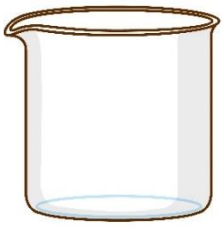
English for the Lab

Warm up:

- Do you or have you ever worked in a lab? What were your day-to-day tasks?
- What are some of the most important safety rules for working in different types of labs?
- Do you like working in a lab? Why or why not?
- What are some industries that need laboratories (medicine etc)?
- If you work in a lab, do you ever have to dispose of hazardous materials? How does your company do it?
- How often do you have to perform maintenance on lab equipment? What does that involve?

1. Match the words in the box to the pictures below

cotton swab *e)*	pipette *j)*	scales *g)*	Bunsen burner *i)*	beaker *a)*
thermometer *c)*	goggles *e)*	test tube *h)*	microscope *b)*	funnel *f)*

a)


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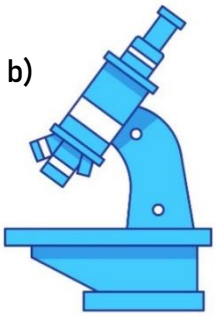

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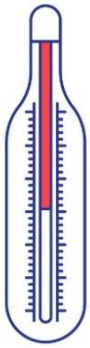

d)


e)


f)


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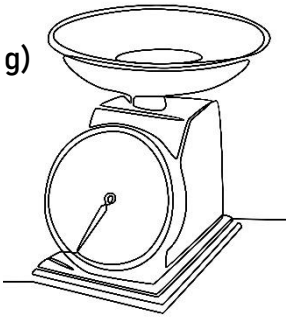

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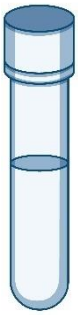
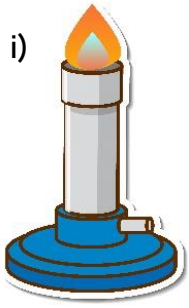


i)


j)


2. Match each set of safety protocols with the appropriate title. Each set of safety protocols has one instruction that does not belong.

General Safety	Biohazards	Radiation Area!
Chemical Hazards	Electrical Hazards	

Caution: Chemical Hazards

☐ Handle all substances with care and in accordance with the safety data sheets (SDS).
☐ Use fume hoods when working with volatile or flammable substances.
☐ Properly label and store all substances in designated areas.
☐ *Do not ingest substances unless specifically instructed to by lab director.*
☐ In case caustic substance comes into contact with skin, immediately wash the affected area with cool running water for at least 15 minutes.

Notice: General Safety

☐ All personnel must wear appropriate personal protective equipment (PPE) at all times.
☐ *In case of emergency, please leave your gloves and goggles at the front desk.*
☐ No food or drink is allowed in the lab area.
☐ Ensure that all emergency exits and pathways are clear of obstructions.
☐ Report any accidents, spills, or unsafe conditions to the supervisor immediately.

Danger: Biohazards

☐ Decontaminate work surfaces and equipment after use.
☐ All organic materials must be handled with appropriate safety equipment.
☐ Use autoclaves (at a temperature of 125 degrees) for sterilization of hazardous waste.
☐ Do not dispose of hazardous materials in regular trash
☐ *Please wash your eyes thoroughly after viewing materials.*

Alert: Radiation Area!

☐ Restricted access – authorized personnel only.
☐ *Report any and all new superpowers to your supervisor immediately.*
☐ Use shielding and personal dosimeters when necessary.
☐ Use tools and remote handling devices to increase distance from materials.
☐ Report any suspected exposure or contamination immediately.

Caution: Electrical Hazards

☐ Inspect all equipment and cords for damage before use.
☐ Do not overload outlets, and keep liquids away from devices and outlets.
☐ Regularly inspect equipment for signs of wear and tear, damage, or malfunction.
☐ *Wear a helmet before touching any live wires.*
☐ Unplug equipment when not in use and during maintenance.

3. Read the statement from the lab technician about how adhesives are tested. Complete the gaps with any verb that makes sense (more than one correct answer is possible).

"I'm a lab technician at an adhesive company, we *sell/supply* adhesives to many other companies, and we quite often *get/receive* orders for adhesives with very particular properties. For example, at the moment we are trying to *produce/develop/make* a glue for a phone company that is helium-tight. That basically means the glue does not let helium escape. This is not easy because helium is a very small molecule, and tends to get past most barriers with ease. When testing adhesives, multiple samples are *predpared/made* with many different properties. Some might be slightly thicker, or some might contain more or less of a certain chemical. We also try to *avoid* contaminating the mixture, as we want it to be as pure as possible. Then the mixture is *mixed/placed/put* in a machine called a meter mixer. After the adhesive is properly mixed, we *perform/do* several tests on all the samples. First, the adhesive is applied to several different surfaces such as rubber, metal, or fabric, and stuck together and left for several hours. Then a machine will slowly *pull/peel* the two pieces apart and measure how much force is required to separate the two pieces. This is called the "tensile test", and *measures/tests* the strength of a bond. Next the mixture is placed in a humidity chamber and subjected to all kinds of humidities and temperatures. For example, if the adhesive is needed in a place like south-east Asia, it's subjected to high heat and high humidity for long periods of time. This process can *take* a long time, but afterwards the damage to the adhesive can be assessed, and we can *assess/judge/tell* if the mixture would be suitable for these kinds of environments. There are many other tests we run on the adhesive depending on what is required from it, but these are the two major tests."

