**ZBIRKA BIOLOŠKIH POSKUSOV PRI SLOVENŠČINI IN ANGLEŠČINI**

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1. UVOD V LABORATORIJSKO DELO– **INTRODUCTION TO LABORATORY WORK**

Laboratorij je znanstvenikova delavnica. Lastno eksperimentalno delo nas nauči, zakaj je znanost odvisna od natančnega merjenja in opazovanja ter od jasnih in jedrnatih podatkov. Da bi mogli slediti raziskovanju, moramo obvladati osnovno tehnologijo z raznimi instrumenti, kot sta mikroskop in tehtnica. Poleg tega moramo poznati delo z živimi organizmi. Spretnost, ki jo zahteva laboratorijsko delo, si lahko pridobimo le, če upoštevamo ustrezna pravila.

A laboratory is a scientist’s workshop. When you do your own experimental work in a laboratory you realize how important exact measuring, precise observation and exact data are. If you want to work in a laboratory you have to be able to work with living organisms, you have to know the basic terminology for the laboratory equipment, and you have to follow safety rules.

**Laboratorijski pribor – Laboratory equipment**

Pri laboratorijskem delu uporabljamo različen laboratorijski pribor.

Poimenujte osnovni laboratorijski pribor.

Fill in the chart. Match the following items in English to the appropriate Slovene ones: test tube, measuring jug, funnel, thermometer, mortar and pestle, measuring cylinder, crystal, tweezers, Petri dish, dropper, Erlenmeyer conical flask, scissors.

|  |  |  |  |
| --- | --- | --- | --- |
| C:\Users\Darija\Desktop\epruveta.gif | C:\Users\Darija\Desktop\čaša.jpg | C:\Users\Darija\Desktop\lij.jpg | C:\Users\Darija\Desktop\neziva_14.png |
| epruveta | čaša | lij | termometer |
| test tube | measuring jug | funnel | thermometer |
| C:\Users\Darija\Desktop\terilnica.jpg | C:\Users\Darija\Desktop\merilni_valj.jpg | C:\Users\Darija\Desktop\urno_steklo.jpg | C:\Users\Darija\Desktop\pinceta_iz_titana_bernstein_5_035_CO808067.jpg |
| terilnica in pestilo | merilni valj | urno steklo | pinceta |
| mortar and pestle | measuring cylinder | watch glass | tweezers |
| C:\Users\Darija\Desktop\petrijevka.jpg | C:\Users\Darija\Desktop\kapalka.jpg | C:\Users\Darija\Desktop\erlenmajerica.jpg | C:\Users\Darija\Desktop\n770200.jpg |
| petrijevka | kapalka | erlenmajerica | škarje |
| Petri dish | dropper | Erlenmeyer conical flask | scissors |

Pri laboratorijskem delu uporabljamo tudi različne materiale.

Different materials are used in laboratory work. Put down the English expressions for:

vata: cotton wool

aluminijasta folija: aluminium foil

vžigalice: matches

lesene trske: wood splinters

**Varnost pri delu v laboratoriju – Safety rules in a laboratory**

Za varno delo v laboratoriju moramo upoštevati določena pravila. Preberite jih in jih med eksperimentiranjem dosledno upoštevajte.

In a laboratory certain safety rules have to be followed. Read them carefully and follow them whenever you do laboratory work.

1. Poskrbimo za zaščito: oblečemo haljo; oči zaščitimo z očali; roke, če ne delamo z gorilnikom, zaščitimo z rokavicami; spnemo dolge lase.

Protect yourself: wear a gown, protect your eyes with goggles. If you don’t work with a burner, protect your hands with gloves, tie-up long hair.

1. Po laboratoriju se gibljemo počasi in previdno.

Make sure you move slowly and carefully around the laboratory.

1. Poslušamo navodila učitelja.

Listen to your teacher’s instructions.

1. Preberemo navodila za izvedbo poskusa.

Read the instructions for how you have to conduct the experiment.

1. Pripravimo vse potrebne pripomočke in kemikalije, ki jih potrebujemo za poskus.

Prepare all the necessary equipment and chemicals.

1. Izvedemo poskus po navodilih.

Conduct the experiment in accordance with the instructions.

1. Rezultate poskusa beležimo na delovni list.

Record the results of the experiment on the worksheet.

1. Po končanem poskusu odpadke odstranimo po navodilih.

Dispose of waste materials in accordance with the instructions.

1. Po navodilih pospravimo laboratorijski pribor in delovni prostor.

Put away your laboratory equipment and clean your workplace.

Look at the safety rules in a laboratory below. They are not in the same order as the Slovene ones. Match each of them to the appropriate Slovene one.

|  |
| --- |
| Make sure you move slowly and carefully around the laboratory |
| Put away your laboratory equipment and clean your workplace. |
| Conduct the experiment in accordance with the instructions. |
| Record the results of the experiment on a worksheet. |
| Listen to your teacher’s instructions |
| Dispose of the waste materials in accordance with the instructions. |
| Prepare all the necessary equipment and chemicals. |
| Read the instructions for how you have to conduct the experiment. |
| Protect yourself: wear a gown, protect your eyes with goggles.If you don’t work with a burner, protect your hands with gloves, tie-up long hair. |

**Oznake za nevarne snovi - Danger signs in laboratory work**

Varnost pri laboratorijskem delu vključuje tudi poznavanje in ustrezno ravnanje s kemikalijami in proizvodi, ki so lahko nevarni.

Poimenujte nevarne lastnosti v slovenskem in angleškem jeziku.

Name dangerous characteristics in Slovene and English language

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| http://www.avtostil.si/ponudba/images/znaki_za_nevarne_snovi/F+.jpg |  |  |  |  |
| Lahko vnetljivo | Zelo lahko vnetljivo | Jedko | Okolju nevarno | Oksidativno |
| Highly flammable | Extremely flammable | Corrosive | Dangerous for the environment | Oxidising |
|  |  |  |  |  |
| Strupeno | Zelo strupeno | Eksplozivno | Zdravju škodljivo | Dražilno |
| Toxic | Very toxic | Explosive | Nocif, Harmful | Irritant |

**PONOVIMO – REVISION**

S pomočjo 15. sodelovalnih kart ponovita s sošolcem. Odgovarjajta izmenično. Zapišita si rezultate in jih na kratko komentirajta.

