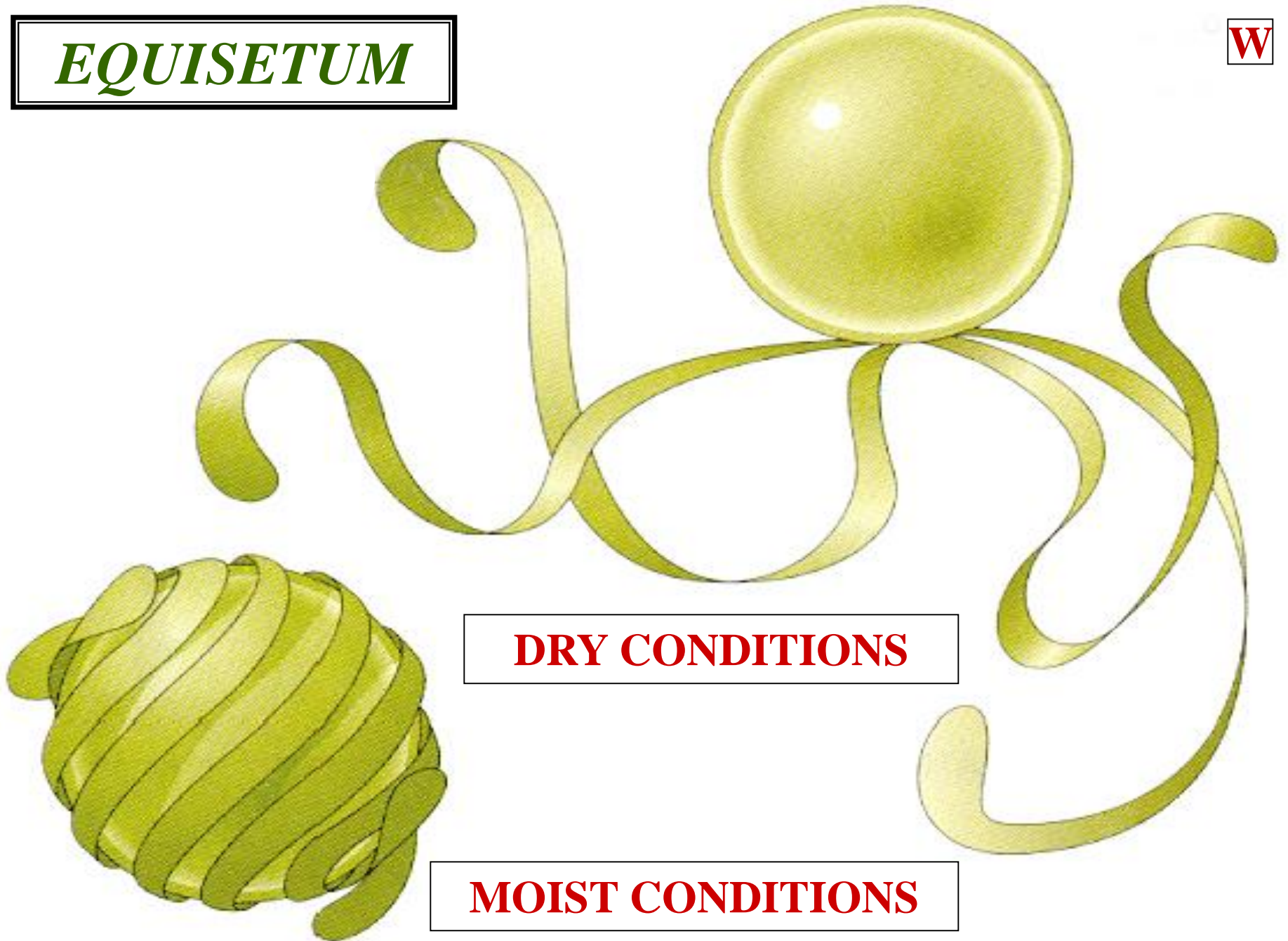


# *EQUISETUM*

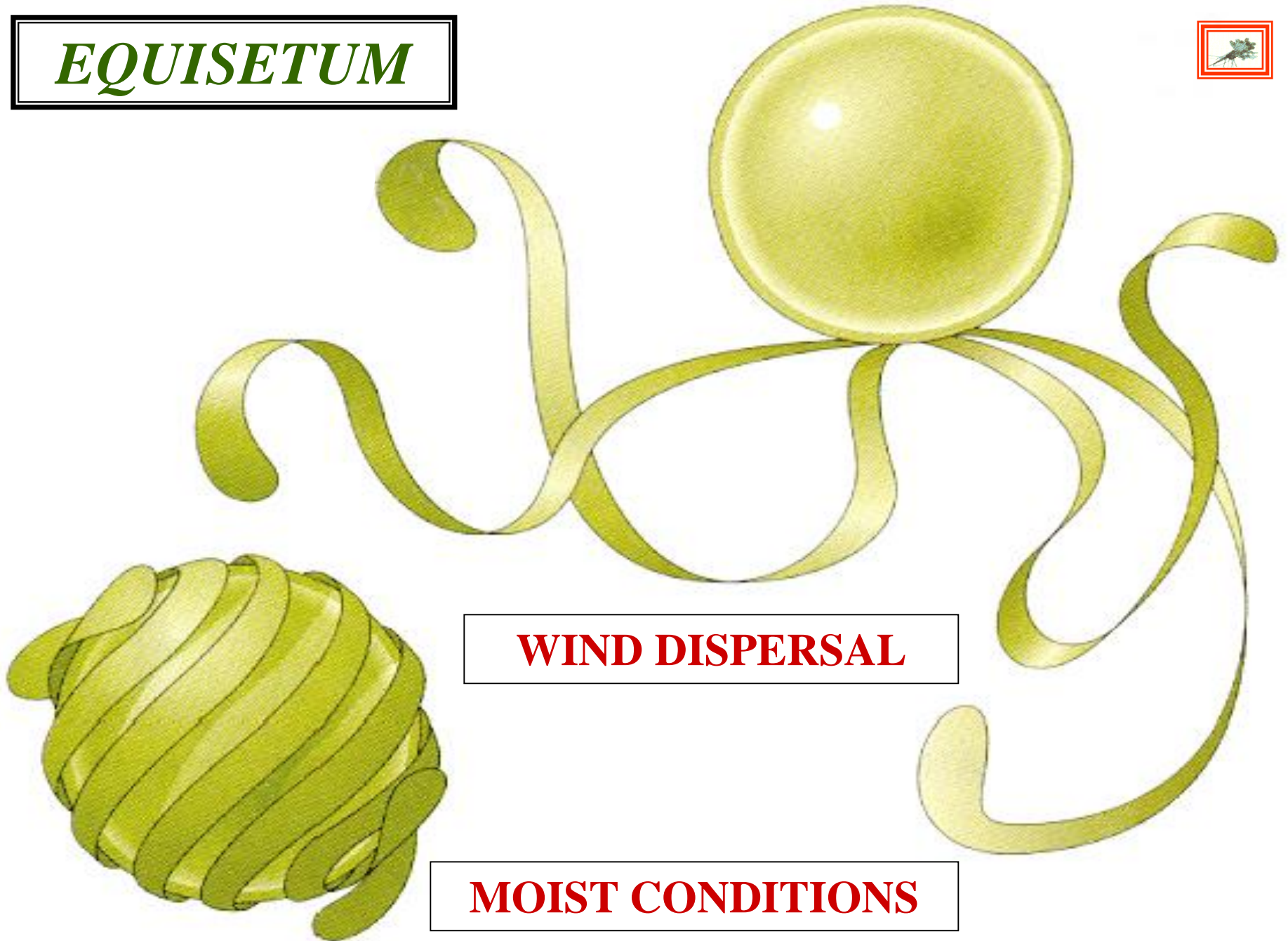
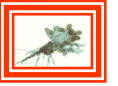
W



**DRY CONDITIONS**

**MOIST CONDITIONS**

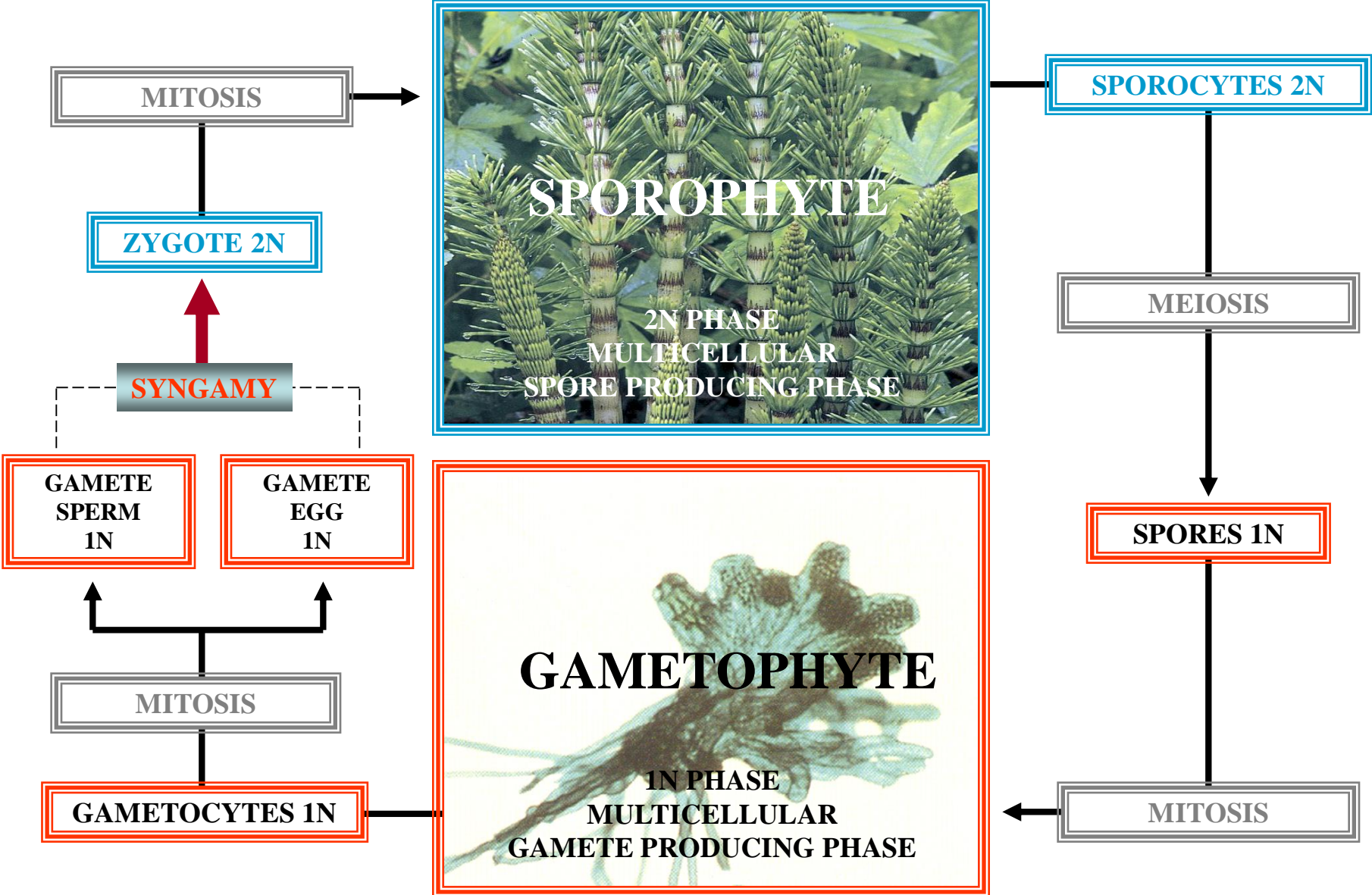
# *EQUISETUM*



**WIND DISPERSAL**

**MOIST CONDITIONS**

# EQUISETALES LIFE CYCLE





# GAMETOPHYTE CHARACTERS



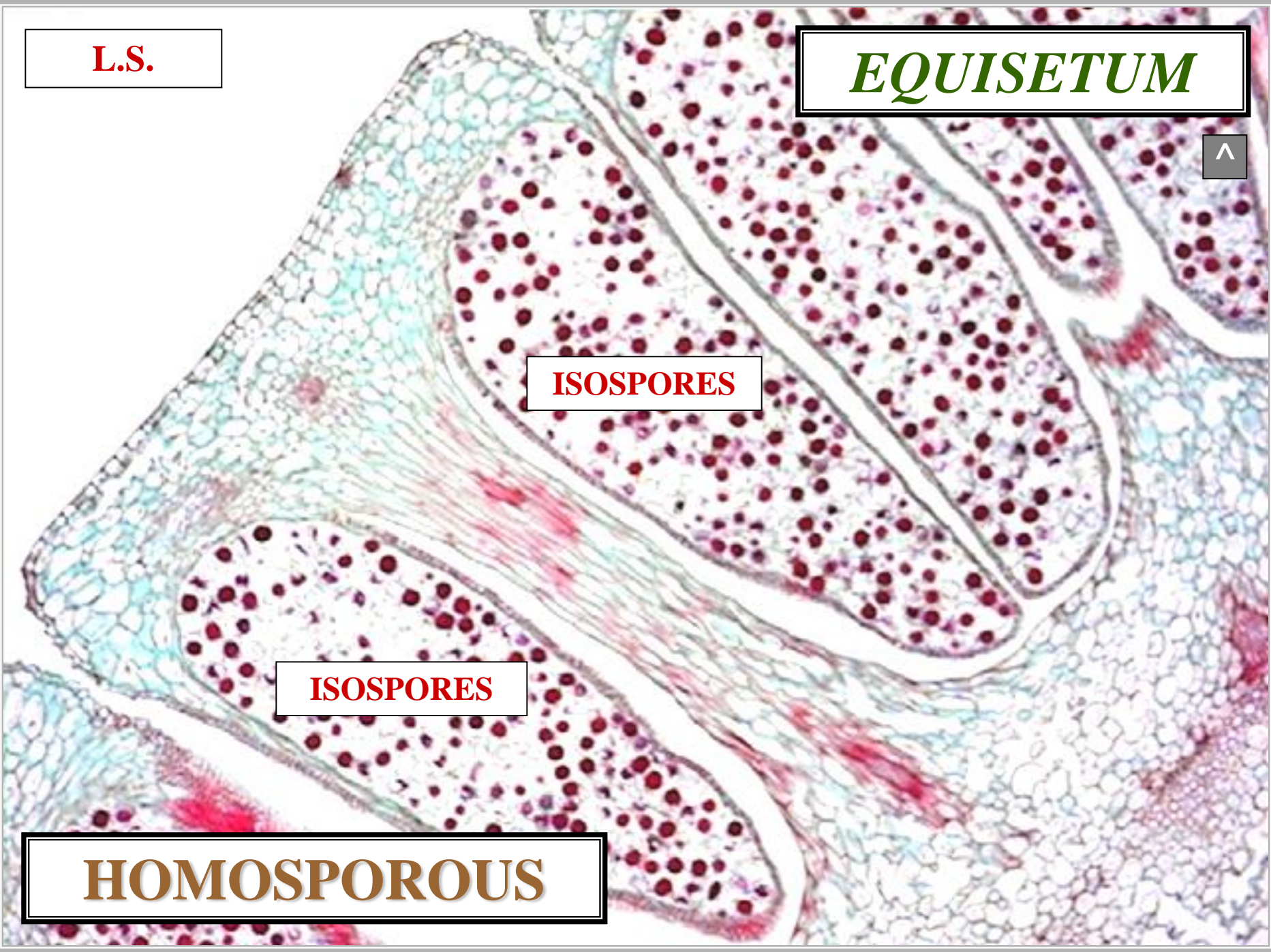
**L.S.**

***EQUISETUM***

**ISOSPORES**

**ISOSPORES**

**HOMOSPOROUS**

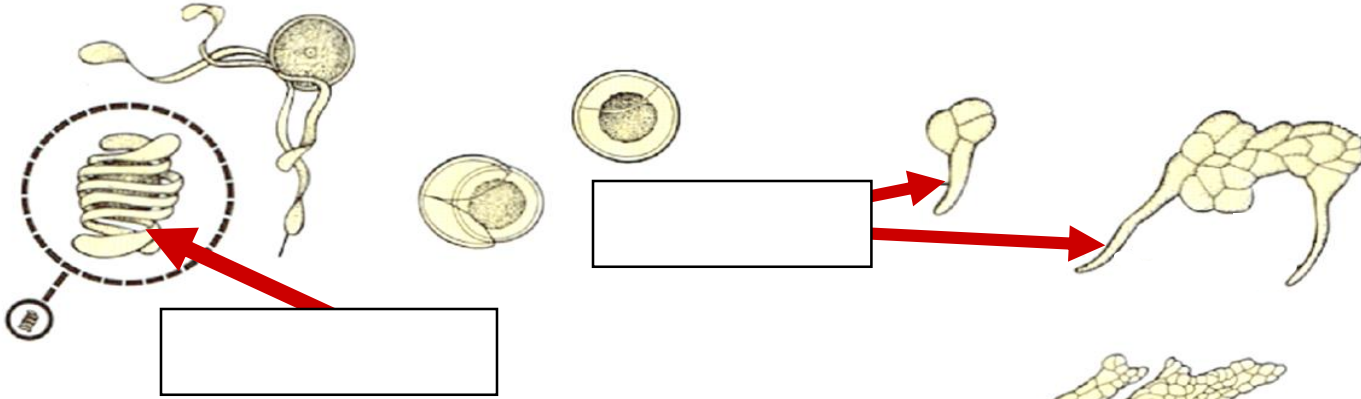




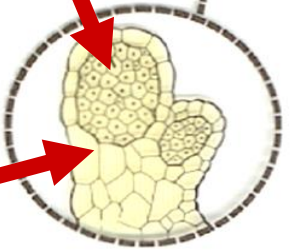
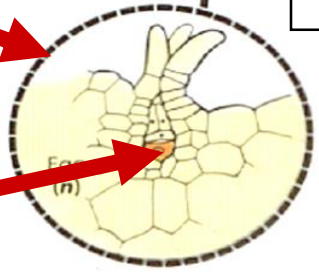
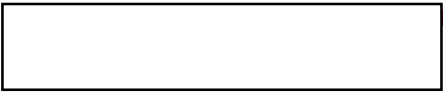
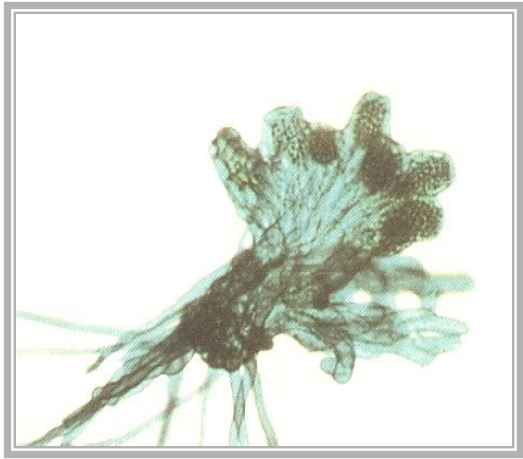
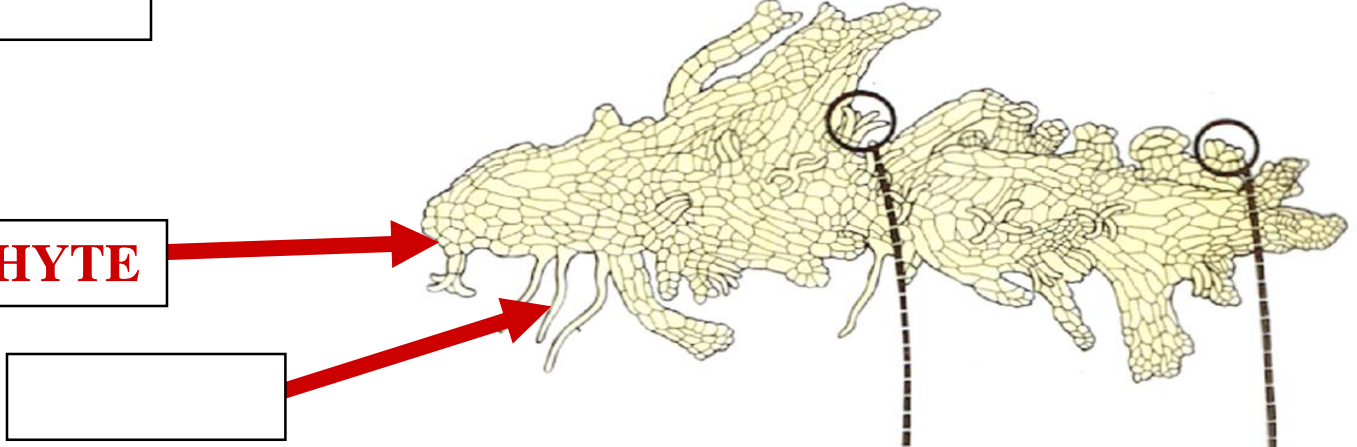
# EXOSPORIC GAMETOPHYTE

+

EX

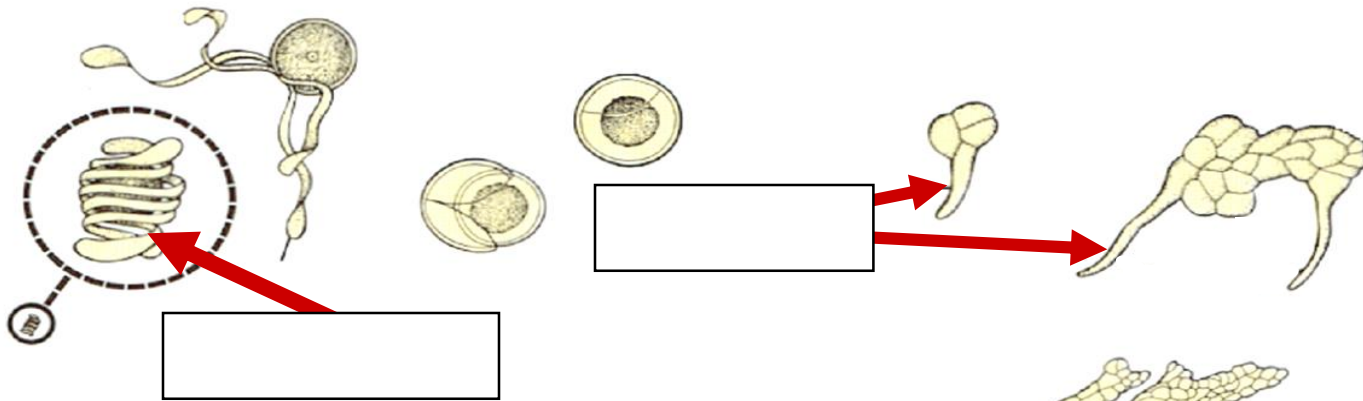


**GAMETOPHYTE**

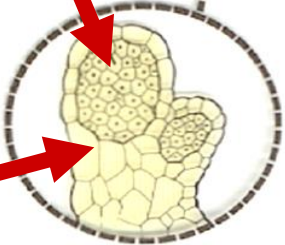
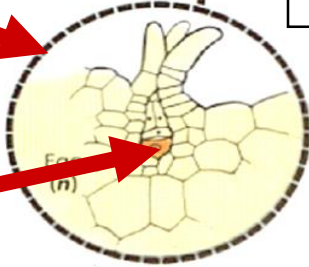
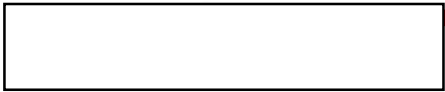
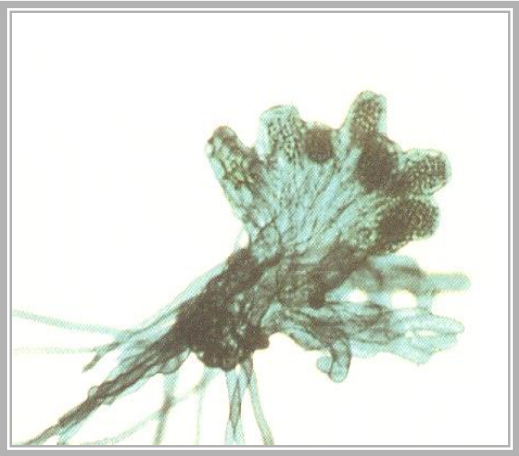
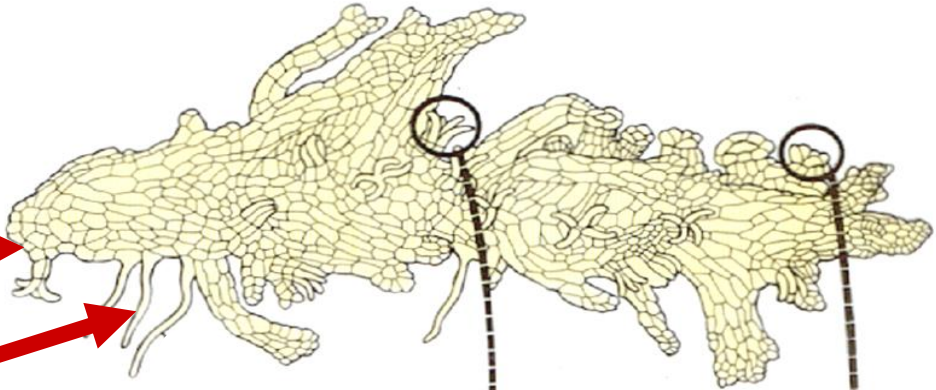




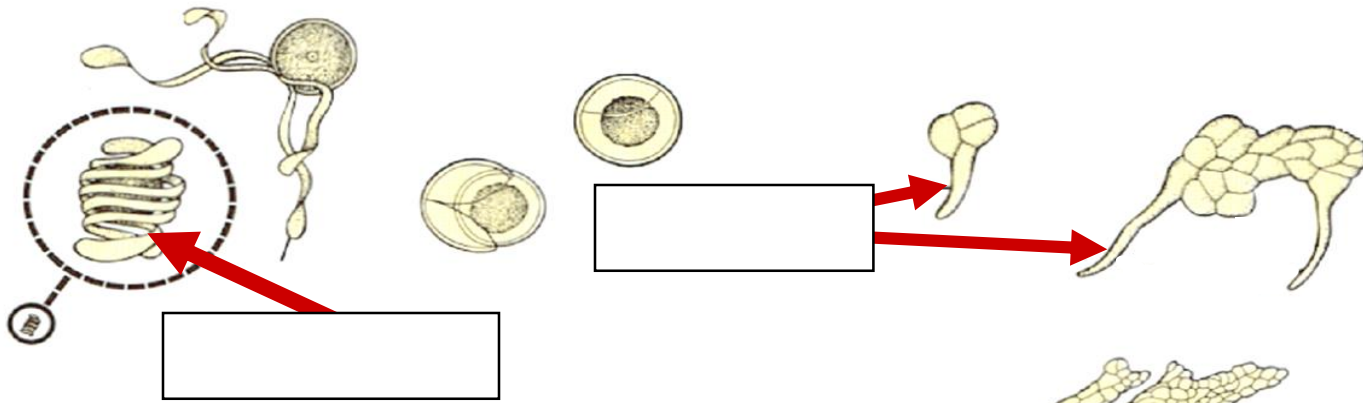
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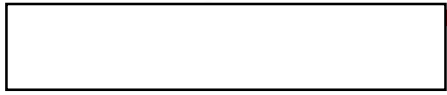
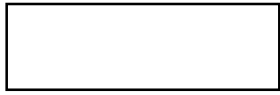
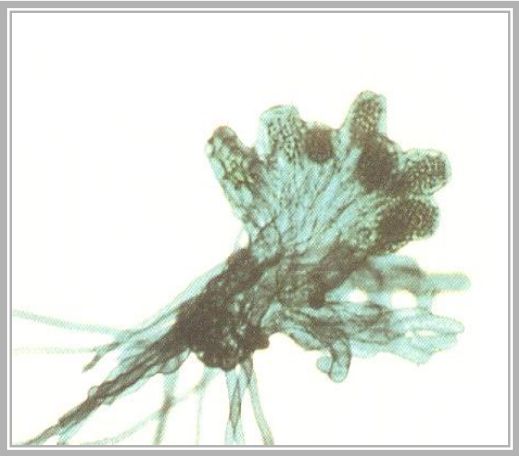
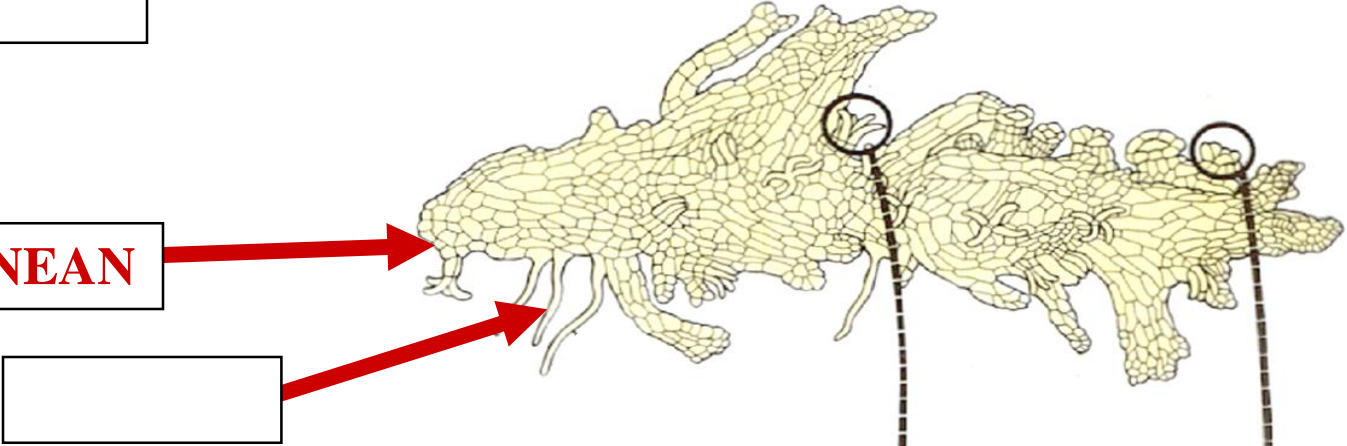
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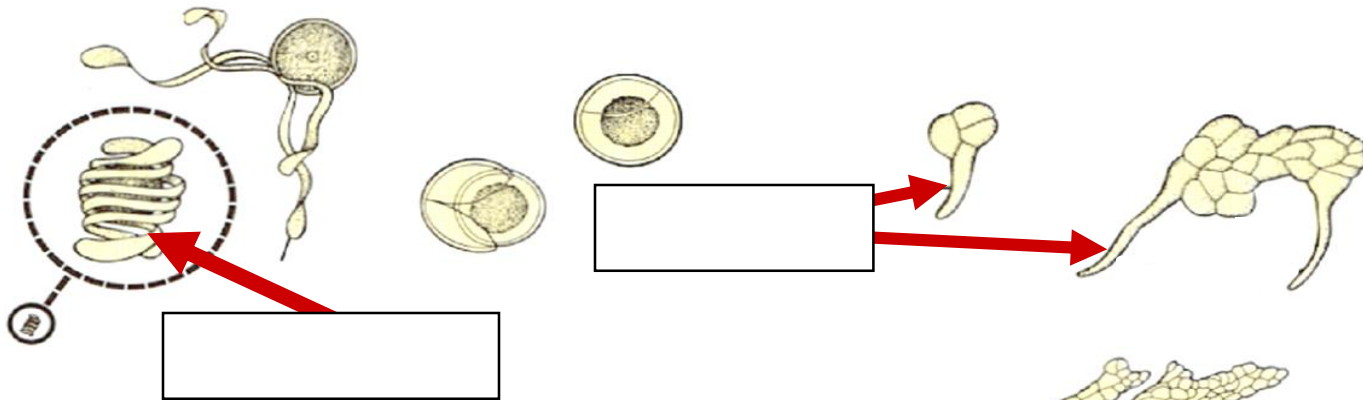




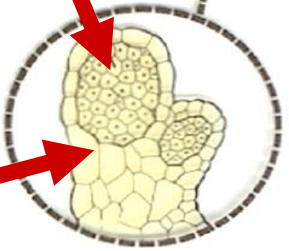
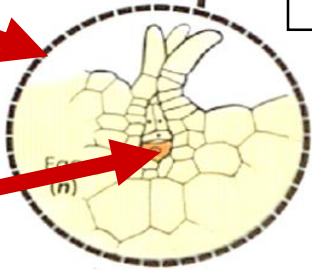
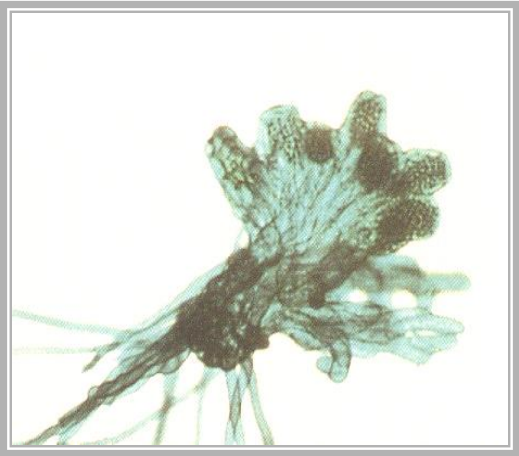
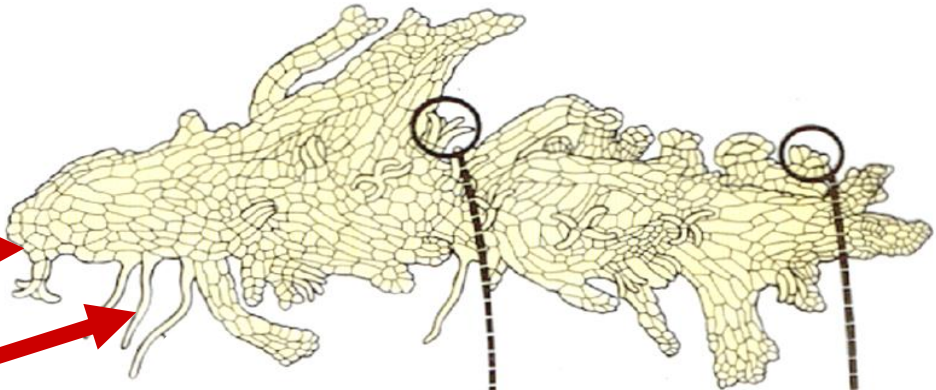
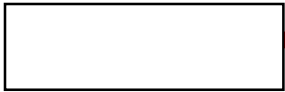
**EPITERRANEAN**

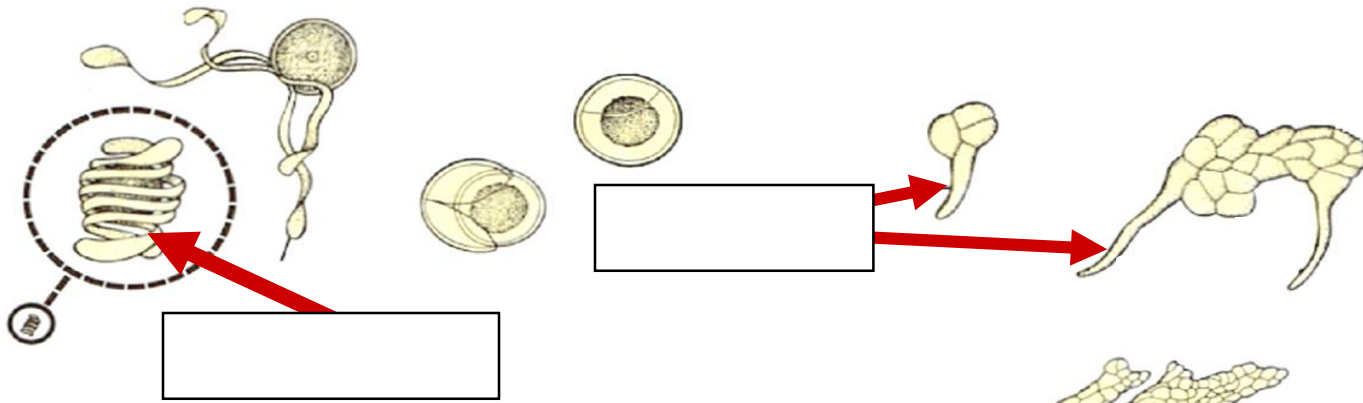


**EX**

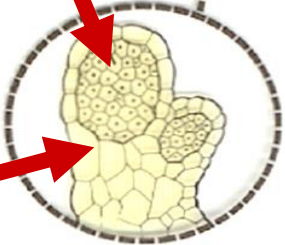
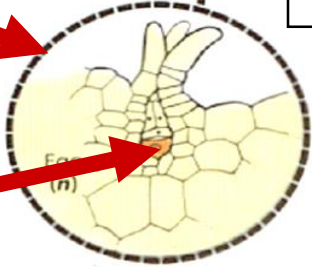
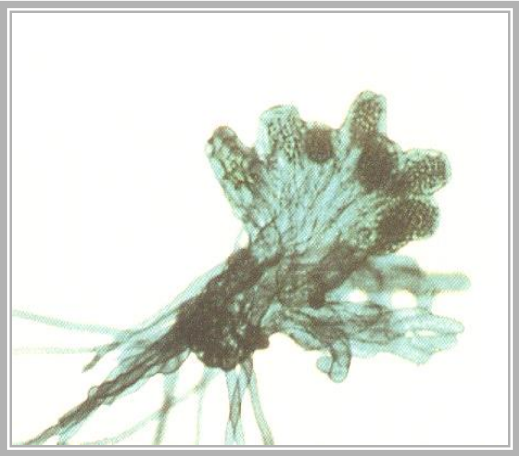
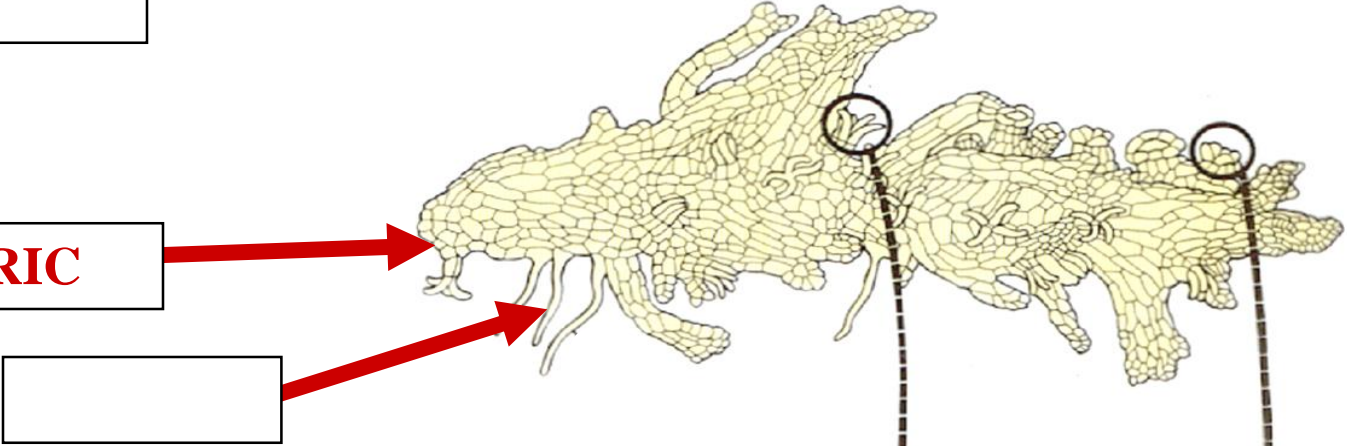


