**[01]** *Dictyostelium discoideum* (a species within the Acrasiomycota (Dictyosteliomycota) group) is an innocuous forest dweller of no economic importance. What makes it so important for biological and medically-relevant research (Choose the best answer)?

A. it has calcium ion channels on its plasma membrane which share many biophysical properties with mammalian calcium channels that function in synaptic transmission

B. it's amoeboid bacteriophagous habit is a model for macrophage behaviour in humans.

C. it's contractile vacuole is also found in cardiocytes (heart cells which contract during the heart beat)

D. it's slug stage is directly relevant to medical research

E. it's coenocytic (multi-nuclear) character shares many similarities to muscle cells

F. it's transition from amoeboid uni-cell to multi-cellular organism involves signaling molecules, such as cyclic AMP, one of the major signaling messengers in animal cells.

G. phylogenetically, it is closely related to animals, and is considered to be the primordial animal organism H. none of the above

The fascination biologists have is with the transition from a unicellular to multicellular organisms, and the role of animal second messengers in that transition:  $\mathbf{F}$ .

**[02]** *Polyphagus* (a member of the Chytridiomycota group) contains chitin in its cell wall, and thus it is believed to be closely related to the major Fungal groups (Ascomycota, Basidiomycota and Zygomycota). What characteristic does it have —common to all Chytrids— which is unique compared to major Fungal groups?

1 J U U	1	
A. it is coenocytic	B. it has rhizoids	C. it is an autotroph
D. it has alternate generations	E. it has motile zoospores	F. it is always dikaryotic
G. it forms ectomycorrhizae	H. none of the above	
The chytrids have been moved from one ma	jor group to another. Presently considered fu	ngi, they are unique in having motile zoospores: $E$ .

Match the following characteristics with the most appropriate fungal division (Choose the best answer, you may use an answer more than once).

[03] Clamp connection	ns [04] Rhizomor	ph	[05] Dolipore	
A. Basidiomycota	B. Teliomycetes	C. Ascomycota	D. Ustomycetes	
E. Zygomycota	F. Hymenomycetes	G. Gasteromycete	es H. None of the above	
All common characteristics of Basidiomycota, including rhizomorphs: A.				

### [06] At what stage in their life cycle are Zygomycetes dikaryotic?

A. immediately after nuclear division B. immediately before nuclear division

C. immediately after karyogamy D. immediately after meiosis

E. immediately after plasmogamy F. during mycelial growth

G. immediately before plasmogamy H. they are never dikaryotic

Unlike other major fungal groups, the Zygomycetes are only transiently dikaryotic, immediately after plasmogamy (cell fusion): E.

#### **[07]** Which one of the following genera belong to the fungal division Ascomycota?

A. Psilocybe	B. Coprinus	C. Rhizopus	D. Aspergillus	
E. Entomopthora	F. Amanita	G. Ustilago	H. None of the above	
It's Aspergillus, a genus which includes species used for fermentation, and species known for toxin production: <b>D</b> .				

### [08] What advantages does a mycorrhizal fungi obtain from the plant symbiont?

A. The Hartig net (hyphal network growing between the root cells of the plant symbiont) provides physical protection from soil predators of fungi

B. The arbuscules (tree-like network of hyphae growing between the root cells of the plant symbiont) provides physical protection from soil grazers of fungi.

C. The fungal symbiont obtains phosphorus and other essential nutrients from programmed death of selected cells in the plant symbiont.

D. The plant symbiont provides photosynthate to the fungal symbiont.

E. B and C F. B and D G. C and D H. all of the above

As a heterotroph, the fungal symbiont relies on photosynthate from the plant symbiont, the plant receives phosphorus from the fungi: **D**.

**[09]** Which one of the following terms does <u>not</u> describe a common trait, structure or characteristic of one or more of the fungal divisions?

A. gametangia	B. sterigma	C. haustoria	D. hymenium	E. gleba
F. pileus	G. basidiomata	H. all describe a co	mmon trait, structure or char	acteristic
They are all traits, structures or characteristics: <b>H</b> .				

**[10]** Which one of the following genera is known to have a very primitive 'eye' capable of guiding the sporangiophore towards light?

0 0 1 0	1 0		
A. Aspergillus	B. Saccharomyces	C. Rhizopus	D. Ustilago
E. Cladonia	F. Allomyces	G. Entomophthora	H. none of the above
It's Pilobolus, not listed: <b>H</b> .	-	-	

Identify the numbered stages in the wheat rust ((*Puccinia graminis* var *tritici*) with the following genetics states and/or events.



## [11] meiosis

A. 1 B. 2 C. 3 D. 4 E. 5 F. A and B G. B and C H. None of the above

## [12] heterokaryon

A.1 B.2 C.3 D.4 E.5 F. A and B G. B and C H. None of the above

## [13] diploid

A.1 B.2 C.3 D.4 E.5 F. A and B G. B and C H. None of the above

As detailed in lecture, your lab manual and the textbook: **A**, **D** and **E**.

Some scientists hypothesize that the successful 'invasion of land' by plants required a symbiotic relationship between fungi and the 'ancestral' plant (presumably a chlorophyte). Certainly, lichens are one example of a successful 'land invasion' involving such a symbiotic relationship.

[14] Which one of the following characteristics is <u>not</u> true for the lichens?

A. lichens may be foliose, crustose or fruticose.

B. Cladonia species are a common ground cover in the Arctic.

C. lichens can survive long periods of time in a desiccated state.

D. the fungi 'invades' the photosynthetic cell using a haustorium

E. they are a symbiotic association between a fungi (commonly an Ascomycete) and a

photosynthetic organism (either a cyanobacteria or green algae).