By means of collaborative cards revise the terminology with your classmate. Answer alternatively. Put down your results and comment them.

|  |  |  |
| --- | --- | --- |
| Ime | dijak 1: | dijak 2: |
|  | število pravilnih odgovorov | število pravilnih odgovorov |
| 1.poskus |  |  |
| 2.poskus |  |  |
| 3.poskus |  |  |

|  |  |  |
| --- | --- | --- |
| name | student 1: | student 2: |
|  | the number of correct answers | The number of correct answers |
| first try |  |  |
| second try |  |  |
| third try |  |  |

1. RAZISKOVANJE NEZNANIH SNOVI **– UNKNOWN SUBSTANCES EXPLORATION**

|  |  |
| --- | --- |
| **Namen vaje:** | **Learning objectives of the experiment:** |
| * uporabljati znanstvene metode dela | * to use scientific methods |
| * spoznati pomen kvalitativnih podatkov | * to realise the importance of qualitative data/information |
| * spoznati pomen kontroliranega poskusa | * to realise the importance of control experiment |
| * naučiti se z natančnim opazovanjem zbirati podatke | * to learn how to collect data by means of exact observation |
| * spoznati in razumeti razlike med dejstvi, podatki in hipotezo | * to realise and understand the difference between facts, data and hypothesis |
| * naučiti se oblikovati hipotezo, ki opredeli dobljene podatke | * to learn to form a hypothesis which defines the gained data |
| * spoznati pojem indikatorja in se naučiti indikatorje tudi praktično uporabljati | * to get to know the term indicator and to learn how to use indicators |

|  |  |
| --- | --- |
| **Material:** | **Materials:** |
| * fenol rdeče barvilo (FR) | * Phenol red (FR) |
| * kalcijev hidroksid /Ca(OH)2*(aq)/* ali apnena voda (AV) | * calcium carbonate |
| * sodavica | * soda water |
| * razredčena kislina | * dilute acid |
| * kapalka | * dropper |
| * slamice | * straws |
| * papirnate brisače | * paper towels |
| * stojalo za epruvete | * test tube holder |
| * 7 malih epruvet z zamaški | * 7 small test tubes with corks |
| * 7 medeninastih vijakov | * 7 brass screws |
| * 6 epruvet standardne velikosti | * 6 standard test tubes |
| * raztopina kvasa in sladkorja | * yeast and sugar solution |
| * prekuhana raztopina kvasa in sladkorja | * boiled yeast and sugar solution |
| * 10 suhih semen | * 10 dry seeds |
| * 10 kalečih semen | * 10 sprouted seeds |
| * 1 živa žuželka | * 1 alive insect |
| * 1 mrtva žuželka | * 1 dead insect |
| * ura | * clock |

|  |  |
| --- | --- |
| **Metode dela:** | **Methodology**: |
| poskus, opazovanje, beleženje opazovanj | experiment, observation, taking notes of observations |

**Raziskovanje - Research**

Problem

Nekateri materiali izločajo snov, ki povzroči, da se barva fenol rdečega spremeni.

A problem

Some materials secrete a substance which causes the change of Phenol red colour.

Zbiranje podatkov

A) Postopek:

Izvedite 1. del vaje po postopku opisanem v Navodilih za laboratorijsko delo (str. 9, 10).

Rezultati:

Tabela 1: Rezultati prvega dela vaje

|  |  |  |  |
| --- | --- | --- | --- |
| Št. epruvete | Delovni material | Sprememba indikatorja (opišite spremembo) | Čas, potreben za spremembo |
| 1 | FR+vijak+ |  |  |
| 2 | FR+vijak+ |  |  |
| 3 | FR+vijak+ |  |  |
| 4 | FR+vijak+ |  |  |
| 5 | FR+vijak+ |  |  |
| 6 | FR+vijak+ |  |  |
| 7 | FR+vijak+ |  |  |

Razgovor:

1. Naštejte materiale, kjer je prišlo do spremembe.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Po čem se materiali, kjer je prišlo do spremembe, razlikujejo od materialov, kjer do sprememb ni prišlo?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Čemu služi prva epruveta?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Kakšna je vloga medeninastih vijakov?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. V kakšnem agregatnem stanju je snov, ki so jo izločali materiali, in ki je povzročila spremembo barve fenol rdečega?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Oblikovanje hipoteze:

Poskušajte na osnovi dobljenih podatkov postaviti hipotezo, ki bo odgovorila na zastavljen problem.

Domnevam, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Dokazovanje hipoteze z zbiranjem in razlago novih podatkov

B) Postopek:

Izvedite 2. del vaje po postopku opisanem v Navodilih za laboratorijsko delo (str. 10).

Rezultati:

Tabela 2: Rezultati drugega dela vaje

|  |  |  |  |
| --- | --- | --- | --- |
| Št. epruvete | Delovni material | Sprememba indikatorja (opišite spremembo) | Čas, potreben za spremembo |
| 8 | FR+ |  |  |
| 9 | FR+ |  |  |
| 10 | FR+ |  |  |
| 11 | AV+ |  |  |
| 12 | AV+ |  |  |
| 13 | AV+ |  |  |

Razgovor:

1. Sodavico, ki jo dobimo tako, da raztapljamo ogljikov dioksid v vodi, imenujemo tudi kisla voda. Katera kislina po vašem mnenju nastaja pri raztapljanju ogljikovega dioksida v vodi?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Napišite še enačbo kemijske reakcije.

2. Katere snovi, ki ste jih dodali, so povzročile spremembo barve fenol rdečega? Naštejte jih.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Katere snovi, ki ste jih dodali, so povzročile spremembo apnene vode? Naštejte jih.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Kaj imajo skupnega snovi, ki povzročajo spremembo apnene vode?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. Katere indikatorje ste uporabljali?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. S katerim indikatorjem ste dokazali prisotnost kislin?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. S katerim indikatorjem ste dokazali prisotnost ogljikovega dioksida?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8. Ali ste potrdili svojo hipotezo? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Razložite.

Sklepi:

Literatura:

**REVISION - Matching exercises**

Match each English definition to its Slovene equivaent.

|  |
| --- |
| **Znanje** je celota podatkov, ki si jih kdo vtisne v zavest z učenjem, študijem. |
| Knowledge is the whole of data/information stored in your brain by studying. |
| **Raziskovanje** je objektivno, načrtno in sistematično delo oziroma odkrivanje novih stvari. |
| Exploration is objective, premeditated and systematic work or discovering unknown things. |
| **Znanstvena metoda** je skupno ime za tehnike preučevanja pojavov, pridobivanja novega znanja ali popravljanja in povezovanja že pridobljenega znanja. |
| A scientific method is a common name for different techniques of studying phenomena, of gaining new knowledge or making corrections to or new links between already gained knowledge. |
| **Hipoteza** ali domneva je razlaga problema oz. je nepreverjen sklep na podlagi znanih dejstev, tisto, kar mislimo, da je za razlago znanstvenega problema najverjetnejše. |
| A hypothesis or supposition is an explanation of a problem in other words unconfirmed deduction on the basis of known facts, something that we consider the most likely explanation of a scientific problem. |
| **Dejstvo** je vsaka utemeljena ugotovitev o tem, kar dejansko obstaja ali se je dejansko zgodilo. |
| A fact is any grounded finding about what exists or about what happened. |
| **Podatek** je opredmeteno dejstvo (črke, številke, merske enote). Podatek predstavlja na jedrnat način zapisana dejstva |
| A piece of information is a tangible fact (letters, numbers or unit of measurement). A piece of information is a concise way of describing a fact. |
| **Poskus** je znanstveni postopek (metoda) s katerim se kaj ugotovi ali dokaže. Poskus je torej preučevanje pojava pod nadzorovanimi pogoji. Poskus je jasno zasnovan in opisan, da je ponovljiv. |
| An experiment is a scientific procedure (method) by means of which something is found out or proved. |
| **Kontroliran poskus** pomeni, da pri enem poskusu menjamo samo 1 dejavnik. |
| A control experiment is an experiment in which only one factor is changed. |
| **Kontrolni poskus** služi kot standard za primerjavo. Izpostavimo ga enakim pogojem iz postopka z izjemo spremenljivke, ki jo preskušamo. |
| A control group serves as a standard for comparison. It is exposed to the same experimental conditions with the exception of the factor which is being tested. |

