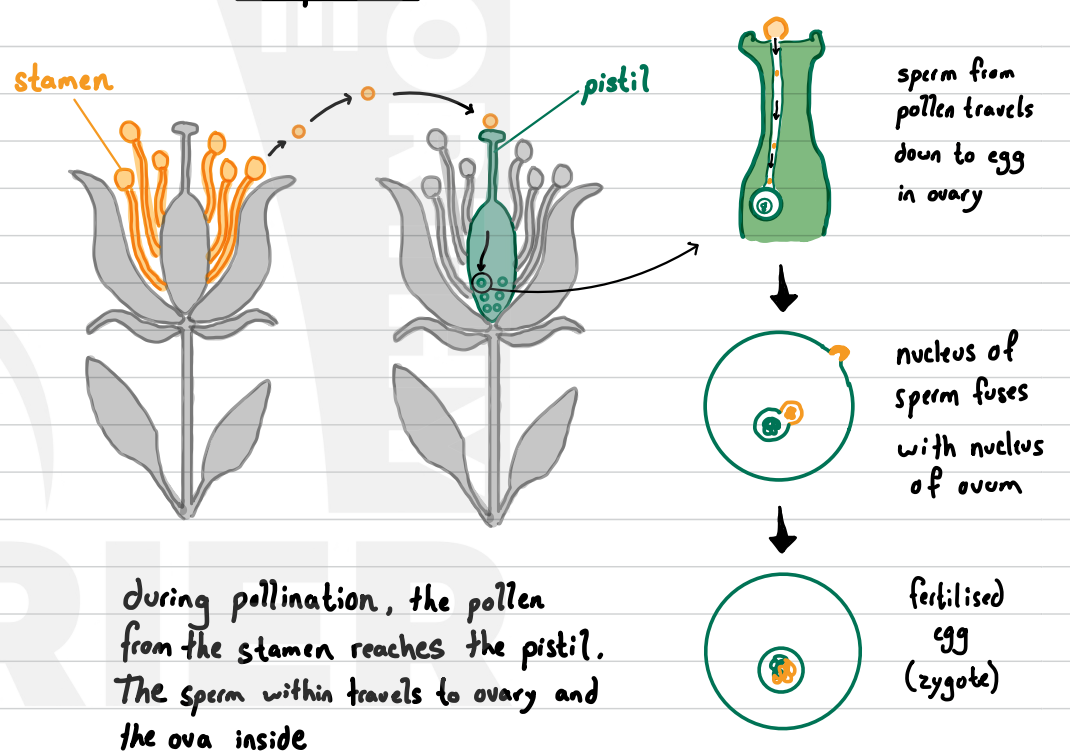
2) **Fertilization:** the fusion of male and female gamete

a) **internal fertilization:** fusion of gametes occurs inside the female (or female part)

in animals:

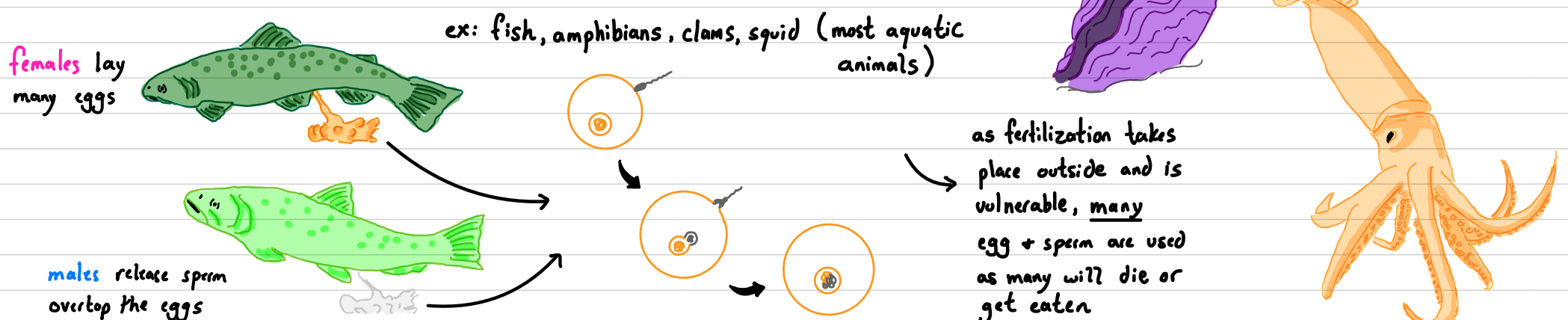


in plants:



b) **external fertilization:** fusion of gametes occurs outside the female (or female part)

