



Slime mold quiz

Beginner level · 10 questions · one right answer per question

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1. What biological group does the blob (*Physarum polycephalum*) belong to?

- ☐ A. Fungus
- ☐ B. Bacterium
- ☐ C. Myxomycete (protist)
- ☐ D. Algae

2. How does slime mold move across surfaces?

- ☐ A. Using tiny legs invisible to the naked eye
- ☐ B. By rhythmic contractions of its cytoplasm (shuttle streaming)
- ☐ C. By rolling like a ball
- ☐ D. By growing roots that pull it forward

3. How did Audrey Dussutour demonstrate that slime mold has a form of memory?

- ☐ A. By training it to recognize colors
- ☐ B. By showing it could learn to ignore a repulsive but harmless substance
- ☐ C. By teaching it to follow a light pattern
- ☐ D. By conditioning it with electric shocks

4. How does slime mold reproduce sexually?

- ☐ A. By budding, like yeast
- ☐ B. By releasing spores that hatch into gamete cells which fuse
- ☐ C. By binary fission
- ☐ D. It cannot reproduce sexually

5. What was remarkable about the 2010 Tokyo railway experiment?

- ☐ A. Slime mold built a network matching Tokyo's rail system
- ☐ B. Slime mold survived Japanese winter outdoors
- ☐ C. Slime mold consumed all food in record time
- ☐ D. Slime mold refused to grow on the map



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6. What does slime mold primarily feed on in the wild?

- ☐ A. Sunlight through photosynthesis
- ☐ B. Bacteria, fungal spores, and yeasts
- ☐ C. Minerals from the soil
- ☐ D. Other slime molds

7. What is the largest verified size of a single *Physarum polycephalum*?

- ☐ A. A few millimeters at most
- ☐ B. About the size of a coin
- ☐ C. No verified record exists: it grows as long as it is fed
- ☐ D. Exactly one square meter

8. What is the maximum speed of slime mold movement under optimal conditions?

- ☐ A. 0.5 cm/h
- ☐ B. 4 cm/h
- ☐ C. 20 cm/h
- ☐ D. 1 m/h

9. What was the main purpose of the 2021 slime mold experiment aboard the International Space Station?

- ☐ A. To test a new medicine on astronauts
- ☐ B. An educational experiment run in parallel with thousands of French schools
- ☐ C. To grow food for the crew
- ☐ D. To prove that slime mold can live without water

10. How many mating types does *Physarum polycephalum* have?

- ☐ A. 2 (male and female)
- ☐ B. 4
- ☐ C. Around 30
- ☐ D. 720



Slime mold quiz - answers

One point per right answer

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No.	Answer	Why
1	C. Myxomycete (protist)	The blob is a myxomycete. It was long filed among the protists, a catch-all for organisms that are neither animals, plants nor fungi, and DNA now places it among the Amoebozoa. It is not a fungus, nor a bacterium, nor an alga.
2	B. By rhythmic contractions of its cytoplasm (shuttle streaming)	Slime mold moves through cytoplasmic shuttle streaming: rhythmic back-and-forth contractions push the cytoplasm toward the leading edge. In ideal lab conditions it can advance up to about 4 cm an hour, closer to 1 cm an hour at home.
3	B. By showing it could learn to ignore a repulsive but harmless substance	In 2016, Romain Boisseau, David Vogel and Audrey Dussutour (CNRS) showed that <i>Physarum polycephalum</i> learns to cross a bridge laced with quinine or caffeine once it has found the substance harmless. Later that year, Vogel and Dussutour showed that a slime mold trained this way could pass the behavior on to an untrained one by fusing with it.
4	B. By releasing spores that hatch into gamete cells which fuse	Under stress, the plasmodium forms fruiting bodies that release spores. These spores hatch into myxamoebae or swarm cells, which then fuse in compatible pairs to form a new diploid plasmodium.
5	A. Slime mold built a network matching Tokyo's rail system	Researchers placed oat flakes on a map at the positions of the cities around Tokyo. The network the slime mold grew between them was comparable to the real rail system in cost, efficiency and resistance to breakdowns, showing it can solve a hard optimization problem without a brain.



