REVISION: BIODIVERSITY OF MICRO-ORGANISMS & PLANTS

13 MARCH 2013

Lesson Description

In this lesson we revise:

- the general characteristics and function of micro-organisms
- the four groupings of plants and their characteristics
- the reproductive mechanisms in bryophytes pteridophytes and gymnosperms

Key Concepts

General characteristics of micro-organisms

- A **virus** is a cellular, parasitic, extremely small and has many different shapes.
- It uses the host to replicate itself so it multiplies inside a host's cell.

- **Bacteria** have a cellular structure are prokaryotes and unicellular with three distinctive shapes – coccus (spherical), bacillus (rod shaped) and spirillus (spiral shaped).
- Bacteria have three ways of obtaining energy; photosynthesis, chemosynthesis or Heterotropism.
- Bacteria reproduce through binary fission.

- **Protista** is a kingdom with three main groups that are classified according to how they obtain their nutrition and how they move
- Protozoa are animal-like protists that are heterotrophic or parasitic and move using pseudopodia, cilia or flagella. Plant-like protists are autotrophic and can be unicellular or multicellular. Fungus-like protists are heterotrophic and are decomposers.

- **Fungi** can be unicellular or multicellular, are all eukaryotic and have cell walls made of chitin.
- Multicellular fungi are inter-twined together by threads called hyphae.
- Fungi are heterotrophic saprophytes and get their food from whatever substrate they grow on. They replicate both sexually and asexually.

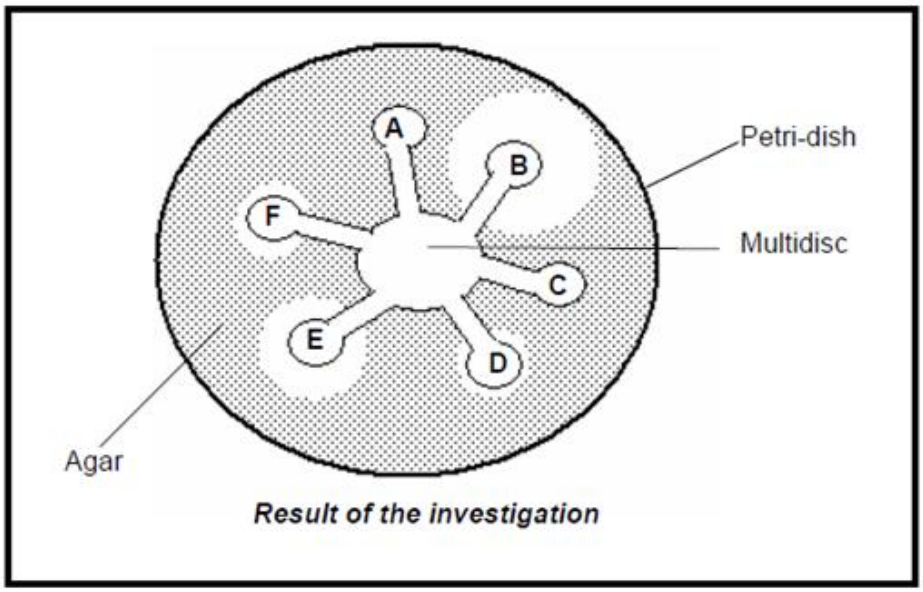
Role of micro-organisms

- Micro-organisms maintain the balance in the environment because they are found everywhere and continually recycle nutrients and energy
- **Viruses** control ecological processes such as nutrient cycling, bacterial and algal biodiversity. They are also pathogens and cause disease
- **Bacteria** are producers, are decomposers or recyclers of nutrients, in particular nitrogen
- **Protists** produce food, are parasites, pathogens or decomposers
- **Fungi** convert organic matter by decomposing it and making nutrients available but can be pathogenic too

Question 1

(Adapted from Life Sciences/P1 DoE/Exemplar 2007 NSC.)