F. the two symbionts can never be grown separately from each other.

G. the fungal 'mycobiont' typically forms an epidermis which serves to protect the cyanobacterial/algal 'photobiont' within the lichen structure

H. all of the above are true

For scientists, it's fascinating that the two symbionts can be grown separately, raising questions the well-defined the morphology of the lichen: F.

[15] Which one of the following characteristics is found <u>only</u> in land plants?

A. antheridium	B. oogonium	C. alternation of generations	C. food-conducting cells
E. apothecium	F. cellulose cell walls	G. stomates	H. none of the above
Stomates for gas exchange: G.			

[16] Which of the following is a small mass of vegetative tissue, an outgrowth of the haploid thallus (multicellular body) that is capable of growing into a new haploid gametophyte and is common in the liverworts?

A. gametangiophoreB. archegoniophoreC. gemmaD. protonemataE. rhizomorphF. elaterG. androeciumH. none of the aboveIt's the gemma (mosses -not liverworts-have protonemata): C.C.C.

### [17] Why are insectivorous plants common in Sphagnum bogs?

A. low nitrogen availability in bogsB. high alkalinity in bogsC. high acidity in bogsD. high nitrogen availability in bogsE. A and BF. A and CG. B and DH. C and DStudents tell me the answer is A. The bog plants are adapted to acid pH, but that is not why they feed on insects.H. C and D

### **[18]** What is a moss calyptra?

A. The sporangium

B. The lid of the sporangium

C. The female gametangium

D. The hood or cap that partly or entirely covers the capsule of some species, formed from the expanded archegonium wall

E. The packet-like swelling that contains the antheridia

F. The stalk that supports the capsule that is part of the sporophyte

G. A branch bearing one or more sporangia

H. None of the above

It's the term used to describe the hood or cap: D.

# [19] Which of the following are adaptations specific to the ability of a 'land' plant to survive on land, without easy access to water?

A. tracheophyticB. embryophyticC. rhizoidsD. sporophyte dominanceE. A and BF. A, B and CG. A, B and DH. all of the aboveVasculature, protection of the embryo and rhizoids all directly impact on survival on land: F.F.

#### [20] What unique characteristic(s) distinguish Lycopodium from Selaginella?

I			0
A. hydroids and leptoids	B. homospory	C. eustelar anatomy	D. protostelar anatomy
E. heterospory	F. ligule	G. D and E	H. none of the above
Lycopodium are homosporic: B			

[21] Which of the following *cannot* be used to distinguish an individual or group within the Pteridophyta (ferns)?

A. non-motile sperm	B. apical initial forming the sporangia (leptosporangia)
C. homospory	D. superficial initials forming the sporangia (eusporangia)
E. arrangement and form of the sori	F. form and function (fertile and sterile) of the leaves (fronds)
G. heterospory	H. All of the above can be used
All ferns have motile sperm, so the answer is: $A$ .	

[22] Which of the following *cannot* be used to distinguish major groups within the Gymnosperms (Coniferophyta, Cycadophyta, Ginkgophyta and Gnetophyta)? A. non-motile sperm B. dioecious C. eustelar anatomy D. leaf morphology G. B, C and D E. A and B F. A and C H. All of the above can be used All the groups have eusteles, so that answer is: C.

[23] Which of the following characteristics are key components of the successful invasion of land by plants (choose the best answer)?

1. leptoids and hydroids	A. 1, 2, 3, 4 and 5	B. 2, 3, 4, 5 and 6
2. glycolate oxidase (photorespiration)	C. 1, 3, 4, 5 and 6	D. 1, 2, 4, 5 and 6
3. rhizoids and roots	E. 1, 3, 4 and 5	F. 2, 3, 4 and 6
4. indeterminant growth of sporophyte	G. 2, 4, 5 and 6	H. 1, 4, 5 and 6

5. stomata (or primitive variants thereof)

6. xylem and phloem

It's a judgement call whether a sporophyte growth habit is key to the land invasion. '1, 3, 5 and 6' is not available. The best answer: C.

[24] How is water transported in vascular plants — most notably in trees (choose the best answer)?

A. The high osmolarity of roots draws water into the plant from the soil at a pressure high enough to push it to the top of the tree.

B. The small diameter of the xylem allows water to be drawn to the top of the tree by capillary action.

C. Evaporation of water in the leaf 'pulls' water up the tree through the xylem.

D. Similar to a barometer, it is the atmospheric pressure that pushes water from the soil through the xylem to the top of the tree.

E. Water movement <u>up</u> the xylem is caused by its movement <u>down</u> the phloem cells -a kind of rotatory pump.

F. Both A and B, working in concert.

G. Both C and D, working in concert.

H. None of the above.

As explained in lecture, the answer is: C.

## [25] Which of these typify the special nature of seeded vascular plants compared to other vascular and non-vascular land plants (Choose the best answer)?

A. The common presence of regions of secondary cellular divisions (meristems) that allow the development of a more complex final form of the mature plant, especially the vasculature.

B. The presence of heterospory (micro- and mega-spores)

C. The complete dependence of the haploid (gametophyte) stage on the parental sporophyte (diploid).

D. The complete dependence of the haploid (gametophyte) stage and sporophyte (diploid) offspring (at least initially) on the parental sporophytes (diploid).

E. A and B F.A.B and D G. A and D H. B and C Secondary meristems and the 'seed' (D) typify seeded vascular plants: G.