Slime mold quiz - answers

One point per right answer

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No.	Answer	Why
6	B. Bacteria, fungal spores, and yeasts	Slime mold feeds by phagocytosis, engulfing bacteria, fungal spores, yeasts, and other microorganisms. It plays an important ecological role as a decomposer in moist forest environments.
7	C. No verified record exists: it grows as long as it is fed	A plasmodium has no known size limit and roughly doubles its area every day when well fed. Figures of several square meters circulate online, but no size record has been measured and published in a verifiable way. In the wild, a few tens of centimeters is already a big one.
8	B. 4 cm/h	Slime mold can advance up to about 4 cm per hour in ideal lab conditions on smooth agar. In a home culture, expect around 1 cm per hour. That is slow for us, but its whole body flows forward through its network.
9	B. An educational experiment run in parallel with thousands of French schools	In September 2021, Thomas Pesquet woke four slime molds aboard the ISS, while 4,500 French schools were invited to run the same experiment on Earth. All four revived and grew in orbit, but four specimens are too few for scientific conclusions, and the project was educational from the start.
10	D. 720	Mating type in <i>Physarum polycephalum</i> is set by three genes: <i>matA</i> (16 known versions), <i>matB</i> (15) and <i>matC</i> (3). That gives $16 \times 15 \times 3 = 720$ combinations, so 720 mating types, and two reproductive cells can only pair if their combinations differ.



Slime mold expert quiz

Advanced level · 15 questions · one right answer per question

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1. What is the mechanism that drives cytoplasmic movement inside a Physarum plasmodium?

- ☐ A. Flagellar rotation
- ☐ B. Actin-myosin shuttle streaming driven by rhythmic contractions
- ☐ C. Microtubule-based transport similar to neurons
- ☐ D. Osmotic pressure differences between nuclei

2. In which journal was Toshiyuki Nakagaki's landmark maze-solving paper published, and in what year?

- ☐ A. Science, 1998
- ☐ B. Nature, 2000
- ☐ C. PNAS, 2002
- ☐ D. Cell, 2001

3. What specific type of learning did Audrey Dussutour's 2016 Proceedings of the Royal Society B paper demonstrate in Physarum?

- ☐ A. Classical conditioning (Pavlovian)
- ☐ B. Habituation to a non-harmful aversive stimulus
- ☐ C. Associative learning with reward
- ☐ D. Spatial memory formation

4. Which gene decides whether two compatible reproductive cells of Physarum polycephalum go on to form a new plasmodium?

- ☐ A. MAT1
- ☐ B. matA
- ☐ C. MATalpha
- ☐ D. sexP

5. Andrew Adamatzky's research has explored using Physarum as what type of computational device?

- ☐ A. A quantum computing substrate
- ☐ B. An unconventional biological logic gate and network optimizer
- ☐ C. A DNA sequencing tool
- ☐ D. A random number generator

6. What specific species of slime mold was used in the 2010 Tokyo railway network optimization study by Tero et al.?

- ☐ A. Dictyostelium discoideum
- ☐ B. Physarum polycephalum
- ☐ C. Fuligo septica
- ☐ D. Stemonitis axifera



Slime mold expert quiz

Advanced level · 15 questions · one right answer per question

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7. What is the term for the hardened, dormant resting state of a *Physarum plasmodium*?

- ☐ A. Cyst
- ☐ B. Sclerotium
- ☐ C. Endospore
- ☐ D. Akinete

8. In the *Physarum* life cycle, what are the two types of cells that hatch from spores?

- ☐ A. Amoebae and flagellated cells
- ☐ B. Myxamoebae and swarm cells
- ☐ C. Trophozoites and merozoites
- ☐ D. Zoospores and aplanospores

9. In 2019, what did Audrey Dussutour's team find inside slime molds that had been habituated to salt?

- ☐ A. Electrical activity concentrated in the veins
- ☐ B. About ten times more salt than in untrained slime molds
- ☐ C. A new type of neuron-like cell
- ☐ D. No measurable difference at all

10. What gives *Physarum polycephalum* its characteristic bright yellow color?

- ☐ A. Chlorophyll from photosynthetic activity
- ☐ B. Yellow pigments specific to the organism, called physarochromes
- ☐ C. Bioluminescent proteins
- ☐ D. Iron oxidation in the cell membrane