|  |
| --- |
| A hypothesis or supposition is an explanation of a problem in other words unconfirmed deduction on the basis of known facts, something that we consider the most likely explanation of a scientific problem. |
| A fact is any grounded finding about what exists or about what happened. |
| A control experiment is an experiment in which only one factor is changed. |
| A control group serves as a standard for comparison. It is exposed to the same experimental conditions with the exception of the factor which is being tested. |
| A piece of information is a tangible fact (letters, numbers or unit of measurement). A piece of information is a concise way of describing a fact. |
| Knowledge is the whole of data/information stored in your brain by studying. |
| A scientific method is a common name for different techniques of studying phenomena, of gaining new knowledge or making corrections to or new links between already gained knowledge. |
| Exploration is objective, premeditated and systematic work or discovering unknown things. |
| An experiment is a scientific procedure (method) by means of which something is found out or proved. |

**SLO – ANG slovar:**

|  |  |
| --- | --- |
| raziskovanje | exploration |
| znanstvene metode dela | scientific methodology |
| dejstvo | fact |
| podatek | information |
| kvalitativni podatek | qualitative information |
| hipoteza | hypothesis |
| indikator | indicator |
| fenol rdeče barvilo | Phenol red (also known as phenolsulfonphthalein or PSP) |
| kalcijev hidroksid | calcium hydroxide |
| sodavica | soda water |
| razredčena kislina | diluted acid |
| slamica | straw |
| papirnate brisače | paper towels |
| stojalo za epruvete | test tube holder |
| zamaški | cork |
| kvas | yeast |
| poskus | experiment |
| kontroliran poskus | control experiment |
| medeninasti vijak | brass screw |
| agregatno stanje | physical form of substance |
| kalcijev karbonat /CaCO3 /ali apnenec | calcium carbonate |
| ogljikov dioksid | carbon dioxide |

1. MIKROSKOP **– THE MICROSCOPE**

Prvi mikroskop naj bi leta 1590 izdelala danska izdelovalca očal Hans Janssen in njegov sin Zacharias Janssen, k razvoju mikroskopa pa je pomembno prispeval tudi Galileo Galilei. Za biološko znanost je pomemben mejnik leto 1665, ko Robert Hooke objavi zbirko mikroskopskih raziskav z naslovom Micrographia in ob opazovanju plute skuje besedo "celica". Njegov sodobnik Anton van Leeuwenhoek je bil izjemno nadarjen izdelovalec mikroskopov in je omogočil napredek svetlobne mikroskopije, opisal pa je tudi mnogo bioloških vzorcev. Od takrat naprej se je zasnova in kvaliteta mikroskopov stalno izboljševala. Omejujoč dejavnik pri ločljivosti mikroskopov pa je ostala valovna dolžina svetlobe, vse do leta 1931, ko je Ernst Ruska kot sredstvo za tvorbo slike uporabil elektrone in izdelal prvi transmisijski elektronski mikroskop.

Mikroskop je \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

A microscope is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

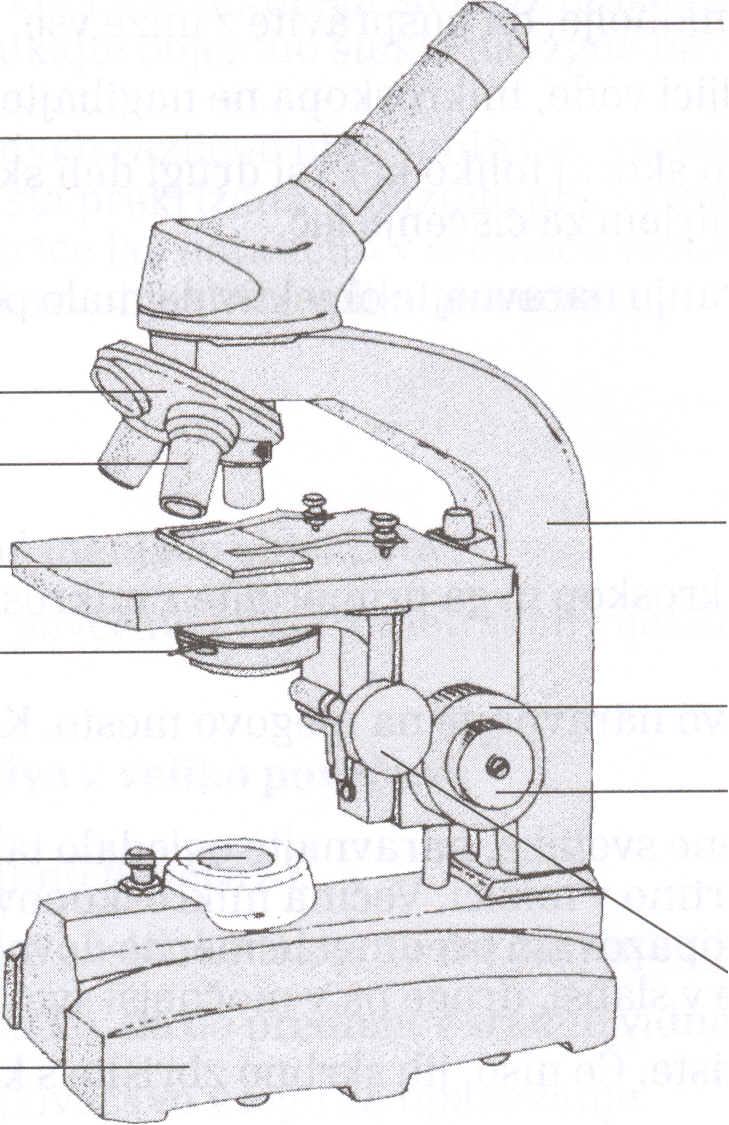
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Navodila za ravnanje z mikroskopom** preberite v Navodilih za laboratorijsko delo na str. 14.

**Zgradba mikroskopa**

Na skico svetlobnega mikroskopa dopišite njegove sestavne dele!

Identify the structural components of the optical microscope.



Primerjajte mikroskop na skici z mikroskopom, ki ga imate na mizi.

Koliko objektivov ima vaš mikroskop? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Napišite njihove povečave: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Kolikšna je povečava okularja? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Povečavo mikroskopa izračunamo tako, da povečavo objektiva pomnožimo s povečavo okularja.

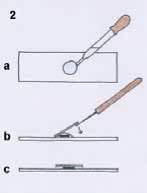
Kolikšna je najmanjša povečava vašega mikroskopa? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Kolikšna je največja povečava vašega mikroskopa? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Priprava mokrih mikroskopskih preparatov**

Za pripravo preparata potrebujemo dve stekli – objektno in krovno:

Na objektno steklo kanemo kapljico vode. Vanjo pazljivo prenesemo predmet.