**PSYN**

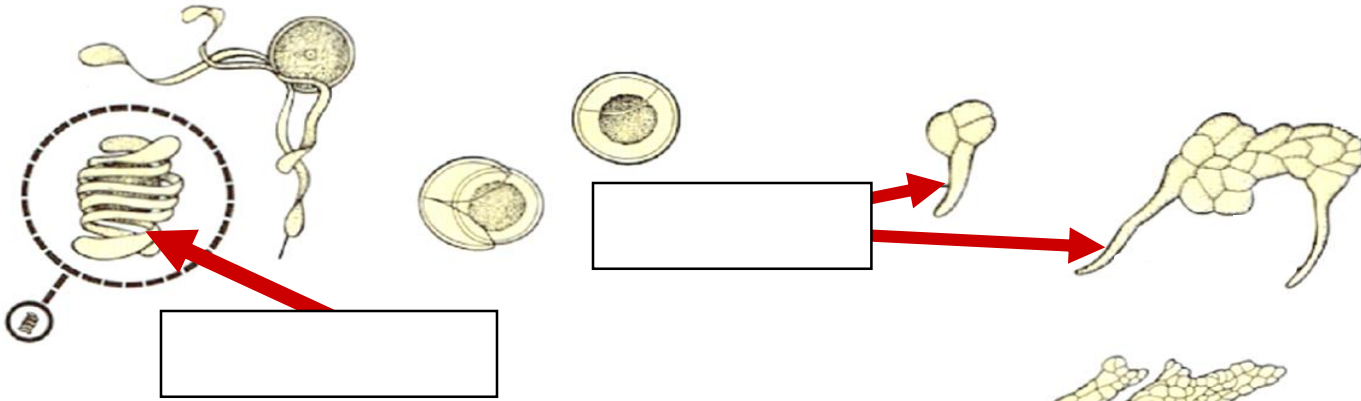




**EXOSPORIC**

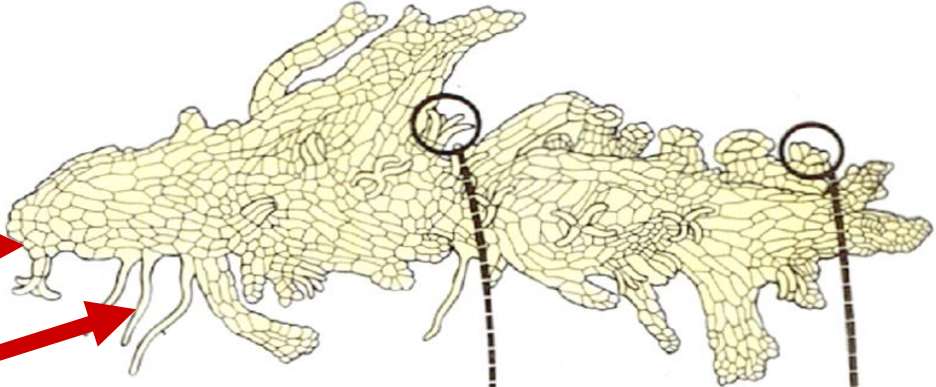


A



**BISEXUAL**

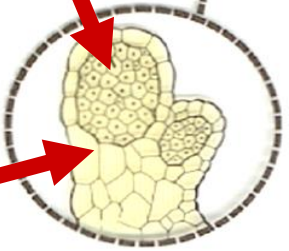
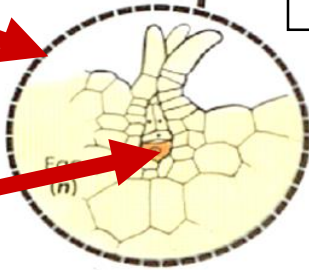
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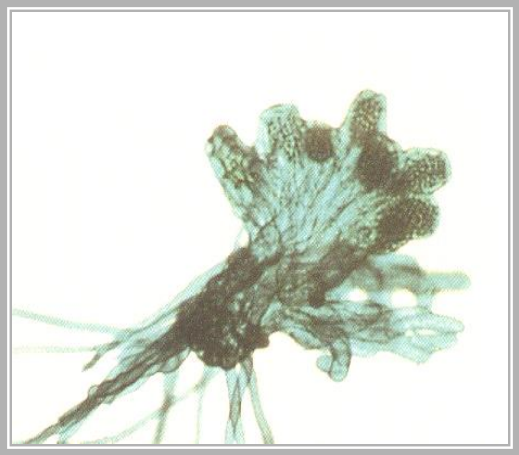
**ARCHEGONIUM**

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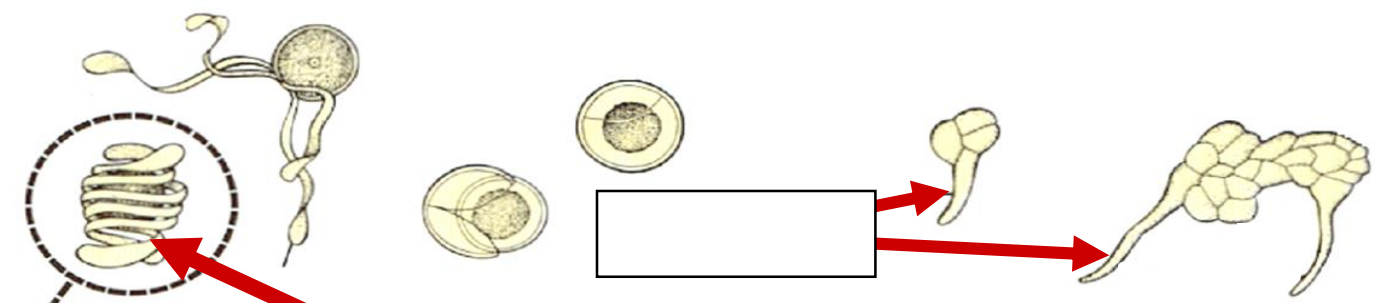
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**ANTHERIDIUM**





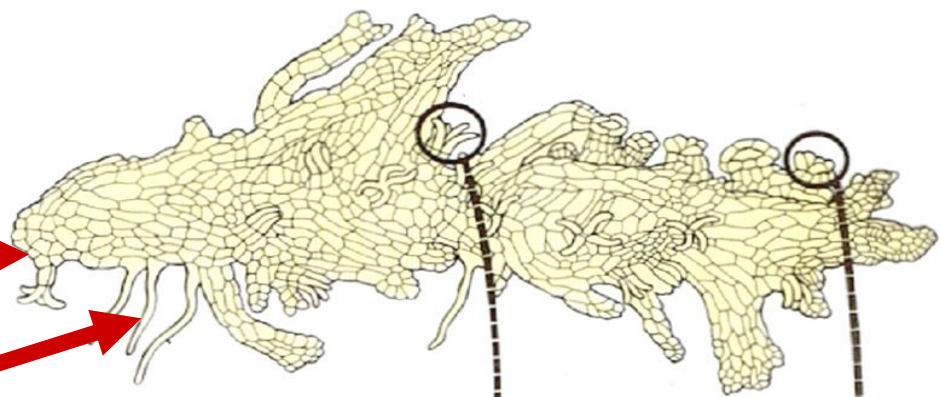


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**BISEXUAL**

[ ]



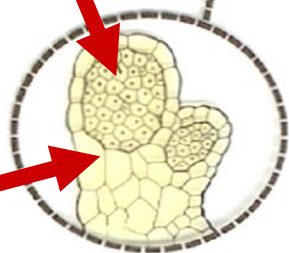
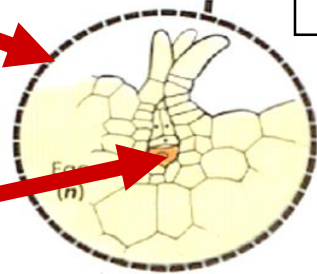
**ARCHEGONIA  
MATURE  
BEFORE  
ANTHERIDIA**

**ARCHEGONIUM**

[ ]

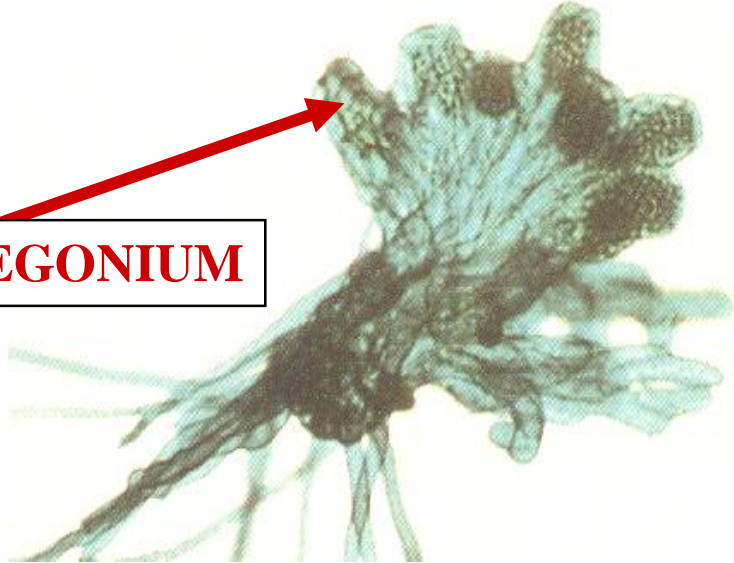
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**ANTHERIDIUM**



**ARCHEGONIA  
MATURE  
BEFORE  
ANTHERIDIA**

**ARCHEGONIUM**



**1<sup>ST</sup> GAMETOPHYTE**



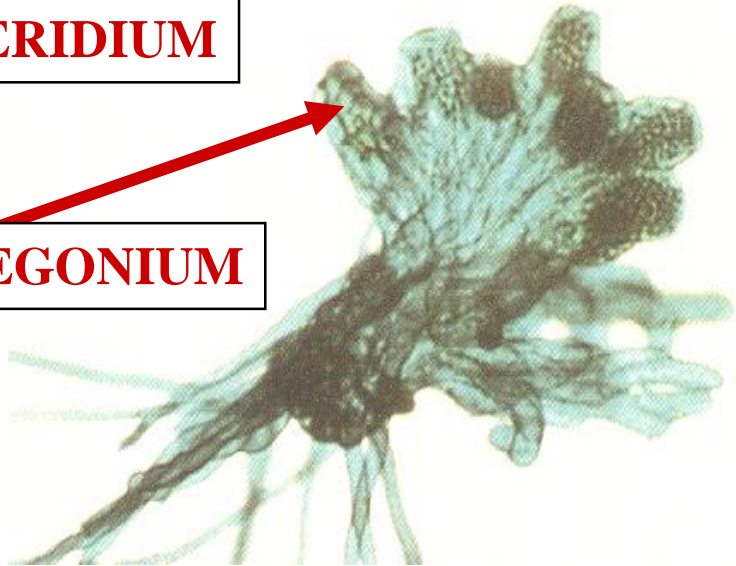
**ARCHEGONIA  
MATURE  
BEFORE  
ANTHERIDIA**

**← ANTHERIDIUM**

**→ ARCHEGONIUM**

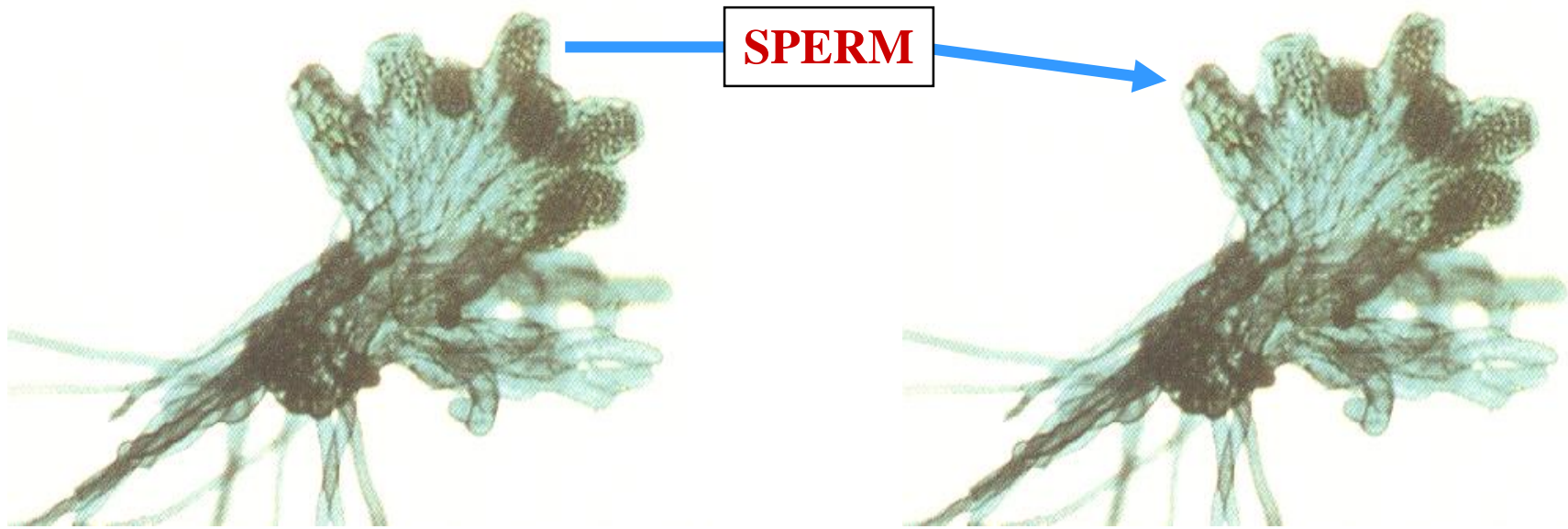


**2<sup>ND</sup> GAMETOPHYTE**



**1<sup>ST</sup> GAMETOPHYTE**

**ARCHEGONIA  
MATURE  
BEFORE  
ANTHERIDIA**

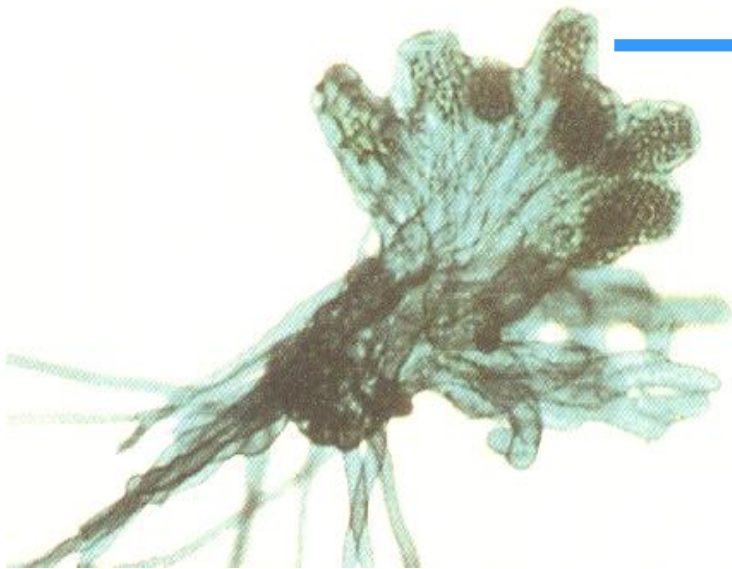


**2<sup>ND</sup> GAMETOPHYTE**

**1<sup>ST</sup> GAMETOPHYTE**

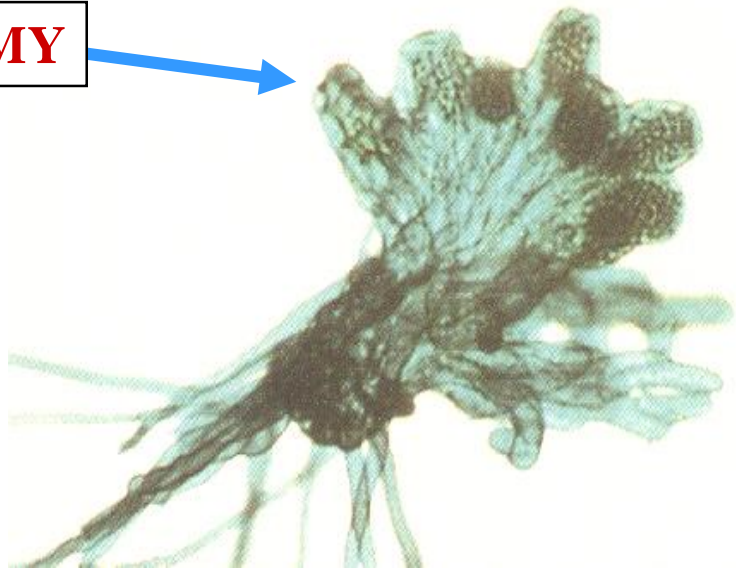


**ARCHEGONIA  
MATURE  
BEFORE  
ANTHERIDIA**



**2<sup>ND</sup> GAMETOPHYTE**

**SYNGAMY**



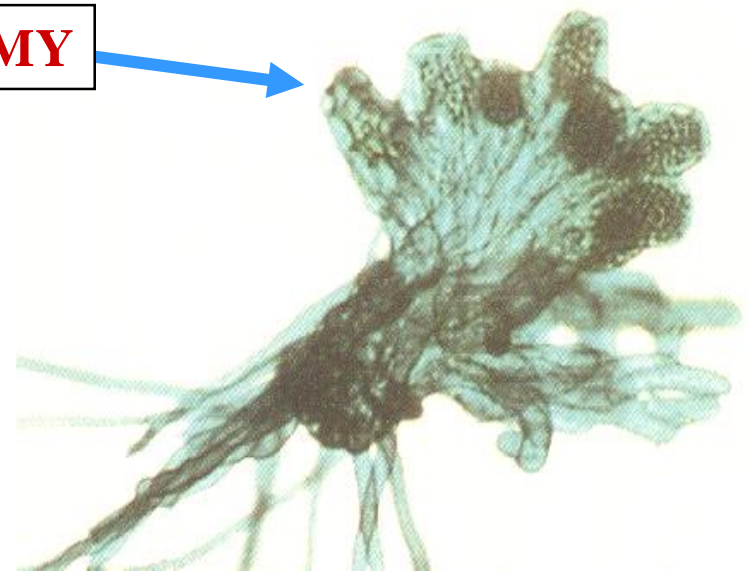
**1<sup>ST</sup> GAMETOPHYTE**

**ARCHEGONIA  
MATURE  
BEFORE  
ANTHERIDIA**



**2<sup>ND</sup> GAMETOPHYTE**

**SYNGAMY**

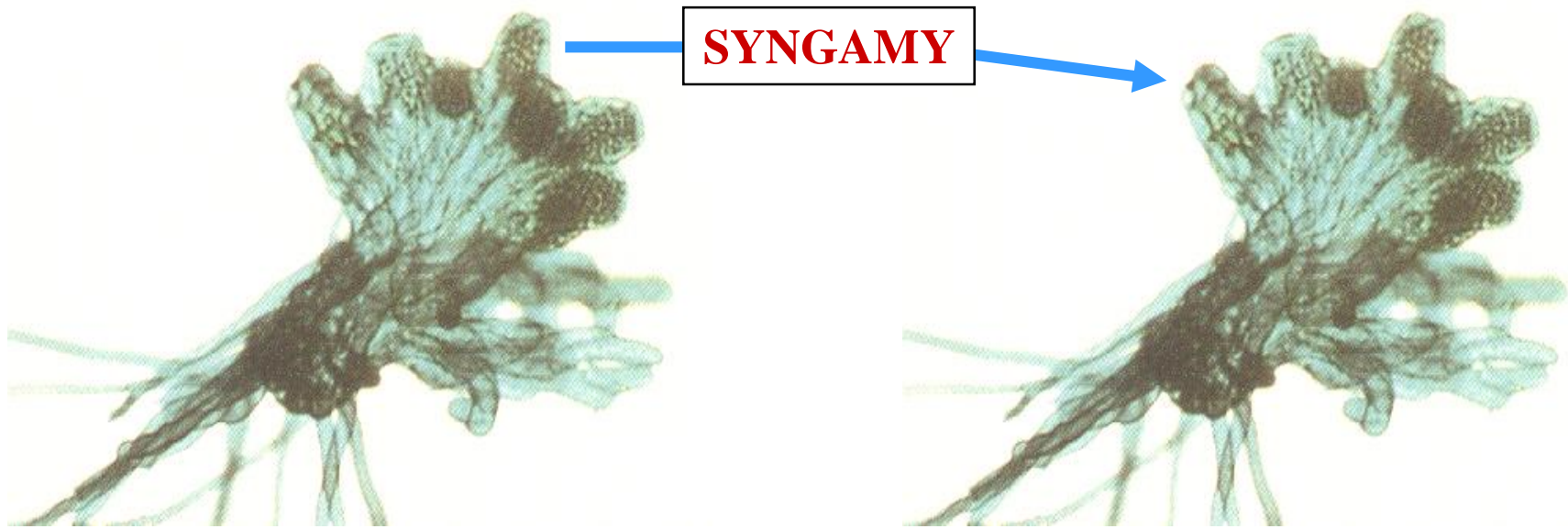


**1<sup>ST</sup> GAMETOPHYTE**

**GAMETANGIA MATURATION: DICHOTOMY**



**ARCHEGONIA  
MATURE  
BEFORE  
ANTHERIDIA**

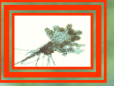


**2<sup>ND</sup> GAMETOPHYTE**

**1<sup>ST</sup> GAMETOPHYTE**

**GAMETANGIA MATURATION: DICHOTOMY  
ENSURES GAMETOPHYTE “OUT-CROSSING”**



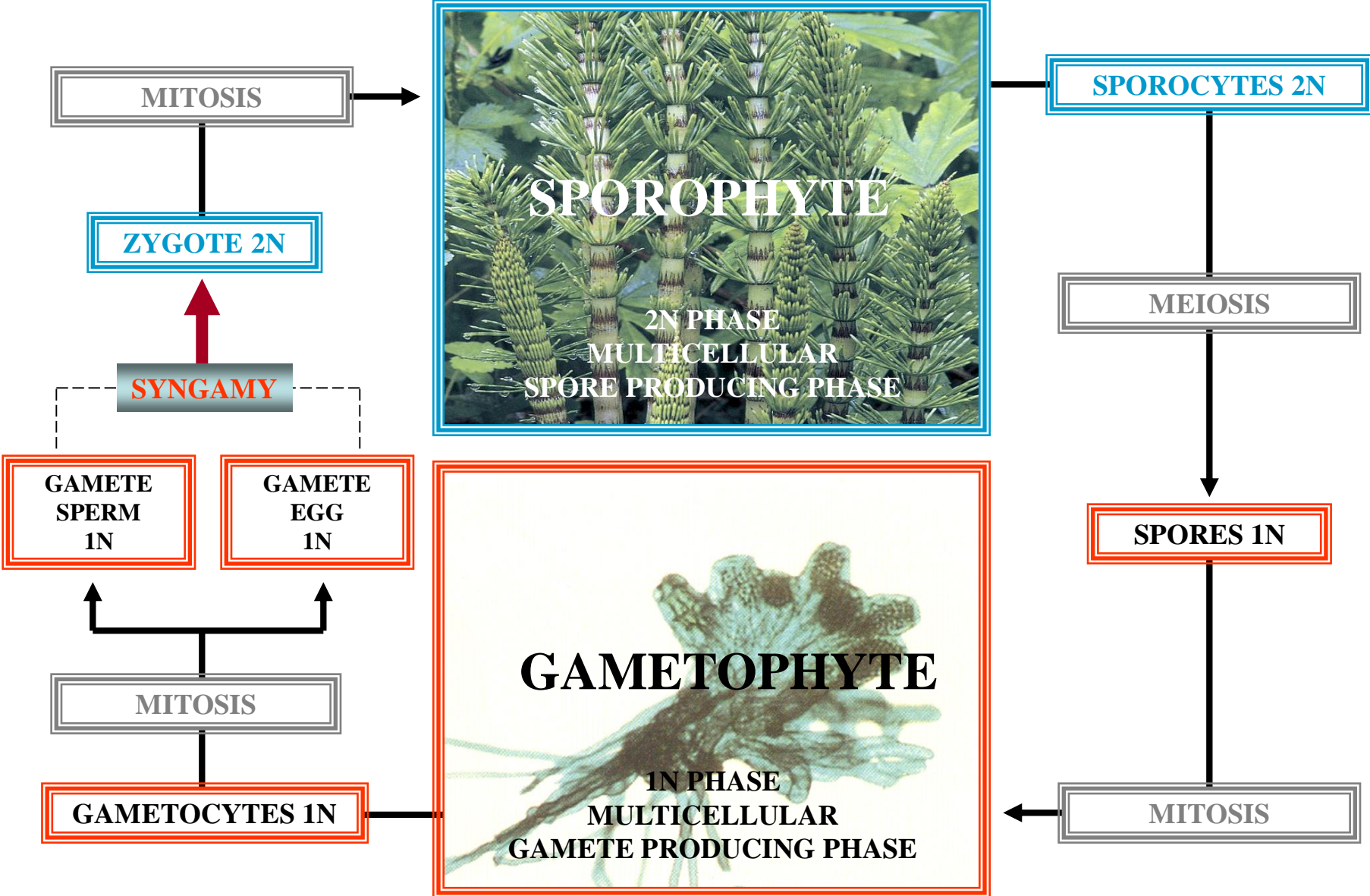


# ENSURES GENETIC DIVERSITY

*EQUISETUM*



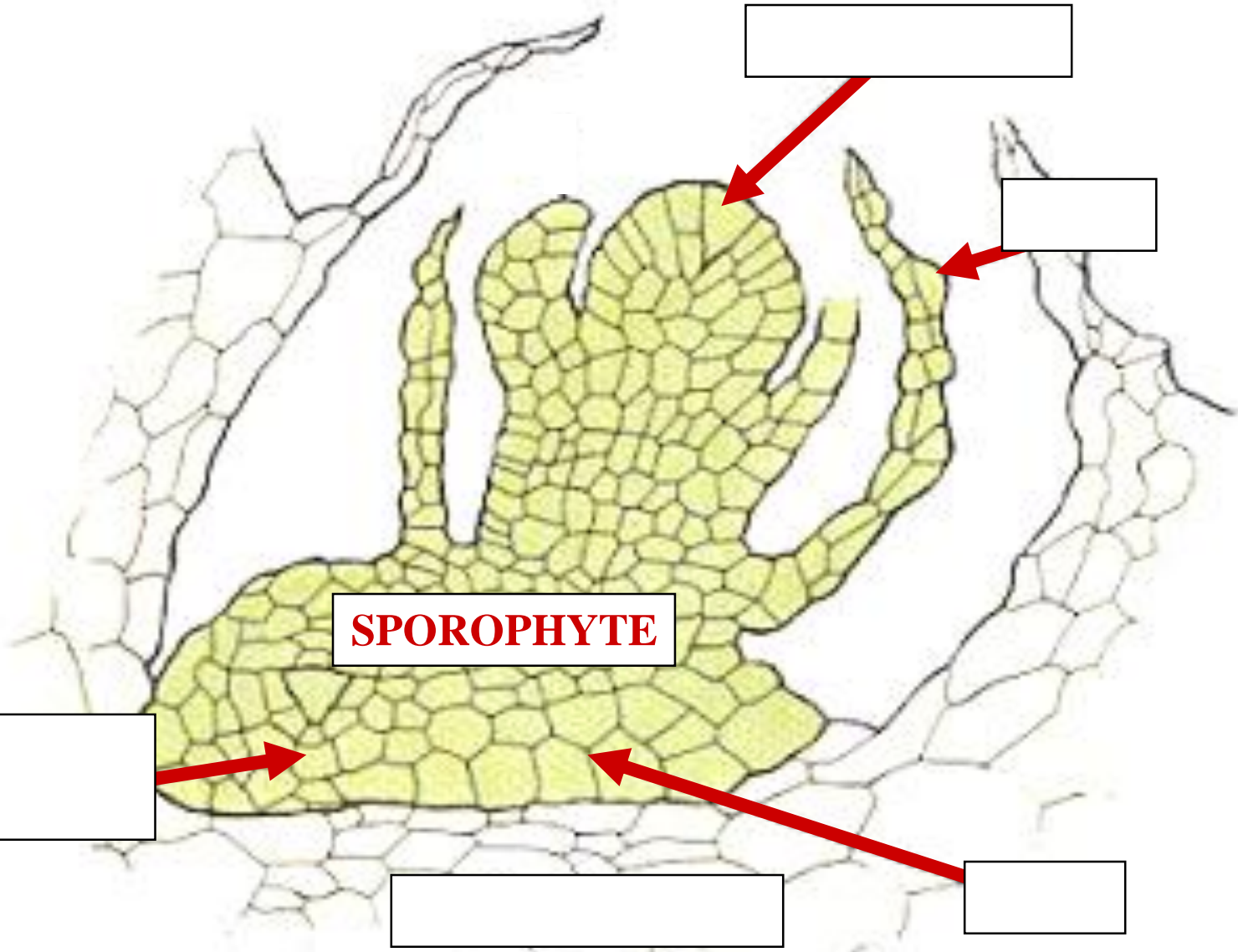
# EQUISETALES LIFE CYCLE



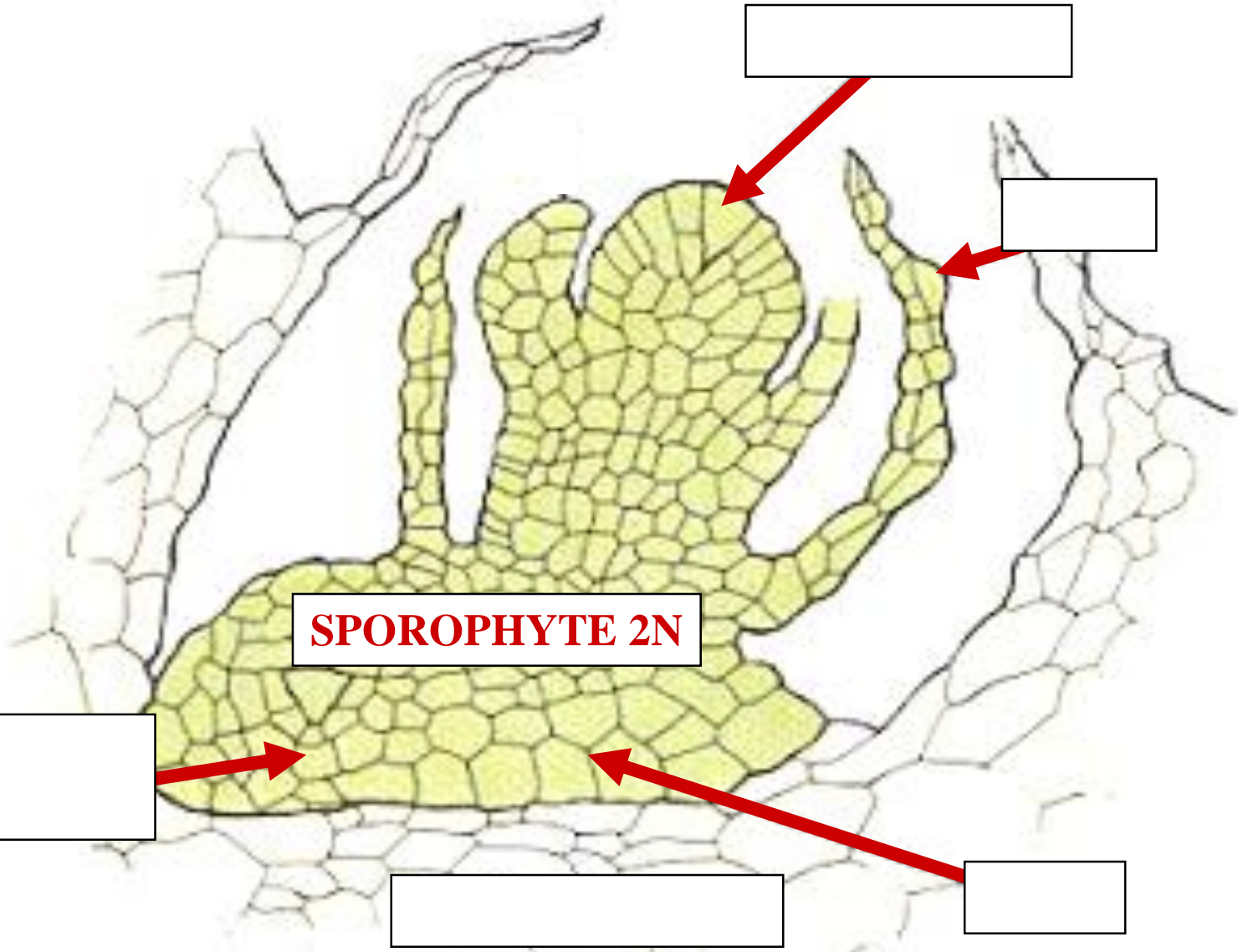


# REPRODUCTION

*EQUISETUM*  
**LIFE CYCLE**  
**PAGE 426**



**SPOROPHYTE**



**SPOROPHYTE 2N**

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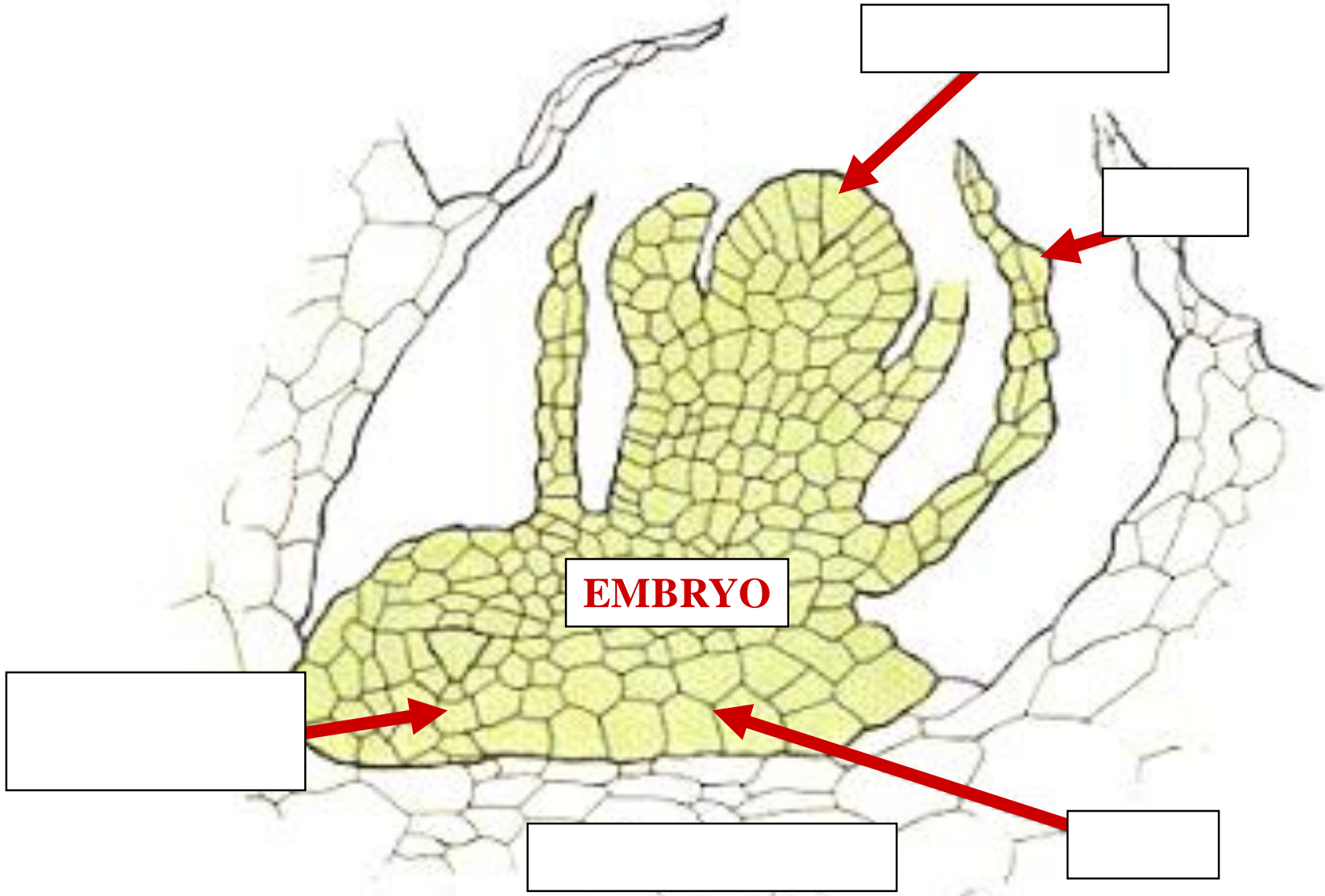
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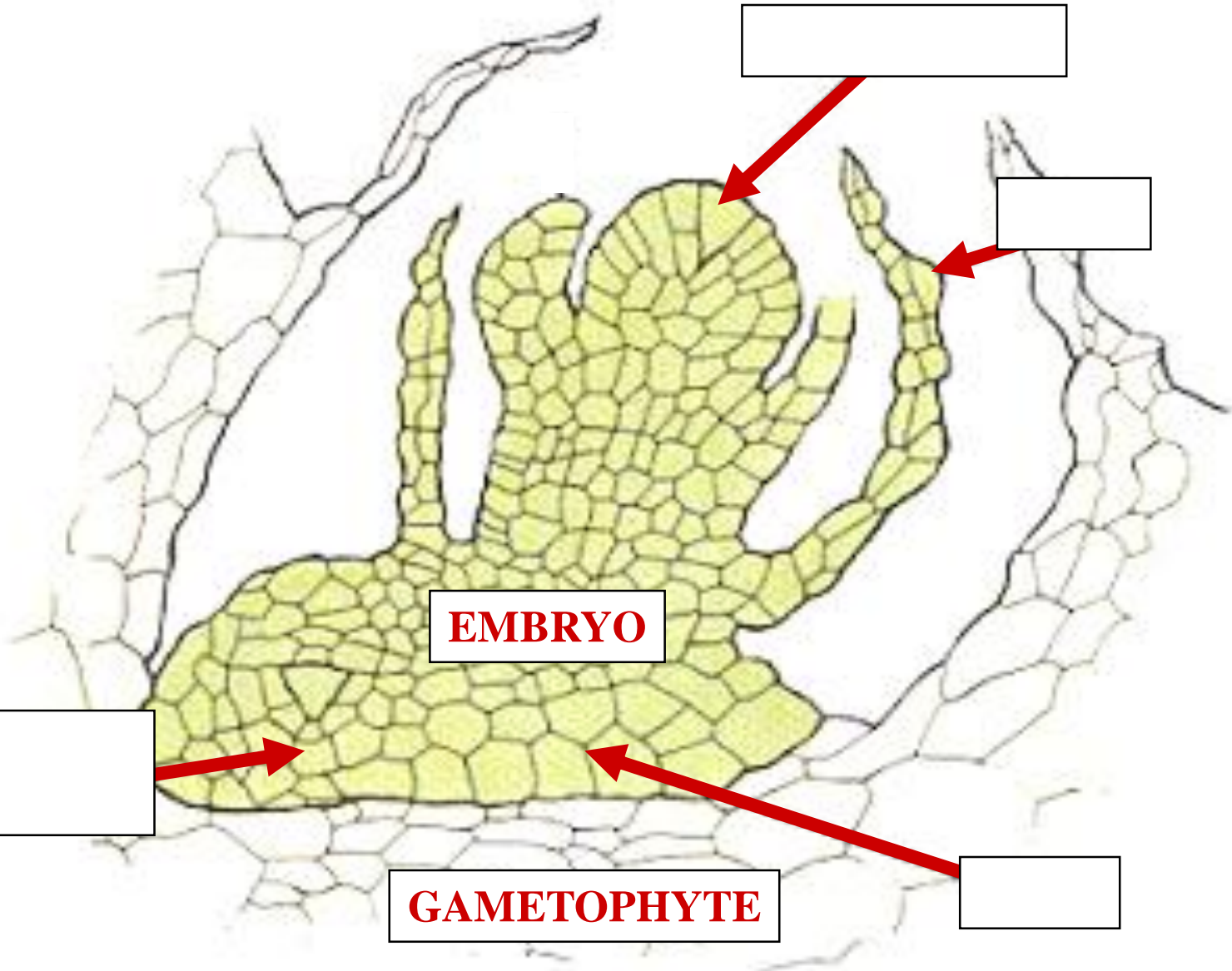
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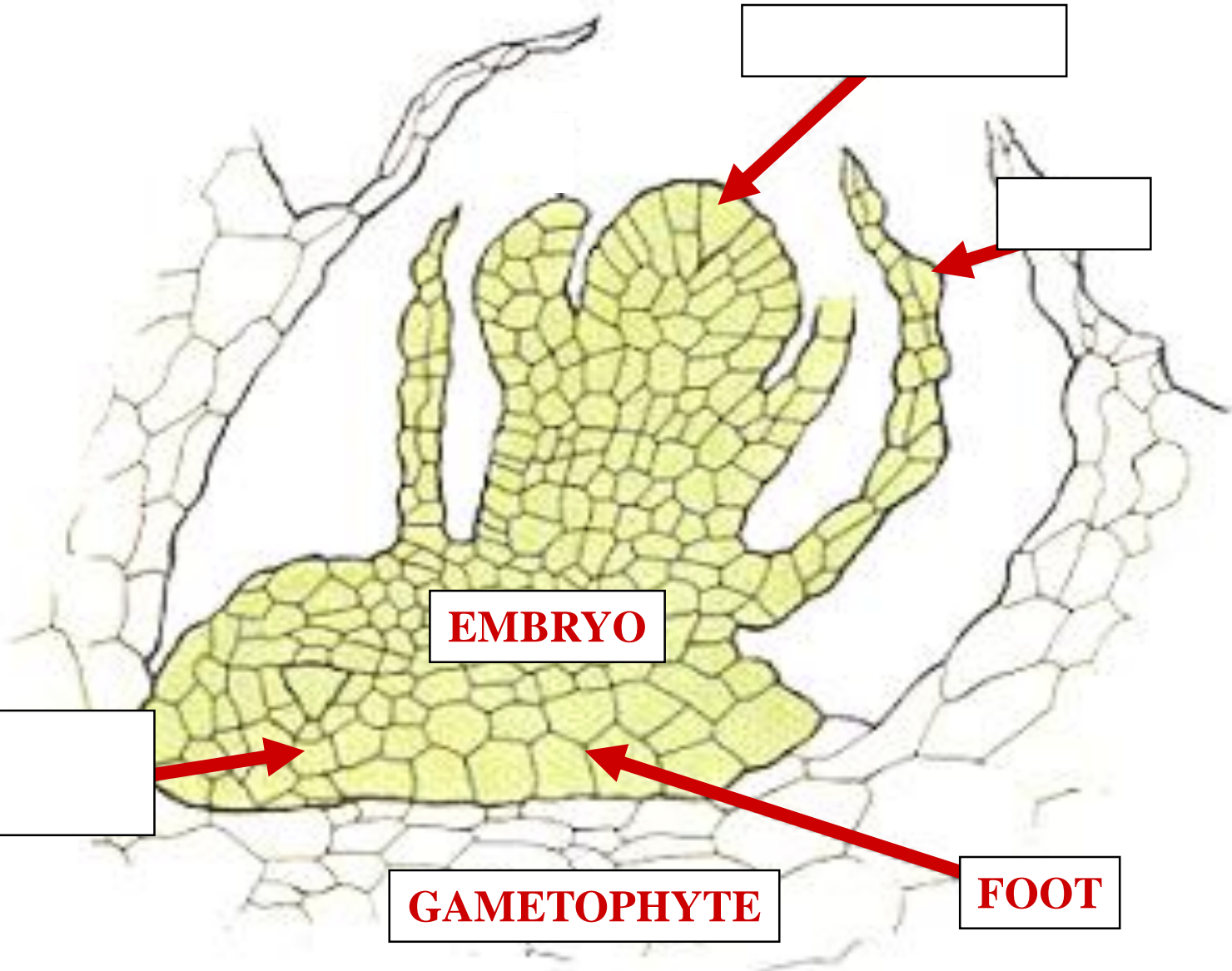