A sample was taken from a patient suffering from a throat infection. The bacteria on the swab were cultured on a nutrient agar in a petri-dish. A multidisc with a different type of antibiotic at the end of each of its six arms was then placed on top of the bacteria. The two halves of the petri-dish were then sealed together and placed in an incubator at 30 ºC. The following diagram shows the result of the investigation after 48 hours:



Result of the investigation

Key:

A - F — Six different types of antibiotic

— Zone of bacterial growth

— Zone of no bacterial growth

a.) State ONE difference in activity between antibiotics B and F. (2)

The patient was known to be allergic to antibiotic B.

b.) Which antibiotic should the patient be given? (1)
c.) Explain your answer to QUESTION 1.b (2)

The organism causing this infection seems to be resistant to two of these antibiotics.

d.) Which TWO antibiotics are referred to in the statement above? (2)
e.) Explain your answer to QUESTION 1 (d). (2)

The patient was given a 5-day course of the appropriate antibiotic. Explain why it is important to finish the course of antibiotics, even if you feel better. (3)

Key Concepts

Grouping or classification of plants

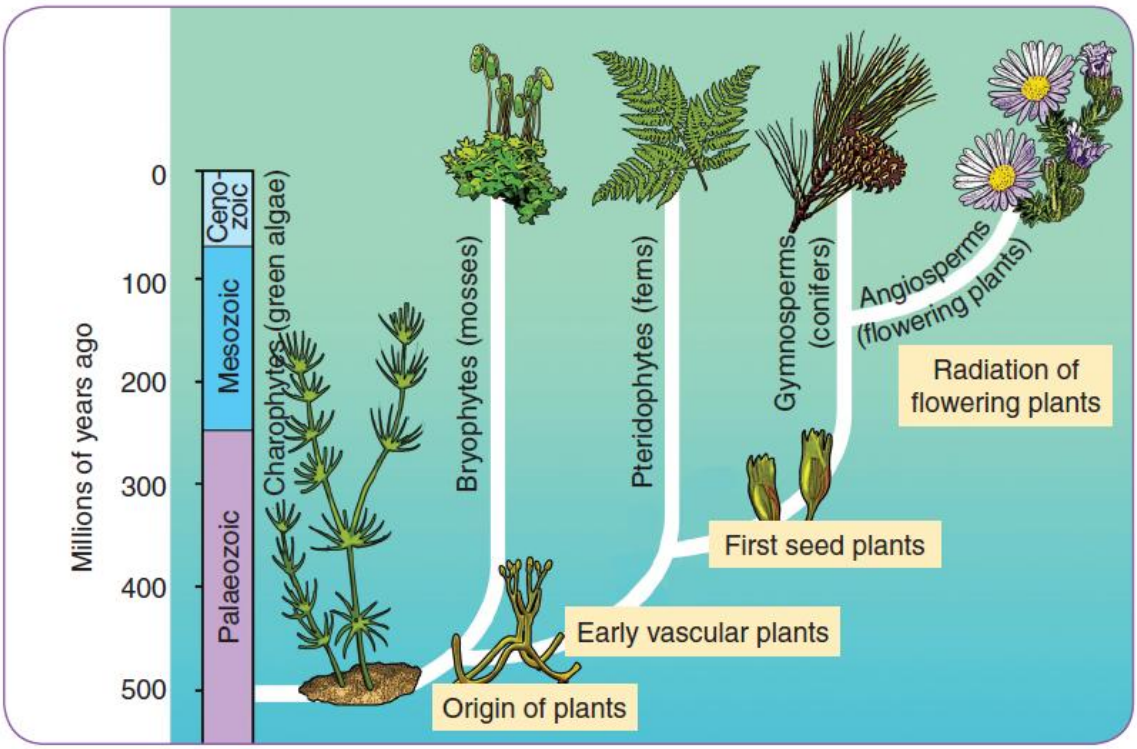


Fig. 2.2 The evolution of plants

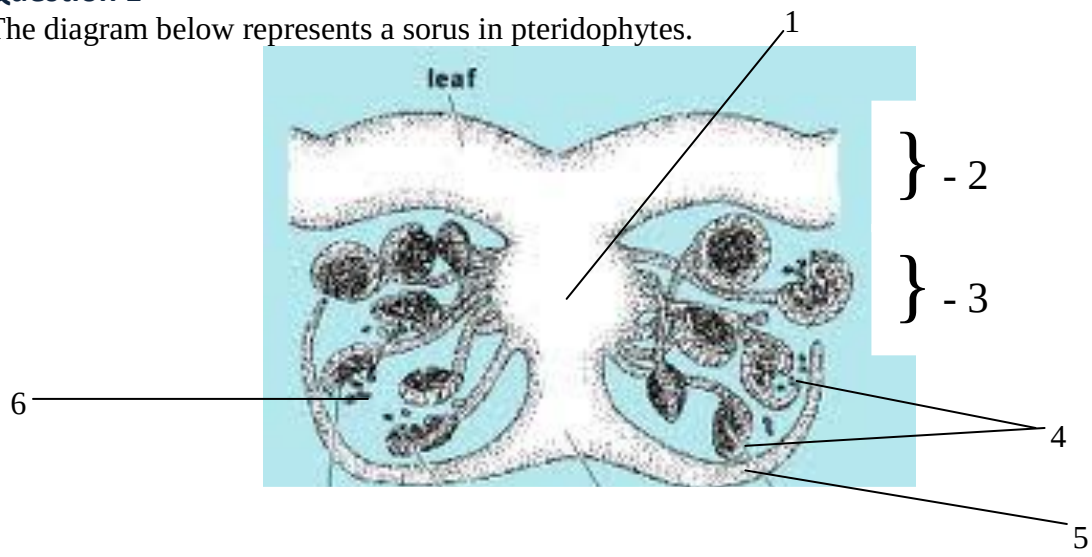
(Solutions for all Life Sciences, Macmillan, p56)

- Plants are grouped according to their evolutionary history and the presence or absence of vascular tissue.
- There is one group of plants, the bryophytes that do not have vascular tissue. The tracheophytes which include the pteridophytes, gymnosperms and angiosperms all have vascular tissue in the form of xylem and phloem. (See fig 2.2 Solutions for all, Macmillan, p56)

Questions

Question 1

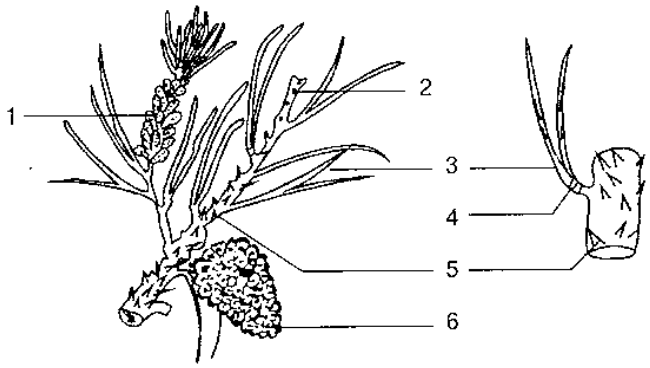
The diagram below represents a sorus in pteridophytes.



a) Name the plant on which a sorus is found. (1)
b) Identify parts numbered 1 to 6. (6)
c) What is the function of part numbered
(i) 3 and (ii) 6? (4)
d) Is this the sporophyte or gametophyte generation? Provide reasons for your answer. (4)
e) What does the term 'haploid' mean? (1)
f) Write down the number of a haploid structure. (1)

Question 2

The diagram shows part of a branch of *Pinus* sp.



