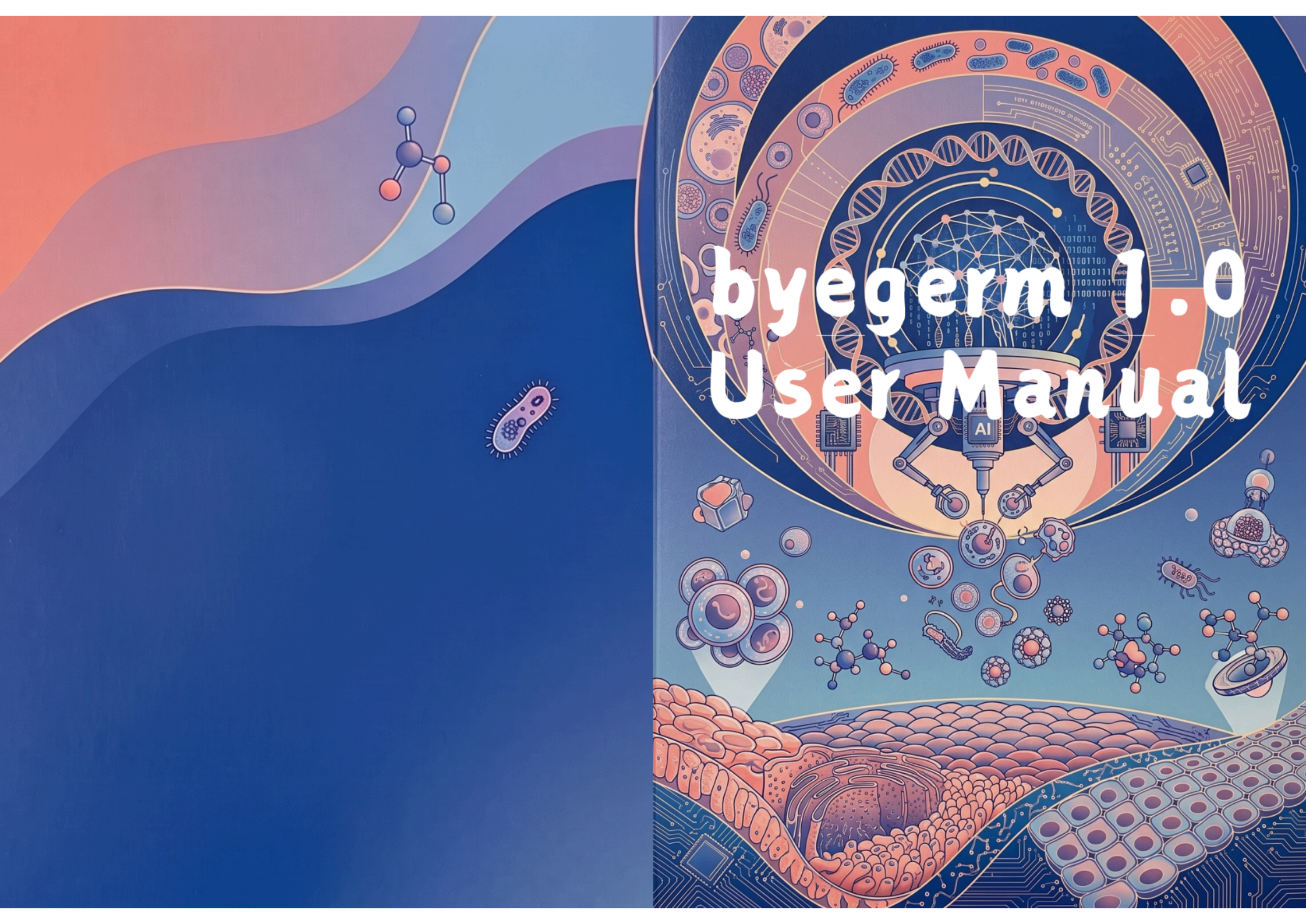




byegerm 1.0

User Manual

Complete workflow from sampling preparation to saving results

This manual explains how to use byegerm 1.0 in the order of a complete test. First prepare and connect the instrument and phone, then collect and process samples. After loading the tubes, use the app to set up and start the run, monitor it, record results, remove the tubes, and clean the instrument. Read the entire manual before first use.