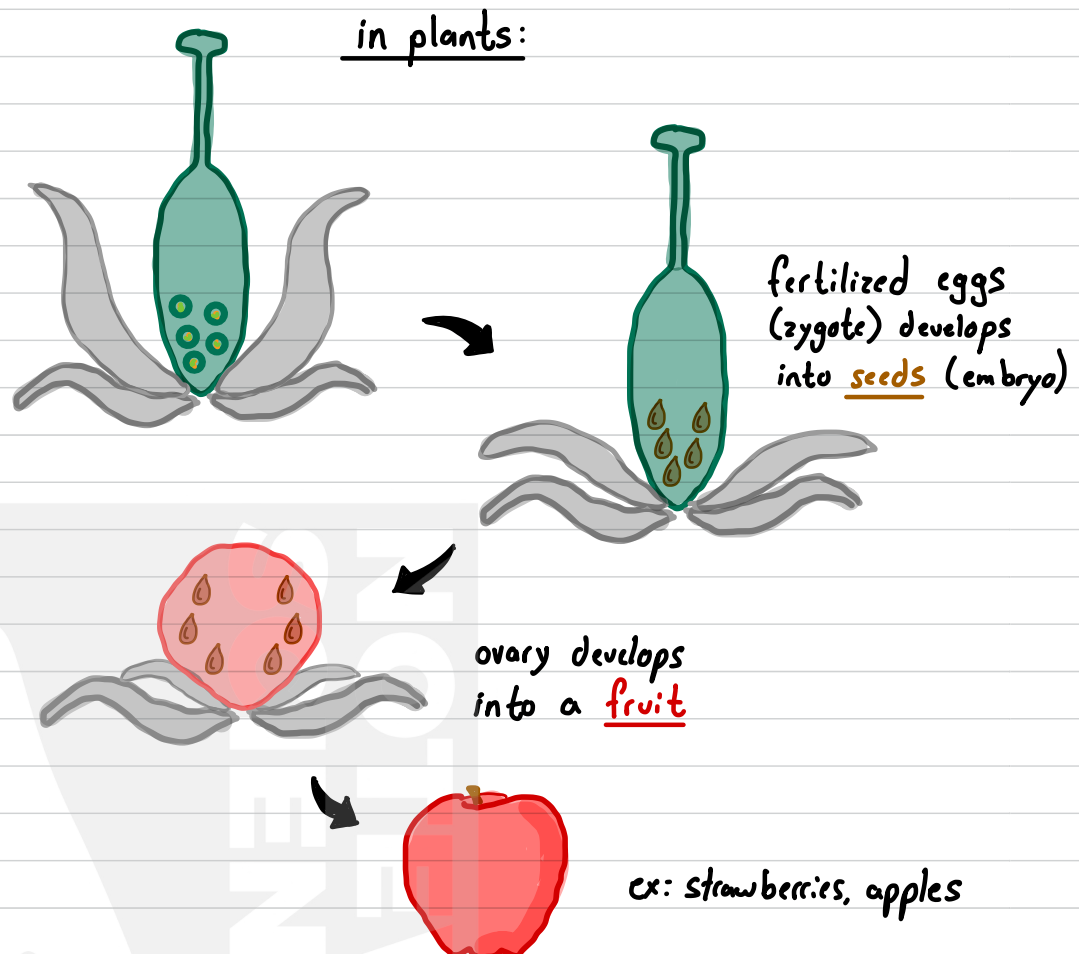