a) Identify the parts numbered 4 and 5. (2)
b) Write down the number of the part in which:
i. Microspores are produced; (1)
ii. Seed is produced; (1)
iii. Photosynthesis takes place; and (1)
iv. Unlimited growth can take place. (1)
c) What is the average life-span of the part numbered 4? (1)

Types of Reproduction

Asexual Reproduction

- Also known as vegetative reproduction - spores (n) are produced in the sporophyte (2n) by meiosis
- Only one parent or individual
- There are three types of asexual reproduction
    - Sideways shoots
    - Lateral buds on underground storage organs
    - Stems produce new roots when cut from main plant

Advantages of asexual reproduction

- Quick and efficient
- Only 1 parent required
- Desirable genetic characteristics not lost

Disadvantages of asexual reproduction

- Genetically identical to parents no genetic variation
- Competition for resources occurs

Sexual Reproduction

- **Sexual reproduction** – fusion of gametes
- **Gametophyte** grows and releases gametes (n)
- More than 1 parent required

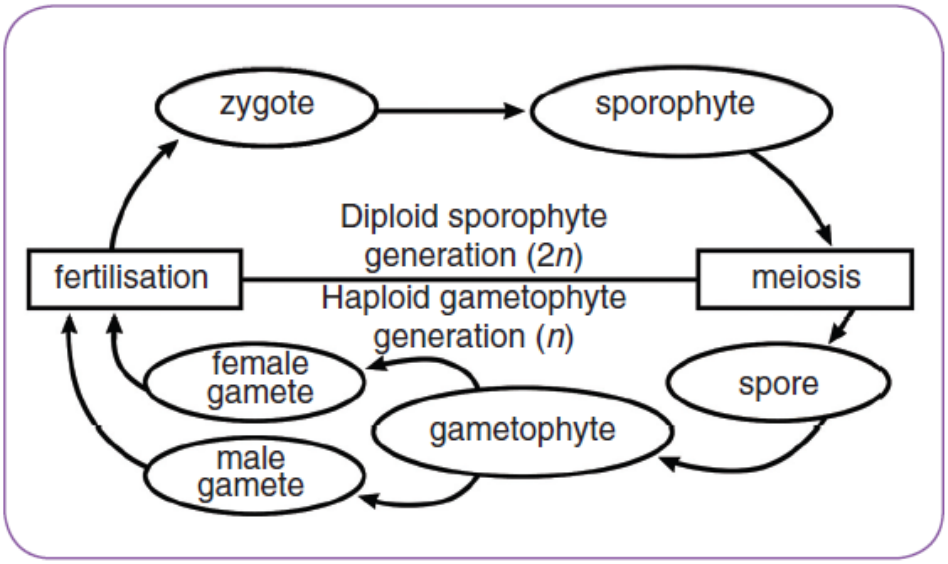
Advantages of sexual reproduction

- **Genetic variation** occurs
- Reduces chances of parasites and diseases moving from parents to offspring
- New species can develop as a result of genetic variation (**evolution)**

Disadvantages of sexual reproduction

- Only half the population can produce offspring
- A mate is required and wind or animals are needed for pollination
- Desirable genetic characteristics are not guaranteed to be passed on
- Populations take a long time to build up

Diagram showing the generalised alternation of generations in plants:



(Solutions for all Life Sciences, Macmillan, p57)

- **Plants** alternate sexual and asexual generations.

Question

Question 1

(Adapted from Solutions for all Life Sciences, Macmillan, p68)

a.) In what ways do the sperm of mosses and ferns differ from those of the spermatophytes? (3)
b.) What is the reason for the difference in structure of the sperm mentioned in question (a)? (2)
c.) Why do gymnosperms and grasses produce more pollen than the rest of the spermatophytes? (2)
d.) How have the spermatophytes achieved total independence from water for reproduction? (2)
e.) Why has reducing the gametophyte generation been an advancement for the spermatophytes? (3)
f.) Explain why most angiosperms are able to produce less pollen than gymnosperms. (2)