**EMBRYO**



**EMBRYO**

**GAMETOPHYTE**



**EMBRYO**

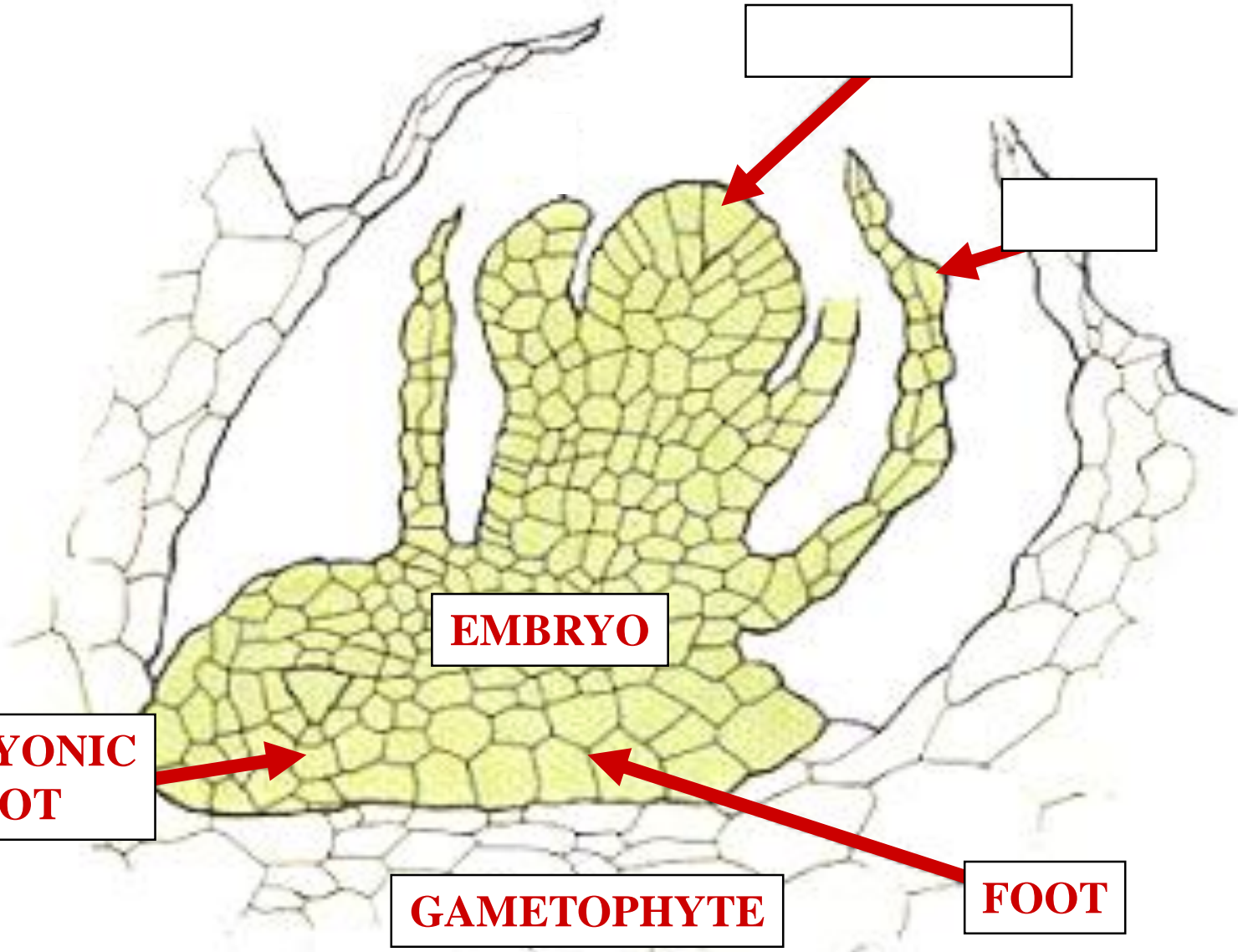
**GAMETOPHYTE**

**FOOT**

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**EMBRYO**

**EMBRYONIC  
ROOT**

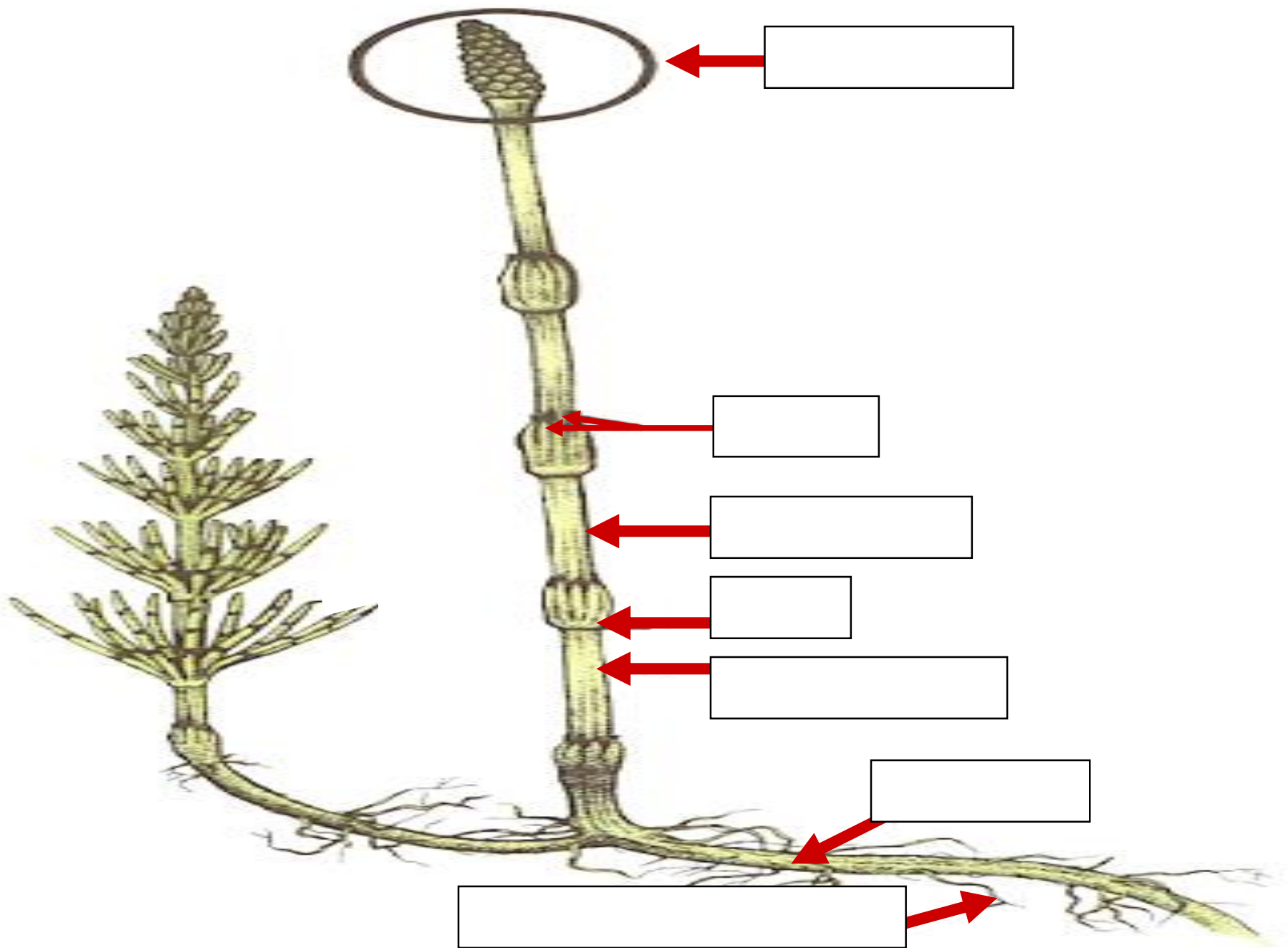
**GAMETOPHYTE**

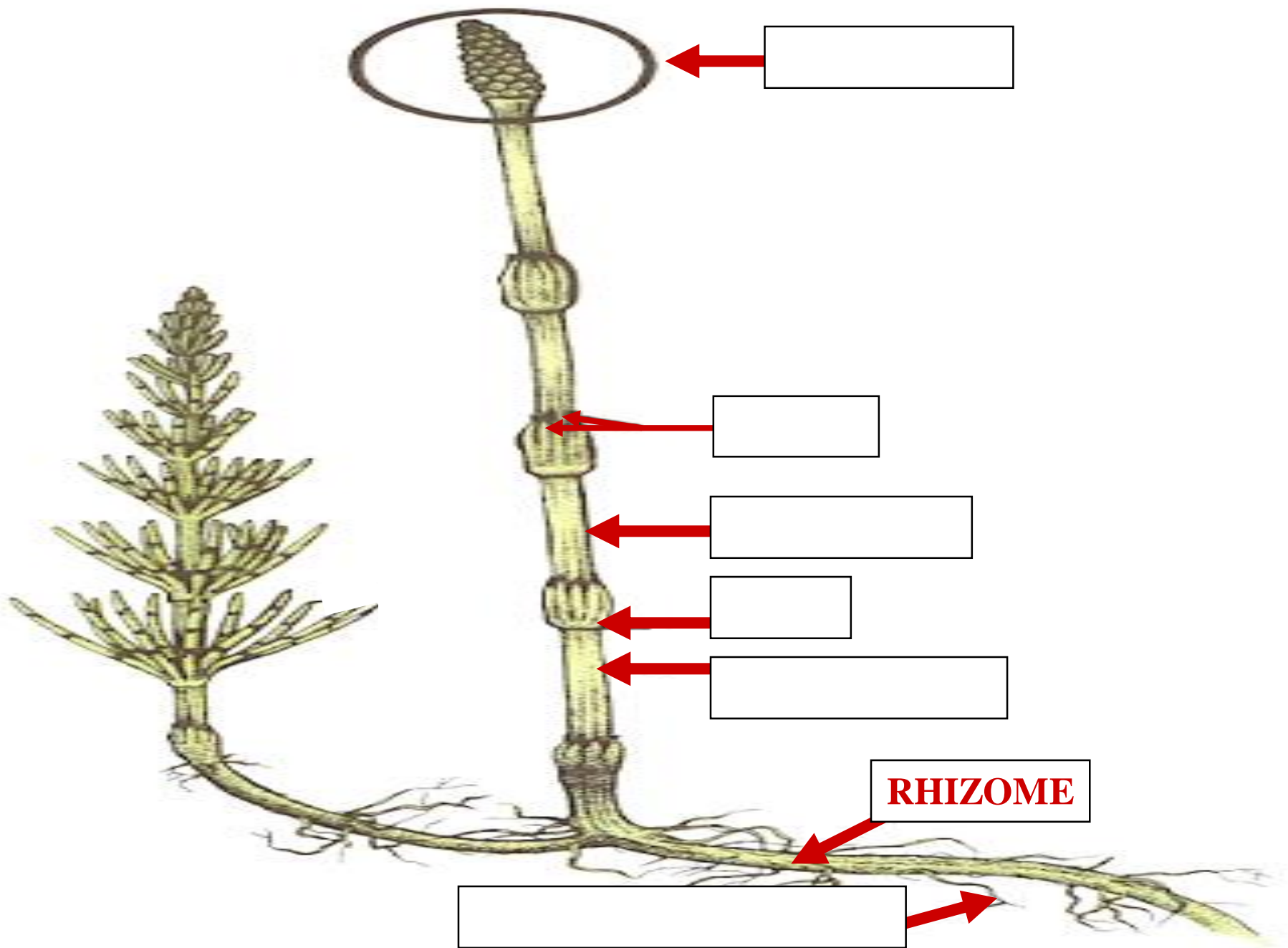
**FOOT**

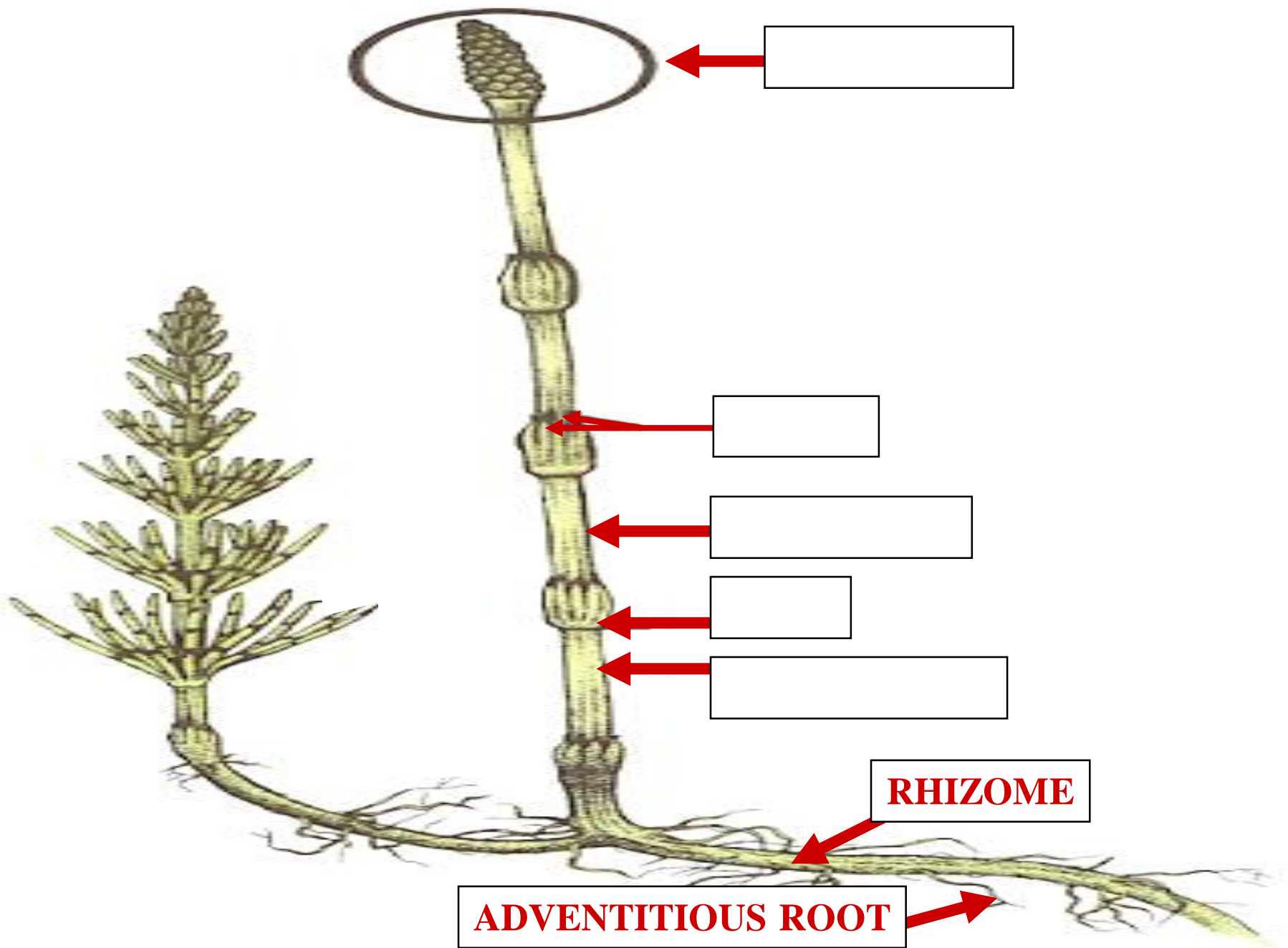
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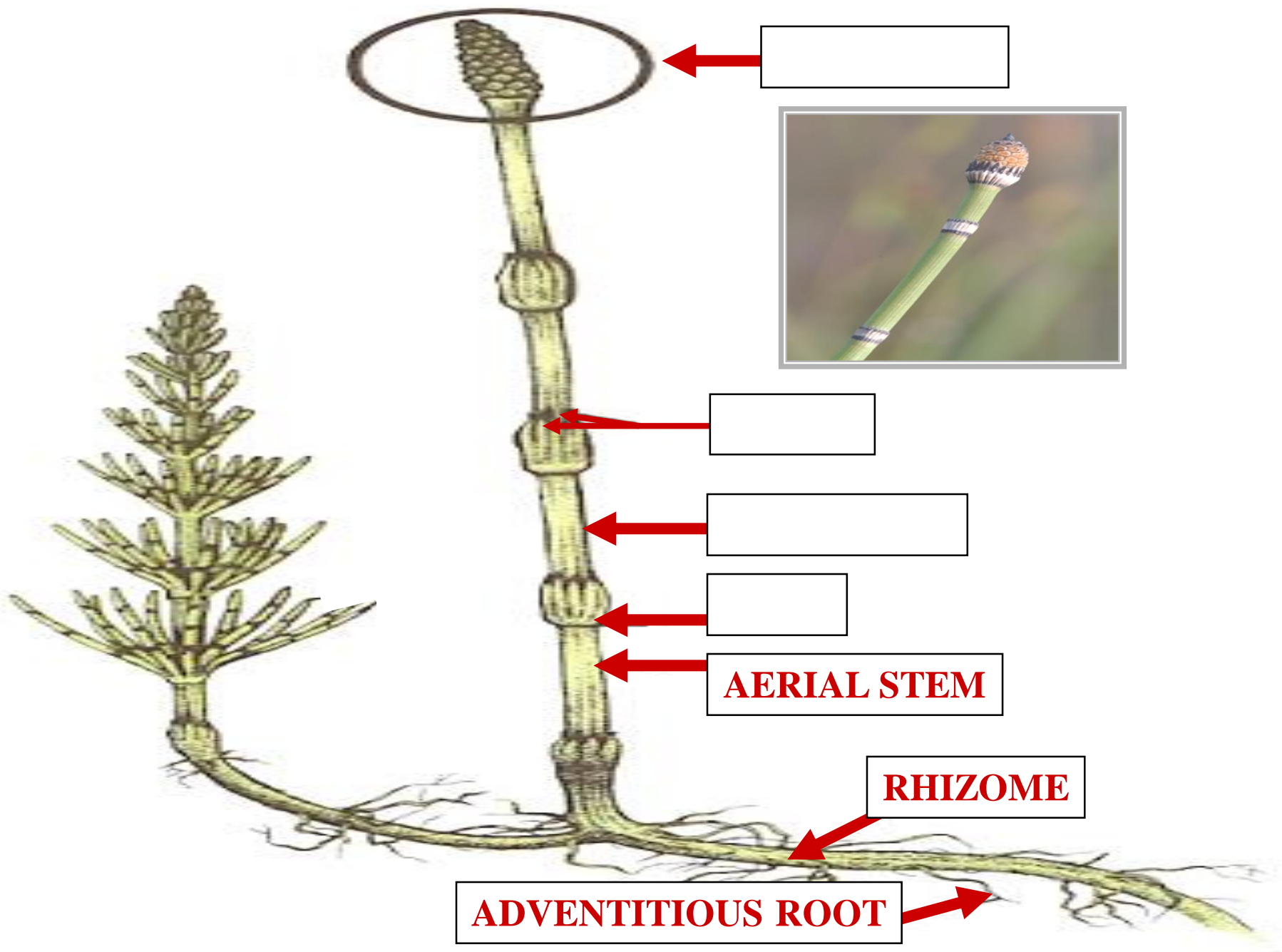






**RHIZOME**

**ADVENTITIOUS ROOT**



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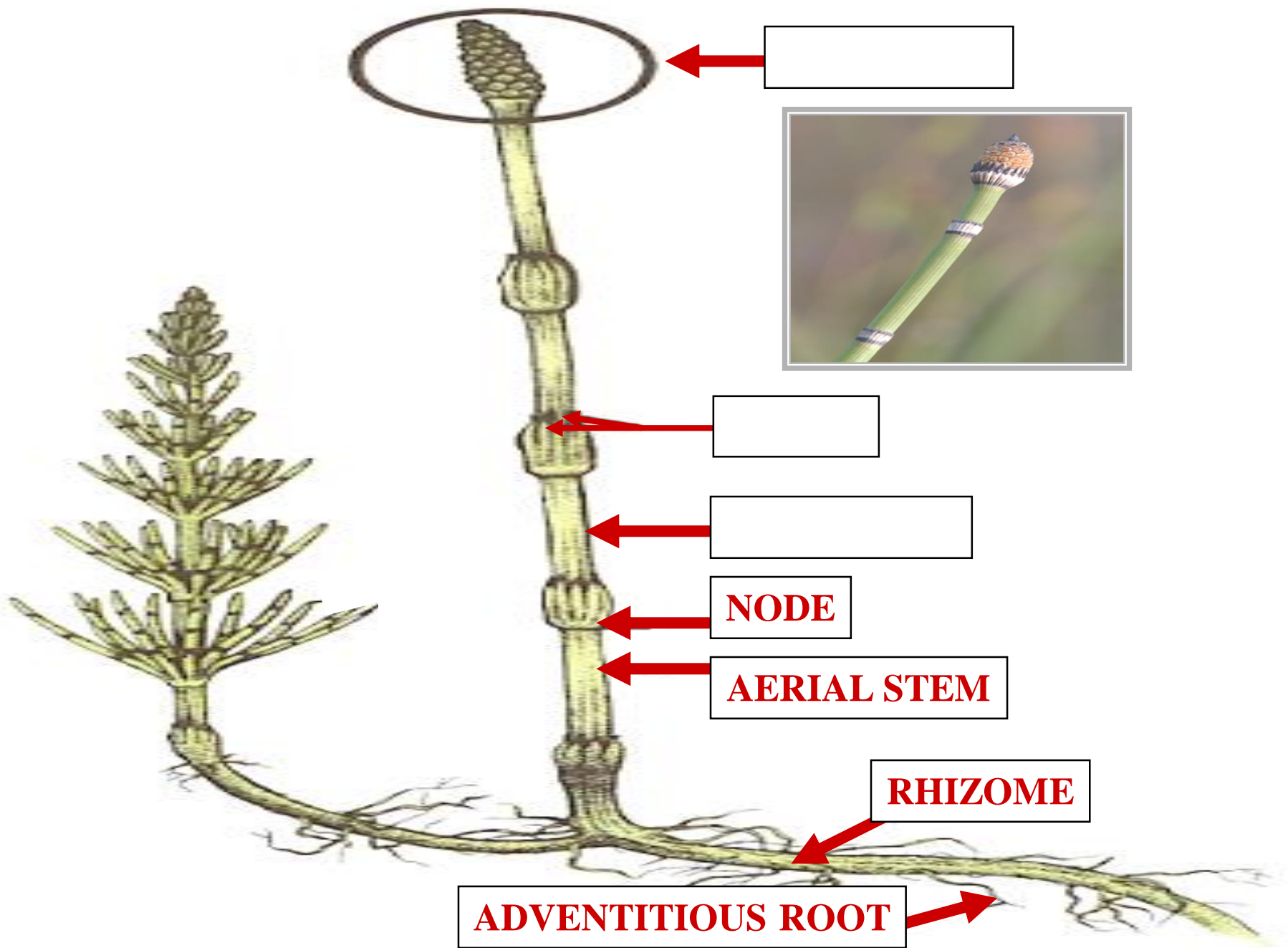
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**AERIAL STEM**

**RHIZOME**

**ADVENTITIOUS ROOT**





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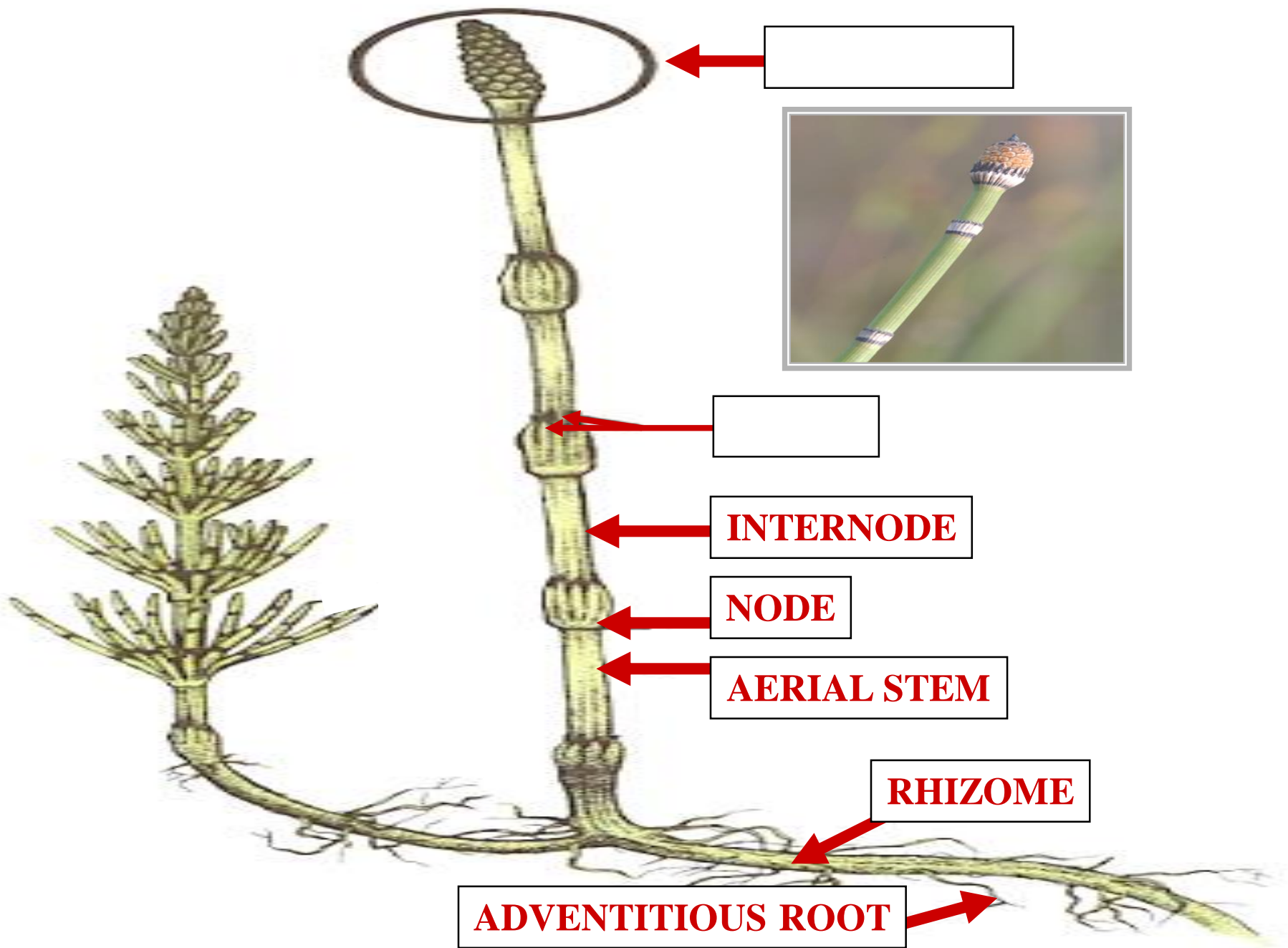
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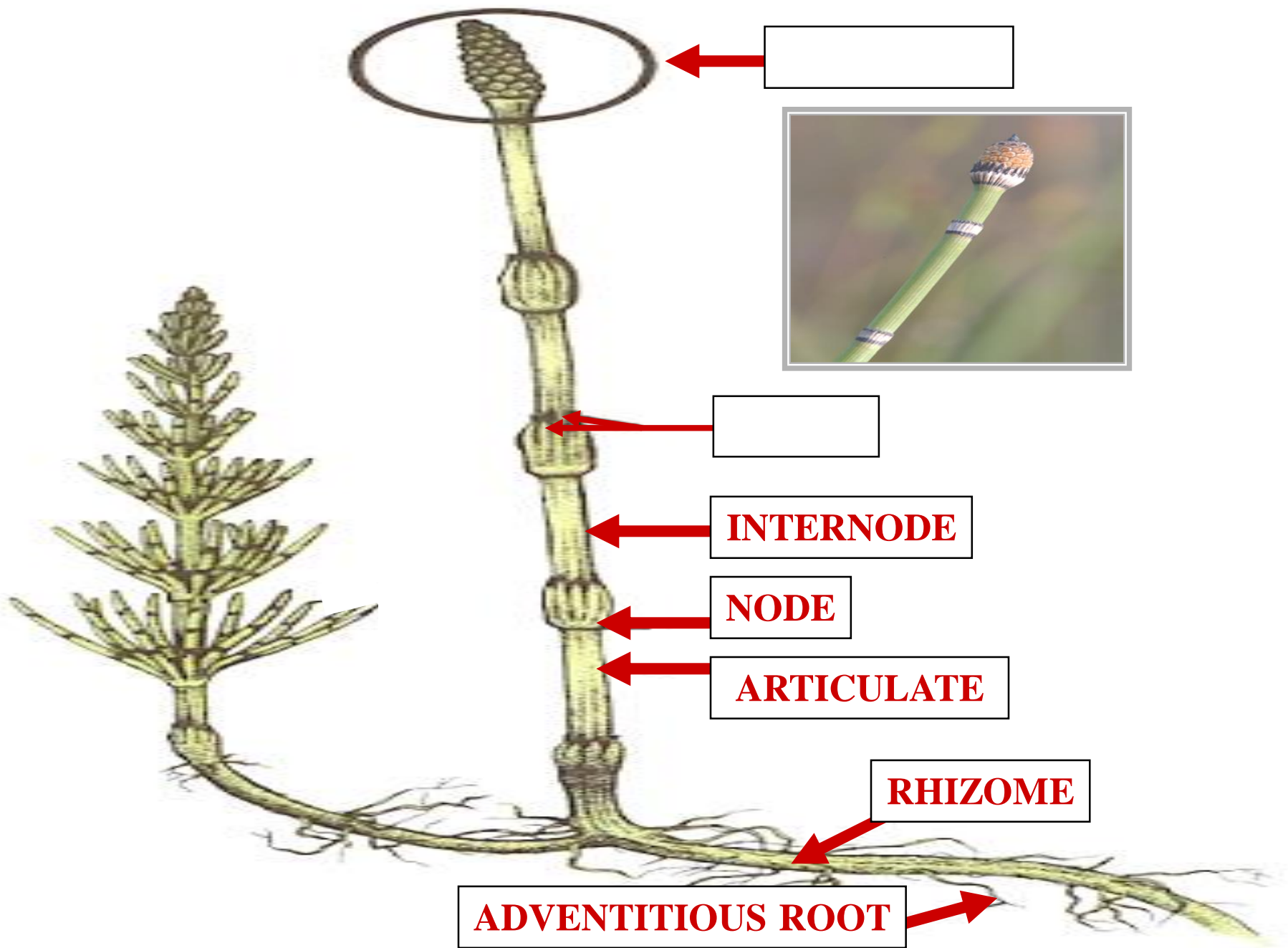
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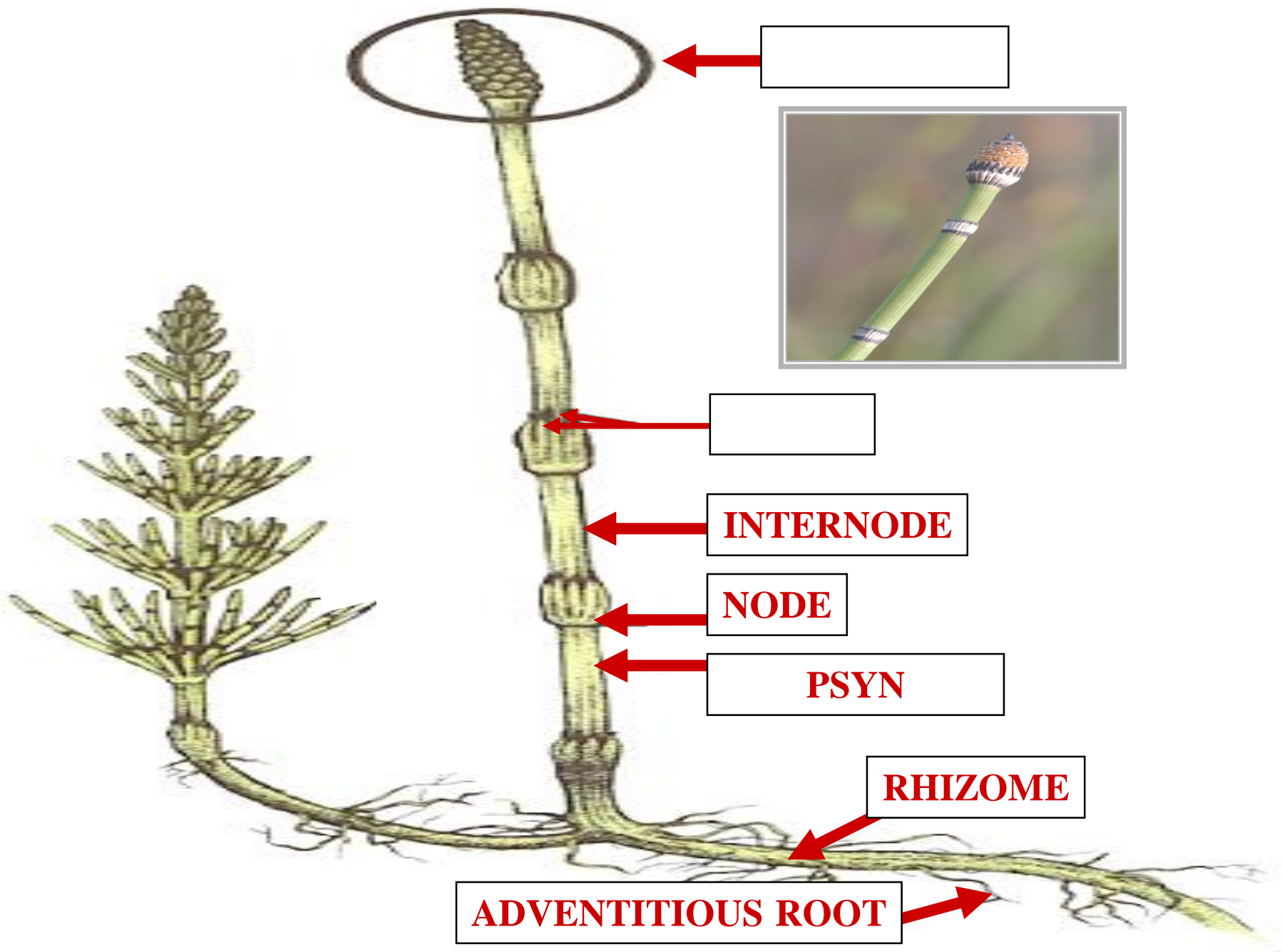
**AERIAL STEM**