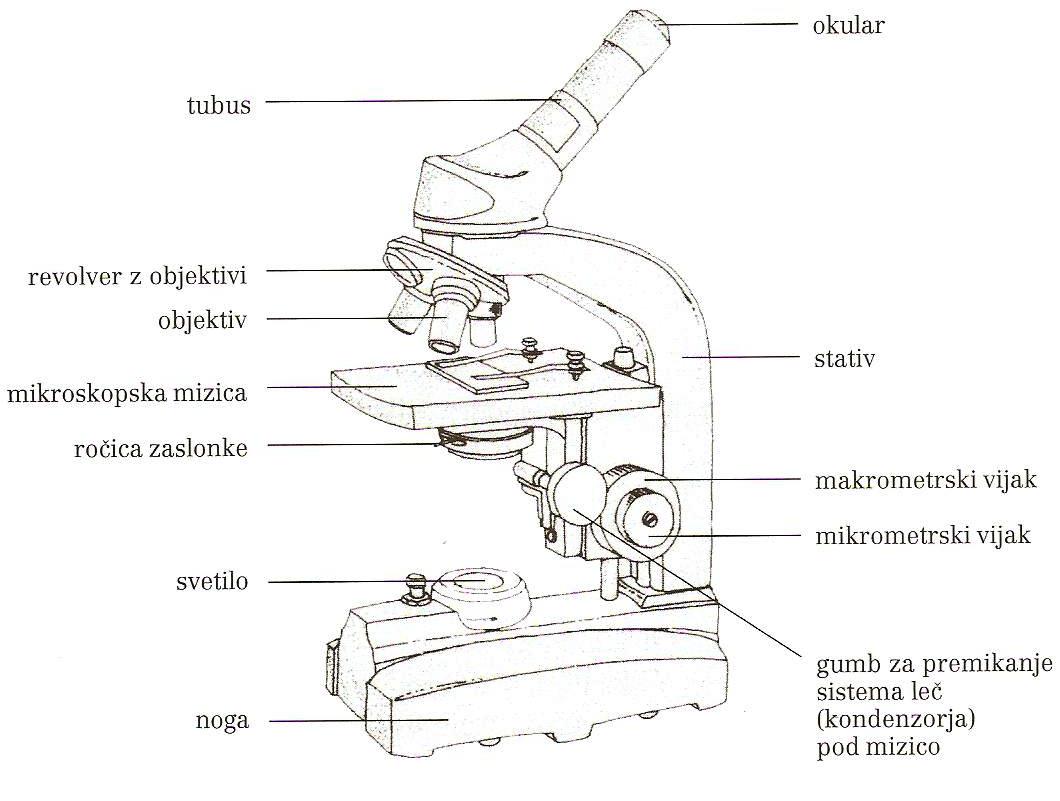
****

Krovno stekelce primemo na robovih, en rob postavimo na objektno steklo ob kapljici pod kotom 45⁰. Krovno stekelce počasi spuščamo na kapljico, da se bo enakomerno razlila.

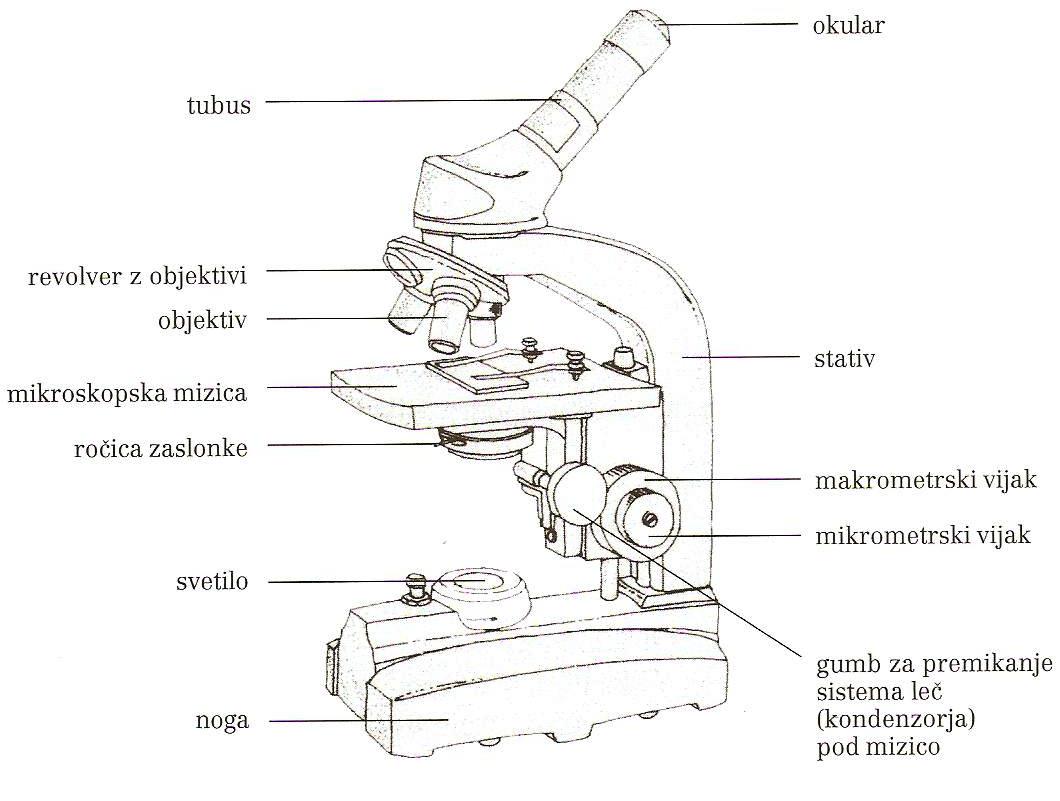
Pri prehitrem spuščanju lahko pod krovnim stekelcem ostanejo zračni mehurčki, ki motijo opazovanje predmeta. Morebitne mehurčke zraka v preparatu odstranimo tako, da po krovnem stekelcu rahlo potolčemo.