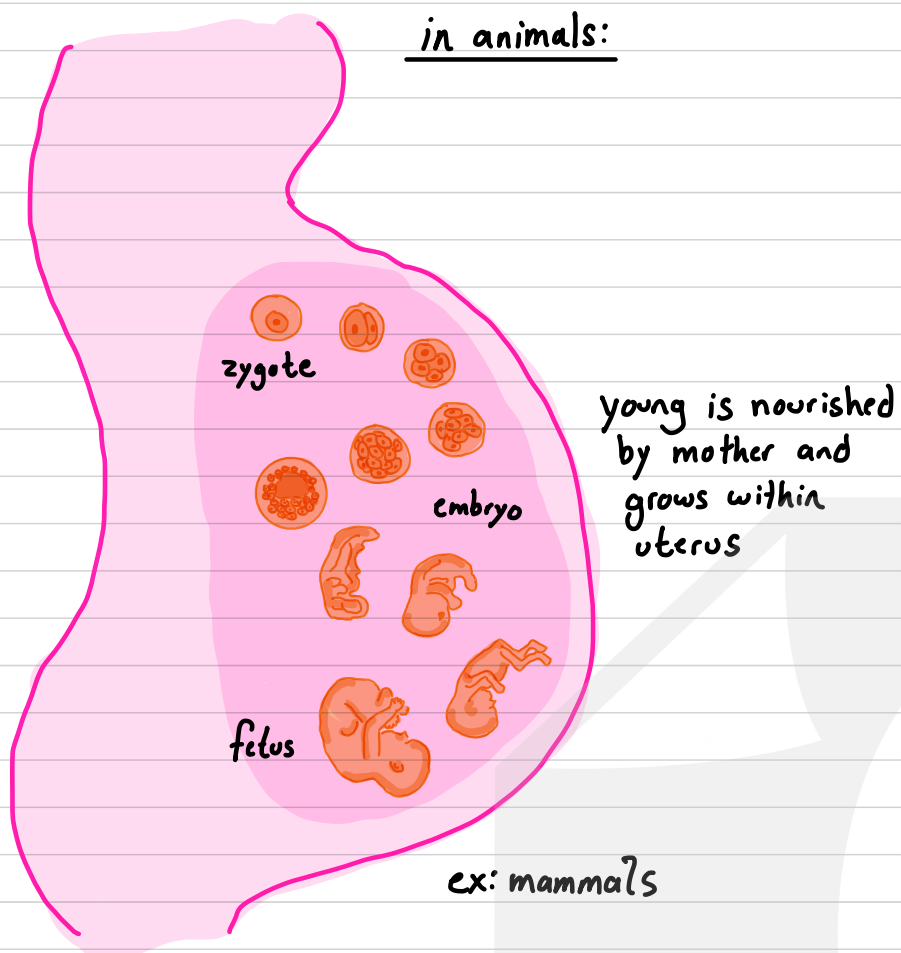
in animals:



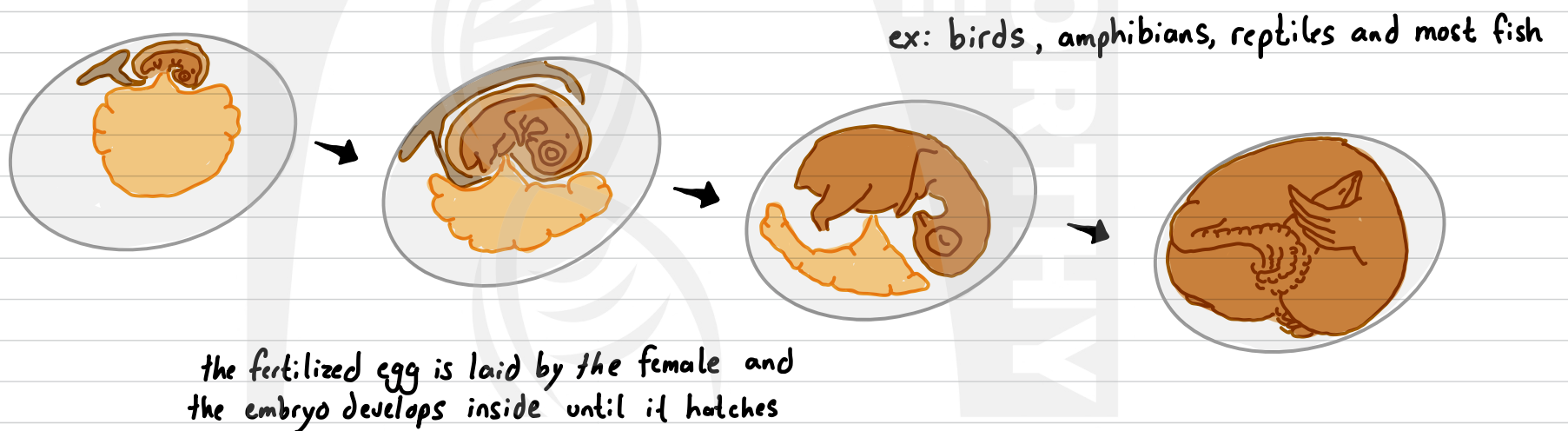
Sexual Reproduction

3) Post-fertilization: after the gametes have fused, the zygote grows into an embryo and divides

a) **vivipary**: young develop within the female



b) **ovipary**: young develop outside female (usually in eggs)



Sexual reproduction

Advantages

- ⊕ genetic variation
 - greater chance that offspring will be better suited to new conditions
 - adaptations!
- ⊕ disease/negative conditions will not impact all offspring the same

Disadvantages

- ⊖ slow reproductive cycle and not frequent
- ⊖ energy required to produce gametes
- ⊖ energy required to find mates
- ⊖ courtship sometimes required to secure mates

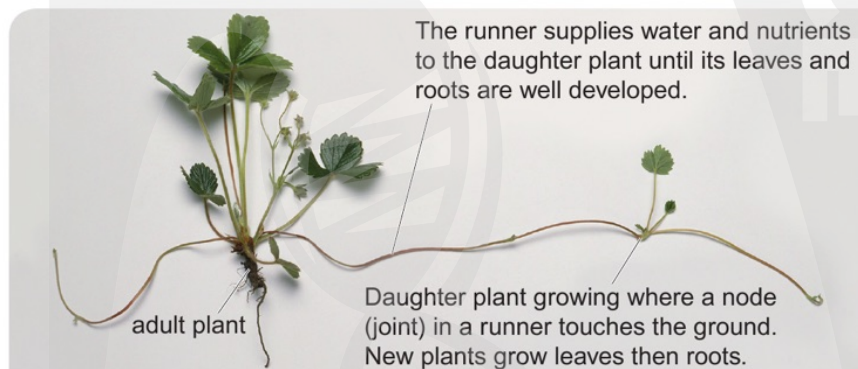
Assessment Tasks

Answer the following questions:

- ① Compare and contrast asexual and sexual reproduction
- ② Bamboo shark eggs were produced by a female shark kept in a zoo with only females in her tank. Genetic analysis of the embryos shows that they are clones of their mother.



- a) what method of reproduction is this an example of?
 - b) suggest how reproducing asexually could be useful to the bamboo shark.
 - c) suggest why the bamboo shark usually reproduces sexually.
- ③ New strawberry plants grow where a runner touches the ground. When the new plant has well-developed roots, the runner dies off and the plant grows on its own.



- a) what method of reproduction is this an example of?
 - b) explain why offspring from this method may be better adapted to conditions near the parent plant than offspring from sexual reproduction.
 - c) Strawberry plants also reproduce sexually, forming seeds on fruits that animals eat. The animals then usually drop their seeds far from the plant in their waste. Explain how sexual reproduction is advantageous in this situation.
- ④ The first study that showed asexual reproduction in vertebrates in the wild was carried out in 2015. DNA analysis of 190 smalltooth sawfish in Florida showed that 7 of the young sawfish were nearly genetically identical. Normally, sawfish reproduce sexually, but the number of sawfish has decreased to less than 5% of what it was 100 years ago. The scientists suggest that the change to asexual reproduction may be the result of the population decrease.



- a) Describe an advantage of asexual reproduction to wild sawfish.
- b) suggest why sexual reproduction is more advantageous for sawfish under normal conditions.