**RHIZOME**

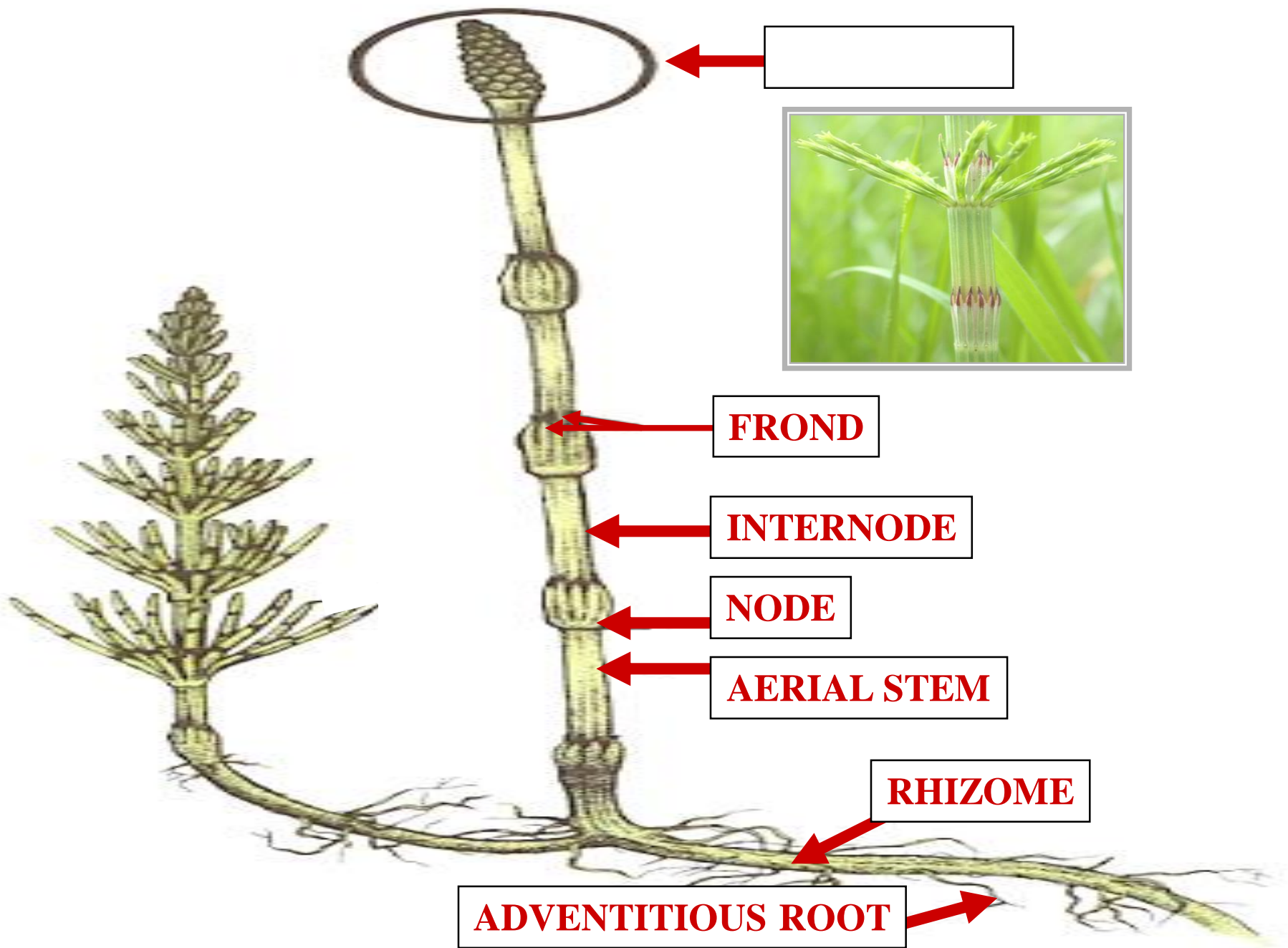
**ADVENTITIOUS ROOT**











**FROND**

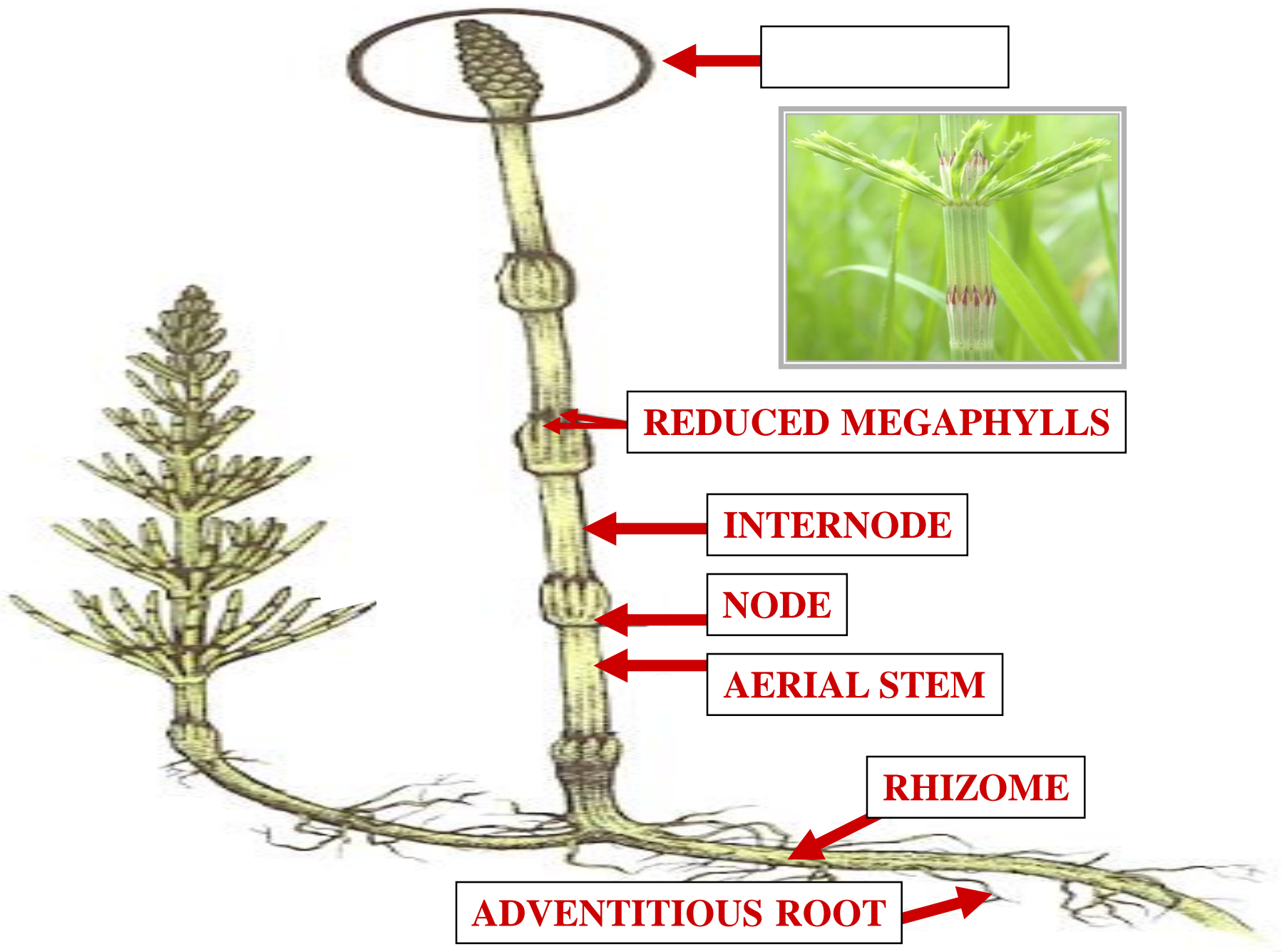
**INTERNODE**

**NODE**

**AERIAL STEM**

**RHIZOME**

**ADVENTITIOUS ROOT**



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**REDUCED MEGAPHYLLS**

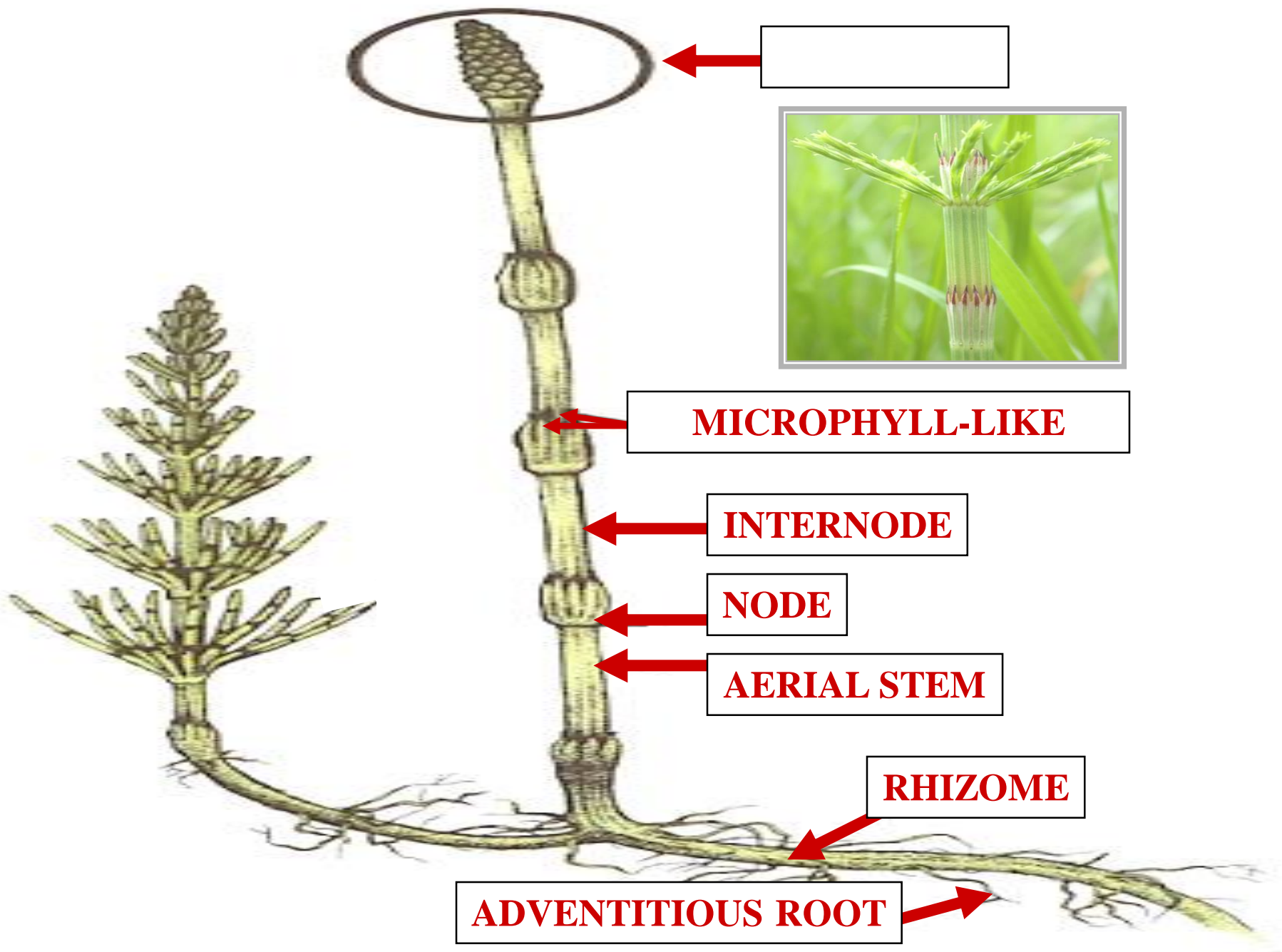
**INTERNODE**

**NODE**

**AERIAL STEM**

**RHIZOME**

**ADVENTITIOUS ROOT**



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**MICROPHYLL-LIKE**

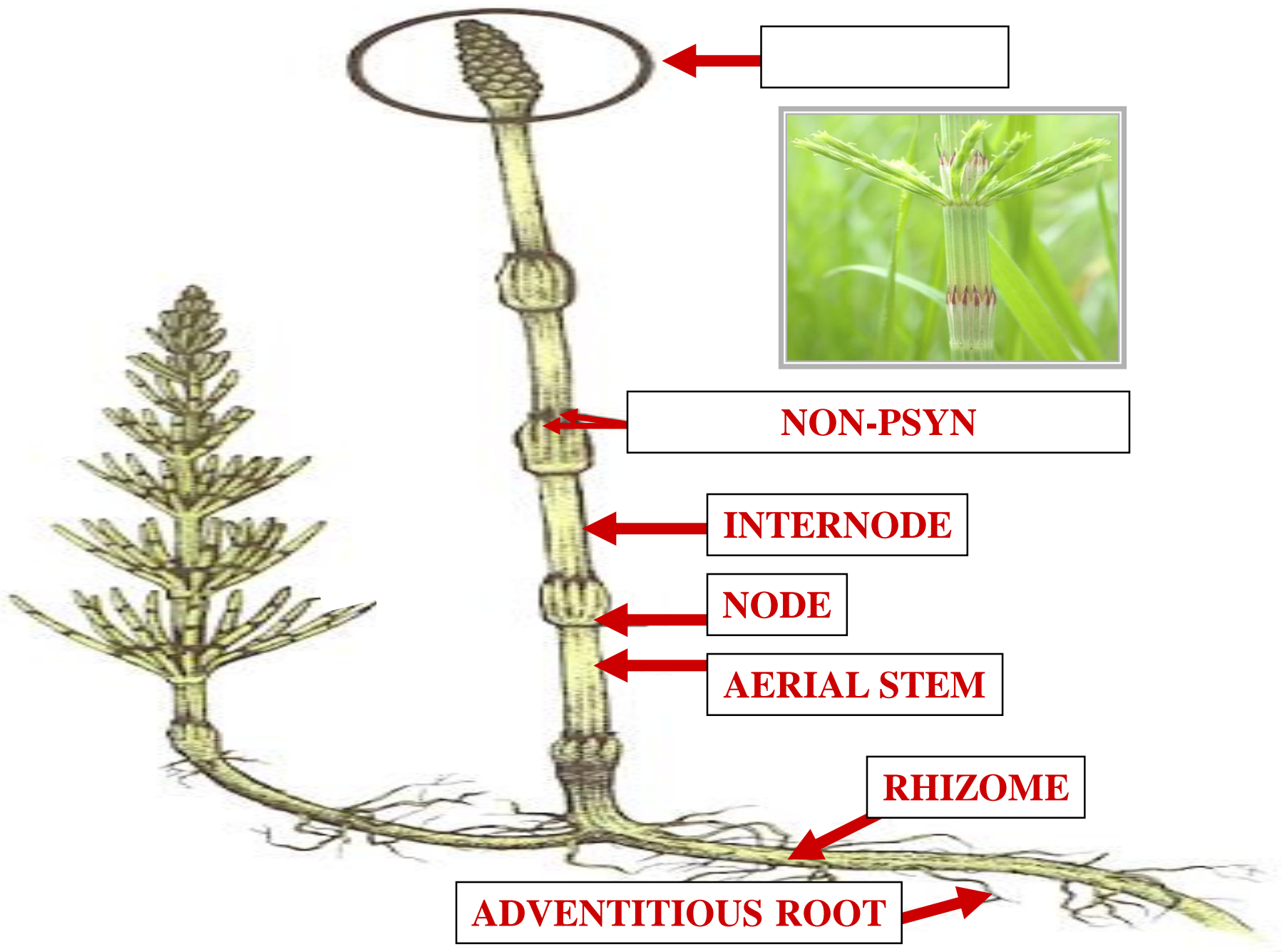
**INTERNODE**

**NODE**

**AERIAL STEM**

**RHIZOME**

**ADVENTITIOUS ROOT**



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**NON-PSYN**

**INTERNODE**

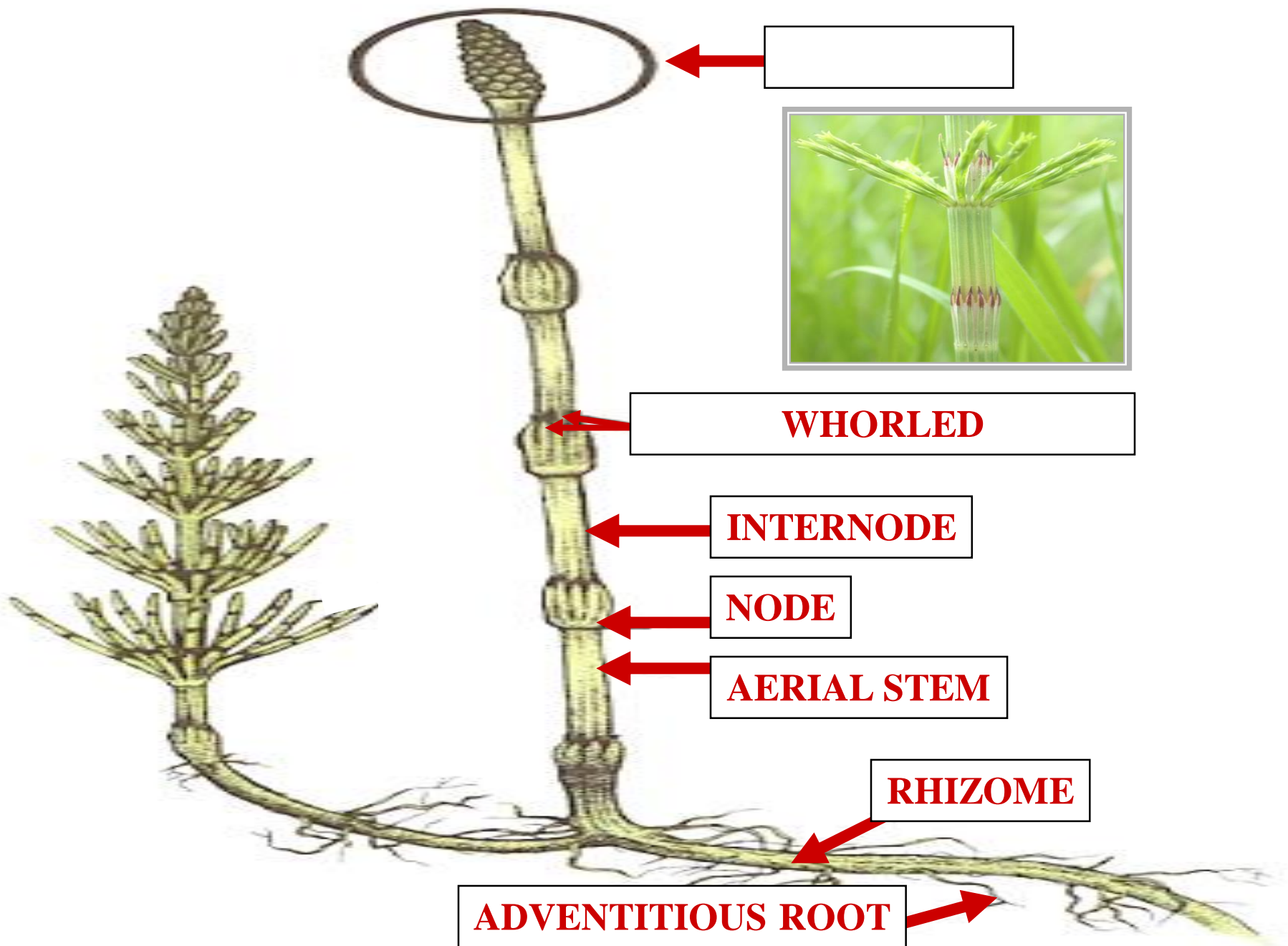
**NODE**

**AERIAL STEM**

**RHIZOME**

**ADVENTITIOUS ROOT**





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**WHORLED**

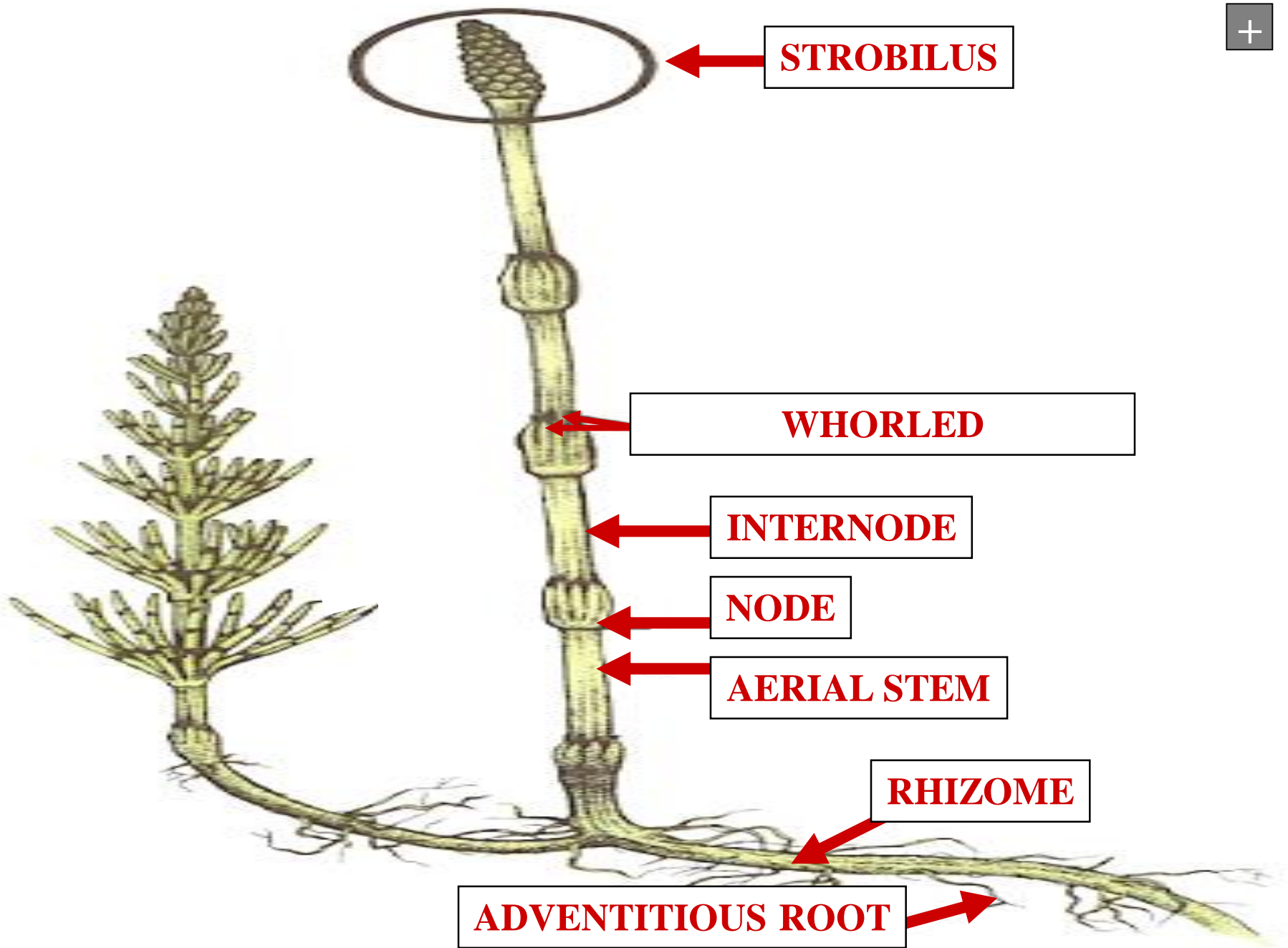
**INTERNODE**

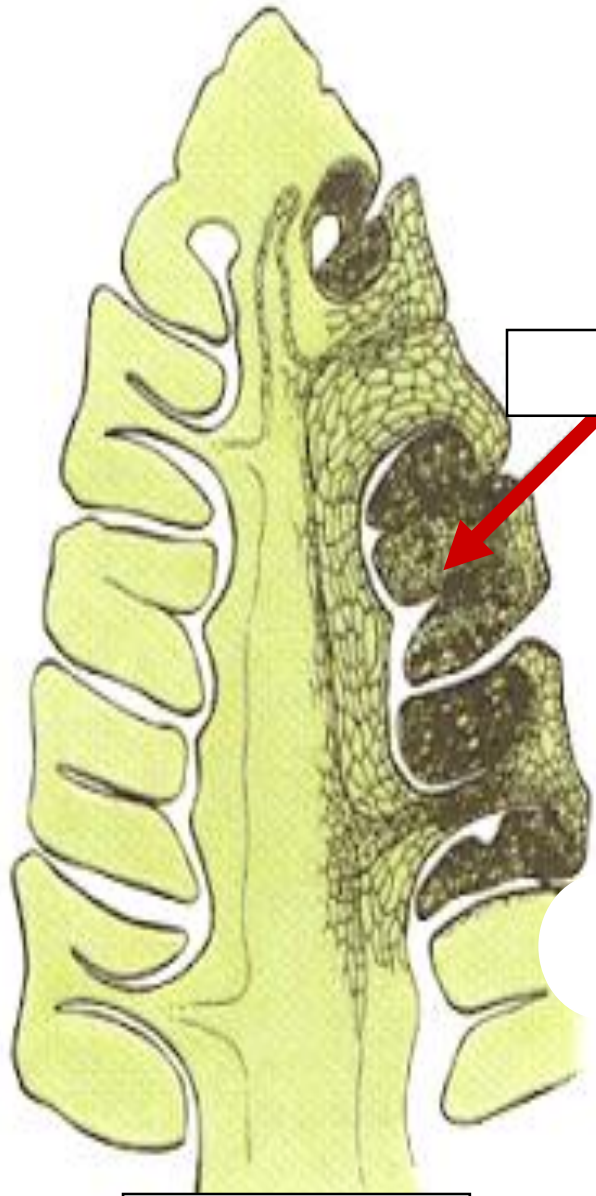
**NODE**

**AERIAL STEM**

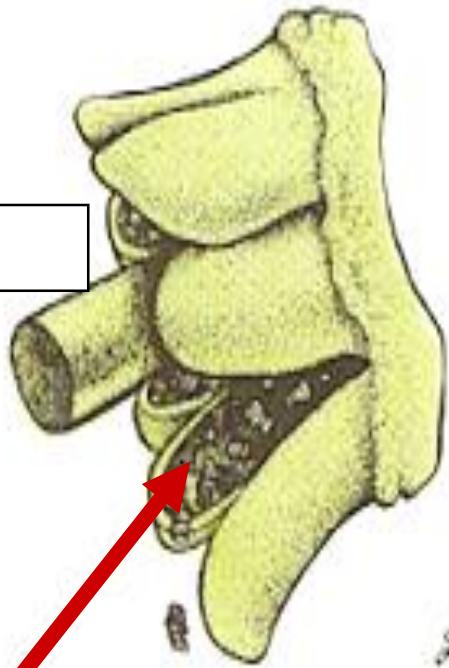
**RHIZOME**

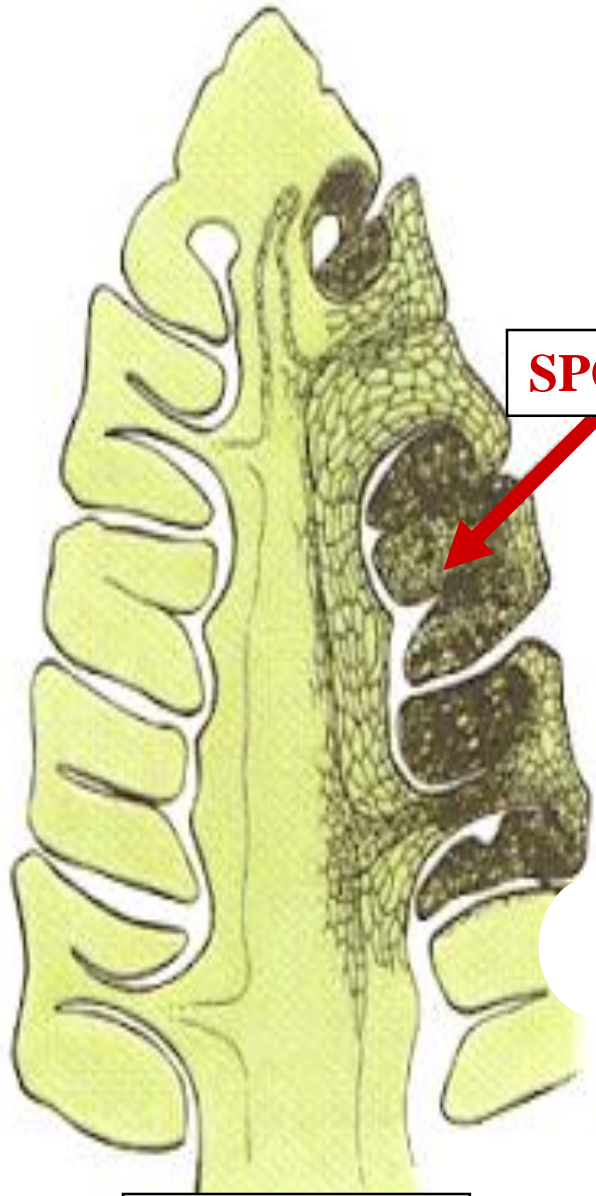
**ADVENTITIOUS ROOT**





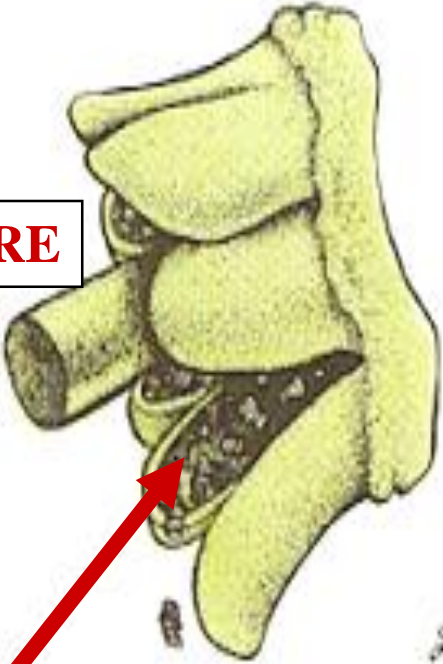
**STROBILUS**



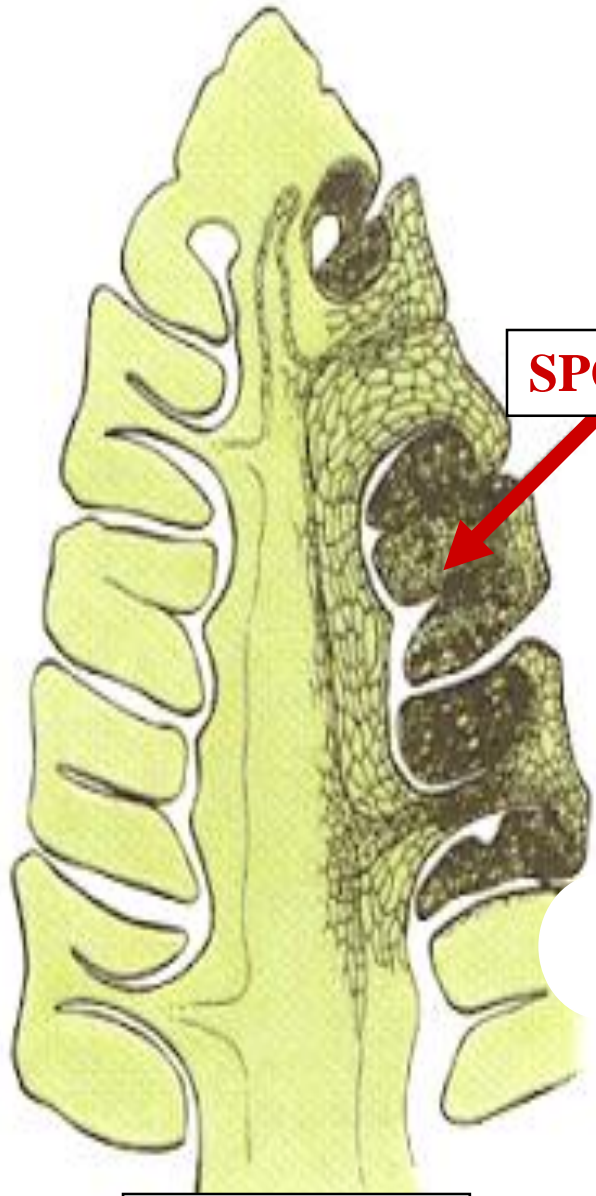


**STROBILUS**

**SPORANGIOPHORE**

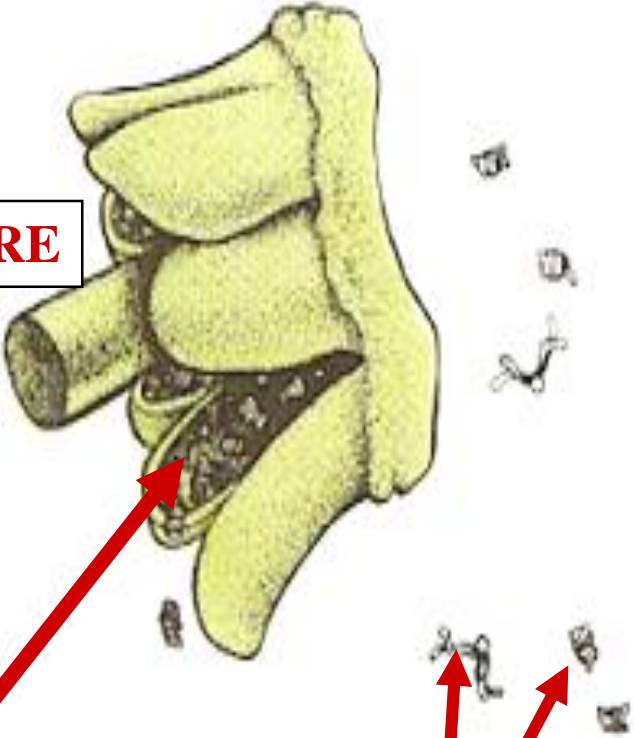




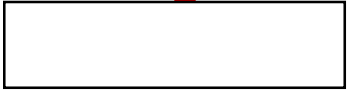


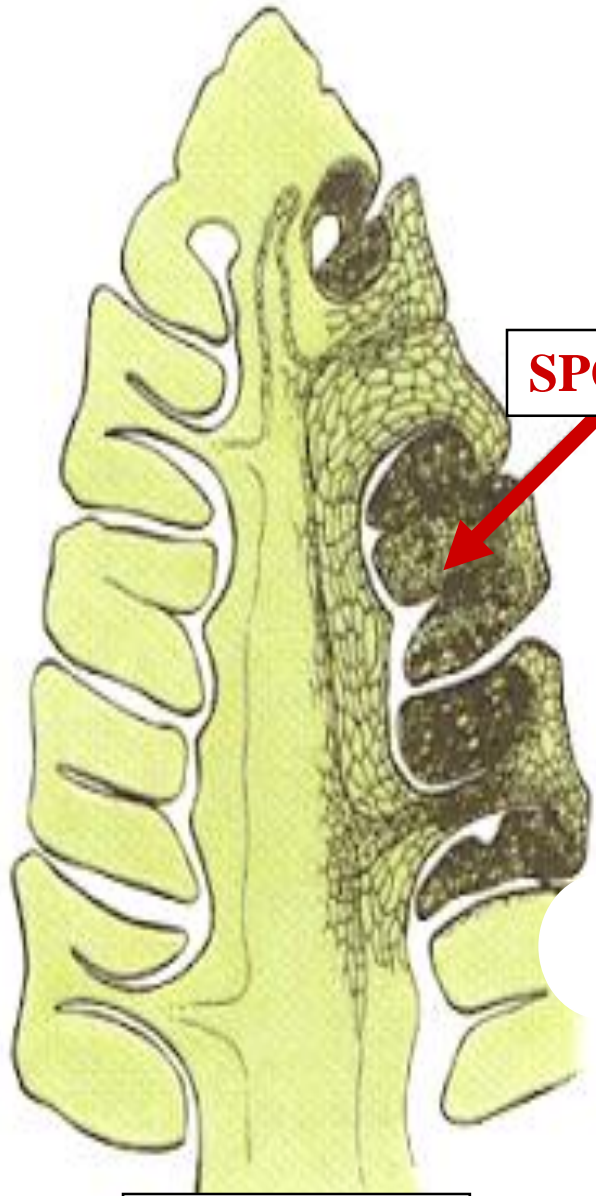
**STROBILUS**

**SPORANGIOPHORE**



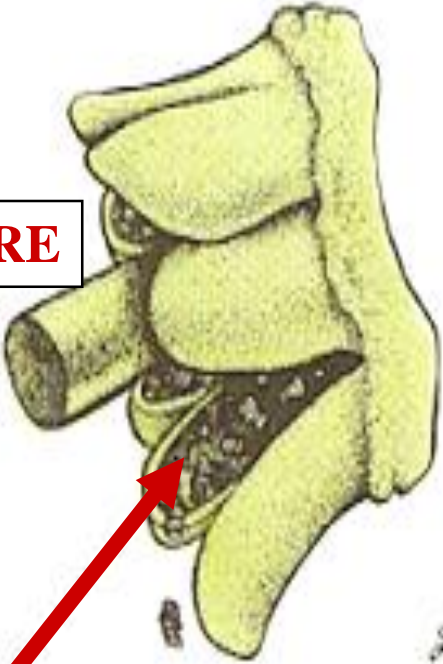
**EUSPORANGIUM**





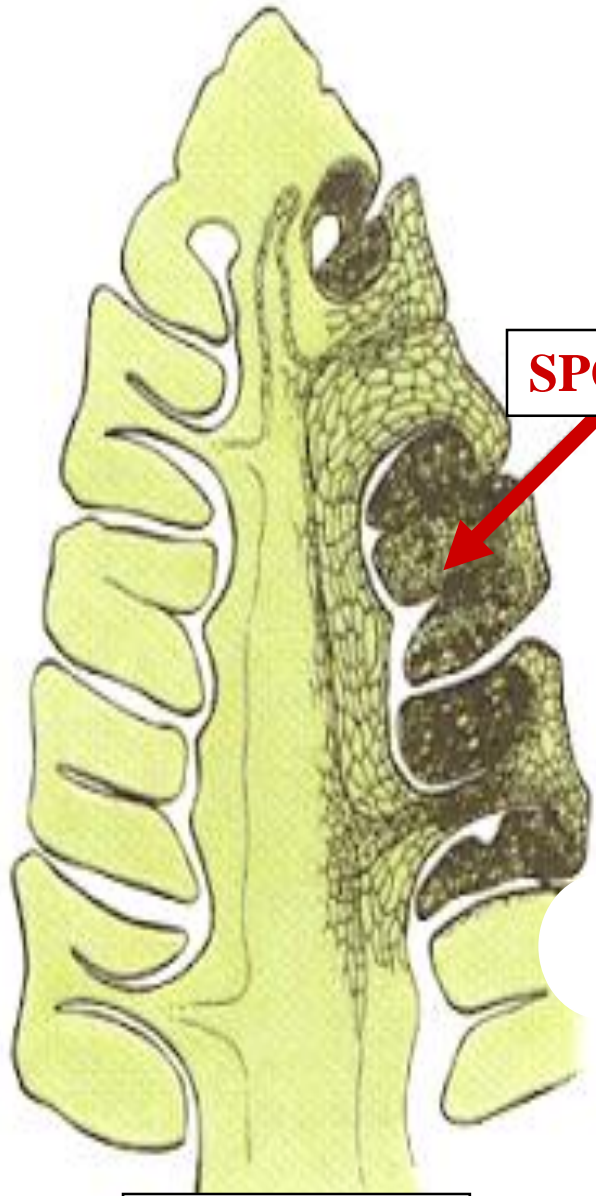
**STROBILUS**

**SPORANGIOPHORE**



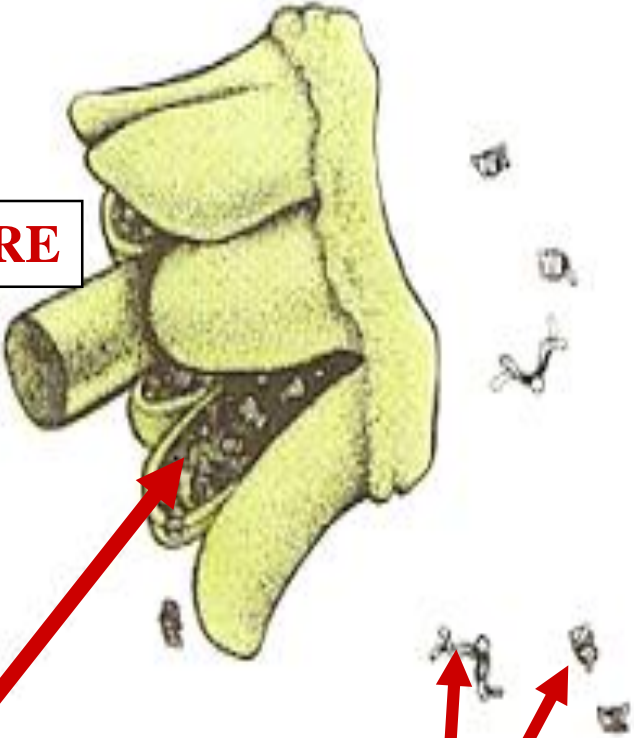
**CAULINE**





**STROBILUS**

**SPORANGIOPHORE**



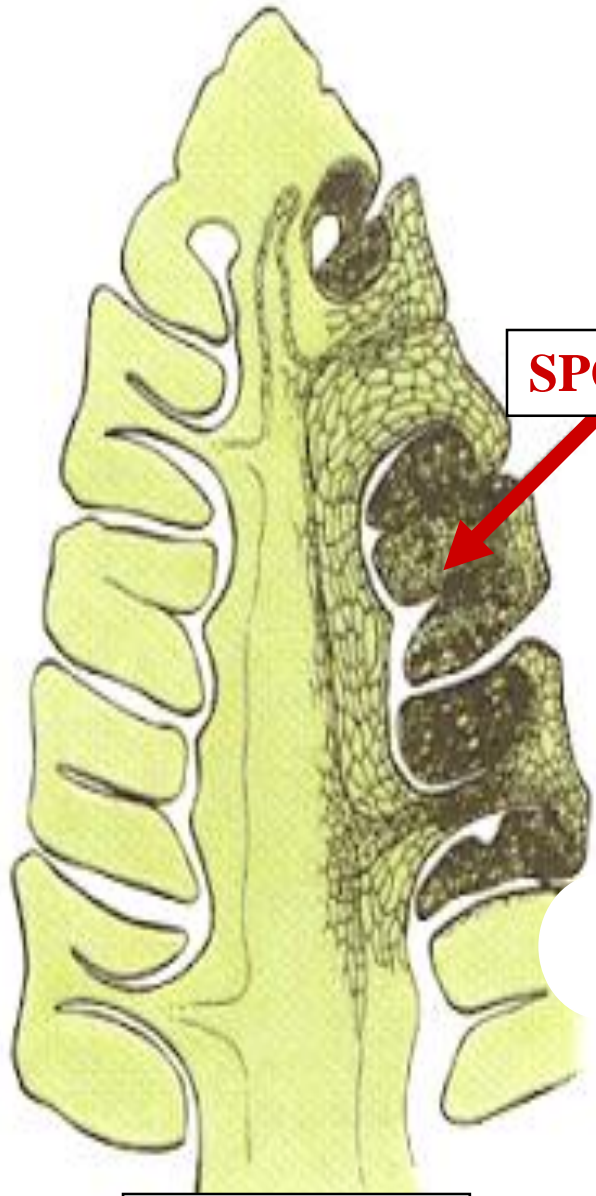
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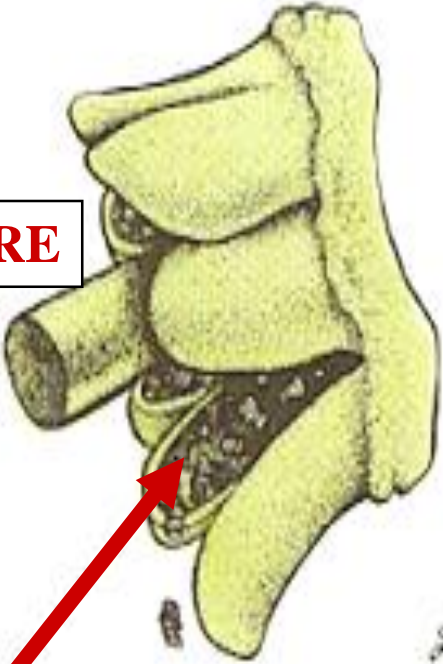