**Risanje skice**

Najboljši način zapisovanja tistega, kar vidimo pod mikroskopom, je skica. Skico vedno rišemo s svinčnikom. Pri tem naj bodo linije gladke, ničesar ne barvamo, črnimo ali črtamo. Rišemo samo tisto kar vidimo. Skico označimo tako, da potegnemo črto iz skice in ob njej napišemo kaj označuje. Pod skico napišemo tudi povečavo, pri kateri smo opazovali preparat.



eyepiece / ocular



fine focus adjustment knob

coarse focus adjustment knob

objective lenses

revolving nosepiece / turret

stage

condenser focus adjustment knob

base

arm

illuminator

diaphragm lever

eyepiece tube

**MIKROSKOPIRANJE - MICROSCOPY**

|  |  |
| --- | --- |
| **Namen vaje:** | **Learning objectives of the experiment:** |
| * razumeti delovanje svetlobnega mikroskopa | * to understand how an optical microscope works |
| * znati mikroskopirati | * to know how to operate a microscope |
| * znati pripraviti mokri preparat | * to know how to prepare a wet mount |
| * znati natančno opazovati in skicirati objekt | * to know how to precisely observe and sketch an object |

|  |  |
| --- | --- |
| **Material:** | **Materials:** |
| * mikroskop | * microscope |
| * čaša z vodo in kapalka | * measuring jug with water and dropper |
| * pinceta | * tweezers |
| * škarje | * scissors |
| * objektno steklo | * microscope slide |
| * krovno stekelce | * cover slip |
| * črke H; A; F | * letters H; A; F |

|  |  |
| --- | --- |
| **Metode dela:** | **Methodology**: |
| mikroskopiranje (priprava preparata, opazovanje, skiciranje) | microscopy (to prepare, observe and sketch a specimen) |

**A. UPORABA MALE POVEČAVE**

**Rezultati:**

črka H črka A črka F

črke vidne

s prostim očesom

črke vidne

pod mikroskopom

povečava: povečava: povečava:

**Razgovor:**

1. Kako je obrnjena slika, ki jo opazujemo skozi mikroskop v primerjavi z objektom?

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2. V katero smer se premika slika glede na premikanje preparata?

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**B. UPORABA VELIKE POVEČAVE**

**Rezultati:**

povečava: povečava:

**Razgovor:**

1. Ali vidite pod veliko povečavo oba lasa hkrati enako ostro? Razložite svoj odgovor.

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2. Zakaj je bolj verjetno, da se bodo objektna stekla ali leče prej poškodovale pri veliki kot pri mali povečavi?

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**Sklepi:**

1. MIKROSKOPSKO OPAZOVANJE CELIC **- MICROSCOPIC OBSERVATION OF CELLS**

|  |  |
| --- | --- |
| **Namen vaje:** | **Learning objectives of the experiment:** |
| * opazovati rastlinske in živalske celice in jih primerjati | * to observe and compare plant and animal cells |
| * spoznati nekatere celične strukture | * to recognise some cell structures |
| * pridobiti izkušnje in izboljšati veščine, ki so potrebne za mikroskopiranje | * to acquire experience and improve skills in the use of the microscope |
| * znati določiti velikost celice | * to know how to determine cell size |

|  |  |
| --- | --- |
| **Material:** | **Materials:** |
| * mikroskop | * microscope |
| * čaša z vodo in kapalka | * measuring jug with water and dropper |
| * pinceta | * tweezers |
| * škarje | * scissors |
| * objektno steklo | * microscope slide |
| * krovno stekelce | * cover slip |
| * čebula | * onion |
| * vodna rastlina | * water plant |
| * metilen modro barvilo | * blue pigment |

|  |  |
| --- | --- |
| **Metode dela:** | **Methodology**: |
| mikroskopiranje (priprava preparata, opazovanje, skiciranje) | microscopy (to prepare, observe and sketch a specimen) |

**Rezultati:**

1. **Rastlinske celice – celice čebule**

povečava: povečava:

premer vidnega polja:

dolžina ene celice:

1. **Rastlinske celice – celice vodne rastline**

povečava:

premer vidnega polja:

dolžina ene celice:

1. **Živalske celice – celice ustne sluznice**

povečava: povečava:

premer vidnega polja:

premer ene celice:

**Razgovor:**

1. Katere celice (rastlinske ali živalske) so bolj pravilnih oblik? Razložite zakaj?

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2. V celicah vodne rastline lahko opazite več organelov zelene barve. Kako imenujemo te organele in kateri življenjski proces poteka v njih?

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3. Primerjajte velikost rastlinskih in živalskih celice!

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**Sklepi:**

**SLO – ANG slovar**

|  |  |
| --- | --- |
| celica | cell |
| dolžina | length |
| fotosinteza | photosynthesis |
| kloroplast | chloroplast |
| organel | organelle |
| povečava | magnification |
| premer (2r) | diameter |
| ustna sluznica | oral mucous membrane |
| vidno polje | field of vision |

1. LASTNOSTI PLAZMALEME **– PROPERTIES OF PLASMA MEMBRANES**

|  |  |
| --- | --- |
| **Namen vaje:** | **Learning objectives of the experiment:** |
| * razumeti plazmolizo in deplazmolizo v rastlinskih celicah | * to understand the plasmolysis and deplasmolysis processes in plant cells |
| * razumeti pojem osmoza | * to understand the concept of osmosis |
| * razumeti pomen selektivne prepustnosti plazmaleme | * to understand the importance of selective permeability in a plasma membrane |

|  |  |
| --- | --- |
| **Material:** | **Materials:** |
| * mikroskop |  |
| * čaša z vodo in kapalka |  |
| * pinceta |  |
| * škarje |  |
| * objektno steklo |  |
| * krovno stekelce |  |
| * vodna rastlina / čebula |  |
| * kvasovke |  |
| * barvilo kongo rdeče |  |

|  |  |
| --- | --- |
| **Metode dela:** | **Methodology**: |
| mikroskopiranje (priprava preparata, opazovanje, skiciranje) | microscopy (to prepare, observe and sketch a specimen) |

**Rezultati:**

**A. Kako vplivajo različne koncentracije vodnih raztopin na rastlinske celice?**

Skicirajte 2 – 3 rastlinske celice in označite dele celice.

povečava: 10 x 40 ali 7 x 40

celice v vodi celice v 10 % raztopini soli celice v destilirani vodi

plazmoliza

deplazmoliza

**Razgovor:**

1. Opišite vse spremembe, ki nastanejo, ko se celice nahajajo v slani vodi.

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Razložite zakaj je do teh sprememb prišlo?

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2. Opišite, kaj se je dogajalo z rastlinskimi celicami, ko ste jih dali v destilirano vodo.

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3. V katero smer je potovala voda (v ali iz celice), ko so bile celice obdane z destilirano vodo?

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Razložite zakaj?

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4. Ali bi živalske celice destilirana voda raztrgala veliko prej kot rastlinske? Razložite.

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5. Učinkovit način za uničevanje plevela je polivanje zemlje okoli plevela s slano vodo. Razložite zakaj rastline propadejo.

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**Rezultati:**

**B. Ali celična membrana uravnava prehajanje snovi?**

Skicirajte nekaj celic kvasovk pod veliko povečavo..

povečava: 10 x 40 ali 7 x 40

žive kvasovke v prekuhane kvasovke v

žive kvasovke kongo rdečem kongo rdečem

**Razgovor:**

1. V preparatu iz nesegrete raztopine kvasovk in kongo rdečega opazite ponavadi le nekaj rdečih celic. Kaj domnevate?

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2. Opišite razliko med delovanjem celičnih membran živih in neživih kvasovk. Razložite zakaj pride do te razlike.

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3. Kaj gre lažje skozi membrane živih celic: molekule kongo rdečega ali molekule vode? Razložite.

