Yeast and other microorganisms in food

Experiment 1 – Yeast under the microscope ✓Done in 6th form✓

Material:

Microscope	Tweezers
Slide and cover slip	Filterpaper
Pipette	Water

Procedure:

Make a microscopic preparation of a yeast suspension and draw some yeast cells (400x). Label the recognizable details (mother cell, daughter cell, cell wall).

Experiment 1.2 – Yeast under the microscope

Material:

Microscope	Yeast (fresh)
Slide and cover slip	Lukewarm milk
Pipette	Water
Sugar	

Procedure:

Crumble the yeast into lukewarm, sweetened milk (or water) and wait a quarter of an hour. Then take a small sample with a pipette and observe it under a light microscope. Add **photos** to the lab report.

Experiment 2 – Yeast at work

Material:

Scale	4g sugar
7.5g fresh yeast or 2.1g dry yeast	150ml water
70g wheat flour	beaker 200ml
Glass rod	5 measuring cylinders 100ml OR beakers
3 water baths (cold, 40°C, 60°C)	2 pots
2 thermometers	stopwatch

Procedure:

1. Mix flour, sugar, and water in a beaker to form a homogeneous dough.
2. Pour 30ml of this into a measuring cylinder as a control mixture (at room temperature).
3. Add fresh or dry yeast to the remaining dough.
4. Fill the remaining four measuring cylinders with 30 ml of yeast dough each and expose them to different temperature conditions:

Measuring cylinder 1: dough without yeast at room temperature.
Measuring cylinder 2: Yeast dough at room temperature
Measuring cylinder 3: Yeast dough in cold water bath
Measuring cylinder 4: Yeast dough in warm water bath (40°C)
Measuring cylinder 5: Yeast dough in hot water bath (60°C)

5. Read the filling level in the 5 graduated cylinders every 5 minutes for 30 minutes and record all the values in tabular form.
6. A graphical evaluation in the form of 5 curves in a diagram (x-axis: time in minutes, y-axis: volume in ml). Use different colors for the 5 curves and record their meaning in the form of a legend.
7. Record your observations in written form and interpret the results of the experiment. Lab report!!

Additional information:
Germ consists of microscopic single-celled organisms with amazing capabilities. They are yeast fungi (Saccaromyces cerevisia) and belong to the tubular fungi (Schlauchpilze, Ascomycetes). Louis Pasteur was able to prove in 1857 with the help of the light microscope that yeast consists of living cells. They are most active at temperatures between 25 and 35°C and multiply strongly by sprouting. Sprouting is a cell division in which a smaller daughter cell is cut off from the mother cell. It is vegetative reproduction.

What happens when the yeast dough rises? The yeast fungi use the sugar present in the dough as a source of energy and multiply very strongly in the presence of oxygen. In the process, they release carbon dioxide. The bubbles of carbon dioxide trapped in the dough cause the dough to rise. However, if yeast fungi grow in the absence of oxygen, i.e. under anaerobic conditions, alcoholic fermentation occurs.

Experiment 3 – Mold under the microscope

Various fungi can grow on bread, forming different colored mold lawns. Green colored mold lawns belong to brush mold (Pinselschimmel, Penicillium) and watering can mold (Gießkannenschimmel, Aspergillus), respectively, two molds that grow very frequently on bread. Whitish woolly lawns belong to the common bread mold (Gemeinser Brotschimmel, Rhizopus).

Material:

Microscope	Scalpel
Slide and cover slip	Moldy bread (has been prepared by your teacher)
Pipette	Water

Procedure:

If pieces of bread are placed in a damp chamber (e.g. a sealed plastic bag), a whitish, woolly and/or green mold turf will grow in a few days at room temperature. A small portion of the whitish-woolly mold turf is transferred to a microscope slide, carefully dispersed in water and covered with a coverslip. The mold turf is a dense network of hyphae (multinucleate tubes) of the common bread mold (*Rhizopus stolonifer*). Create a drawing = Lab report

Additional information:

The entire hyphal network of a fungus is called the mycelium. The common bread mold belongs to the group of zygote fungi (Jochpilze, Zygomycetes), which can form enormous quantities of tiny spores both sexually and asexually. These spores are formed at the end of upright hyphae in special receptacles (Behälter) called sporangia.

The spherical, black sporangia can also be seen very clearly under a light microscope. The spores are dispersed through the air and germinate very rapidly (= they form a new hyphal network) as soon as they encounter suitable nutrient medium. Spores of molds are practically everywhere in the air. Therefore, food should not be left uncovered for too long to prevent infection with mold spores, which would cause the food to spoil and become inedible.

Experiment 4 – More fungi under the microscope

Material:

Microscope	Scalpel
Slide and cover slip	Champignon
Pipette	

Procedure:
Using a razor blade, cut a very thin cross-section through the cap of a mushroom in the area of the fruit layer. In the microscope, one can then observe the fruit layer with the sporangia. If you place the cap of a mushroom, which is already fully unfolded, on a sheet of white paper, you can microscope the spores that trickle out from the underside of the cap (This would need a few hours).

Additional information:
If a mushroom cap is placed with its underside on white paper, after a few hours you can see that a fine "dust" trickles out of the cap. If you look at this dust under the microscope, you can see that it is spores.
Spores are tiny (single-celled) dispersal units. They are formed by the millions in special containers (sporangia), which are located on or in the fruit body. According to the shape of the sporangia, two major classes of fungi are distinguished, the tubular fungi (Schlauchpilze, Ascomycetes) and the stator fungi (Ständerpilze, Basidiomycetes). The sporangia, together with sterile hyphae, form the so-called fruiting layer, the hymenium. It sits in the fruiting body either on lamellae (e.g. champignong, parasol, green button mushroom – Grüner Knollenblätterpilz), in tubes (e.g. boletus-Steinpilz), on spines (e.g. hawk mushroom - Habichtpilz), covers the entire surface, or is enclosed in the fruiting body (e.g. boviste).

If the spores finally lay out in the open and on a suitable substrate (soil, tree stump, branch, bark, etc.), they germinate into new hyphae, form new mycelia and thus contribute to the multiplication and spread of the fungus.