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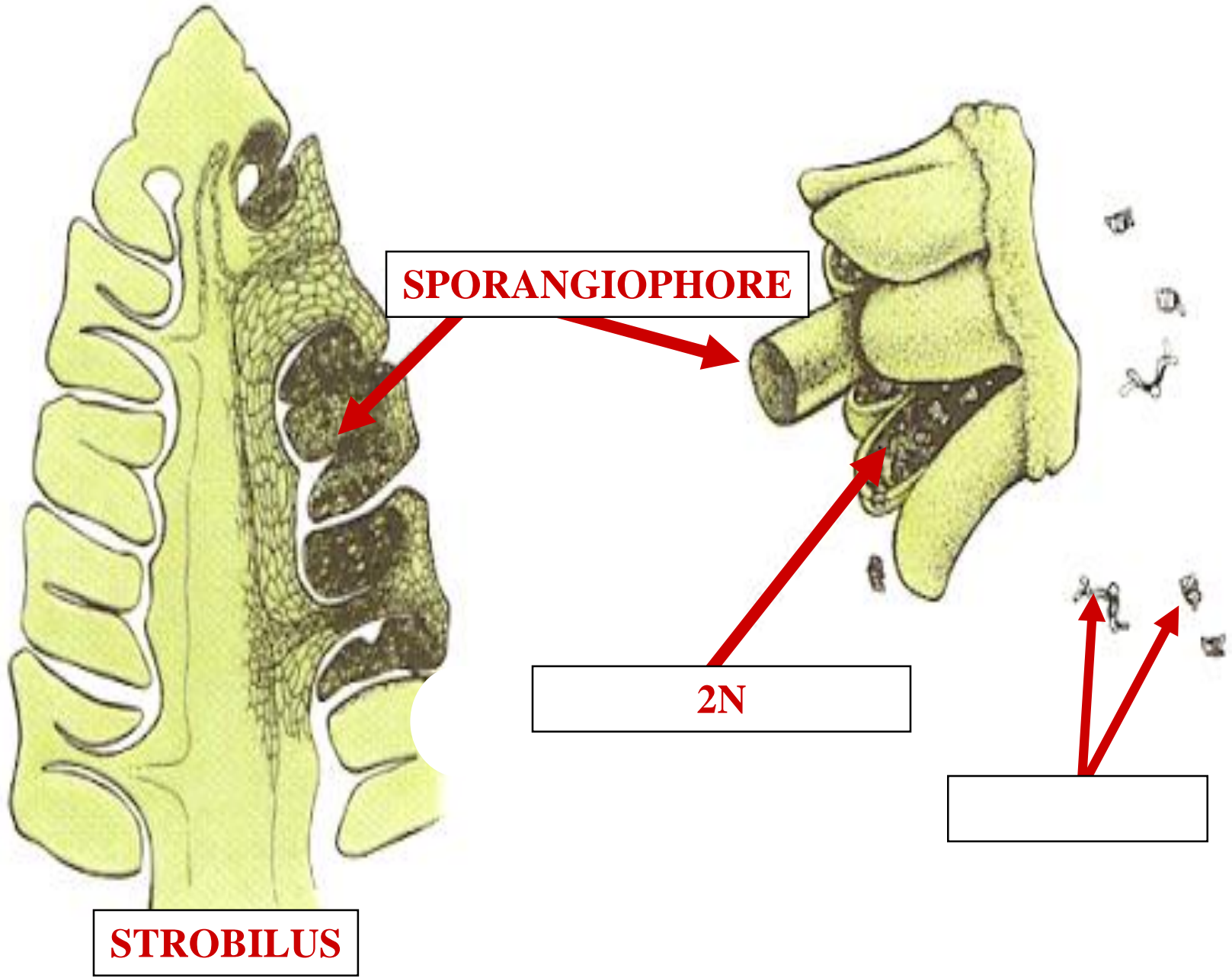
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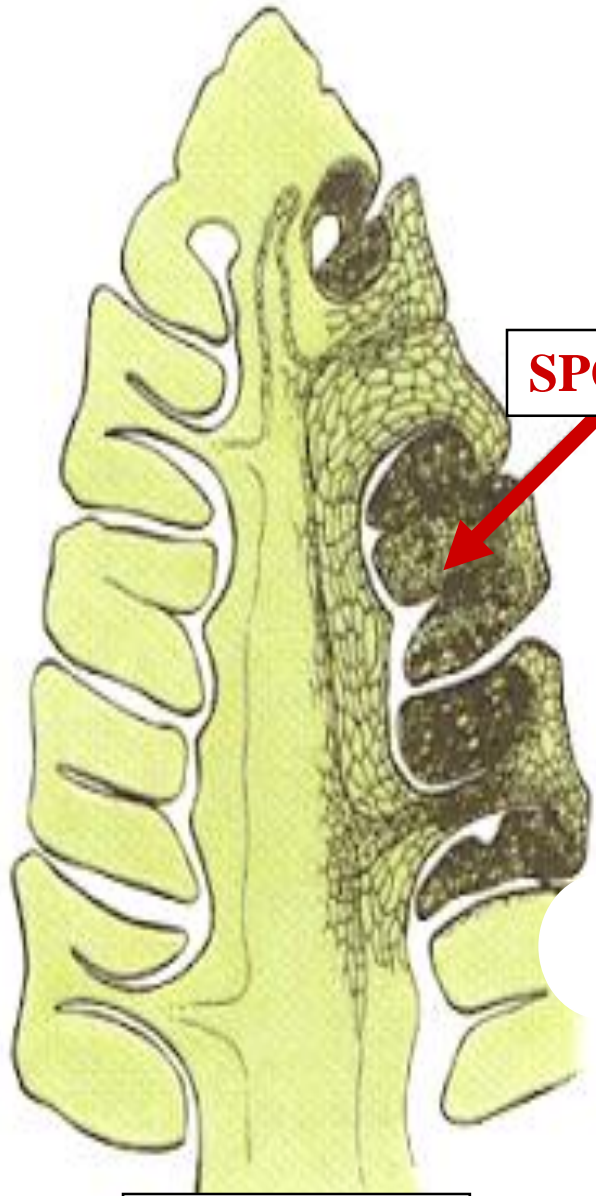


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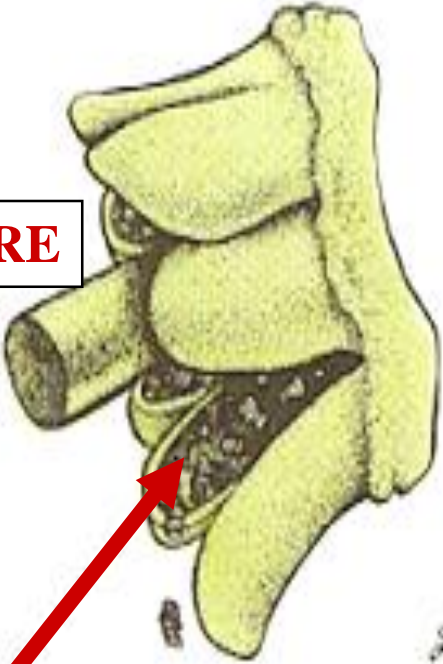






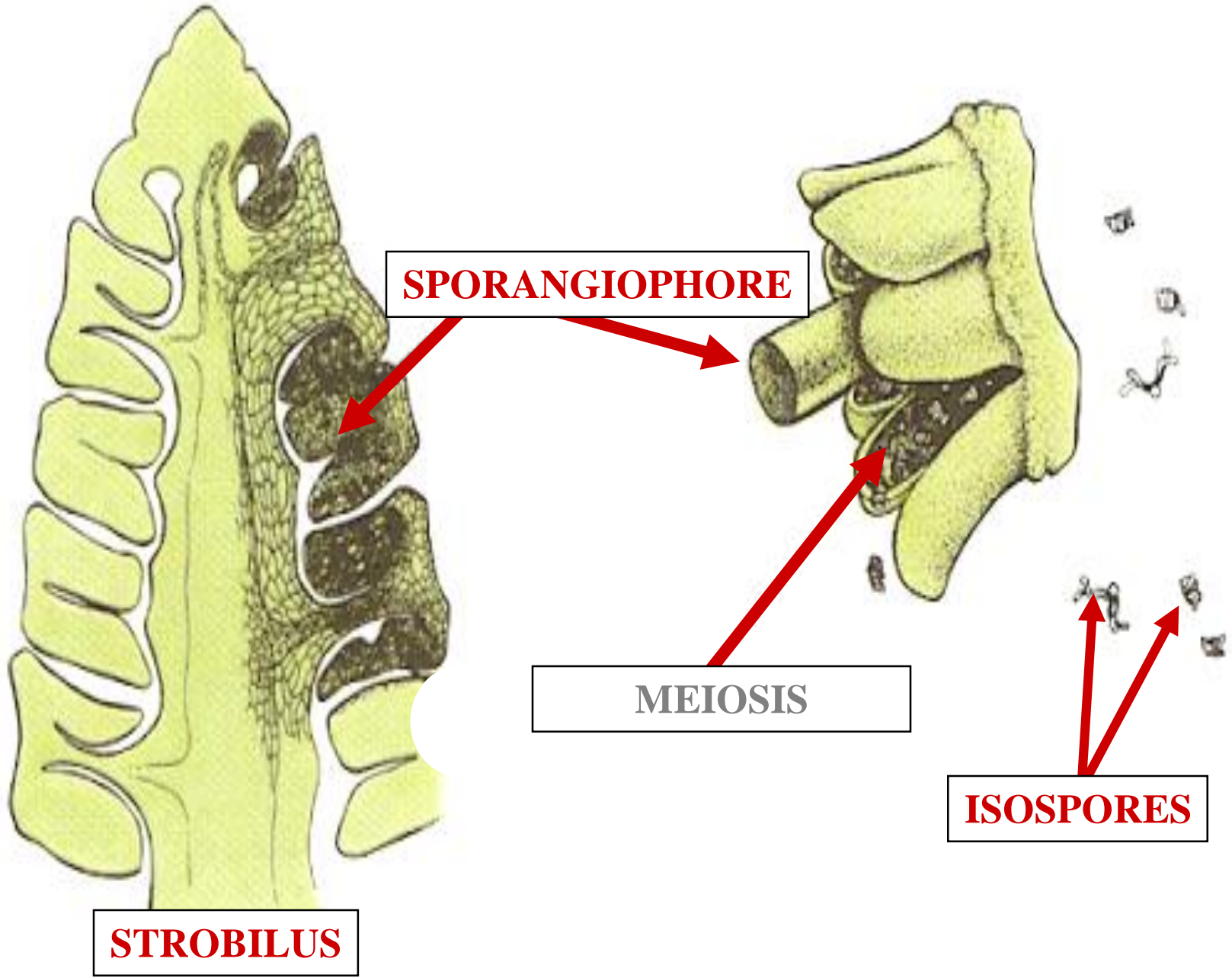
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**SPORANGIOPHORE**



**MEIOSIS**





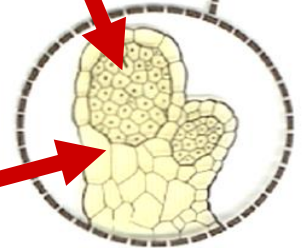
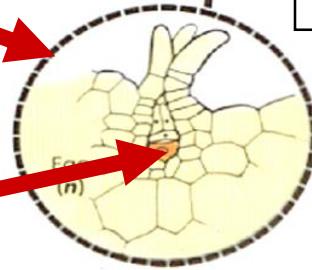
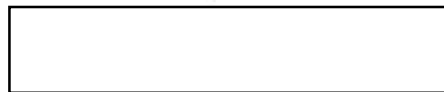
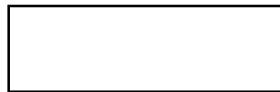
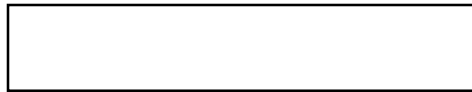
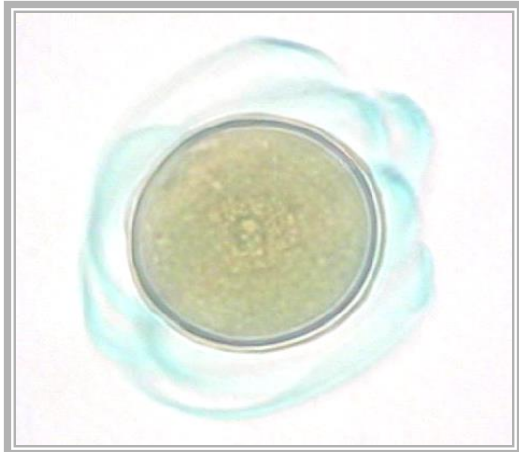
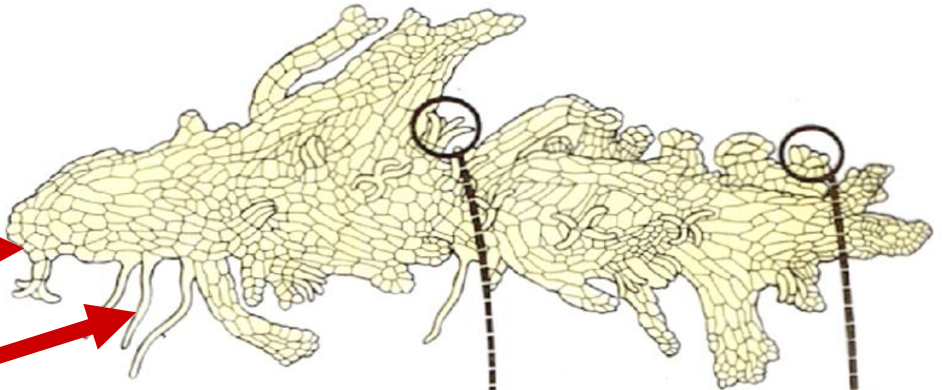
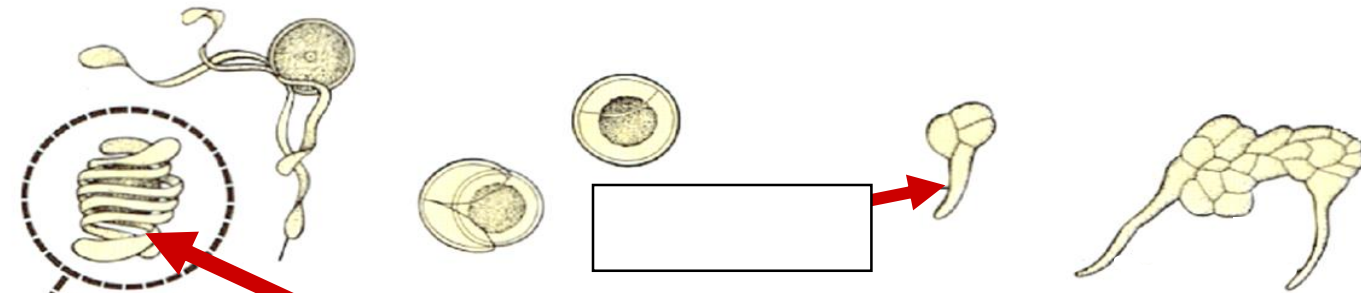
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**MEIOSIS**

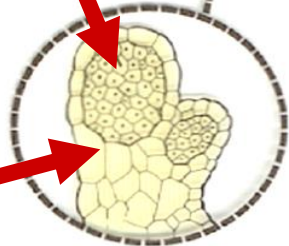
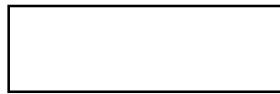
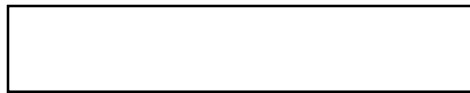
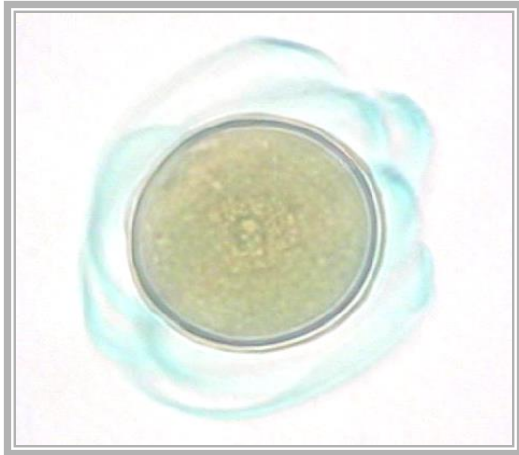
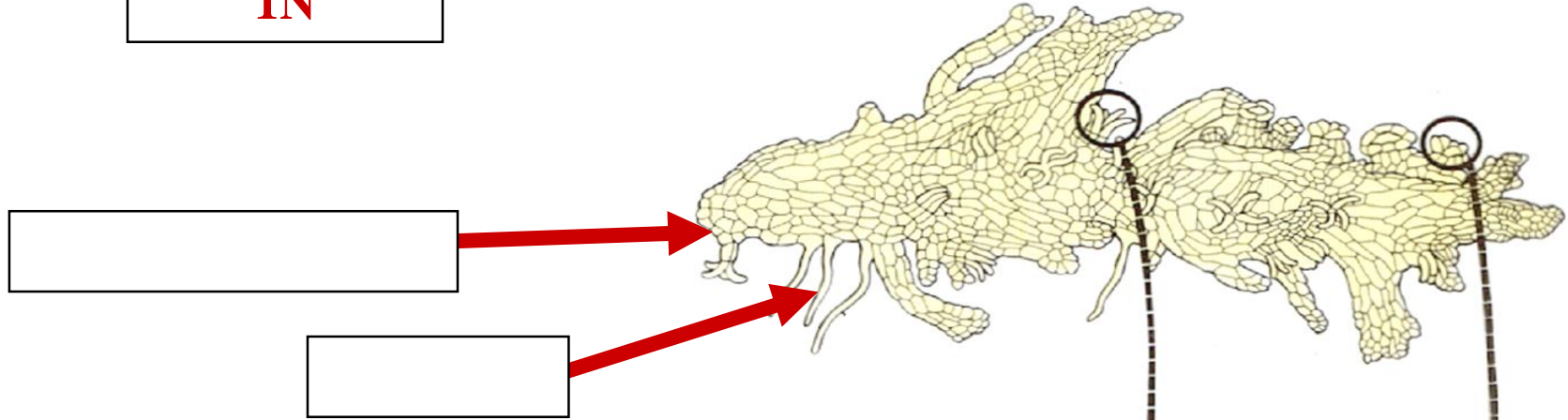
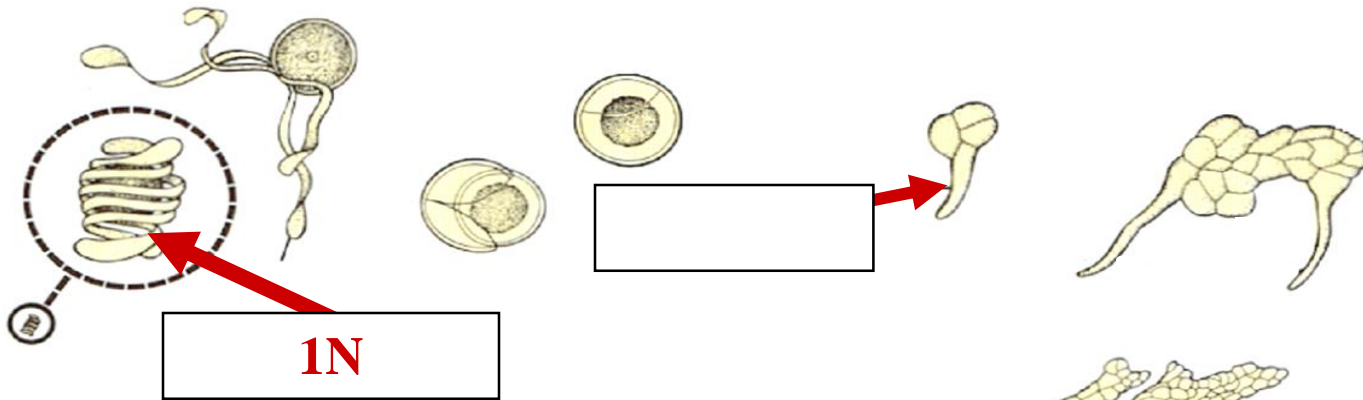
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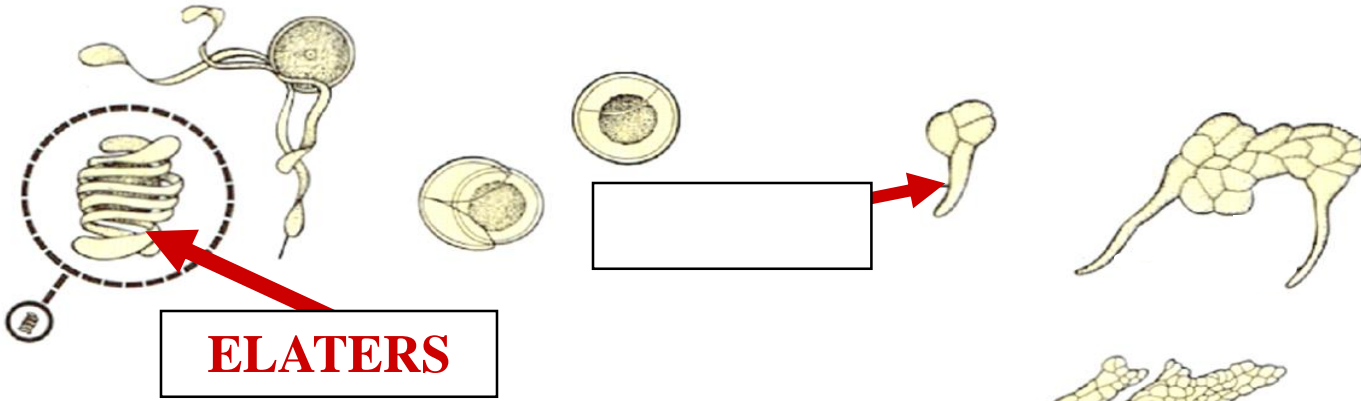
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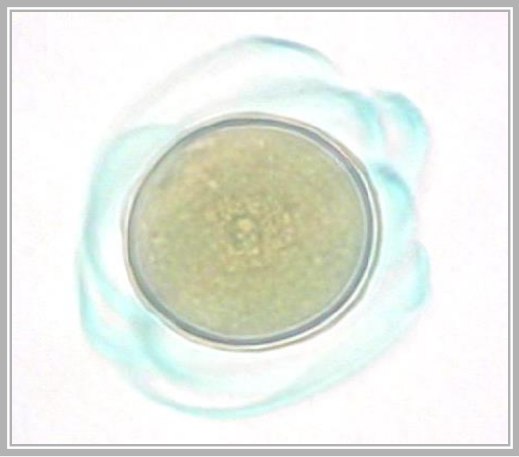
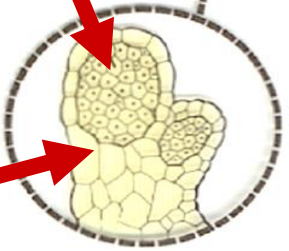
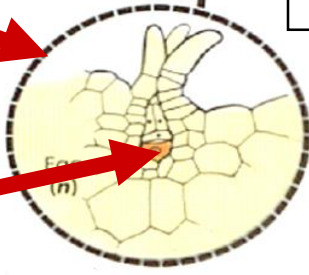


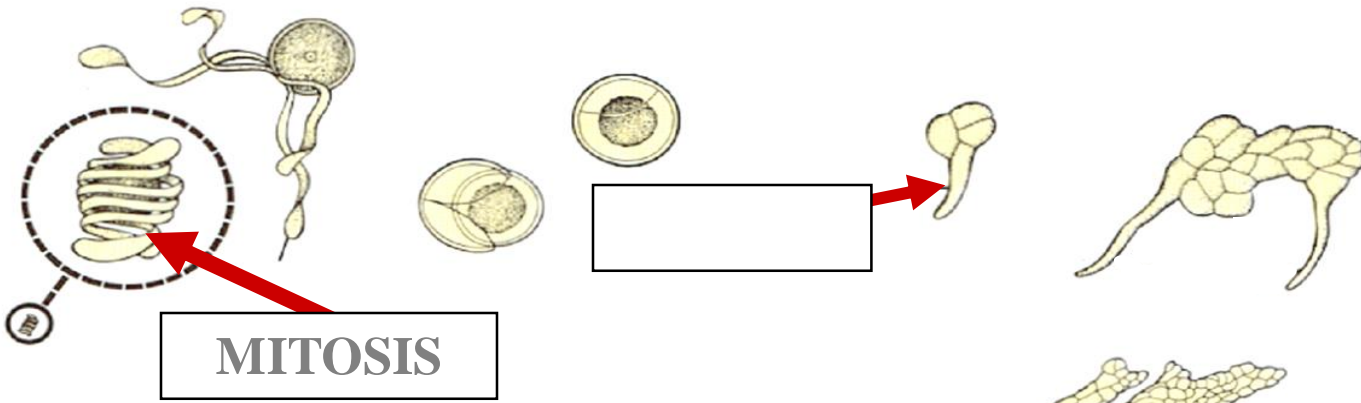
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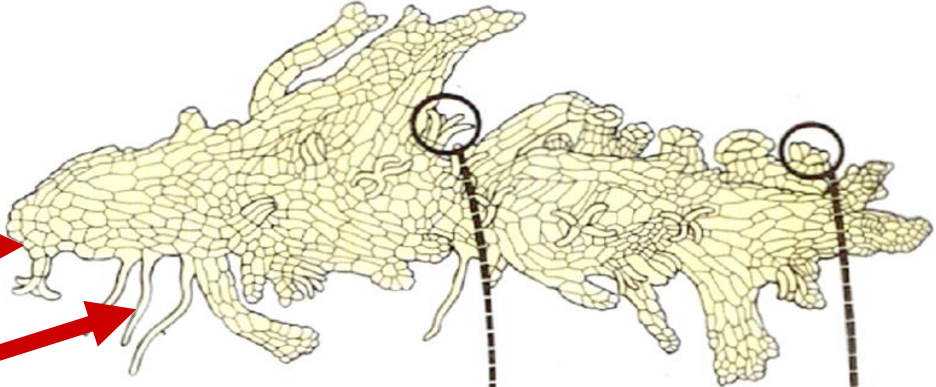
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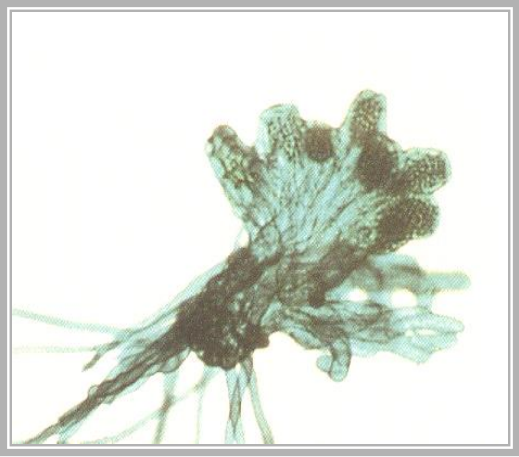
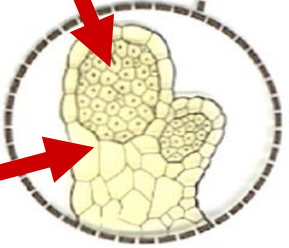
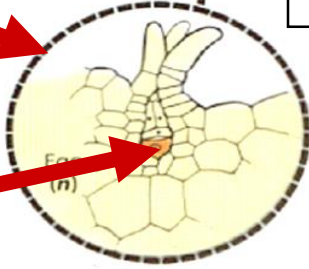


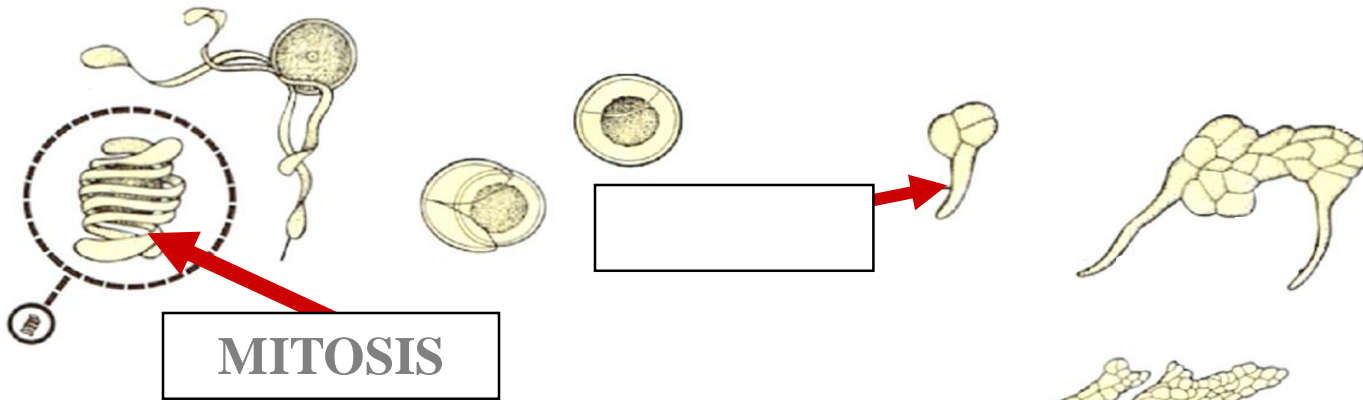
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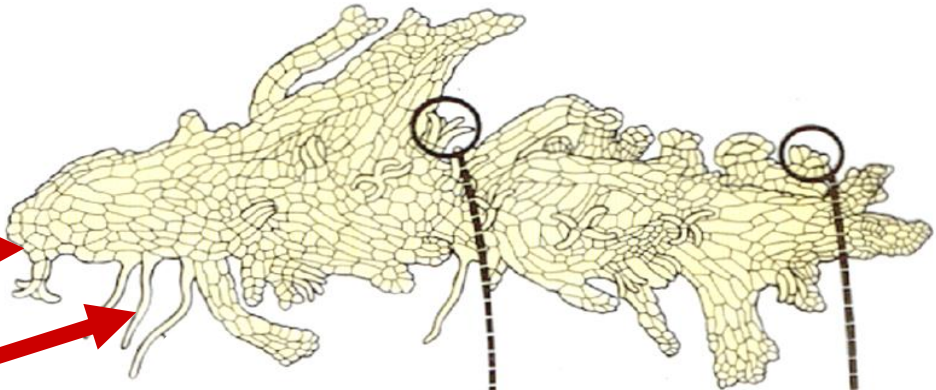
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**GAMETOPHYTE**

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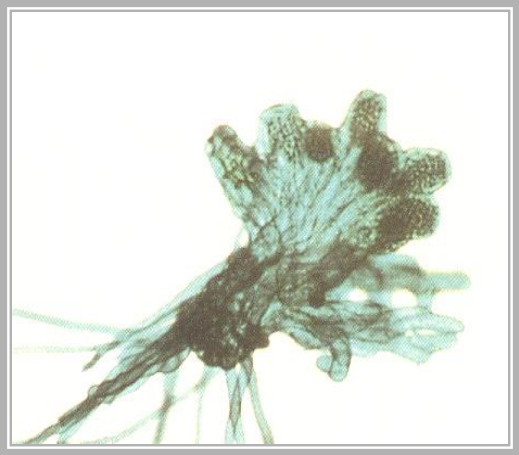
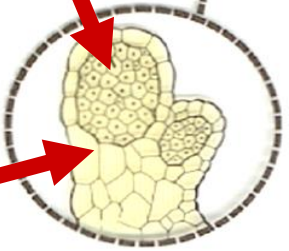
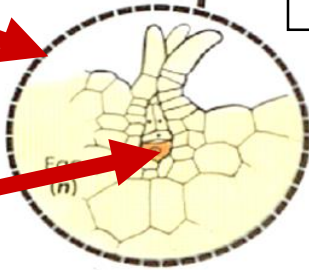


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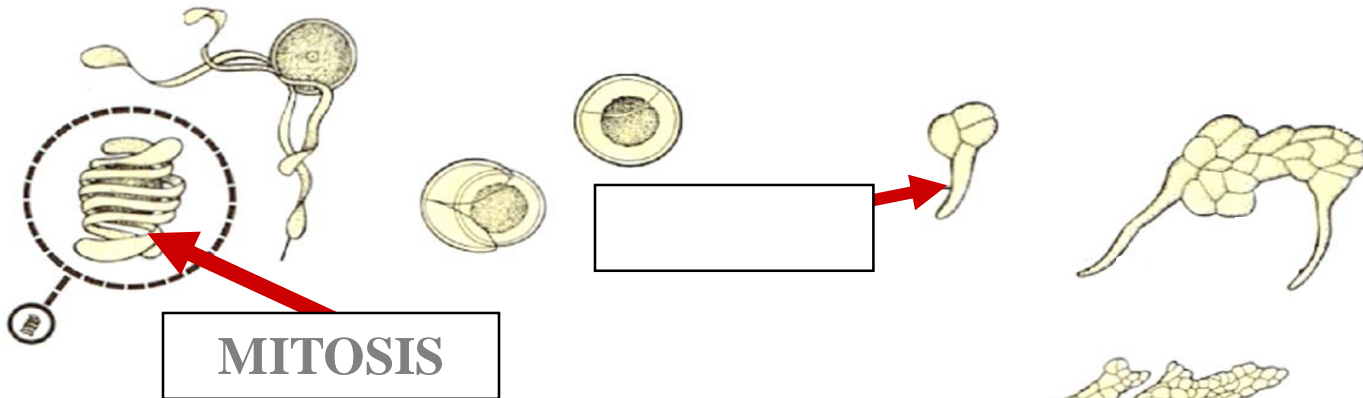
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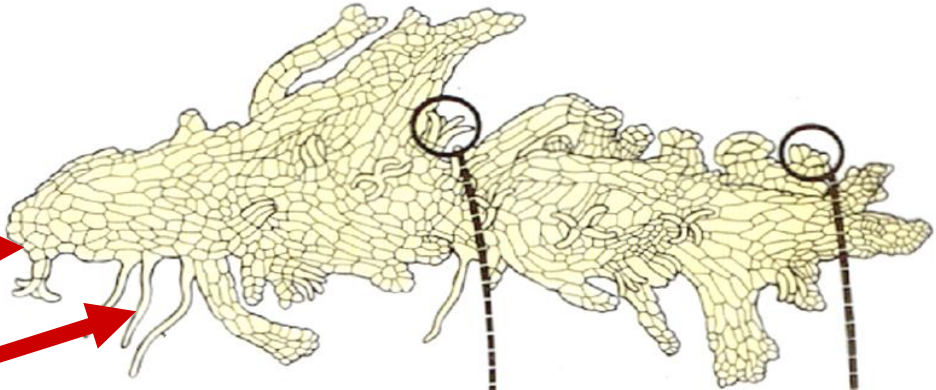






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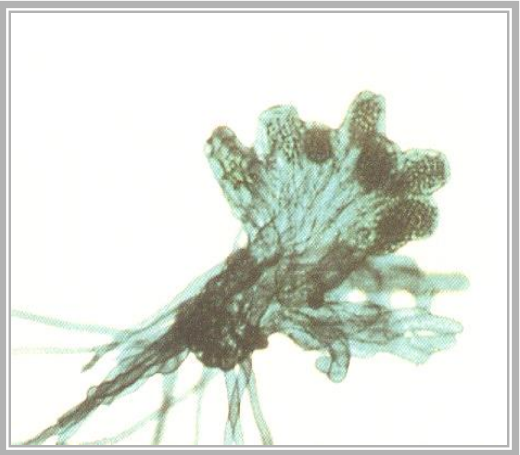
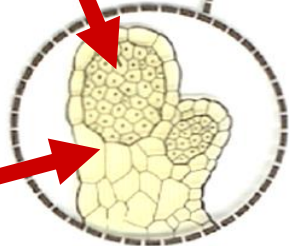
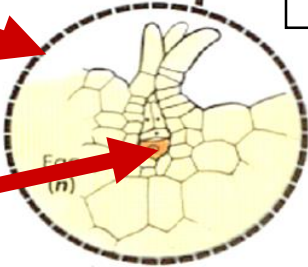