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**Sklepi:**

- Osmoza je glavni način vstopanja in izstopanja vode v celico oziroma iz celice. ***Osmosis is the main means of entry and exit of water into or out of a cell***

- Osmoza je gibanje vodnih molekul skozi polprepustno membrano v smeri od višje proti nižji koncentraciji vodnih molekul. ***Osmosis is the movement of water molecules through permeable membranes in the direction from higher to lower concentration of water molecules***

- Če je okolje hipertonično, voda izhaja iz celice, če je okolje hipotonično voda vdira v celice. ***In a hypertonic environment, cells lose water; in a hypotonic environment, cells gain water.***

- Celična membrana ali plazmalema je selektivno prepustna. ***Cell and plasma membranes are selectively-permeable.***

Pri prekuhavanju plazmalema izgubi svoje lastnosti – je uničena. ***Plasma membranes are destroyed by boiling water.***

1. DELOVANJE ENOSTAVNIH KATALIZATORJEV **– OPERATION OF SIMPLE CATALYSTS**

|  |  |
| --- | --- |
| **Namen vaje:** | **Learning objectives of the experiment:** |
| * spoznati razlike med organskimi in anorganskimi katalizatorji | * to recognise the difference between organic and inorganic catalysts |
| * spoznati dejavnike, ki vplivajo na delovanje katalizatorjev | * to recognise the factors which affect the operation of catalysts |
| * spoznati encim katalazo | * to recognise the catalase enzyme |
| * razumeti pomen encimov v celicah | * to understand the importance of enzymes in cells |

|  |  |
| --- | --- |
| **Material:** | **Materials:** |
| * epruvete | * test tube |
| * pinceta | * tweezers |
| * steklena paličica | * glass (stirring) rod |
| * terilnica in pestilo | * mortar and pestle |
| * manganov dioksid | * manganese dioxide |
| * vodikov peroksid | * hydrogen peroxide |
| * goveja jetra | * beef liver |
| * krompir | * potato |
| * kremenčev pesek | * quartz sand |
| * univerzalni indikatorski papir | * universal indicator paper |
| * raztopina NaOH | * sodium hydroxide solution |
| * raztopina HCl | * hydrochloric acid solution |

|  |  |
| --- | --- |
| **Metode dela:** | **Methodology**: |
| poskus (izvajanje, opazovanje, primerjanje, skiciranje) | experiment (conducting, monitoring, comparing, sketching) |

**Rezultati:** Skicirajte poskuse (dodani material) in zapišite rezultate!

Poskus 2: Delovanje katalizatorja in delovanje encima

hitrost reakcije: hitrost reakcije:

Poskus 3: Učinek encima

hitrost reakcije: hitrost reakcije:

Poskus 4: Ponovna uporaba encima

hitrost reakcije: hitrost reakcije:

Poskus 5: Vpliv velikosti delcev na delovanje encima

hitrost reakcije: hitrost reakcije:

Poskus 6: Vpliv temperature na delovanje encima

temperatura: temperatura: temperatura:

hitrost reakcije: hitrost reakcije: hitrost reakcije:

Poskus 7: Vpliv pH na delovanje encima

pH: pH: pH:

hitrost reakcije: hitrost reakcije: hitrost reakcije:

Poskus 8: Produkti reakcije

Skicirajte poskus!

Poskus 9: Dokazovanje produktov reakcije

Skicirajte!

**Razgovor:**

1. S kakšnimi katalizatorji ste se srečali pri vaji? Poimenujte jih.

***What kind of catalysts did you encounter during the experiment? Name them.***

2. Ali je mogoče razgraditi vodikov peroksid tudi z nebeljakovinskimi katalizatorji?

***Is it possible to decompose hydrogen peroxide with non-protein catalysts?***

Razložite:

***Explain*:**

3. Poglejte ponovno rezultate pri 4 poskusu in sklepajte ali se encim pri reakciji spremeni, ali pa ostane nespremenjen.

***Review the results of the 4 experiments and deduce whether the enzyme in the reaction changed or remained unchanged.***

Razložite svoj odgovor.

***Explain your answer.***

4. Opišite, kako vpliva velikost delcev na delovanje encimov.

***Decribe how particle size affects enzyme function.***

5. Opišite, kako vpliva temperatura na delovanje encimov.

***Decribe how temperature affects enzyme function.***

6. Opišite, kako vpliva pH na delovanje encima katalaze.

***Decribe how pH affects the functioning of the catalase enzyme.***

7. Kateri plin se pri delovanju encimov sprošča iz vodikovega peroksida?

***Which gas is released from the hydrogen peroxide during enzyme function?***

Opišite kako smo ga dokazali.

***Describe how we can prove it.***

8. Kaj je po vašem mnenju tekočina, ki je poleg peska in jeter ostala v erlenmajerici, ko je reakcija potekla?

***What do you think was the liquid that besides the quartz sand and liver remained in the flask after the reaction was over.***

9. Napišite kemijsko enačbo razgradnje vodikovega peroksida.

***Write a chemical equation for the decomposition of hydrogen peroxide.***

**Sklepi:**

Encimi so biokatalizatorji.

***Enzymes are biocatalysts.***

Katalizatorji pospešujejo kemijsko reakcijo.

***Catalysts accelerate chemical reactions.***

V jetrih in krompirju je encim katalaza, ki razgrajuje vodikov peroksid.

***The enzyme catalase, found in liver and potatoes, decomposes hydrogen peroxide.***

Vodikov peroksid je za celice nevarna snov.

***Hydrogen peroxide is a hazadous material for cells.***

Na encim katalazo vpliva temperatura, pH in velikost delcev.

***The catalase enzyme is affected by temperature, pH and partice size.***

Optimalno okolje za encim katalazo je pri 37⁰ C in pH 7.

***The optimal environment for the catalase enzyme is 37⁰ C and pH 7.***

Vodikov peroksid razpade na kisik in vodo.

***Hydrogen peroxide decomposes into oxygen and water.***

Katalaza je organski katalizator.

***Catalase is an organic catalyst.***

Manganov dioksid je anorganski katalizator.

***Manganese dioxide is an inorganic catalyst.***

1. ALKOHOLNO VRENJE **– ALCOHOLIC FERMENTATION**

|  |  |
| --- | --- |
| **Namen vaje:** | **Learning objectives of the experiment:** |
| * spoznati proces alkoholnega vrenja | * to know the alcoholic fermentation process |
| * spoznati pomen kontrolnega poskusa | * to know the meaning of a control experiment |

|  |  |
| --- | --- |
| **Material:** | **Materials:** |
| * termovki | * **thermos** |
| * erlenmajerici | * **Erlenmeyer conical flask** |
| * računalnik | * **computer** |
| * Vernier senzor za temperaturo | * **Vernier temperature sensor** |
| * Vernier vmesnik | * **Vernier interface** |
| * grozdni sok | * **grape juice** |
| * kvasovke | * **yeast** |
| * kalcijev hidroksid | * **calcium hydroxide** |

|  |  |
| --- | --- |
| **Metode dela:** | **Methodology**: |
| poskus (opazovanje, primerjanje, skiciranje) | experiment (monitoring, comparing, sketching) |