11. What is '*Dictyostelium discoideum*' and how does it differ fundamentally from *Physarum polycephalum*?

- ☐ A. It is a subspecies of the same organism
- ☐ B. It is a cellular slime mold where individual amoebae aggregate, unlike *Physarum*'s true multinucleate plasmodium
- ☐ C. It is the sexual stage of *Physarum*
- ☐ D. It is a bacterium that feeds on *Physarum*

12. What mathematical model best describes the tube network optimization process in *Physarum*?

- ☐ A. Fibonacci sequence growth
- ☐ B. A conductivity reinforcement model based on Hagen-Poiseuille flow
- ☐ C. Mandelbrot fractal branching
- ☐ D. Simple random walk diffusion



Slime mold expert quiz

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Advanced level · 15 questions · one right answer per question

13. What is the approximate oscillation period of cytoplasmic streaming in a healthy Physarum plasmodium?

- ☐ A. 0.1 seconds
- ☐ B. 1 to 2 minutes
- ☐ C. 10 to 15 minutes
- ☐ D. Once per hour

14. In Adamatzky's experiments, how were Physarum-based logic gates physically implemented?

- ☐ A. By genetically engineering different Physarum strains
- ☐ B. By controlling the geometry of channels and food placement to guide tube formation
- ☐ C. By applying electric fields to direct growth
- ☐ D. By using different chemical attractants as binary signals

15. What is 'Fuligo septica' and why is it noteworthy among myxomycetes?

- ☐ A. The fastest-moving slime mold species ever recorded
- ☐ B. A common large yellow slime mold known as 'dog vomit,' one of the most visible wild species
- ☐ C. A parasitic slime mold that attacks crops
- ☐ D. The only bioluminescent myxomycete species



Slime mold expert quiz - answers

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One point per right answer

No.	Answer	Why
1	B. Actin-myosin shuttle streaming driven by rhythmic contractions	Physarum moves its cytoplasm through shuttle streaming, powered by actin-myosin contractions that create rhythmic oscillations (a cycle of about 100 seconds). This generates a pressure differential that pushes cytoplasm back and forth, with net movement toward favorable stimuli.
2	B. Nature, 2000	Nakagaki's groundbreaking paper 'Maze-solving by an amoeboid organism' was published in Nature in September 2000 (Volume 407). It demonstrated that Physarum polycephalum could find the shortest path through a maze connecting two food sources.
3	B. Habituation to a non-harmful aversive stimulus	Dussutour's 2016 paper demonstrated habituation, the simplest form of learning. Physarum learned to cross bridges coated with quinine or caffeine (unpleasant but harmless) after repeated exposure. This was the first demonstration of habituation in a non-neural organism.
4	B. matA	matA decides whether the union of two reproductive cells gives rise to a new plasmodium. It has 16 known versions. Combined with matB (15 versions) and matC (3), it produces the 720 mating types of Physarum polycephalum ($16 \times 15 \times 3 = 720$).
5	B. An unconventional biological logic gate and network optimizer	Adamatzky (University of the West of England) has extensively studied Physarum as an unconventional computing medium. His work includes implementing logic gates (AND, OR, NOT) using slime mold tubes, solving graph-theoretic problems, and creating Physarum-based sensor arrays.
6	B. Physarum polycephalum	The 2010 Science paper by Tero, Takagi, Saigusa, Ito, Bebber, Fricker, Yumiki, Kobayashi, and Nakagaki used Physarum polycephalum. The researchers placed oat flakes on a map of the Tokyo area and showed that the slime mold formed a network comparable in efficiency, fault tolerance, and cost to the actual rail system.