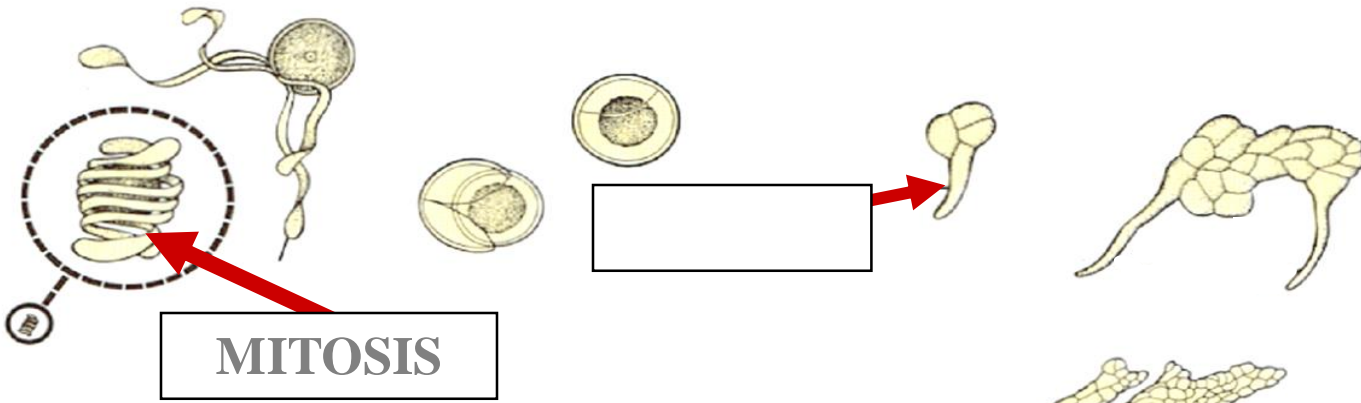
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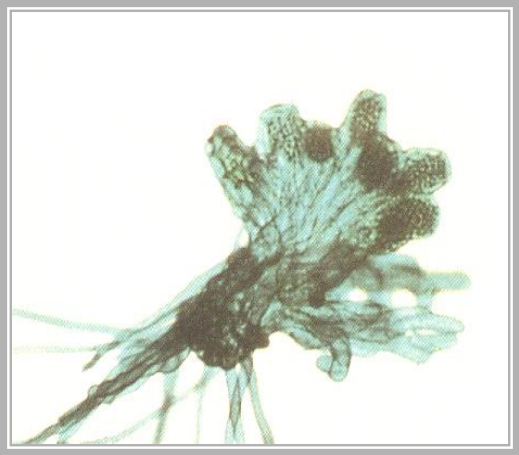
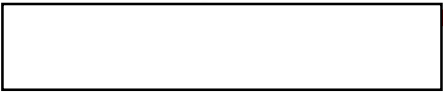
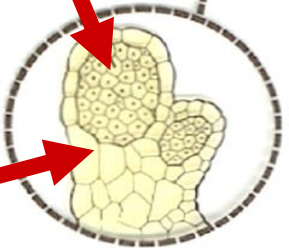
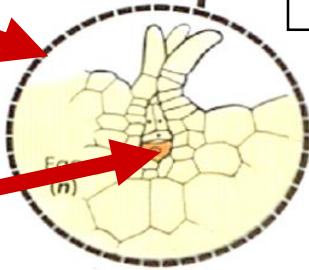
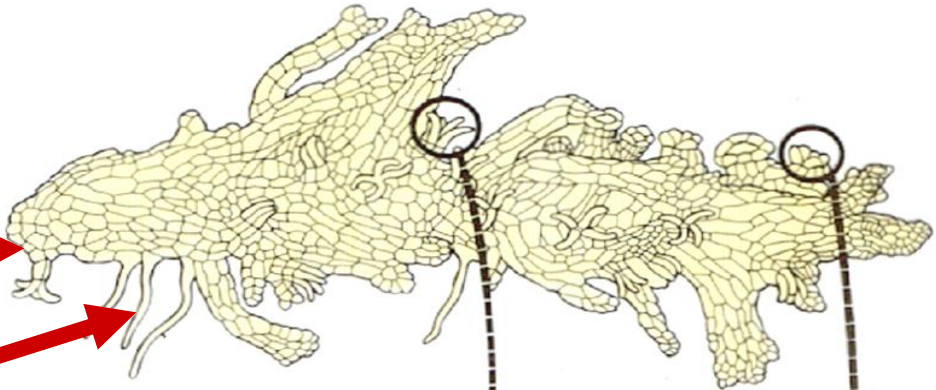
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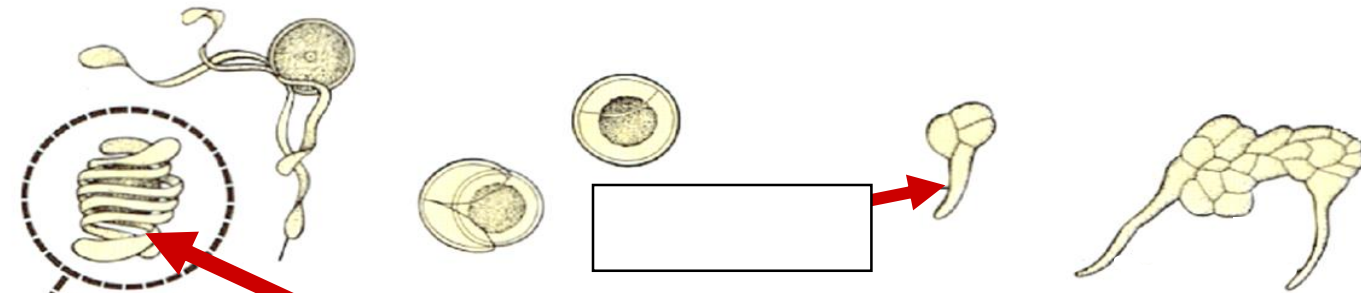
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**EXOSPORIC**





**MITOSIS**

**EPITERRANEAN**

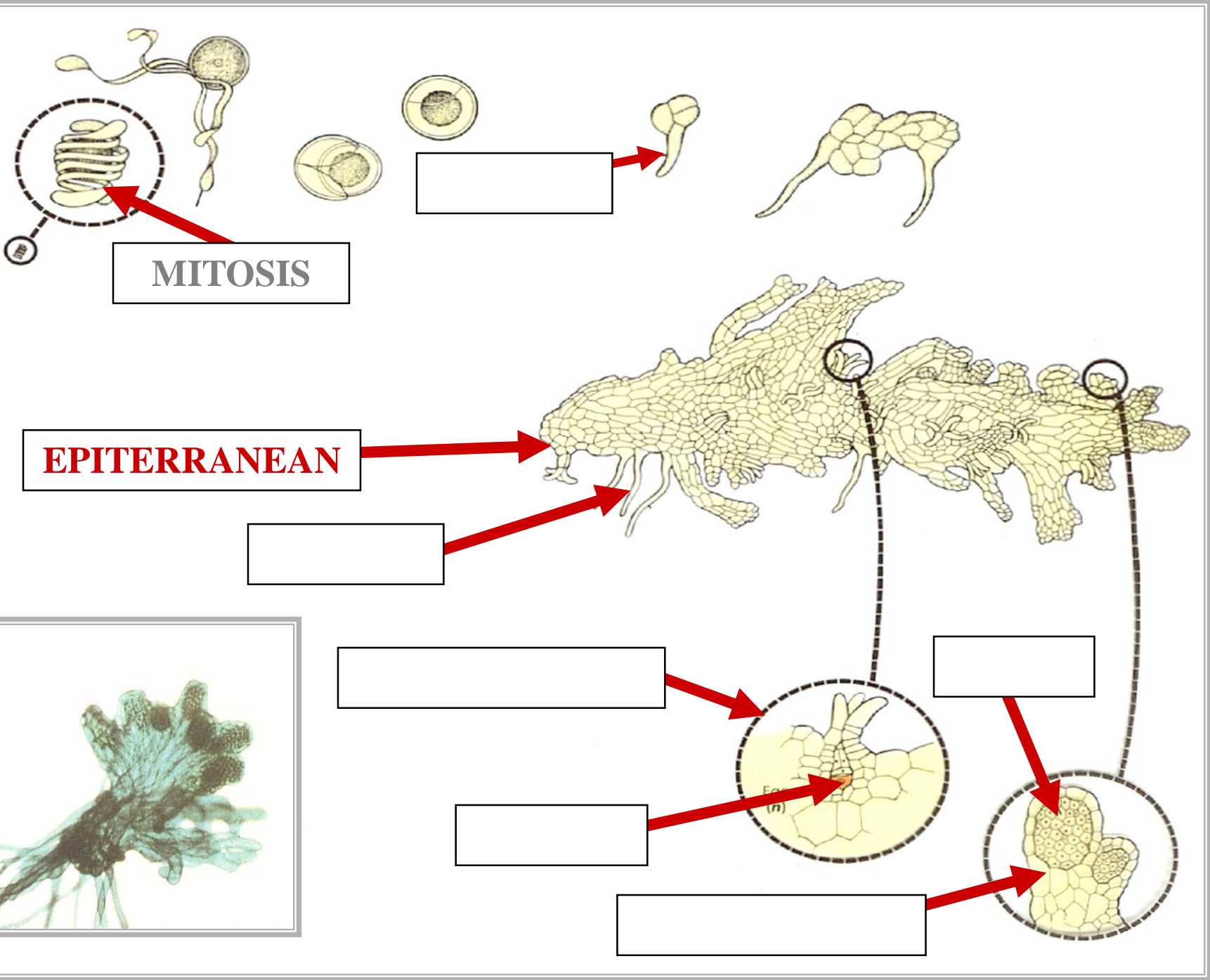
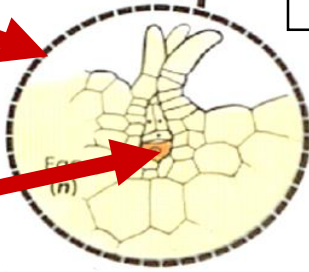
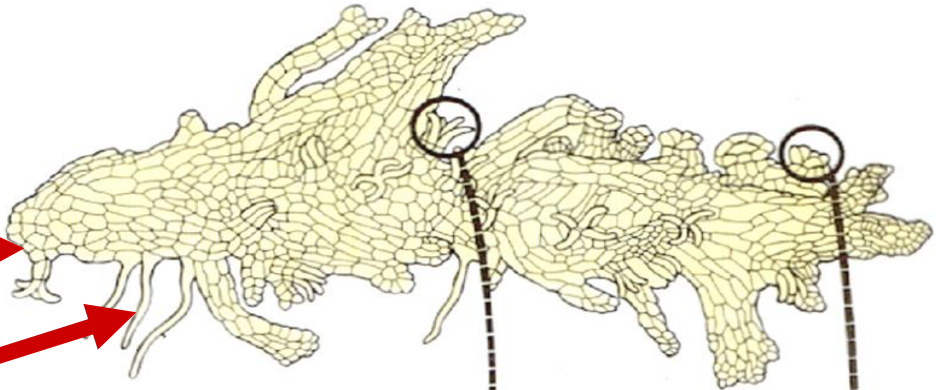
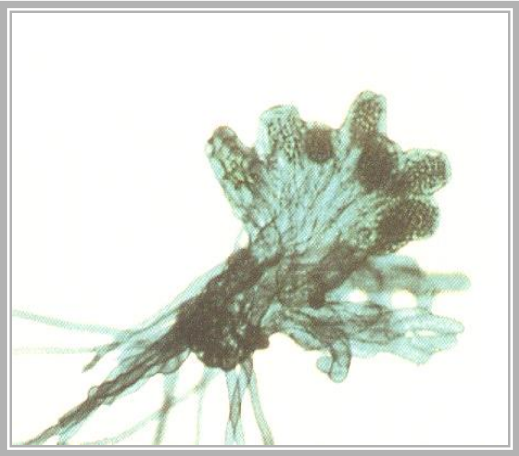
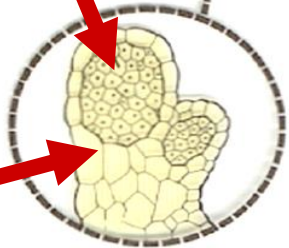
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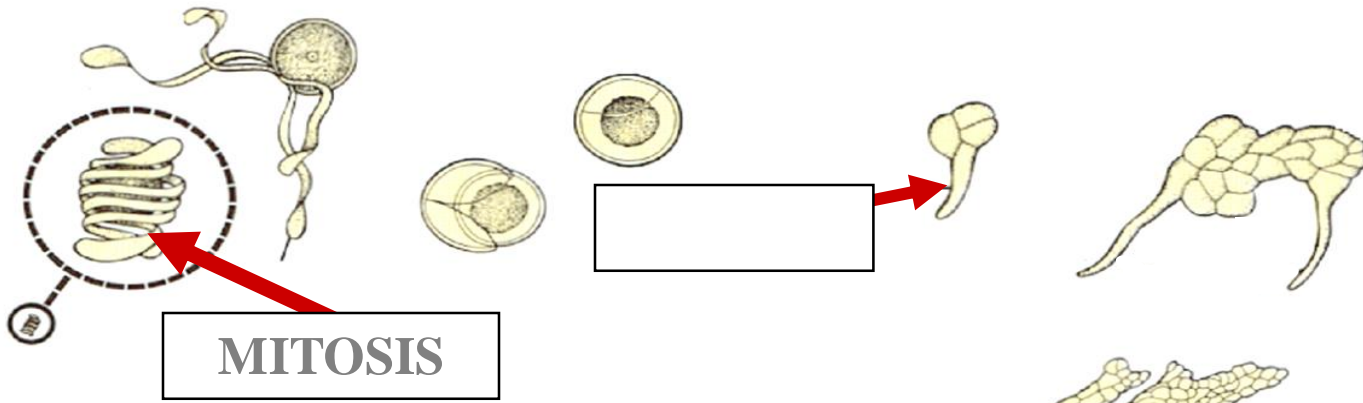
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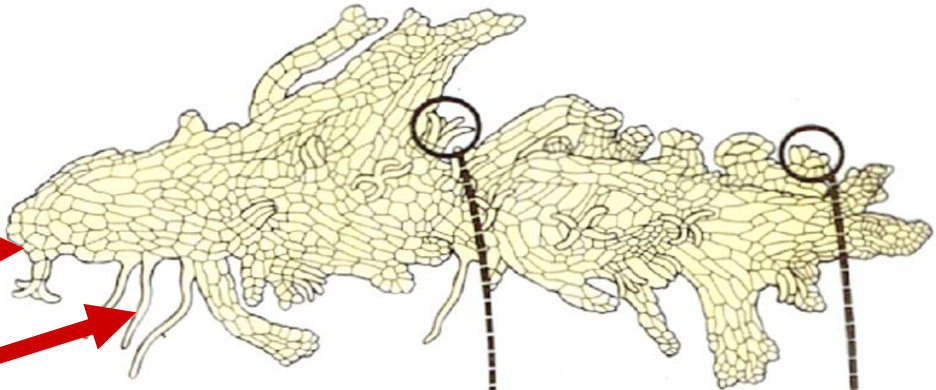
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**PSYN**

[ ]

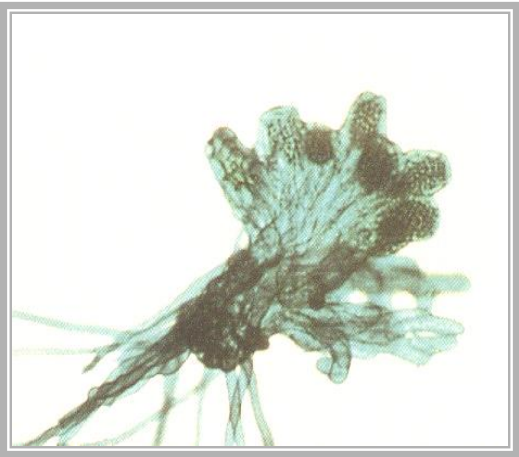
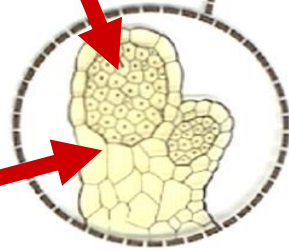
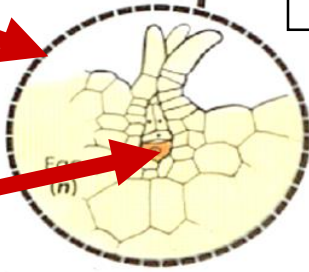


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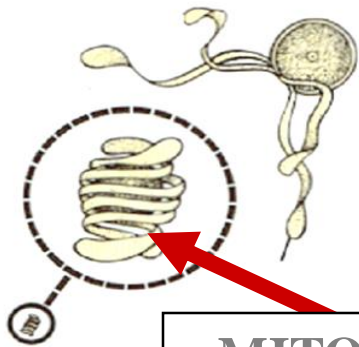
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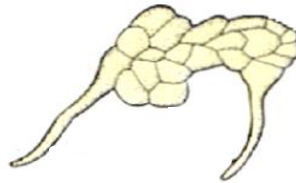




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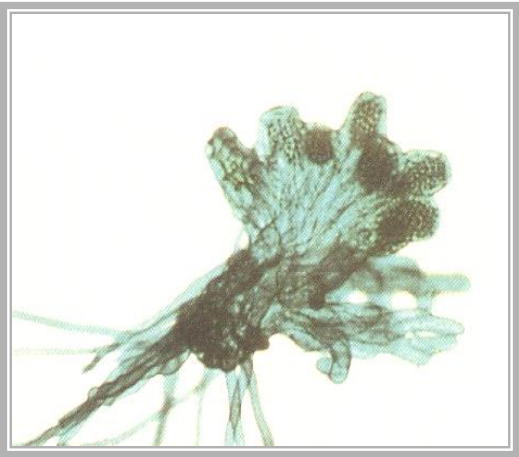
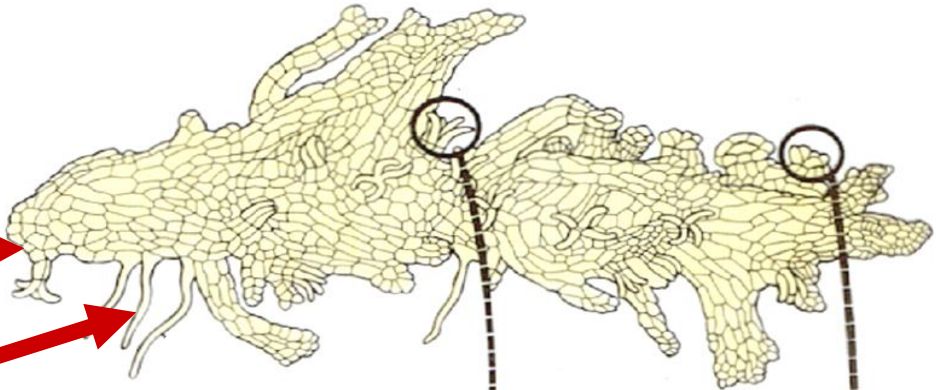


**RHIZOID**



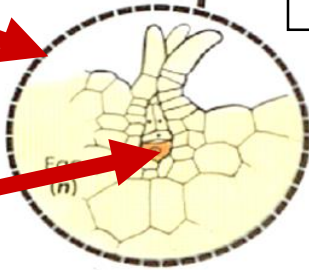
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**RHIZOID**

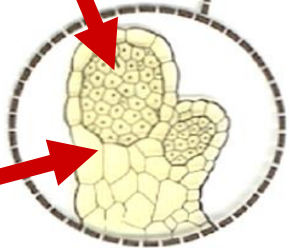


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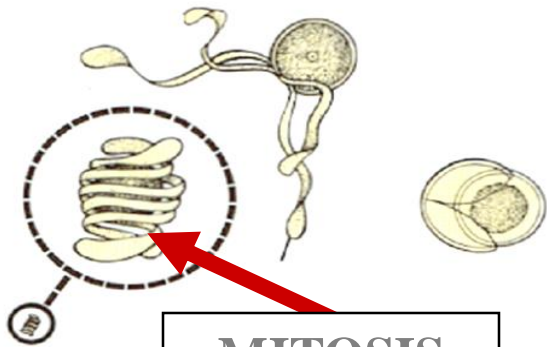
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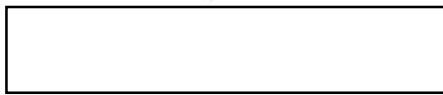
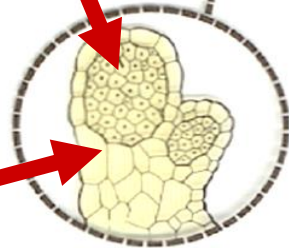
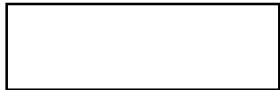
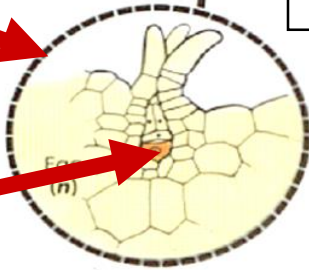
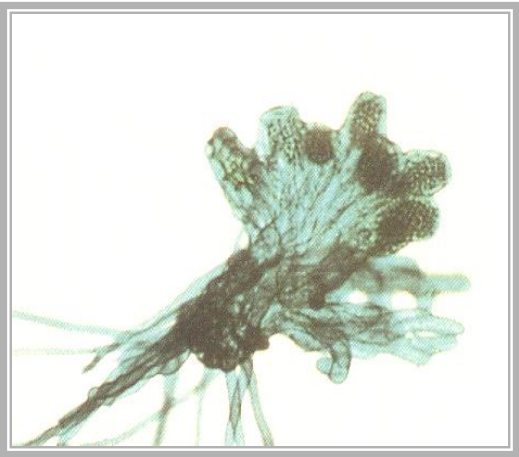
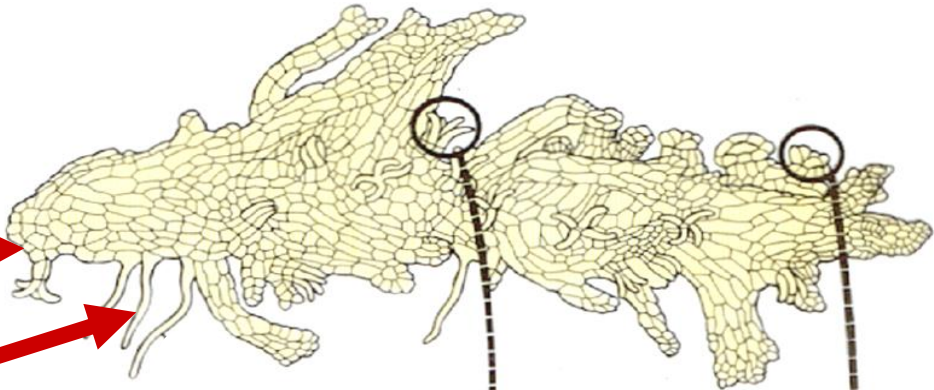


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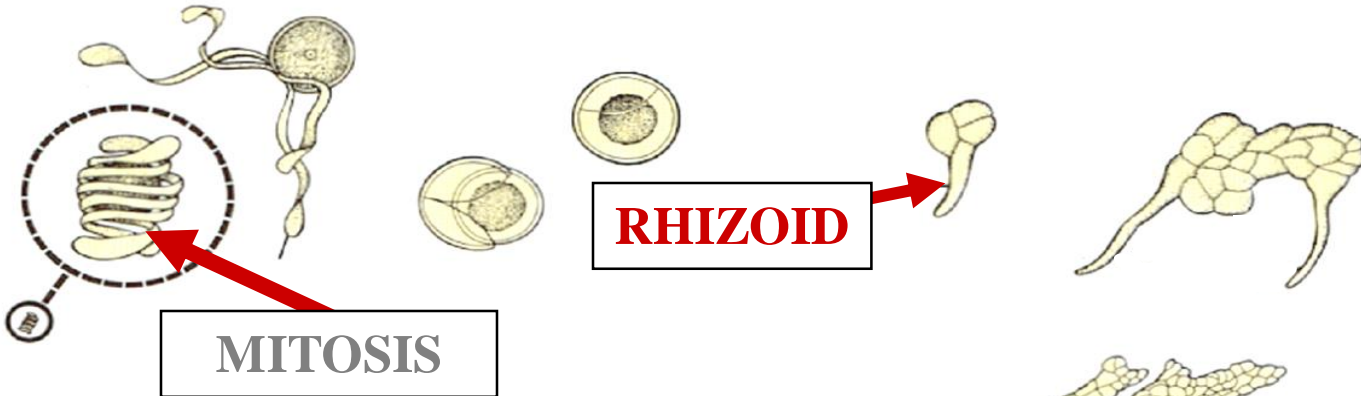


**BISEXUAL**

**RHIZOID**



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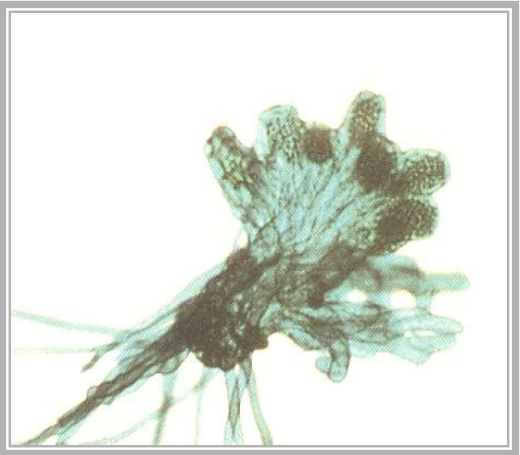
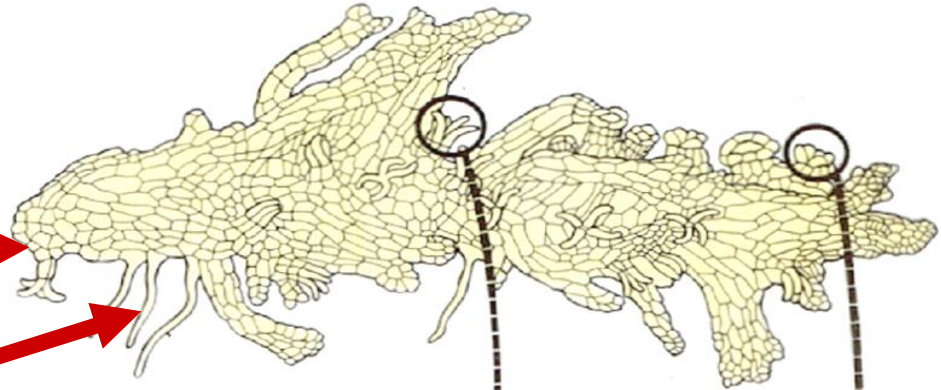


**MITOSIS**

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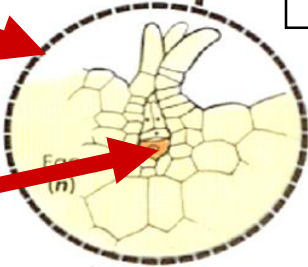
**GAMETANGIA**

**RHIZOID**

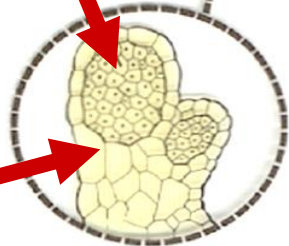


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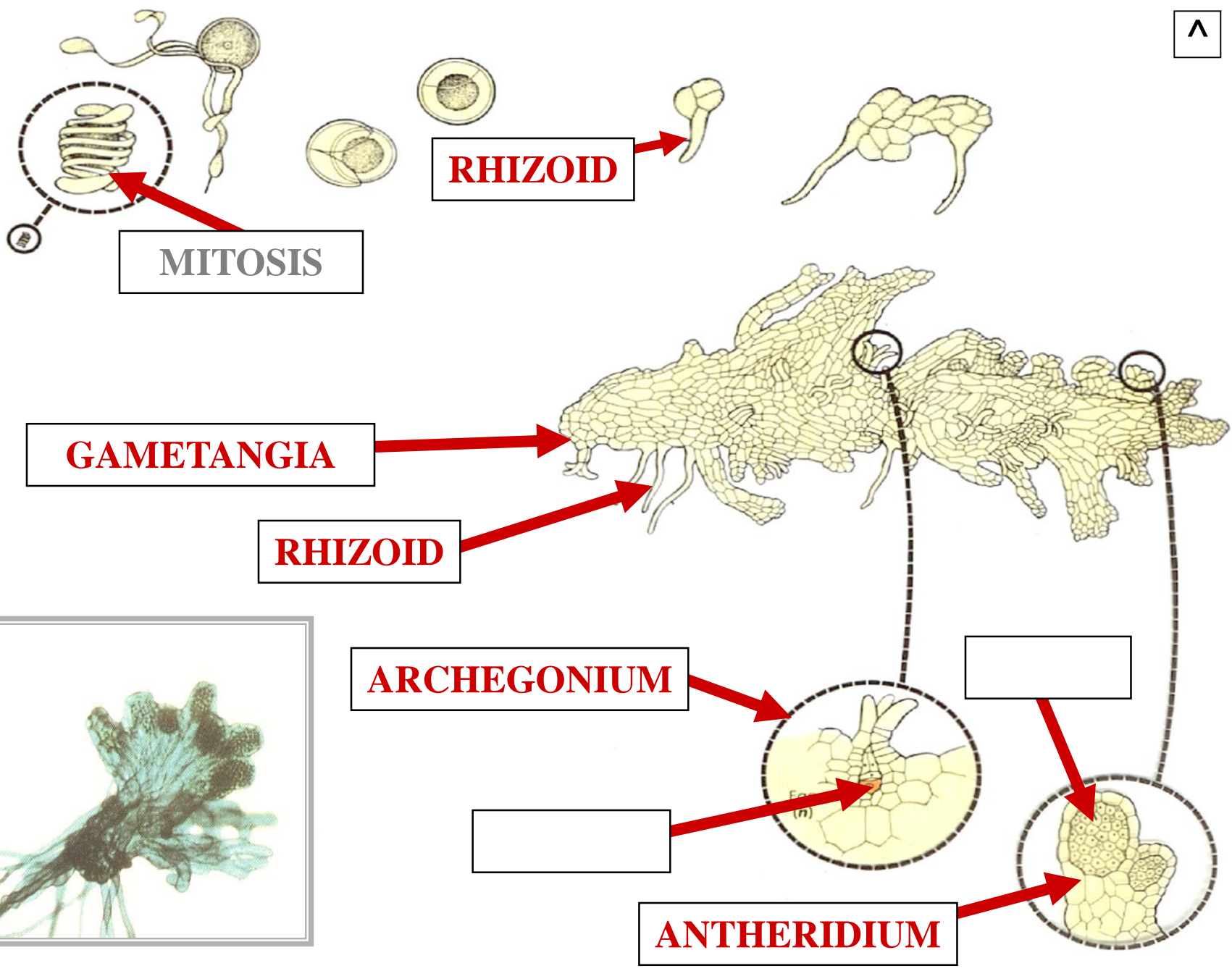


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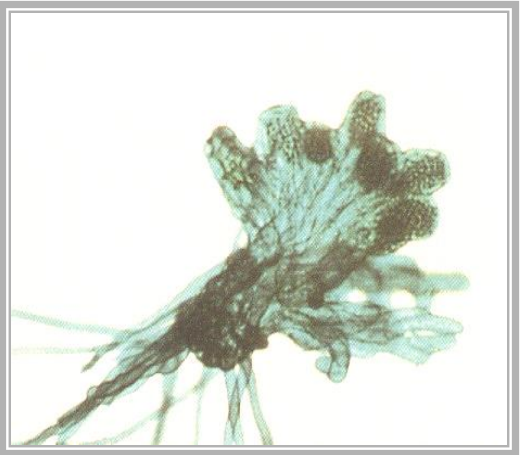
**RHIZOID**

**GAMETANGIA**

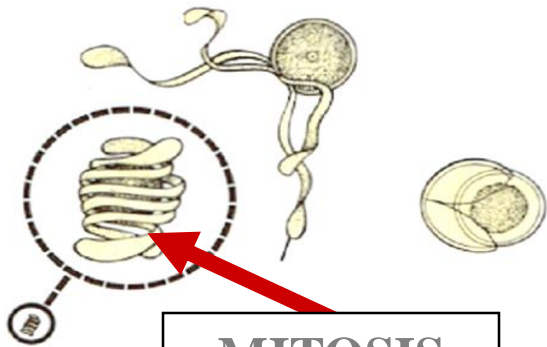
**RHIZOID**

**ARCHEGONIUM**

**ANTHERIDIUM**



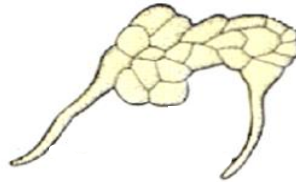




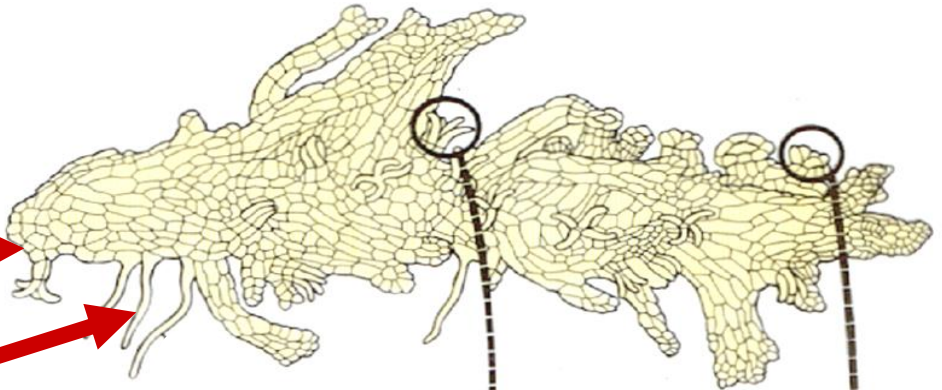
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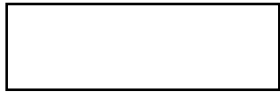
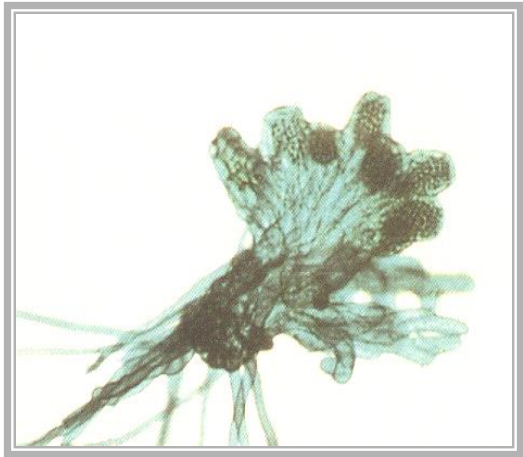
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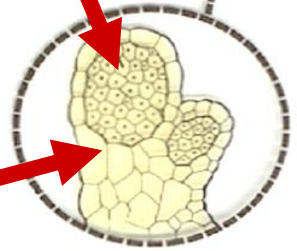
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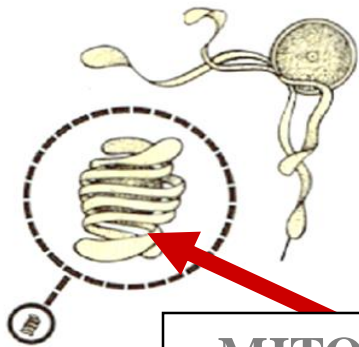


**RHIZOID**



**ANTHERIDIUM**





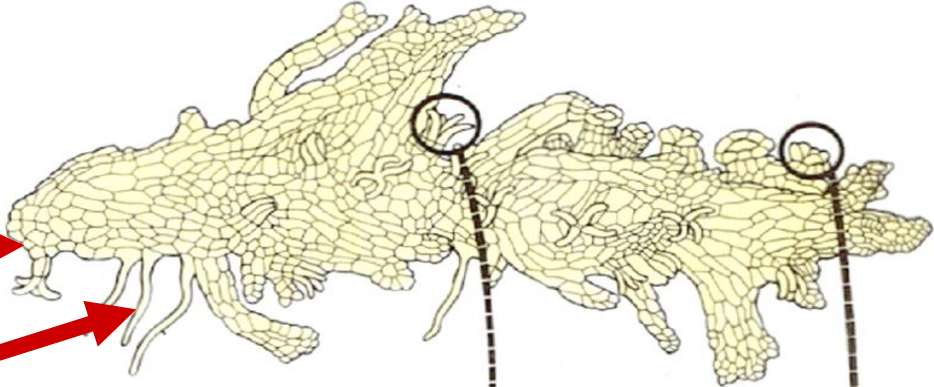
**MITOSIS**



**RHIZOID**

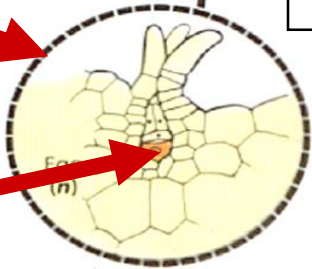
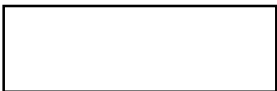


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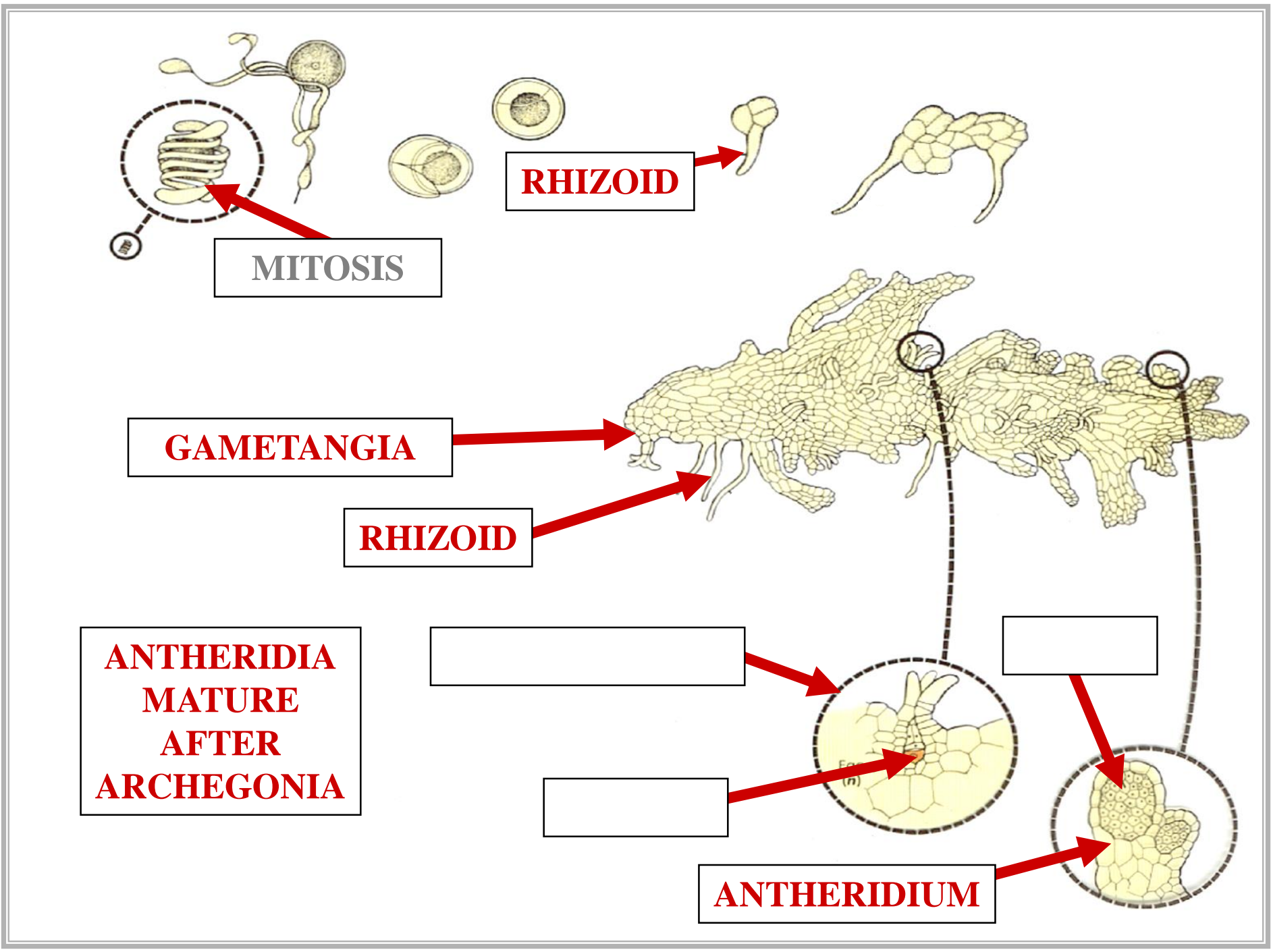
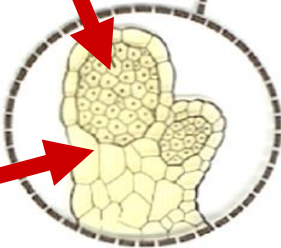