**Rezultati:** Skicirajte poskus (+ dodani material)!

V preglednici so vpisane spremembe temperature v obeh termovkah v 48 urah. Narišite grafa (odvisnost temperature od časa).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Temperatura v ⁰C** | |  | **Temperatura v ⁰C** | |
| **Ura** | **Prva termovka**  **sok + kvas** | **Druga termovka**  **sok** | **Ura** | **Prva termovka**  **sok + kvas** | **Druga termovka**  **sok** |
| 10 | 20 | 20 | 10 | 25 | 20 |
| 11 | 20 | 20 | 11 | 25,2 | 20 |
| 12 | 20 | 20 | 12 | 25,3 | 20 |
| 13 | 20,2 | 20 | 13 | 25,5 | 20 |
| 14 | 20,4 | 20 | 14 | 25,7 | 20 |
| 15 | 20,6 | 20 | 15 | 25,9 | 20 |
| 16 | 20,9 | 20 | 16 | 26 | 20 |
| 17 | 21,2 | 20 | 17 | 26,2 | 20 |
| 18 | 21,5 | 20 | 18 | 26,4 | 20 |
| 19 | 21,8 | 20 | 19 | 26,5 | 20 |
| 20 | 22 | 20 | 20 | 26,5 | 20 |
| 21 | 22,1 | 20 | 21 | 26,4 | 20 |
| 22 | 22,3 | 20 | 22 | 26,2 | 20 |
| 23 | 22,5 | 20 | 23 | 26 | 20 |
| 24 | 22,8 | 20 | 24 | 25,8 | 20 |
| 1 | 23 | 20 | 1 | 25,6 | 20 |
| 2 | 23,3 | 20 | 2 | 25,4 | 20 |
| 3 | 23,5 | 20 | 3 | 25,2 | 20 |
| 4 | 23,8 | 20 | 4 | 25 | 20 |
| 5 | 24 | 20 | 5 | 24,8 | 20 |
| 6 | 24,2 | 20 | 6 | 24,7 | 20 |
| 7 | 24,5 | 20 | 7 | 24,5 | 20 |
| 8 | 24,7 | 20 | 8 | 24,5 | 20 |
| 9 | 24,9 | 20 | 9 | 24,5 | 20 |

**Razgovor:**

1. Kaj dokazuje, da je prišlo do kemijske spremembe?  
**What is the evidence that there has been a chemical change?**

2. Napišite kemijsko enačbo za reakcijo, ki je potekla v prvi erlenmajerici. Razložite!  
**Write the chemical equation for the reaction which occured in the 1st Erlenmeyer conical flask. Explain!**

3. Kateri produkt lahko odkrijemo po vonju? Bi znali to snov določiti tudi drugače?  
**What product can be detected by smell? Would you be able to detect it in a different way?**

4. Z besedami in simboli napišite enačbo za alkoholno vrenje.  
**Write the chemical equation for alcoholic fermentation in both words and symbols.**

Sklepi:

1. Alkoholno vrenje poteka v citoplazmi kvasovk, s pomočjo njihovih encimov.  
**Alcoholic fermentation occurs in the cytoplasm of yeast with the assistance of its enzymes.**

2. Produkti alkoholnega vrenja so energija, ogljikov dioksid in alkohol.  
**The products of alcoholic fermentation are energy, carbon dioxide and alcohol.**

3. Alkoholno vrenje je eksotermna reakcija.  
**Alcoholic fermentation is an exothermic reaction.**

4. Kalcijev hidroksid je indikator za ogljikov dioksid.  
**Calcium hydroxide is an indicator for carbon dioxide.**

5. Druga termovka služi kot kontrolni poskus.  
**The 2nd thermos serves as a control group.**

6. Človek uporablja kvasovke in njihove metabolne produkte že tisočletja. Alkohol uporablja za pripravo različnih alkoholnih pijač, produkt vrenja v plinastem stanju (CO2) pa uporablja pri peki kruha za vzhajanje testa.  
**People have used yeast and its metabolic products for thousands of years. Alcohol is used in the preparation of different alcoholic beverages; the product of fermentation in its gaseous state (CO2) is used to make dough rise when baking bread.**

1. BARVILA V ZELENIH LISTIH **– PIGMENTS IN GREEN LEAVES**

|  |  |
| --- | --- |
| **Namen vaje:** | **Learning objectives of the experiment:** |
| * ugotoviti ali daje listu barvo le eno barvilo, ali pa jih je več | * to determine whether a leaf’s colour comprises one or more pigments |
| * spoznati in razumeti metodo papirne kromatografije | * to know and understand the paper chromatography method |

|  |  |
| --- | --- |
| **Material:** | **Materials:** |
| * ekstrakt iz zelenih listov | * **green leaf extract** |
| * petrijevka | * **petri dish** |
| * epruveta | * **test tube** |
| * filtrirni papir | * **filter paper** |
| * topilo | * **solvent** |
| * škarje | * **scissors** |

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| **Metode dela:** | **Methodology**: |
| poskus (izvajanje, opazovanje, merjenje, računanje) | experiment (conducting, monitoring, measurement, calculation) |

**Rezultati:**

**A.** Nalepite dobljeni kromatogram in označite posamezne barve.

**B**. Izračunajte retencijske faktorje (Rf) za vse barvne lise na vaših kromatogramih in jih zapišite v preglednico.

Preglednica: Rf za barvne lise ne kromatogramu

|  |  |
| --- | --- |
| Barvne lise – ime barvila | Rf |
|  |  |
|  |  |
|  |  |
|  |  |

**Razgovor:**

1. Kaj pomeni vrednost retencijskega faktorja?  
**What is the meaning of the retention factor value?**

2. Kakšna metoda je kromatografija?  
**What is the chromatography method?**

3. Razložite, zakaj so listi jeseni rumeni, oranžni ali rdeči.  
**Explain why autumnal leaves are yellow, orange or red.**

**Sklepi:**

V zelenem listu je več različnih barvil.  
**In green leaves are many different pigments.**

Okolje (temperatura, dolžina dneva, nadmorska višina, mikroelementi v tleh,..) vpliva na vrste pigmentov in njihove količine.  
**The environment (temperature, length of day, altitude, microelements in the earth) affect the types of pigment and their quantity.**

1. NASTAJANJE ŠKROBA **--STARCH GENERATION**

|  |  |
| --- | --- |
| **Namen vaje:** | **Learning objectives of the experiment:** |
| * spoznati dokaze za kemično aktivnost v zelenih rastlinah | * **to know the evidence for chemical activity in green plants** |
| * znati ugotoviti odvisnost količine nastalega škroba od trajanja osvetlitve | * **to know how to determine the dependence of the amount of resultant starch on the duration of illumination** |
| * znati uporabljati indikator za dokaz škroba | * **to know how to use indicator for the detection of starch** |

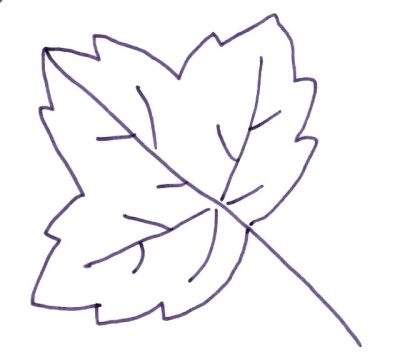
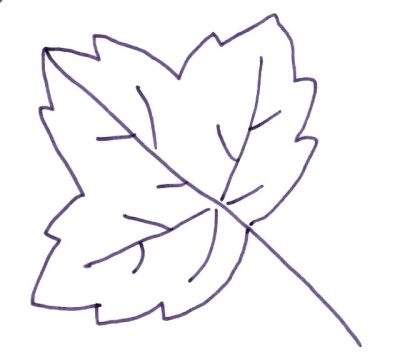
|  |  |
| --- | --- |
| **Material:** | **Materials:** |
| * rastlina | * **plant** |
| * raztopina joda | * **iodine solution** |
| * petrijevke | * **petri dish** |
| * pinceta | * **tweezers** |

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| **Metode dela:** | **Methodology**: |
| poskus (izvajanje, opazovanje, skiciranje) | **experiment (conducting, observing, sketching)** |

**Rezultati:**

Skicirajte demonstracijski poskus.