Slime mold expert quiz · answers

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One point per right answer

No.	Answer	Why
7	B. Sclerotium	The sclerotium is the dehydrated, dormant form that Physarum adopts under unfavorable conditions (desiccation, cold, starvation). The plasmodium hardens into a crusty mass that can survive for years and reactivate when conditions improve.
8	B. Myxamoebae and swarm cells	Physarum spores can hatch into either myxamoebae (amoeboid cells that move on surfaces) or swarm cells (biflagellated cells that swim in water), depending on moisture levels. Both forms are interconvertible and can fuse with a compatible mating type to form a new plasmodium.
9	B. About ten times more salt than in untrained slime molds	Boussard and colleagues showed that slime molds trained to cross salt had absorbed it, ending up with about ten times more salt inside their cell than untrained ones. The salt stayed in the sclerotium during a month of dormancy, and the habituation was still there on waking. The absorbed substance itself may act as the memory.
10	B. Yellow pigments specific to the organism, called physarochromes	The yellow of Physarum polycephalum comes from its own pigments, the physarochromes. It has no chlorophyll and does not photosynthesize. Other myxomycetes come in white, pink, red, brown or iridescent blue, each with different pigments.
11	B. It is a cellular slime mold where individual amoebae aggregate, unlike Physarum's true multinucleate plasmodium	Dictyostelium discoideum is a cellular slime mold (Dictyosteliida). Its amoebae live independently and only aggregate into a multicellular slug when starving. Physarum, by contrast, is an acellular (plasmodial) slime mold: it forms a single giant multinucleate cell. They belong to different branches of the Amoebozoa.
12	B. A conductivity reinforcement model based on Hagen-Poiseuille flow	The Tero-Kobayashi model describes tube dynamics using Hagen-Poiseuille flow equations: tubes carrying more cytoplasm increase in conductivity (positive feedback), while underused tubes shrink and vanish. This creates an efficient, self-optimizing transport network that can approximate Steiner tree solutions.



Slime mold expert quiz · answers

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One point per right answer

No.	Answer	Why
13	B. 1 to 2 minutes	The cytoplasm oscillates with a period of roughly 1 to 2 minutes. These rhythmic contractions are coordinated across the entire plasmodium and serve as both the locomotion mechanism and a rudimentary form of information processing, as the oscillation frequency changes in response to stimuli.
14	B. By controlling the geometry of channels and food placement to guide tube formation	Adamatzky implemented logic gates by carefully designing the spatial arrangement of food sources and physical constraints (channels, barriers). The presence or absence of a Physarum tube connecting specific points represented binary outputs. By engineering the geometry, he created functional AND, OR, and NOT gates.
15	B. A common large yellow slime mold known as 'dog vomit,' one of the most visible wild species	Fuligo septica, commonly called 'dog vomit slime mold' or 'scrambled egg slime,' is one of the most frequently encountered myxomycetes worldwide. It forms large, conspicuous yellow or white aethalia (fruiting bodies) on mulch, lawns, and rotting wood, and is completely harmless despite its alarming appearance.



True or false: slime mold

10 statements to decide

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No.	Statement	My answer
1	A slime mold is a single cell, no matter how large it grows.	☐ True ☐ False
2	Slime mold can remember and learn, even though it has no brain or neurons.	☐ True ☐ False
3	Slime mold needs sunlight to grow and develop properly.	☐ True ☐ False
4	A slime mold can be cut into several pieces, and each piece can live on independently.	☐ True ☐ False
5	Slime mold is closely related to mushrooms and belongs to the fungus kingdom.	☐ True ☐ False
6	Slime mold can grow a network comparable to the Tokyo rail system.	☐ True ☐ False
7	Slime mold is dangerous and can cause infections in humans.	☐ True ☐ False
8	A dried-out slime mold (sclerotium) can be revived after more than two years of dormancy.	☐ True ☐ False
9	Slime mold has only two sexes, like most animals.	☐ True ☐ False
10	Slime mold has traveled to space and survived aboard the International Space Station.	☐ True ☐ False