**RHIZOID**

**ANTHERIDIA  
MATURE  
AFTER  
ARCHEGONIA**



**ANTHERIDIUM**



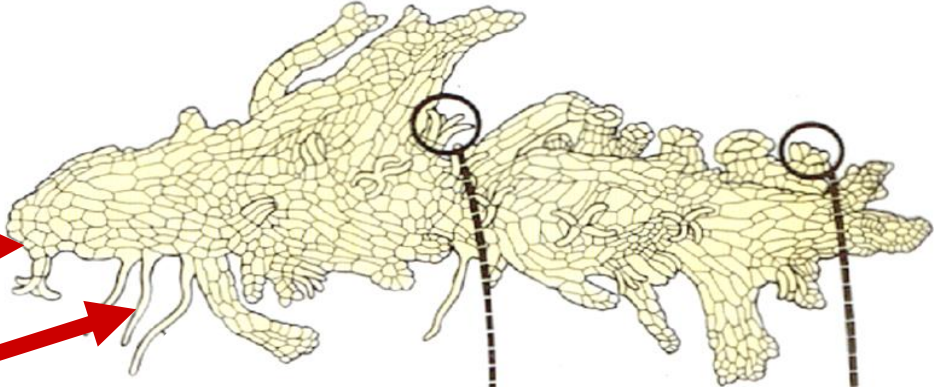


**MITOSIS**

**RHIZOID**

**GAMETANGIA**

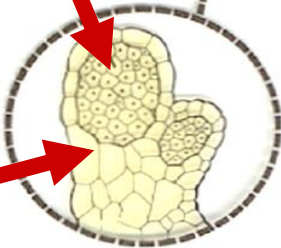
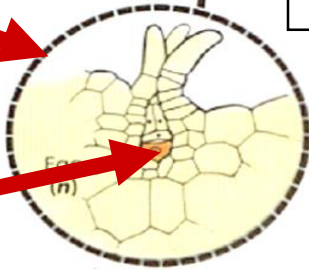
**RHIZOID**



**ANTHERIDIA  
MATURE  
AFTER  
ARCHEGONIA**



**SPERMATOCYTES**





**MITOSIS**

**RHIZOID**

**GAMETANGIA**

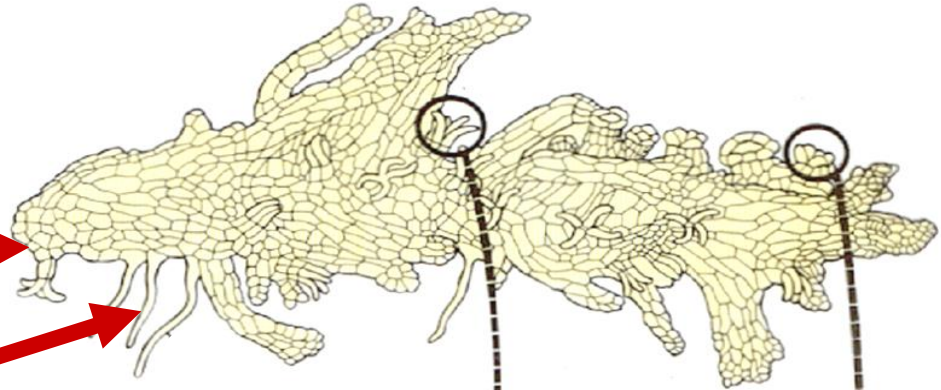
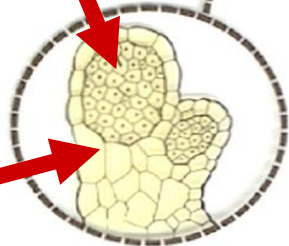
**RHIZOID**

**ANTHERIDIA  
MATURE  
AFTER  
ARCHEGONIA**

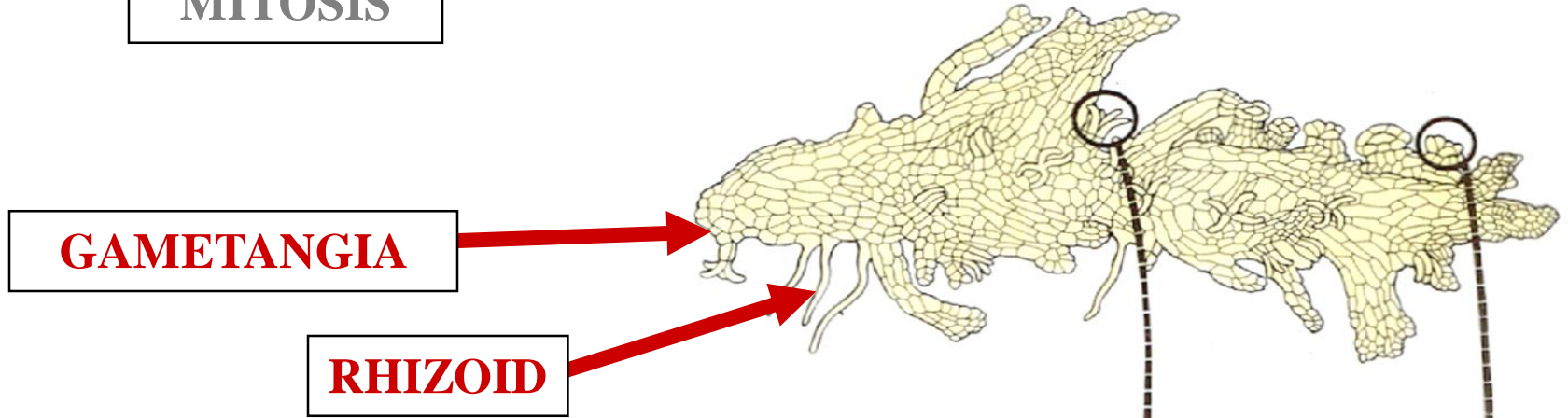
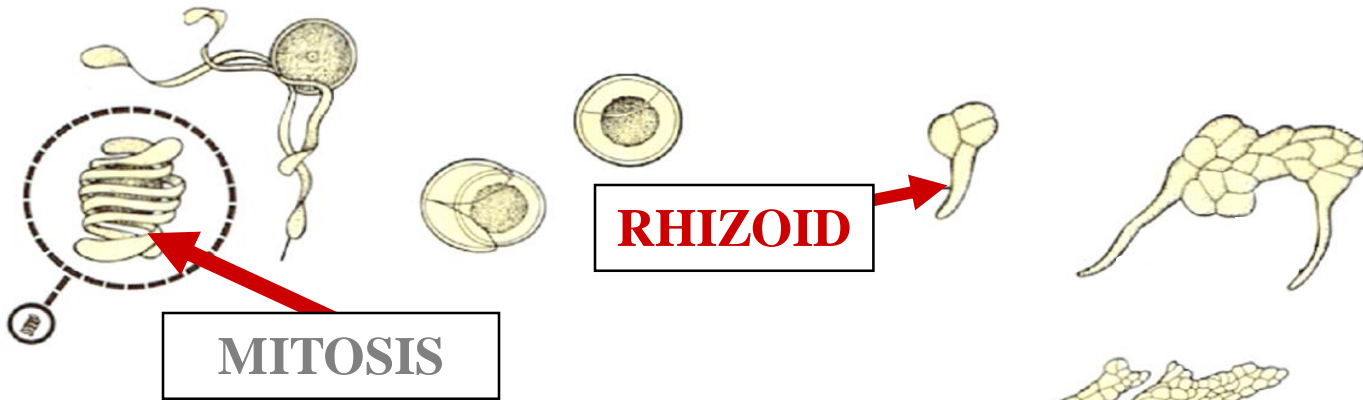
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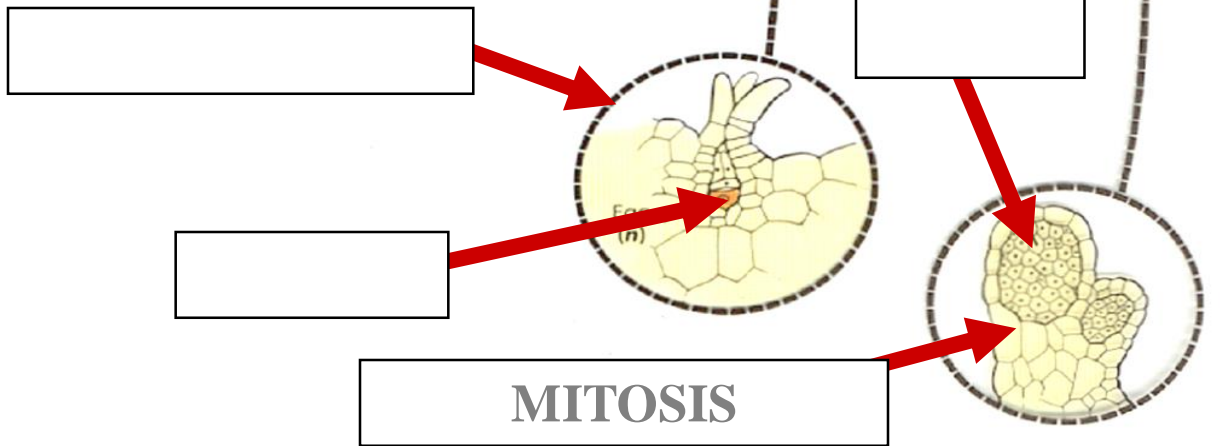
**1N**







**ANTHERIDIA  
MATURE  
AFTER  
ARCHEGONIA**



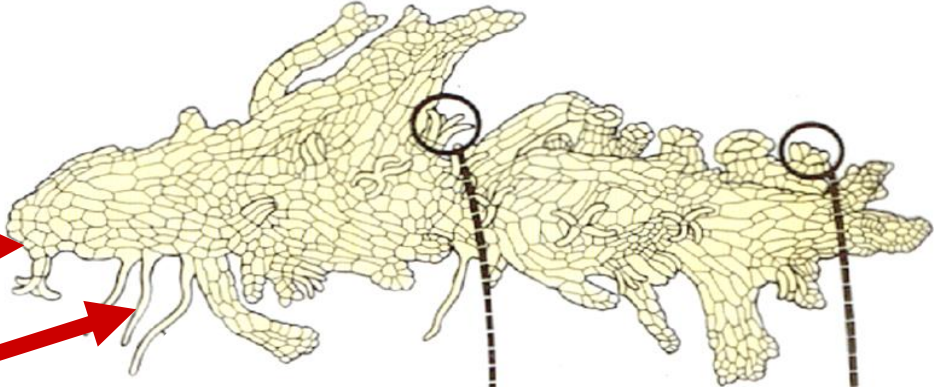


**MITOSIS**

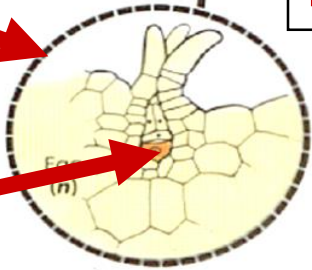
**RHIZOID**

**GAMETANGIA**

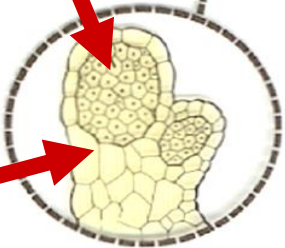
**RHIZOID**



**ANTHERIDIA  
MATURE  
AFTER  
ARCHEGONIA**

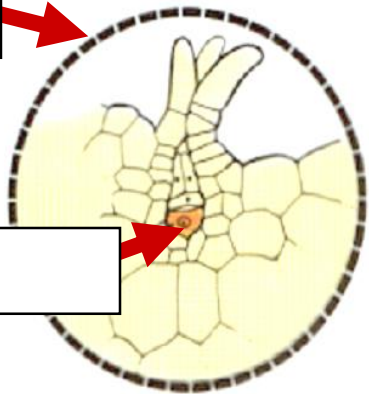


**SPERM**



**MITOSIS**

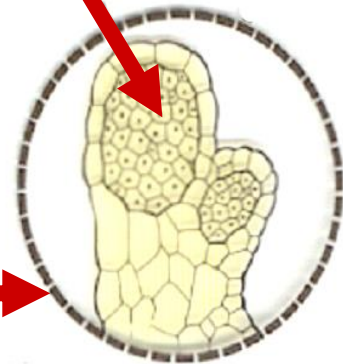
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**SPERM**

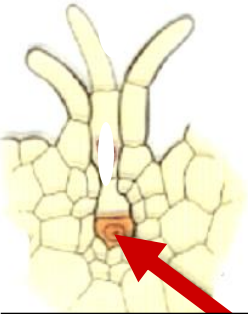
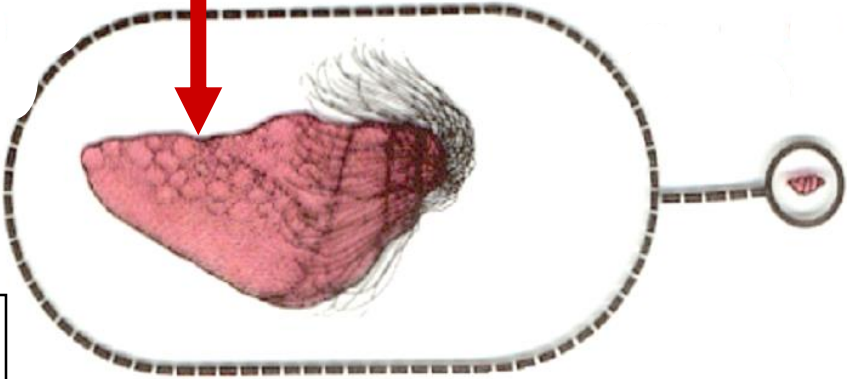


**ANTHERIDIUM**

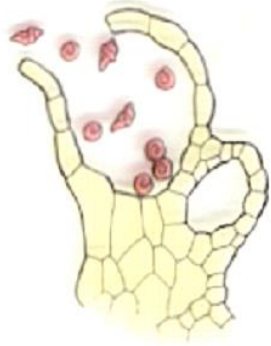


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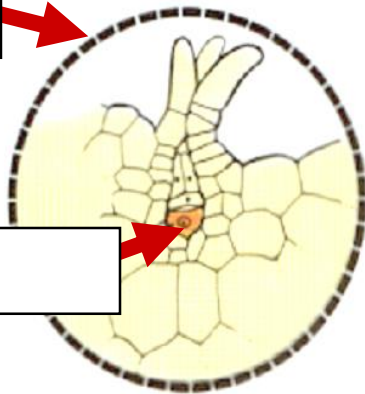
**SPERM**



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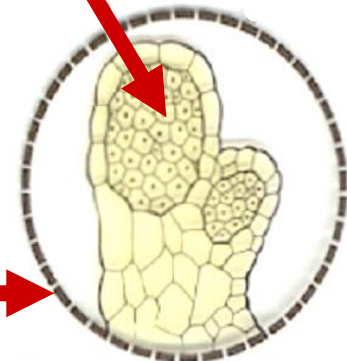
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**SPERM**

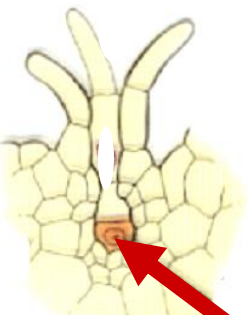
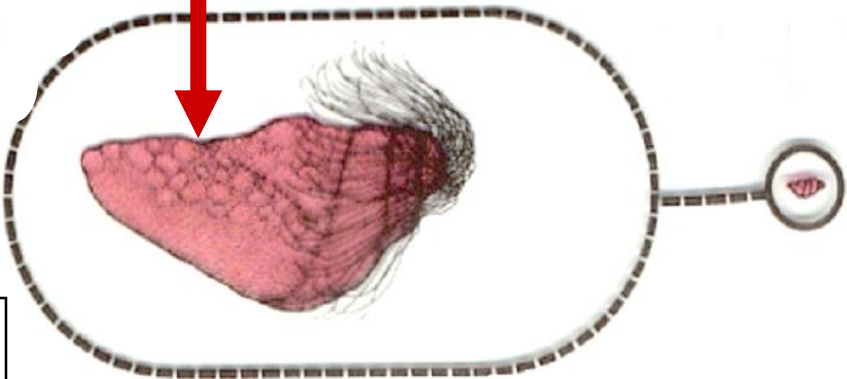


**ANTHERIDIUM**

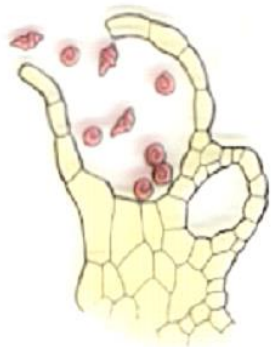


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**1N**

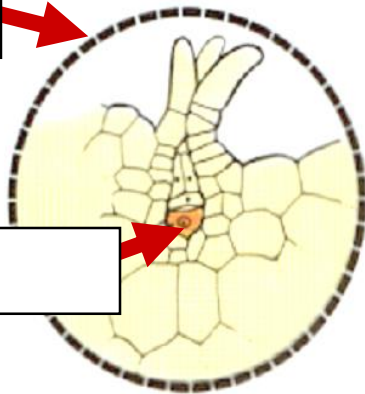


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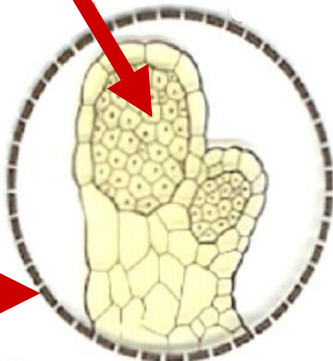


[ ]



[ ]

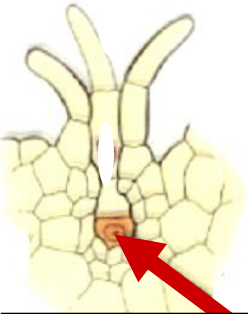
**SPERM**



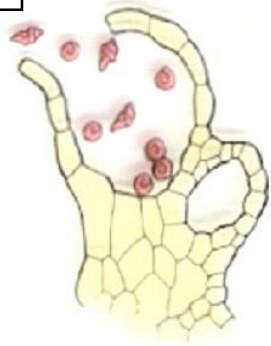
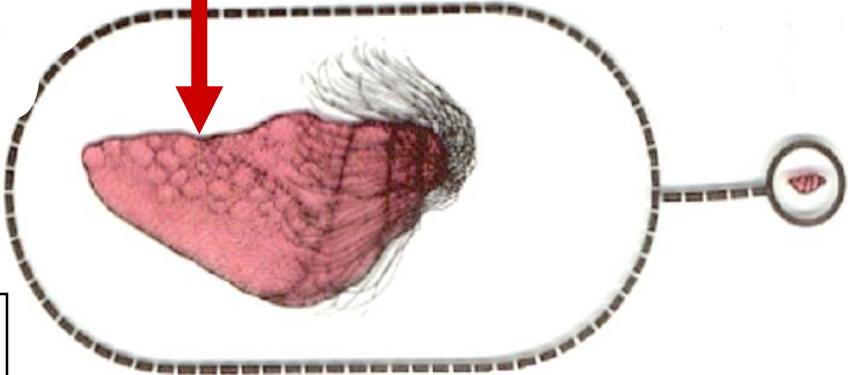
**ANTHERIDIUM**

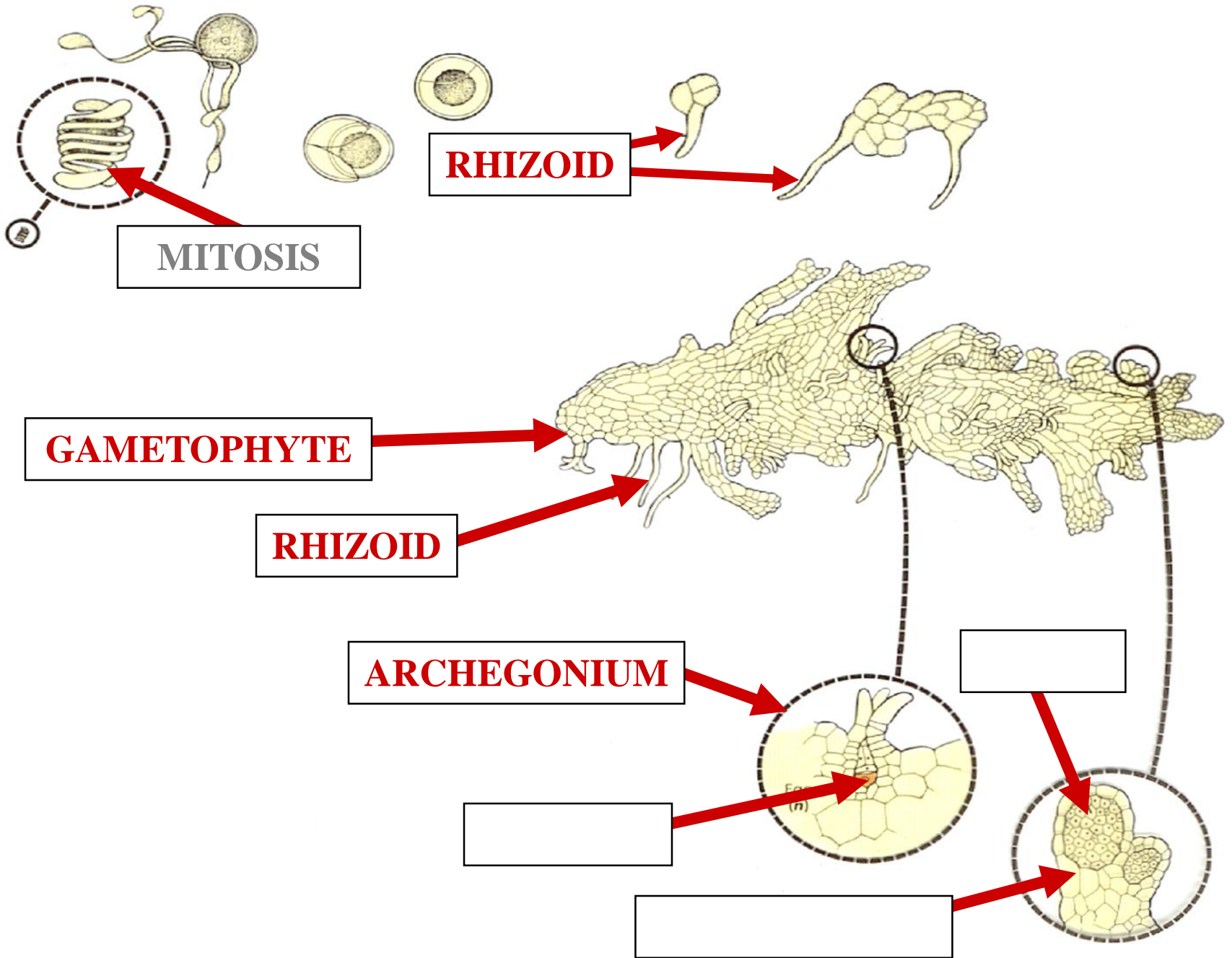
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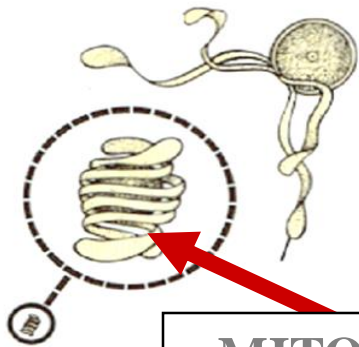
**MULTI-FLAGELLATED SPERM**



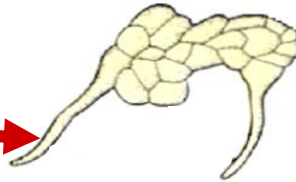
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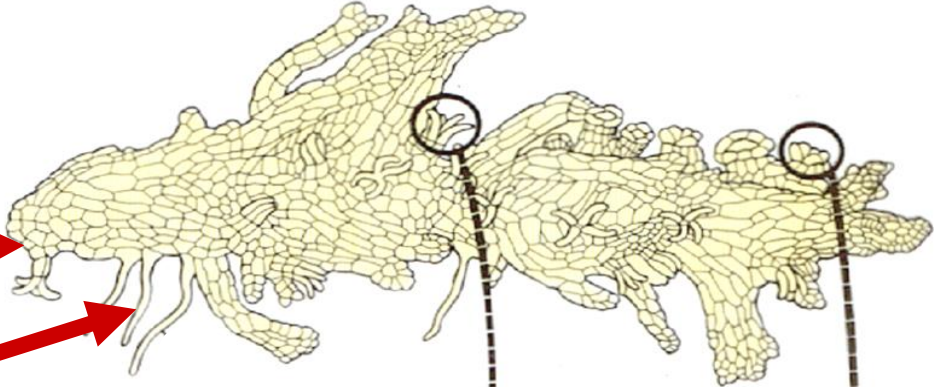


**MITOSIS**



**RHIZOID**

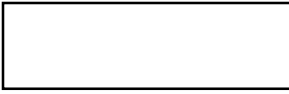
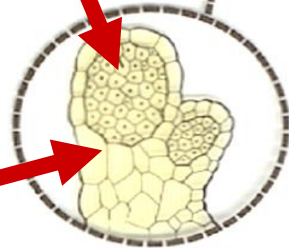
**GAMETOPHYTE**

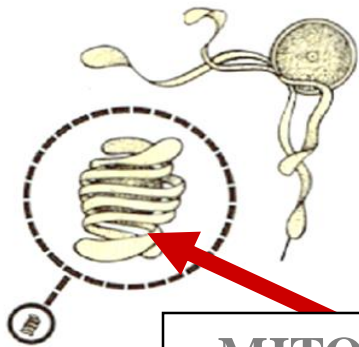


**RHIZOID**

**ARCHEGONIA  
MATURE  
BEFORE  
ANTHERIDIA**

**ARCHEGONIUM**

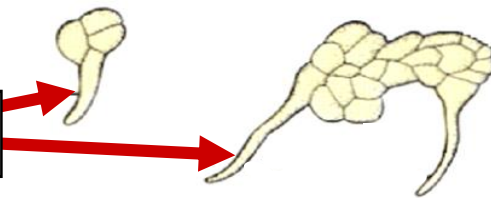




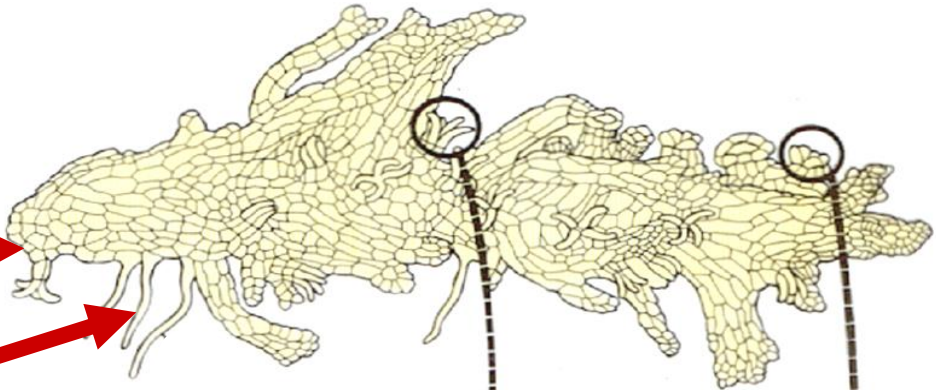
**MITOSIS**



**RHIZOID**



**GAMETOPHYTE**

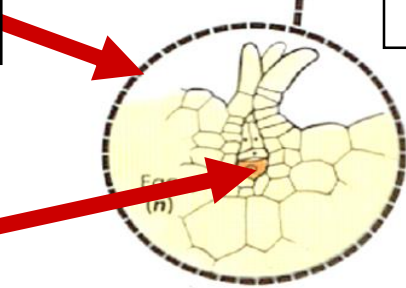


**RHIZOID**

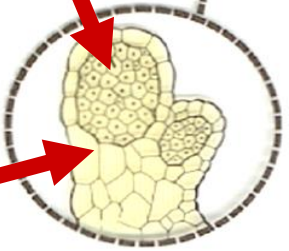
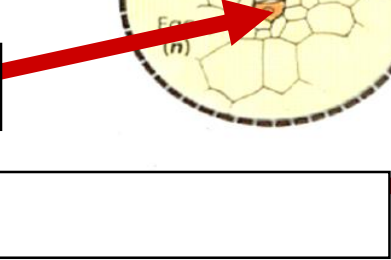


**ARCHEGONIA  
MATURE  
BEFORE  
ANTHERIDIA**

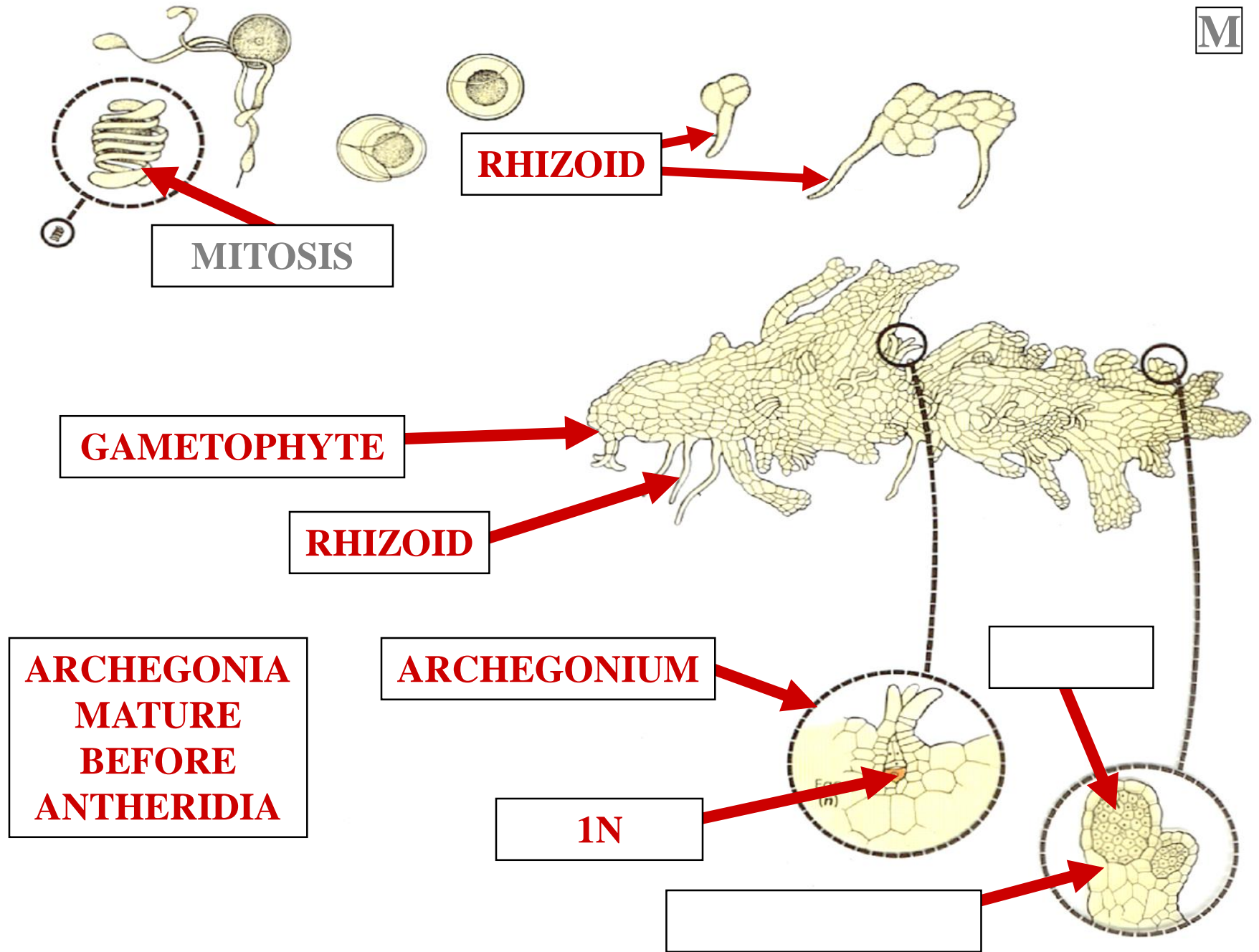
**ARCHEGONIUM**

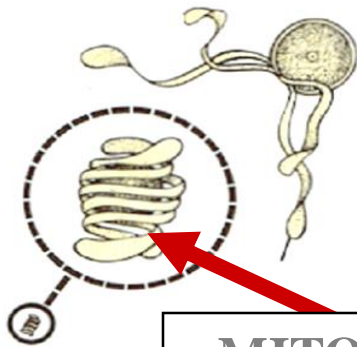


**OOCYTE**





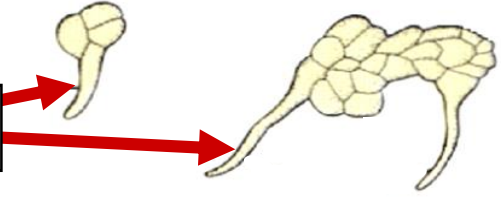




**MITOSIS**

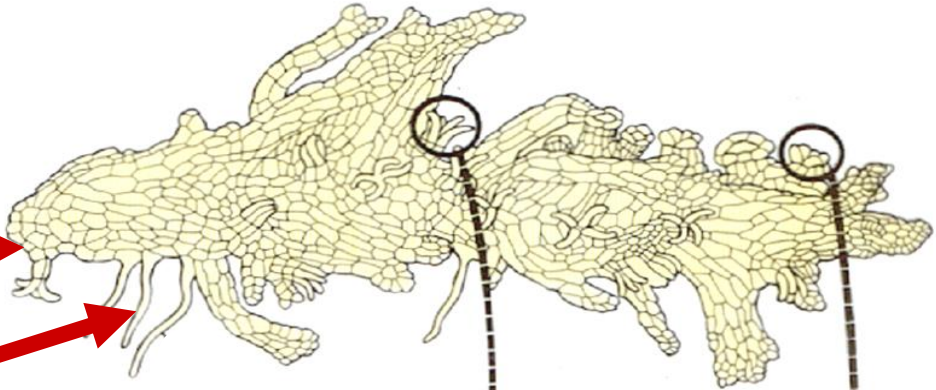


**RHIZOID**



**GAMETOPHYTE**

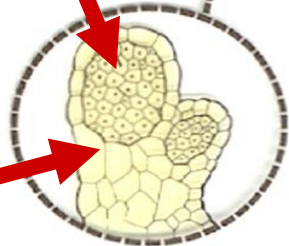
**RHIZOID**

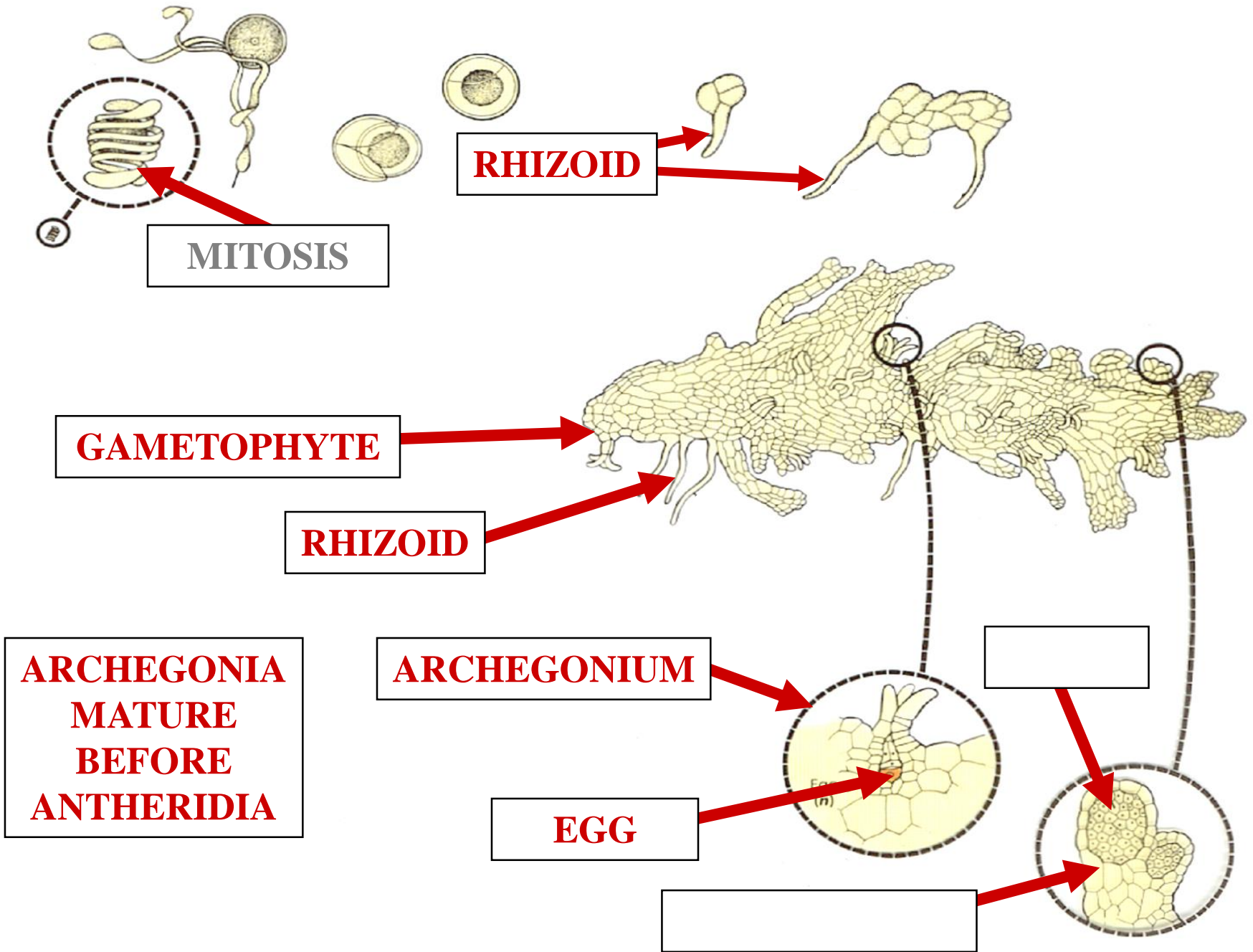


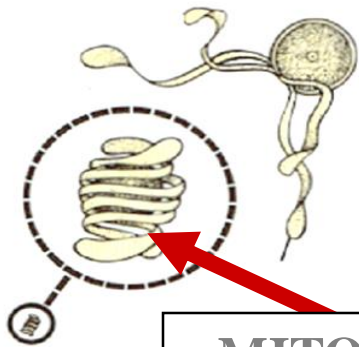
**ARCHEGONIA  
MATURE  
BEFORE  
ANTHERIDIA**

**ARCHEGONIUM**

**MITOSIS**



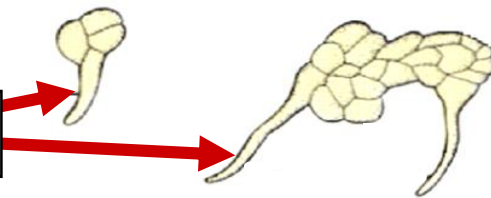




**MITOSIS**

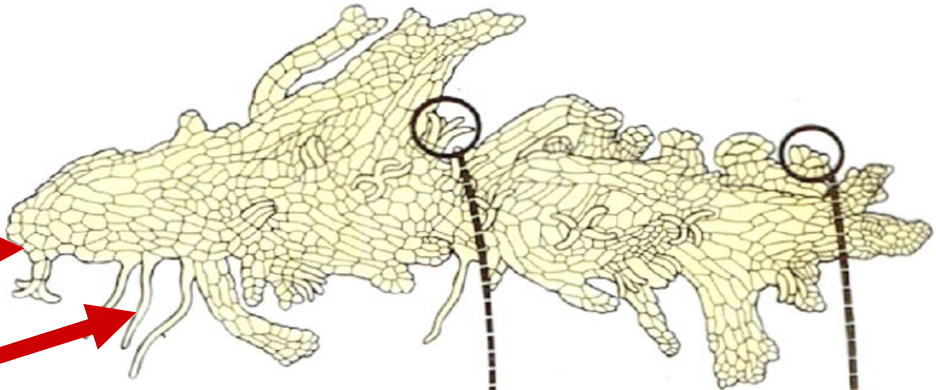


**RHIZOID**



**GAMETOPHYTE**

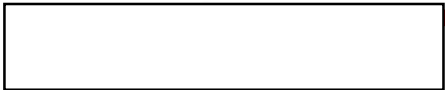
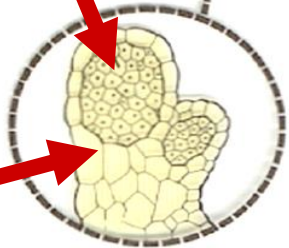
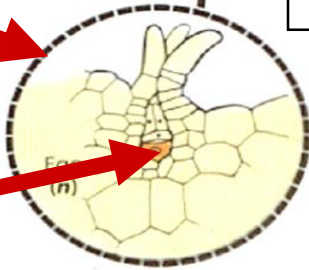
**RHIZOID**