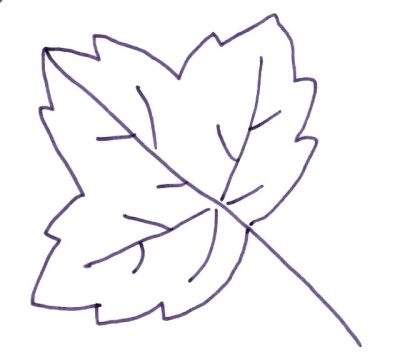
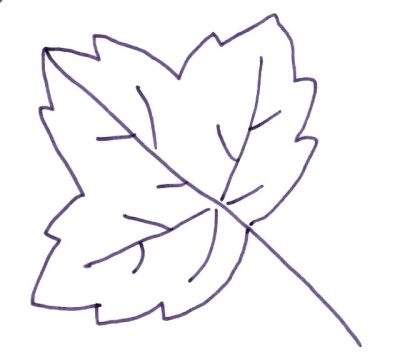
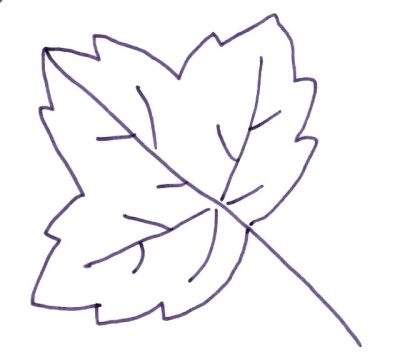
Poskus A: Pobarvajte!

razbarvan list na svetlobi + raztopina joda razbarvan list v temi + raztopina joda

Poskus B:

Pobarvajte!

razbarvan list 2 uri na razbarvan list 4 ure na razbarvan list 6 ur na

svetlobi + raztopina joda svetlobi + raztopina joda svetlobi + raztopina joda

**Razgovor:**

1. V katerih listih nastaja škrob?  
**In which leaf is starch produced?**

2. Kateri proizvod fotosinteze je najbolj verjeten za nastanek škroba?  
**What product of photosynthesis is the most likely in the formation of starch?**

3. Albinizem je pojav, pri katerem osebki nimajo barvila. Kakšen rezultat bi napovedali, če bi pri tem poskusu uporabili albino rastlino namesto normalne zelene rastline?  
**Albinism is a phenomenon in which a specimen has no pigmentation. What result would be predicted if we used an albino plant instead of a normal green plant?**

**Sklepi:** Prevedi!

Jodavica je indikator za škrob.  
**Iodine solution is an indicator for starch.**

Fotosinteza poteka na svetlobi.  
**Photosynthesis occurs in light.**

Škrob dokažemo v zelenih listih, ki so bili vsaj 4 ure na svetlobi.  
**Starch is evident in green leaves which have been at least 4 hours in light.**

1. FOTOSINTEZA **– PHOTOSYNTHESIS**

|  |  |
| --- | --- |
| **Namen vaje:** | **Learning objectives of the experiment:** |
| * znati samostojno načrtovati in izvesti Sposkus | * **to know how to independently plan and carry out an experiment** |
| * s pravilno načrtovanim poskusom znati dokazati, da se pri fotosintezi porablja ogljikov dioksid in sprošča kisik | * **with a correctly planned experiment, know how to demonstrate that the photosynthesis process uses carbon dioxide and releases oxygen** |
| * s pravilno načrtovanim poskusom znati ugotoviti, da rastline dihajo | * **with a correctly planned experiment know how to determine that plants breathe** |

|  |  |
| --- | --- |
| **Material:** | **Materials:** |
| * bromtimol modrilo | * **Bromothymol blue** |
| * račja zel | * **pondweed** |
| * epruvete | * **test tube** |
| * slamica | * **straw** |
| * radenska (sodavica) | * **soda water** |
| * aluminijeva folija | * **aluminium foil** |

|  |  |
| --- | --- |
| **Metode dela:** | **Methodology**: |
| poskus (samostojno načrtovanje in izvajanje poskusa, postavljanje hipoteze, opazovanje, ugotavljanje vzroka sprememb) | **experiment (independent planning and implementing experiment, setting hypothesis, observing, determining reason for change)** |

**Rezultati:**

Okrajšave: BTM = bromtimol modrilo

RZ = račja zel

S/T = svetloba ali tema

Spremembe indikatorja: moder → rumen

rumen → moder

moder → moder (ni spremembe)

rumen → rumen (ni spremembe)

Preglednica: Rezultati opazovanj

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Dodani material  BTM CO2 RZ S/T | | | | Pričakovana sprememba indikatorja | Dejanska sprememba indikatorja (rezultati) | Zakaj je nastala sprememba? (razlaga) |
| 1. | + |  |  |  |  |  |  |
| 2. | + |  |  |  |  |  |  |
| 3. | + |  |  |  |  |  |  |
| 4. | + |  |  |  |  |  |  |
| 5. | + |  |  |  |  |  |  |
| 6. | + |  |  |  |  |  |  |
| 7. | + |  |  |  |  |  |  |
| 8. | + |  |  |  |  |  |  |

Skicirajte demonstracijski poskus, ga opišite in zapišite rezultate.

Opis: Rezultati:

**Razgovor:**

1. Ali zelena rastlina porablja CO2, če je nekaj časa izpostavljena svetlobi?  
***Does a green plant use CO2 if exposed to light for a short time?***

Katere kombinacije dodanega materiala to dokazujejo?  
***Which combination of additional material demonstrate this?***

2. Ali rastlina, kadar v njej ne poteka fotosinteza, CO2 sprejema, oddaja ali kakorkoli drugače uporablja?  
***Do plants, which undergo no photosynthesis process, accept, emit or do something else with CO2?***

Katere kombinacije dodanega materiala to dokazujejo?  
***Which combination of additional materials demonstrate this?***

3. Ali nastaja presežek kisika v zeleni rastlini, ki opravlja fotosintezo? Razložite.  
***Is a surplus of oxygen produced in green plant which undergo photosynthesis? Explain.***

**Sklepi:**

Napišite vsaj pet povedi v slovenskem in angleškem jeziku.  
**Write at least 5 sentences in both Slovene and Engish.**