No.	Answer explained
1	TRUE. A slime mold plasmodium, even when it covers an entire dinner plate, is a single cell (a coenocyte) with billions of nuclei sharing one continuous cytoplasm, with no internal walls separating them.
2	TRUE. In 2016, Audrey Dussutour's team showed that <i>Physarum polycephalum</i> learns to ignore bitter but harmless substances such as quinine or caffeine after a few days of exposure. The same year, they showed that this learned behavior can be passed to another slime mold through cell fusion.
3	FALSE. Slime mold actually avoids light (a behavior called negative phototaxis). It thrives in darkness and is typically grown in the dark or under very dim red light in laboratory settings.
4	TRUE. Each fragment carries thousands of nuclei and its share of cytoplasm, so a piece that is not too small regenerates into a complete organism. If the pieces of the same slime mold are put back together, they can fuse into one again.
5	FALSE. Although slime mold was historically classified with fungi due to its spore-producing structures, molecular analysis has placed it among the protists (Amoebozoa). It is no more related to mushrooms than you are.
6	TRUE. In 2010, Atsushi Tero and colleagues placed oat flakes on a map at the positions of the cities around Tokyo. The network the slime mold built between them was comparable to the real rail network in cost, efficiency and resistance to breakdowns.
7	FALSE. Slime mold is harmless to humans. It produces no toxins and does not parasitize animals. At most, the spores released by wild species when they fruit can bother people with asthma or mold allergies.
8	TRUE. As a sclerotium, slime mold enters deep dormancy. If it was dried slowly and kept dry and in the dark, it reliably revives after two years and more, waking within a day or two once moisture and food return.
9	FALSE. <i>Physarum polycephalum</i> has 720 mating types, produced by combining three genes: <i>matA</i> (16 versions), <i>matB</i> (15) and <i>matC</i> (3). Two reproductive cells can only pair if their combinations differ.
10	TRUE. In 2021, four slime molds traveled to the ISS as dry sclerotia. Astronaut Thomas Pesquet woke them on 2 September, and all four grew in orbit while thousands of French classes ran the same experiment on Earth.



Are you ready to grow a slime mold?

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Profile test · no right answers, tick one box per question

1. How often are you willing to take care of your slime mold?

- | | |
|---|--|
| ☐ Every day. I enjoy daily routines. | ☐ 2 to 3 times a week is manageable. |
| ☐ Once a week if I remember. | ☐ As little as possible. My schedule is packed. |

2. How do you react when a living thing you care for behaves unexpectedly?

- | | |
|---|---|
| ☐ I investigate the cause and adjust conditions. | ☐ I worry but give it time. |
| ☐ I get discouraged fairly quickly. | ☐ I have never cared for a living organism before. |

3. What is the climate like in your home?

- | | |
|--|---|
| ☐ Stable, between 18 and 24 degrees C year-round. | ☐ Variable with the seasons, sometimes warm, sometimes cool. |
| ☐ Often dry and bright. I love natural light. | ☐ Frequently above 25 degrees C in summer. |

4. What attracts you to the idea of growing slime mold?

- | | |
|--|---|
| ☐ The science. I want to run experiments. | ☐ Curiosity. I have never seen one in real life. |
| ☐ The idea of having an unusual pet. | ☐ Not sure. It was an impulse. |

5. How comfortable are you with mold or tiny organisms?

- | | |
|--|--|
| ☐ Very. Microscopic life fascinates me. | ☐ It does not bother me. It is natural. |
| ☐ A little uneasy, but I can learn. | ☐ Honestly, it grosses me out. |

6. Can you remember to moisten a substrate 2 to 3 times a week?

- | | |
|---|--|
| ☐ Yes. I already care for plants or pets and never forget. | ☐ Yes, if I set phone reminders. |
| ☐ Maybe, but I often travel on weekends. | ☐ Honestly, I forget small tasks regularly. |

7. Do you travel or go away often (more than a week at a time)?

- | | |
|--|--|
| ☐ Rarely. I am mostly at home. | ☐ Sometimes, but I know I can put it into sclerotium. |
| ☐ Fairly often, several weeks per year. | ☐ Very often. I am rarely home. |

8. What would you do if your slime mold disappeared into a corner of its container?

- | | |
|---|---|
| ☐ Search methodically and check humidity levels. | ☐ Look around and wait a few days. |
| ☐ Panic a bit but ask for help online. | ☐ Assume it died and give up. |



Are you ready to grow a slime mold? - scoring

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Add up your points, out of 24

Question	1st answer	2nd answer	3rd answer	4th answer
1	3	2	1	0
2	3	2	1	2
3	3	2	1	1
4	3	3	2	1
5	3	2	2	0
6	3	2	1	0
7	3	3	2	1
8	3	2	2	0

Total	Profile	What it means
21 to 24	Expert grower	The right conditions and the right habits. Start running experiments in your first week.
16 to 20	Keen beginner	Off to a good start. Reminders to moisten the dish and a spot with a steady temperature will do the rest.
11 to 15	Careful and curious	Doable with a little organization. Start with a single slime mold and learn how to turn it into a sclerotium.
0 to 10	Just looking	Maybe not the right moment. A sclerotium can wait in a drawer for years.