**ARCHEGONIA  
MATURE  
BEFORE  
ANTHERIDIA**

**ARCHEGONIUM**

**1N**







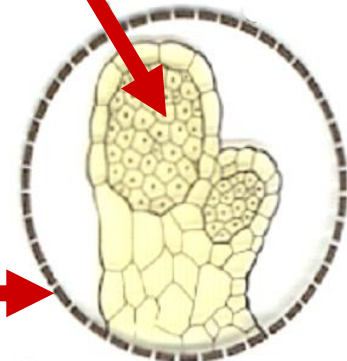
**ARCHEGONIUM**



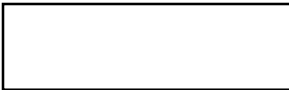
**EGG**



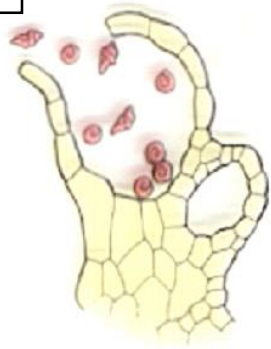
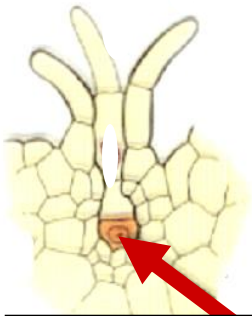
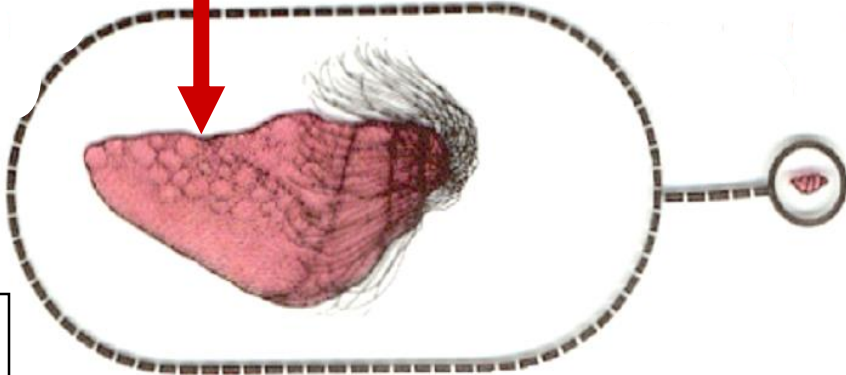
**SPERM**



**ANTHERIDIUM**



**MULTI-FLAGELLATED SPERM**





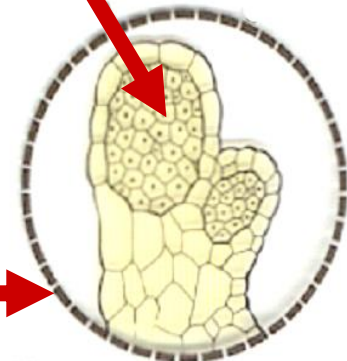
**ARCHEGONIUM**



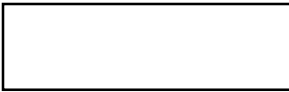
**EGG**



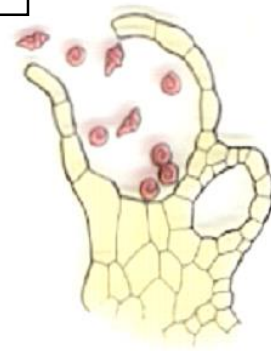
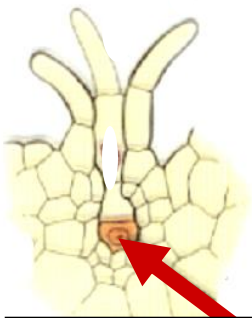
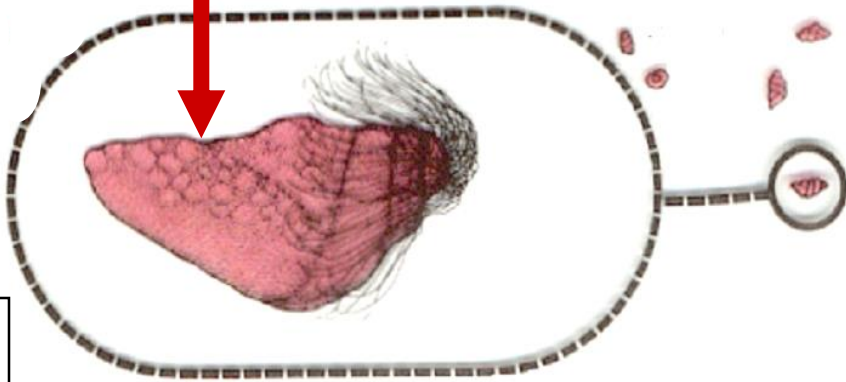
**SPERM**



**ANTHERIDIUM**



**MULTI-FLAGELLATED SPERM**



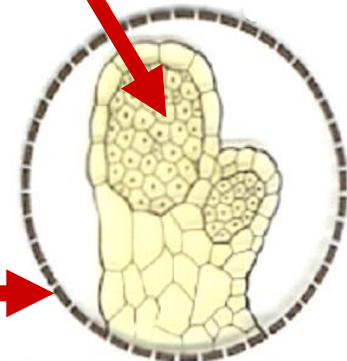
**ARCHEGONIUM**



**EGG**



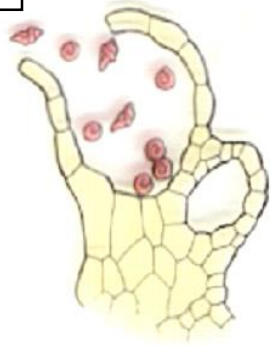
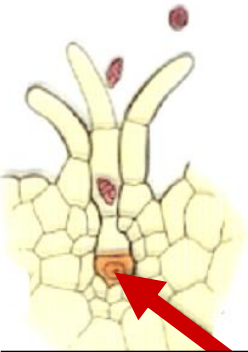
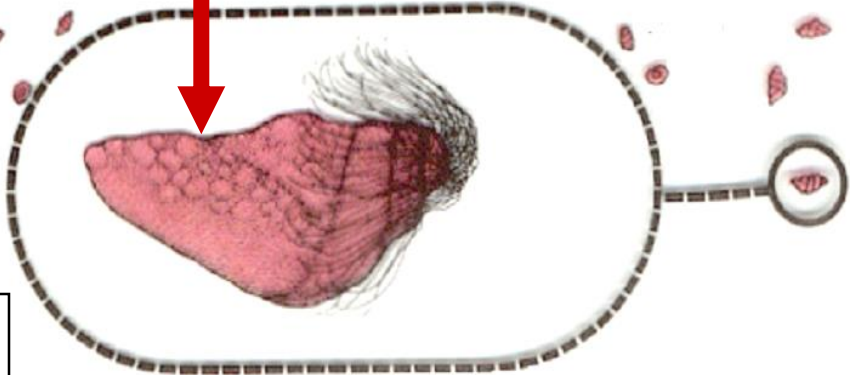
**SPERM**



**ANTHERIDIUM**



**MULTI-FLAGELLATED SPERM**

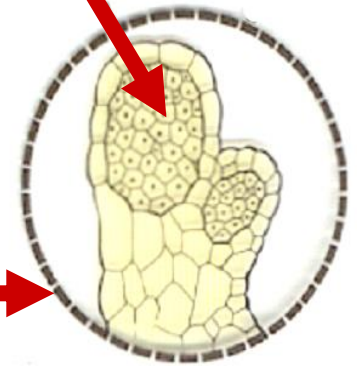


**ARCHEGONIUM**

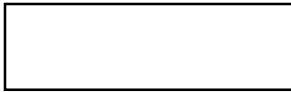


**EGG**

**SPERM**



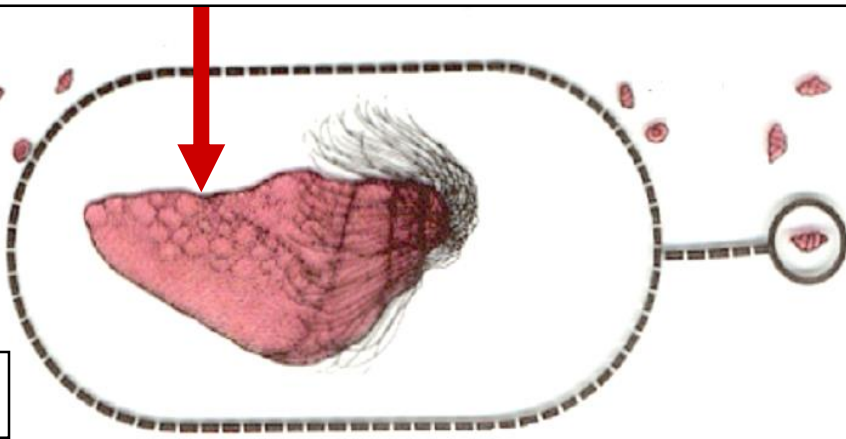
**ANTHERIDIUM**



**MULTI-FLAGELLATED SPERM**



**SYNGAMY**





**ARCHEGONIUM**



**EGG**



**SPERM**



**ANTHERIDIUM**

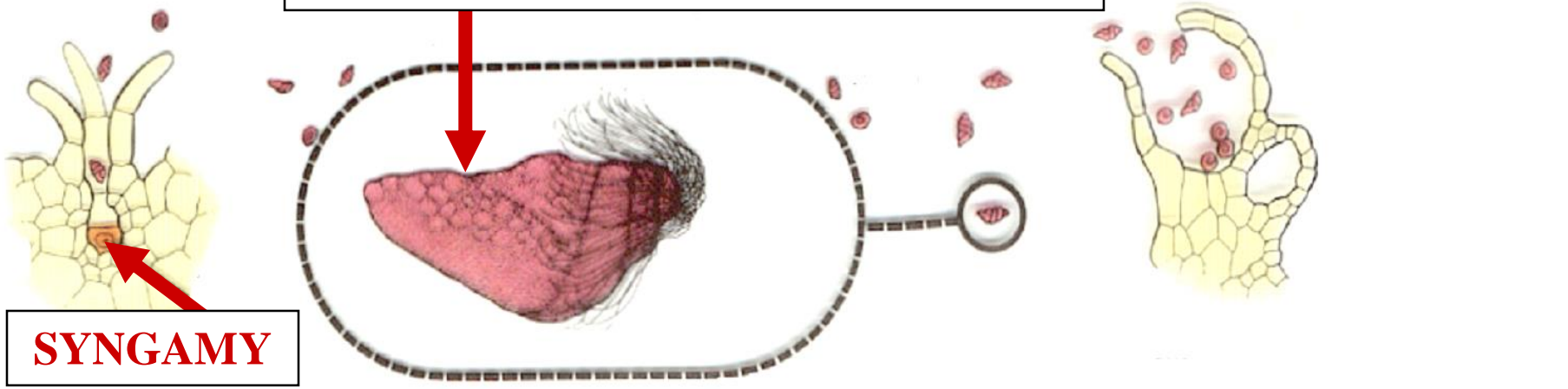


**WATER**

**MULTI-FLAGELLATED SPERM**



**SYNGAMY**



**ARCHEGONIUM**



**EGG**



**SPERM**



**ANTHERIDIUM**

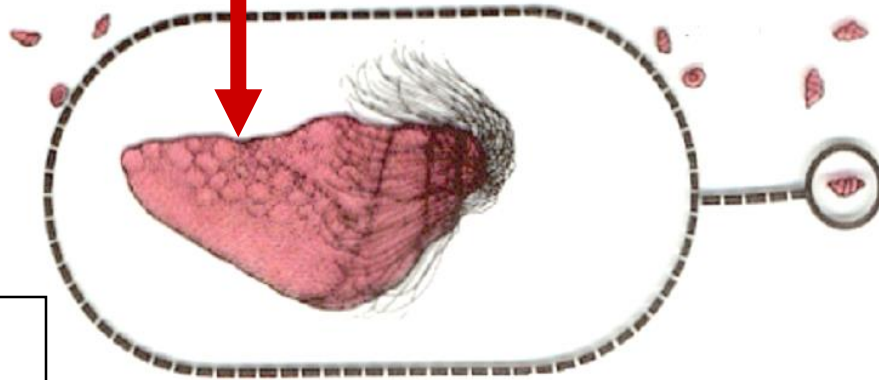


**WATER**

**MULTI-FLAGELLATED SPERM**



**ZYGOTE**

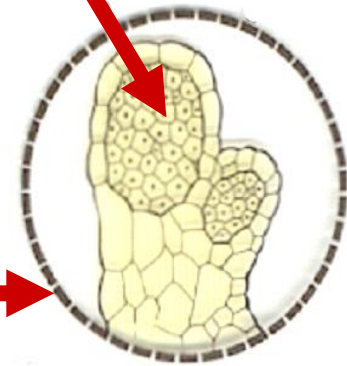


**ARCHEGONIUM**



**EGG**

**SPERM**



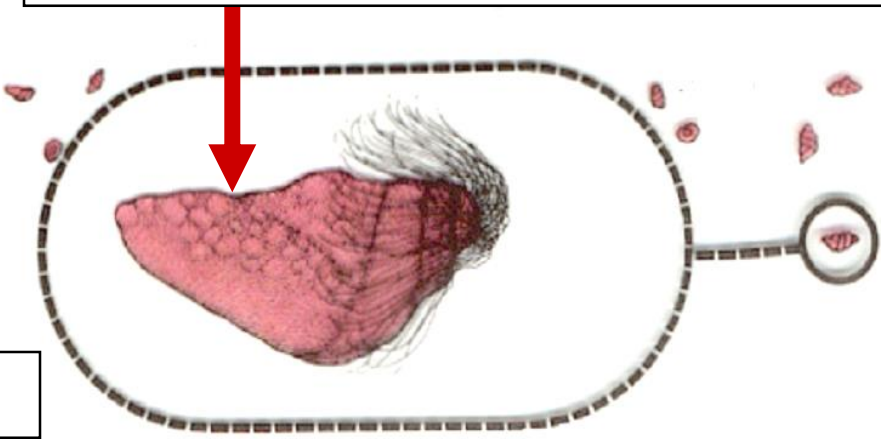
**ANTHERIDIUM**

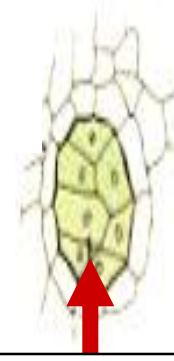
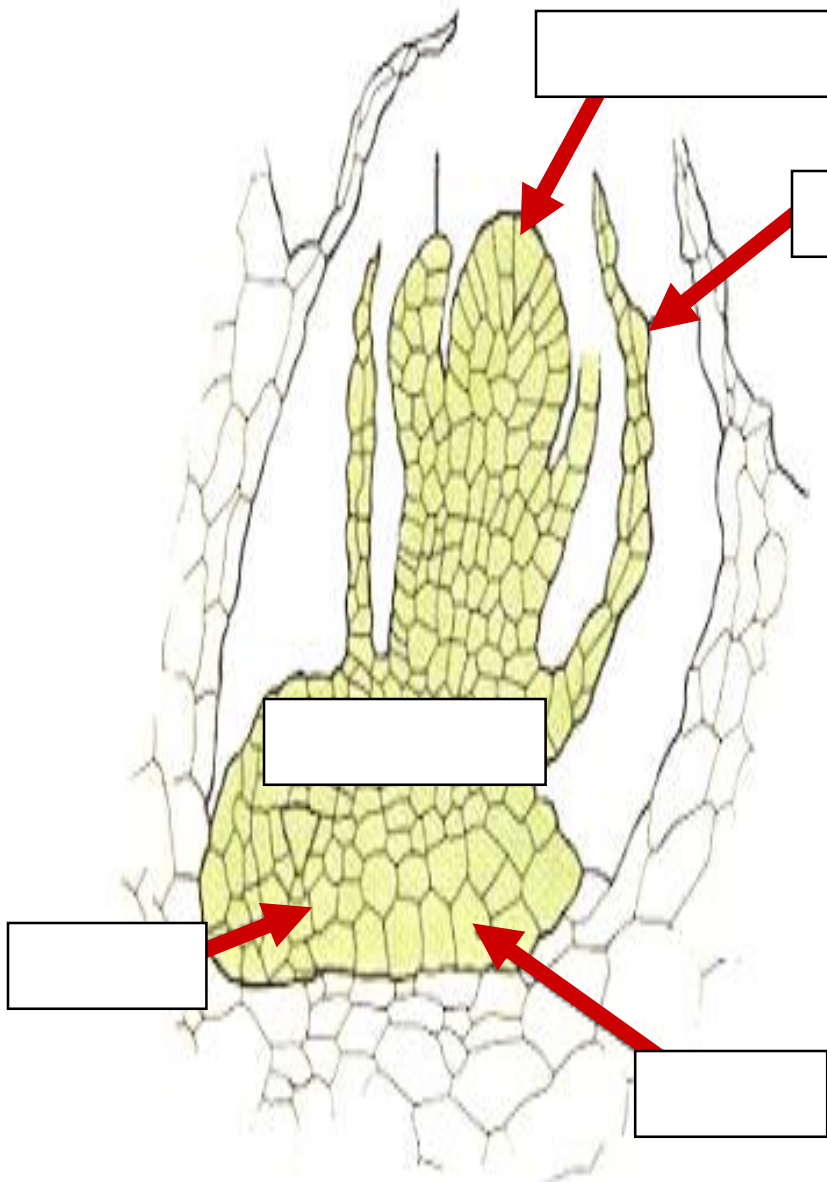
**WATER**

**MULTI-FLAGELLATED SPERM**



**2N**



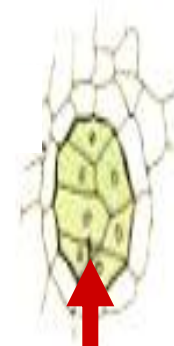
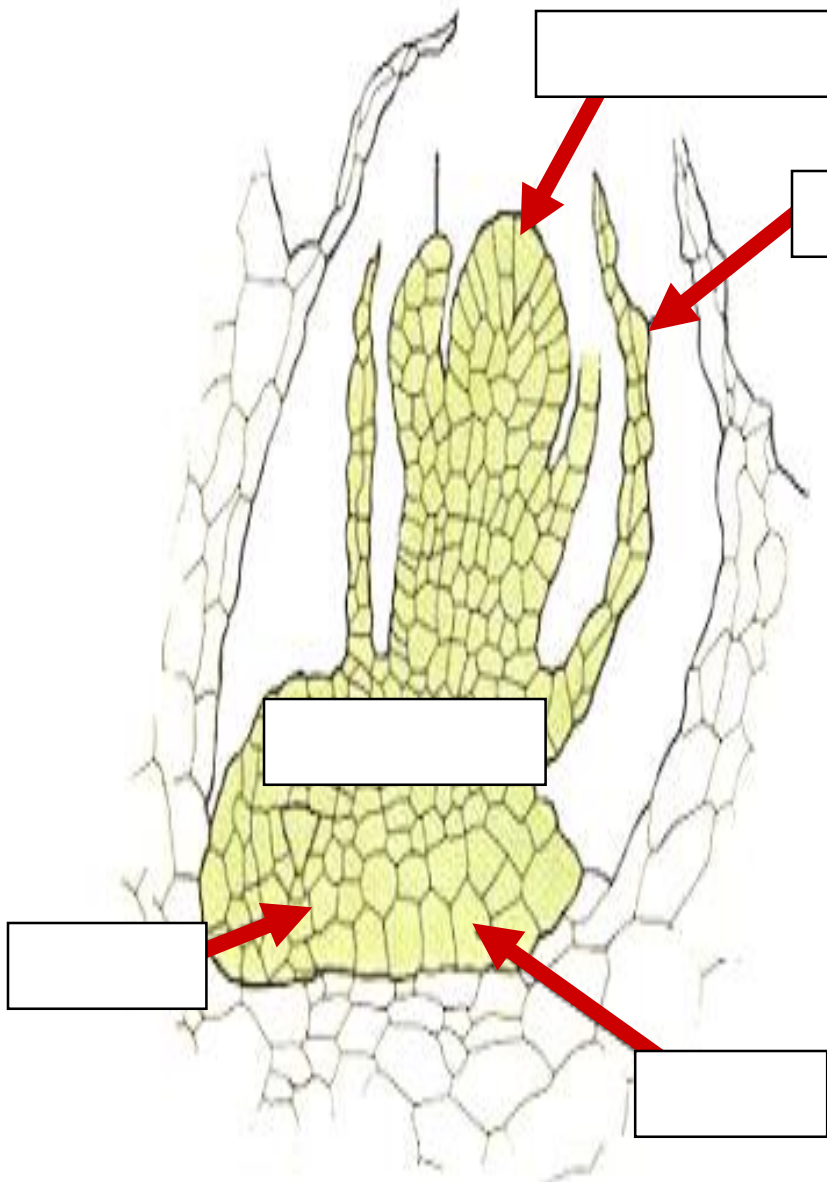


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MITOSIS

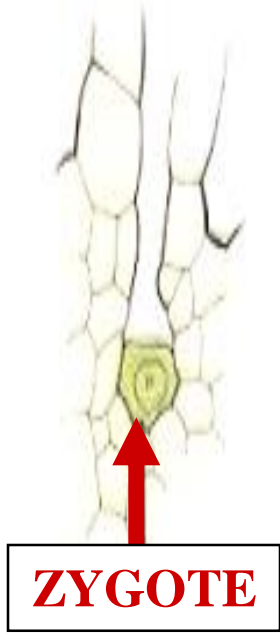
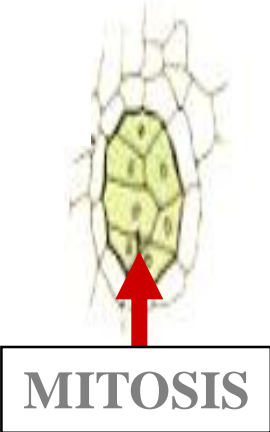
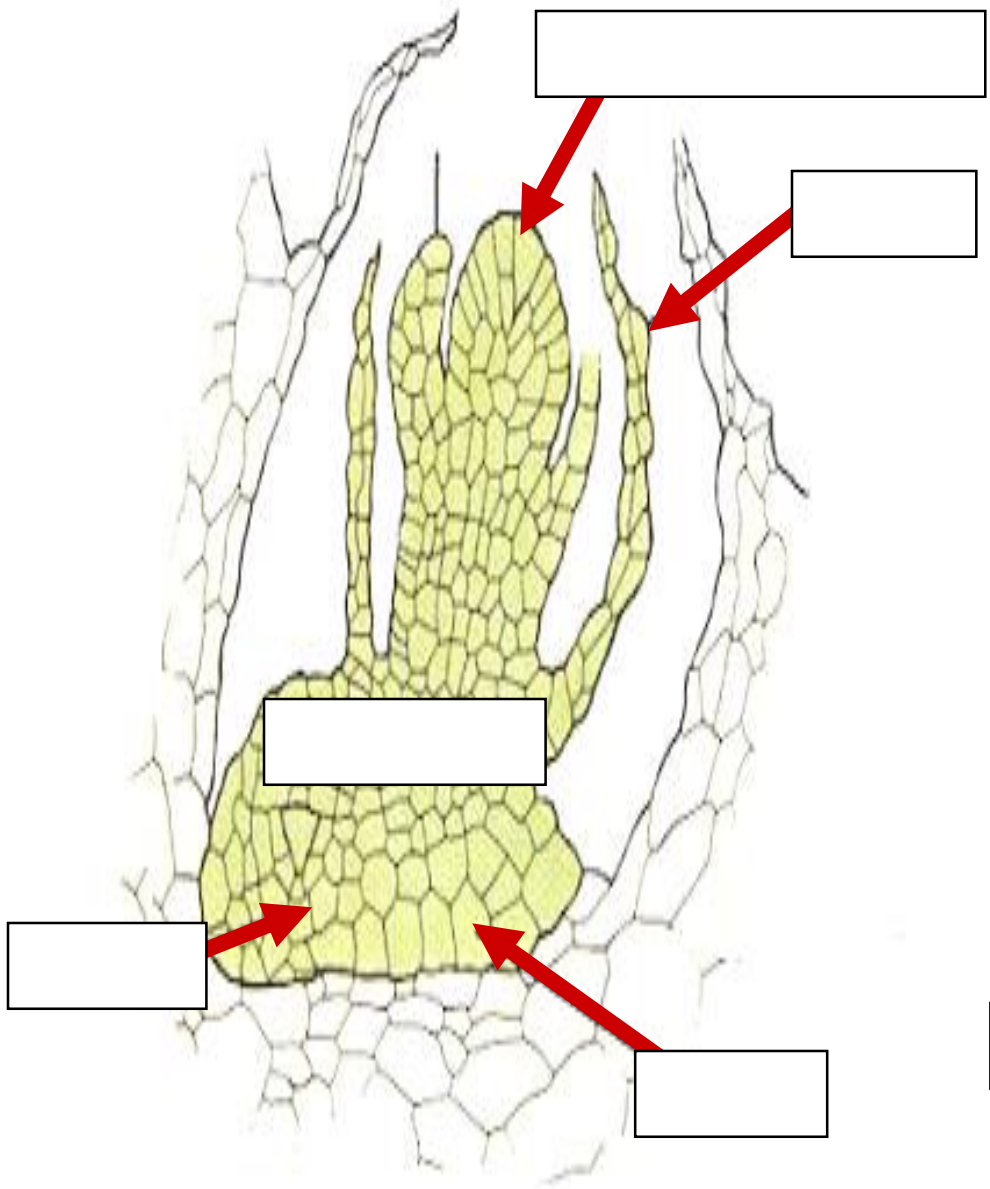


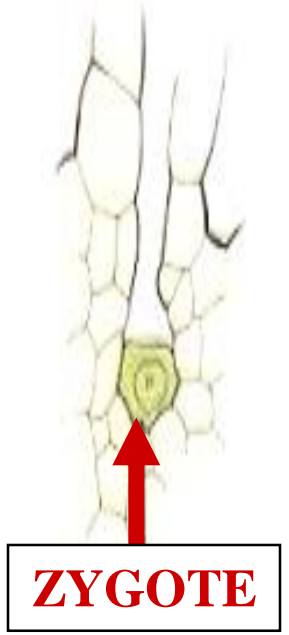
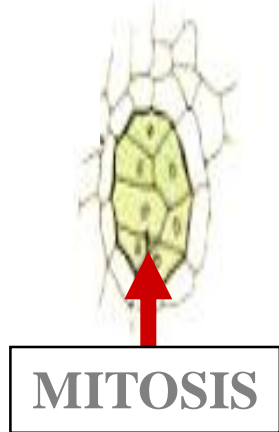
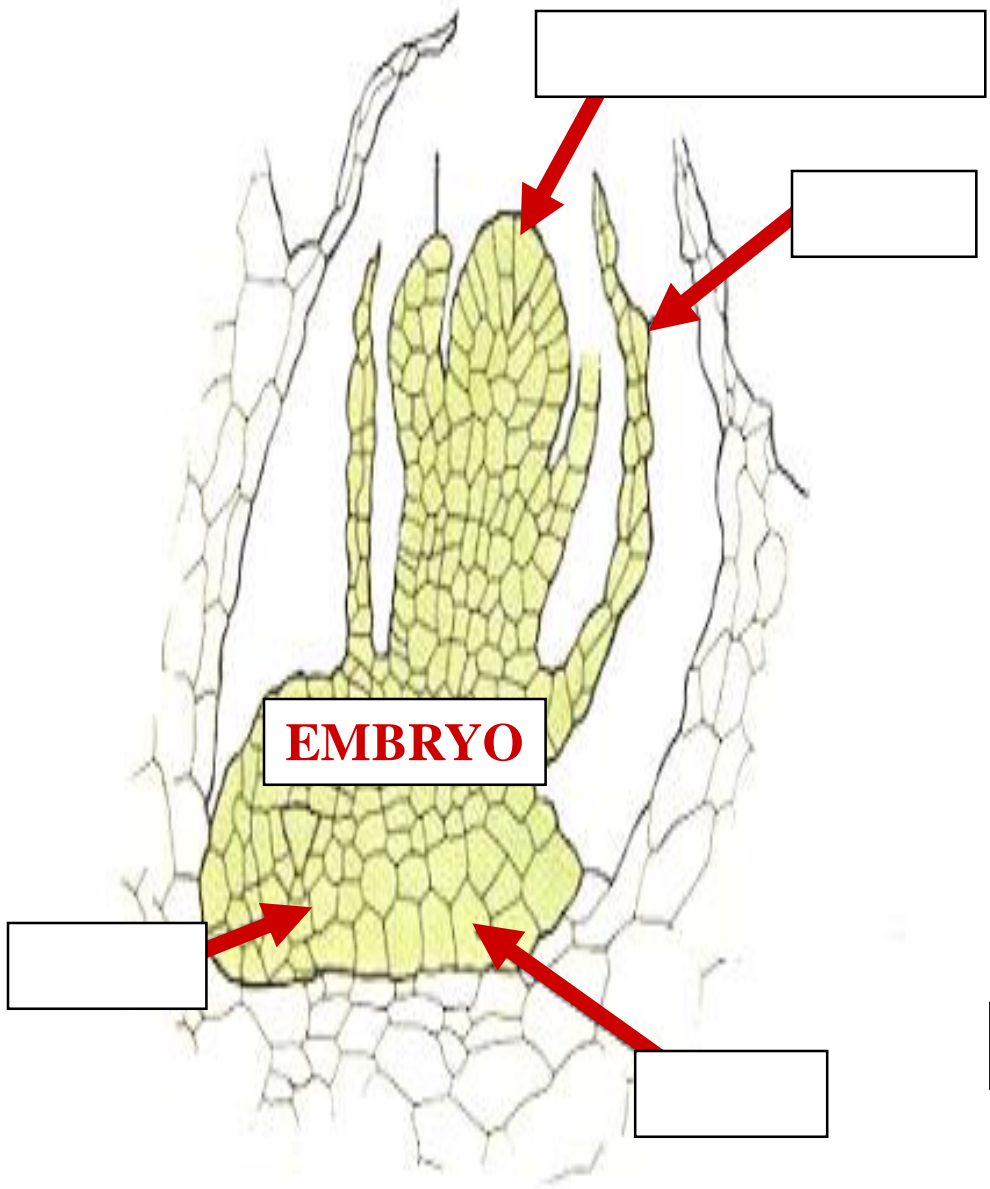


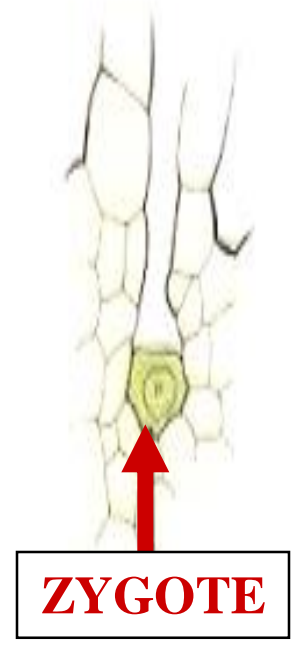
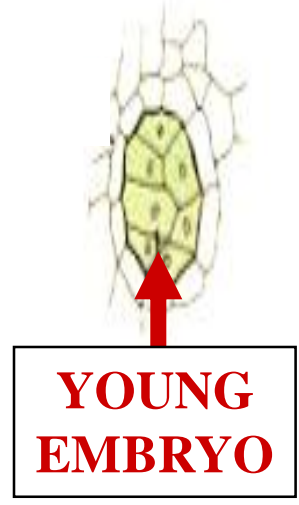
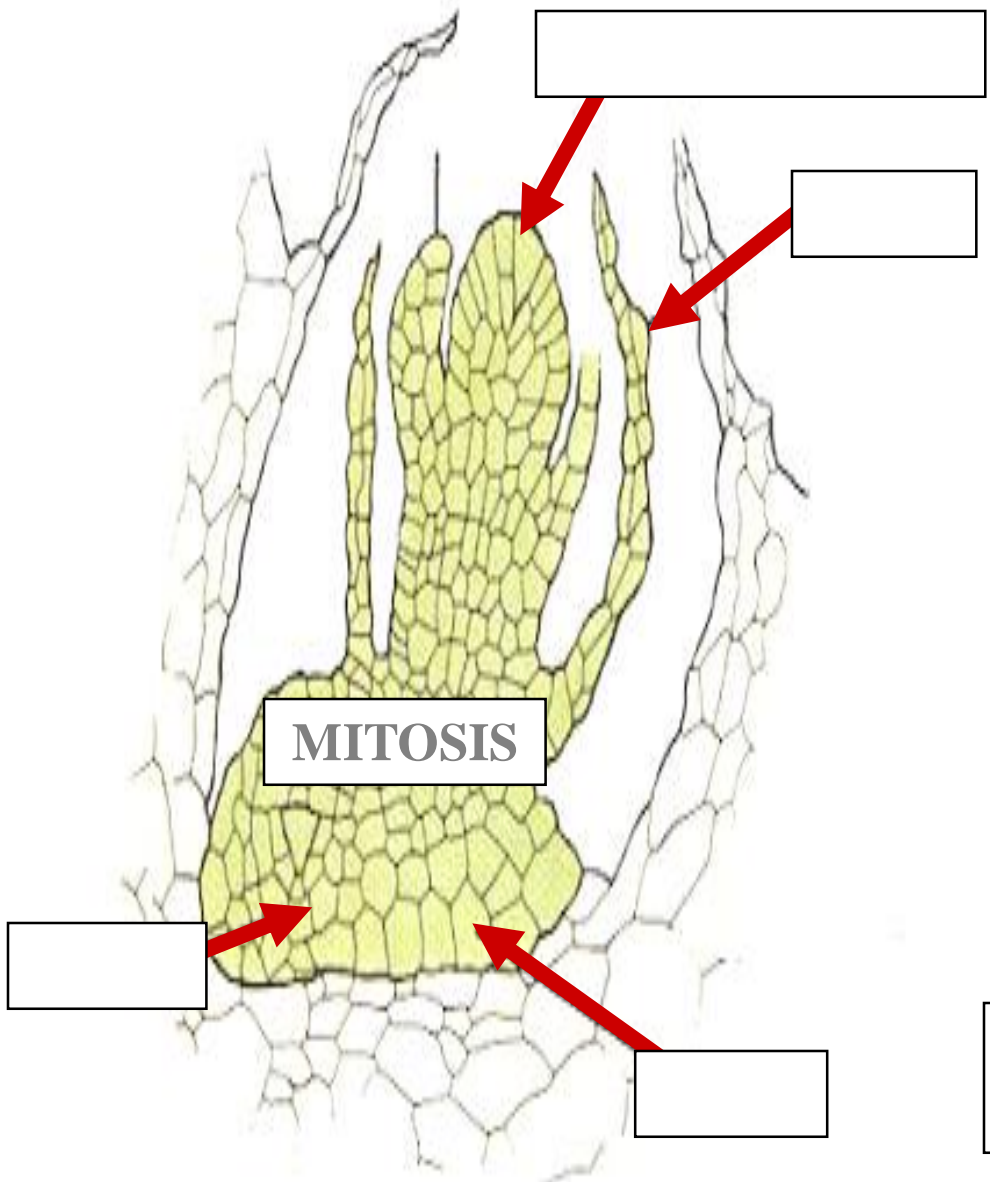
**YOUNG EMBRYO**



**MITOSIS**











**STROBILUS**

**MATURE SPOROPHYTE**



**WHORLED**



**INTERNODE**



**NODE**



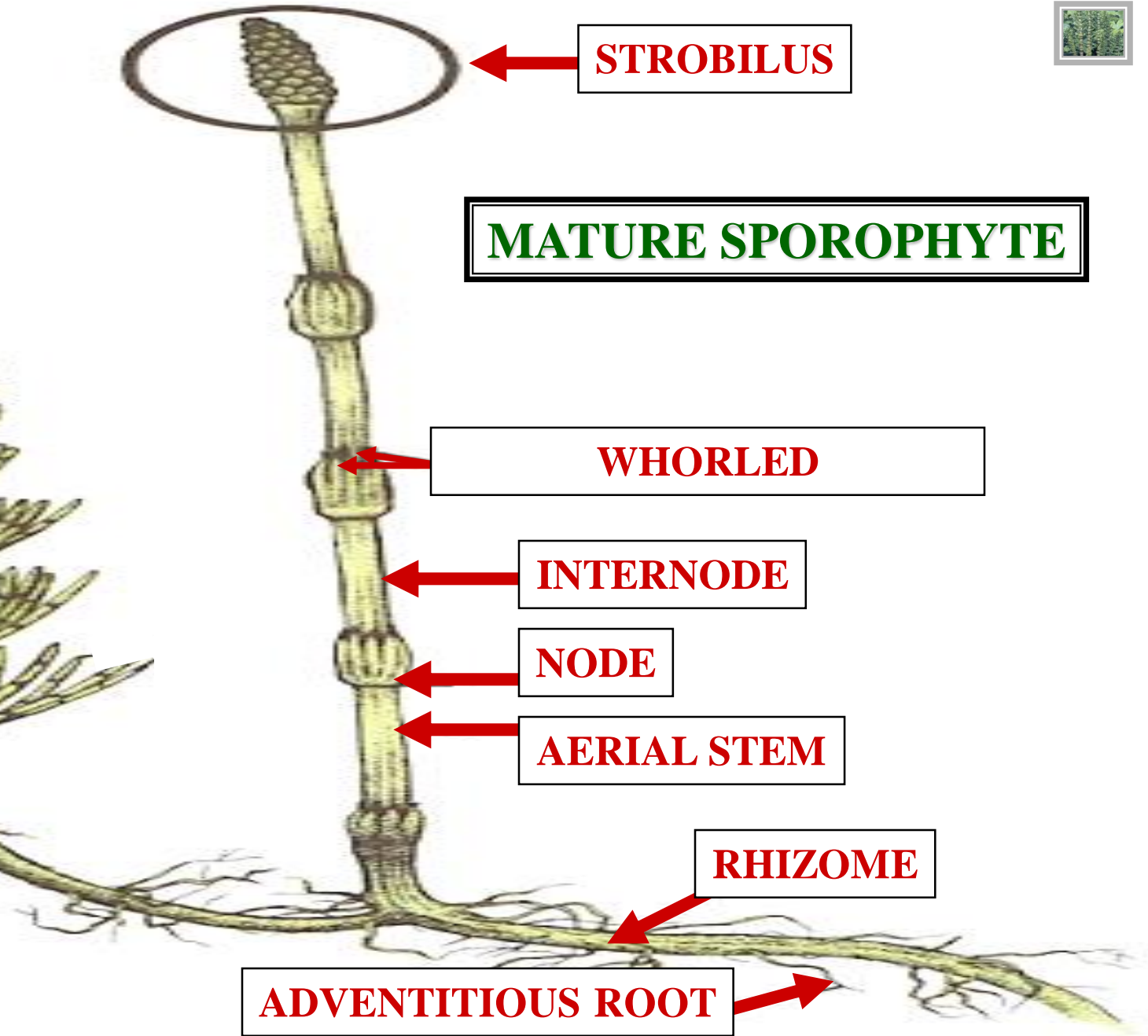
**AERIAL STEM**



**RHIZOME**



**ADVENTITIOUS ROOT**







***EQUISETUM***



# **PTERIDOPHYTA CLASSIFICATION**

**EXTANT  
CLASS**

**MARATTIOPSIDA**

**EXTANT  
CLASS**





# COMMON NAME



# **EUSPORANGIATE TREE-FERNS**

# MARATTIOPSIDA CHARACTERS