Passive Voice

When describing a process, passive voice is often used. Passive voice takes the subject out of the sentence.

E.g. "We mix the glue for several hours" (active voice, "we" is the subject)

"The glue is mixed for several hours" (passive voice, no subject)

The structure of passive voice is *(object)* The glue *(verb to be)* is *(past participle)* mixed.

This structure is often used if the person or people doing the action is either obvious or not particularly important.

E.g. "The man was arrested last week." It is obvious that the police arrested him.

"The computers are updated every 6 months." It is not important who updates them, the important thing is that *they are updated*.

This structure is often used when describing processes.

4. Read through the statement in exercise 3 again and find 5 examples of passive voice.

5. Think about a process that you do or know how to do in the lab and describe it using passive voice sentences where possible. Try to go into as much detail as possible

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6. Listen to the lab technician talk about the method for extracting DNA and answer the questions.

a) What tool is used to collect the DNA? *A cotton swab*

b) What is a "lysis buffer"? *A solution which breaks down the cell membrane and releases the DNA*

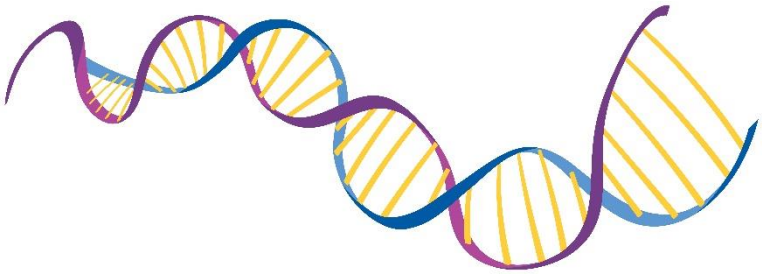
c) What is the purpose of the protease enzyme? *It breaks down any proteins attached to the DNA and "purifies" the DNA*

d) At what temperature and how long should the sample be incubated for? *56 degrees Celsius for 30 mins*

e) What machine is used to separate the liquid from the DNA sample? *A centrifuge*

f) What is a "pellet"? *a ball of DNA created after the centrifuge has separated the liquid*.

g) Is the DNA stored in a dry or a wet environment? *Wet, it is stored in a "buffer solution."*



Audio Transcript

"Welcome to our lab. Today, I'll be walking you through the process of DNA extraction from human cells. To begin with, let me explain the basic principle: DNA extraction involves breaking down cell membranes to release the DNA, then purifying it so it can be analyzed or used in experiments.

First, we start with our sample. Today, we're going to use a cotton swab to collect saliva from a person's mouth and then transfer the cells into this test tube here, which contains something called a lysis buffer. A lysis buffer is a liquid solution which breaks down the cell membrane and releases the DNA into the solution. Basically we can't properly examine the DNA without getting rid of the cell membrane first.

Next, the protease enzyme is added. This enzyme helps to break down proteins that are attached to the DNA. By dissolving these proteins, we ensure that our DNA sample is as clean and pure as possible. A few microliters of protease is added to the test tube and then gently mixed.

Then the mixture is incubated at 56 degrees Celsius for about 30 minutes which helps the protease enzyme work more effectively.

After incubation, we will add a solution called ethanol. Ethanol helps the DNA to stand out from the rest of the solution, making it easier for us to study. When we add ethanol, you'll see the DNA start to clump together. It's quite a fascinating process.

Now that the ethanol has been added, we'll put the DNA in the centrifuge. The centrifuge is a machine which spins the sample at high speeds, causing the DNA to collect at the bottom of the test tube in a small ball. This ball is called a "pellet.". This is a vital step because it separates the DNA from the rest of the solution. The sample is placed in the centrifuge for about 10 minutes at 12,000 RPM.

When the centrifuge is finished, the liquid above the DNA pellet is carefully removed, and then we wash the pellet with a small amount of ethanol to remove any remaining impurities. Then we'll let the pellet dry to evaporate any ethanol.

Finally, we'll rehydrate the DNA pellet in a buffer solution, making it ready for analysis or further experiments. This is also what the DNA is stored in if we need to keep it for long periods of time. And there you have it – a pure sample of DNA, ready to be used in a variety of genetic tests or research studies. And that's it, the whole process of testing DNA from a saliva swab. If you have any questions, feel free to ask."