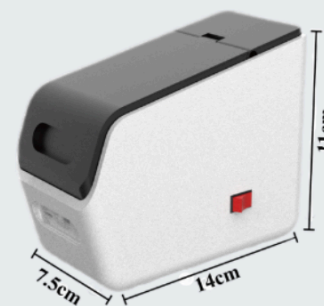


Figure 1 byegerm 1.0 exterior

Identify the parts you will use

This generation is designed for small-scale testing at home. Open the loading lid and place sealed reaction tubes in the fixed viewing area. With the lid closed, the instrument controls temperature and captures images; the mobile app provides settings, viewing, and recording functions. Prepare samples outside the instrument. Do not place collection tubes directly in the detection positions.

Prepare the required items

Prepare the instrument, its supplied power source, an Android phone with the matching app version, a sampling kit, identification labels, sample preparation materials, test reagents, compatible reaction tubes, pipetting equipment, required controls, protective equipment, and waste containers. Check material expiry dates, the test to be performed, its protocol, and the result interpretation rules.

This manual is for trained operators of the research prototype. Throat swabs are collected by trained healthcare personnel. Design for home or institutional use does not replace validation of suitability for real specimens and diagnostic performance.



01 Prepare the instrument and phone

Position and inspect the instrument

Place the instrument on a stable, dry bench with space for ventilation. Once it has stopped and cooled, check the lids, tube-loading area, and power cable. Remove any remaining tubes and foreign objects. Do not use the instrument if parts are loose, liquid has entered, or cables are damaged. Routine operators must not disassemble or adjust the camera, optical filters, or internal circuitry. Power on and wait until ready. Use the supplied adapter, or ensure the battery has sufficient charge before powering on. Wait for the instrument's specified ready indication before using the app.

If power ratings or connector functions are unclear, check the configuration card first. Do not connect another power source merely because its plug fits.

Connect the phone to the instrument

Open the phone's Wi-Fi settings, join the instrument's local network, and open the companion app. In the connection area, enter the configured device address and port in Server IP and Port, then tap Connect to Server. After the connection confirmation appears, check that device status and temperature readings update. If the connection fails, check in order that the instrument is on,



the phone is on the correct network, and the IP address and port match. Do not change settings or start a test until the connection is confirmed. The person responsible for the instrument records the Wi-Fi name, IP address, and port on the configuration card on the last page.

Perform an integrated check before first use

Before first use, after repairs, or after replacing key components, the person

responsible for the instrument checks temperature control, fixed-position imaging, record saving, and stopping functions using non-infectious test materials. Capture an image with the lid closed. Confirm that tube positions match the records and that temperature feedback and stopping behavior meet the validation requirements. Complete the check, allow cooling, and remove the test materials before processing actual samples.

Before proceeding, confirm that the instrument and app are connected, startup checks have passed, and test materials have been removed.

For routine use, retain the verified configuration. Do not change network, optical, or temperature-control settings without authorization.

02 Collect and prepare samples

Assign identifiers before sampling

Confirm the person's identity, the requested test, and the sample ID, and prepare the appropriate swab and collection tube. The collector performs hand hygiene, uses the required protection, and explains the procedure. Collection tube labels must correspond to the subsequent processing and reaction tubes.

Collect the throat swab and seal the tube

A trained healthcare professional inserts the swab into the posterior pharynx and tonsillar areas, swabs both tonsillar pillars and the posterior oropharynx, and avoids the tongue, teeth, and gums.

Place the swab tip in the supplied collection tube. Retain or break off the swab as directed by the kit instructions, tighten the cap, record the collection time, and check for leakage. Store and transfer the sample under the conditions specified in the applicable protocol.

Process samples outside the instrument

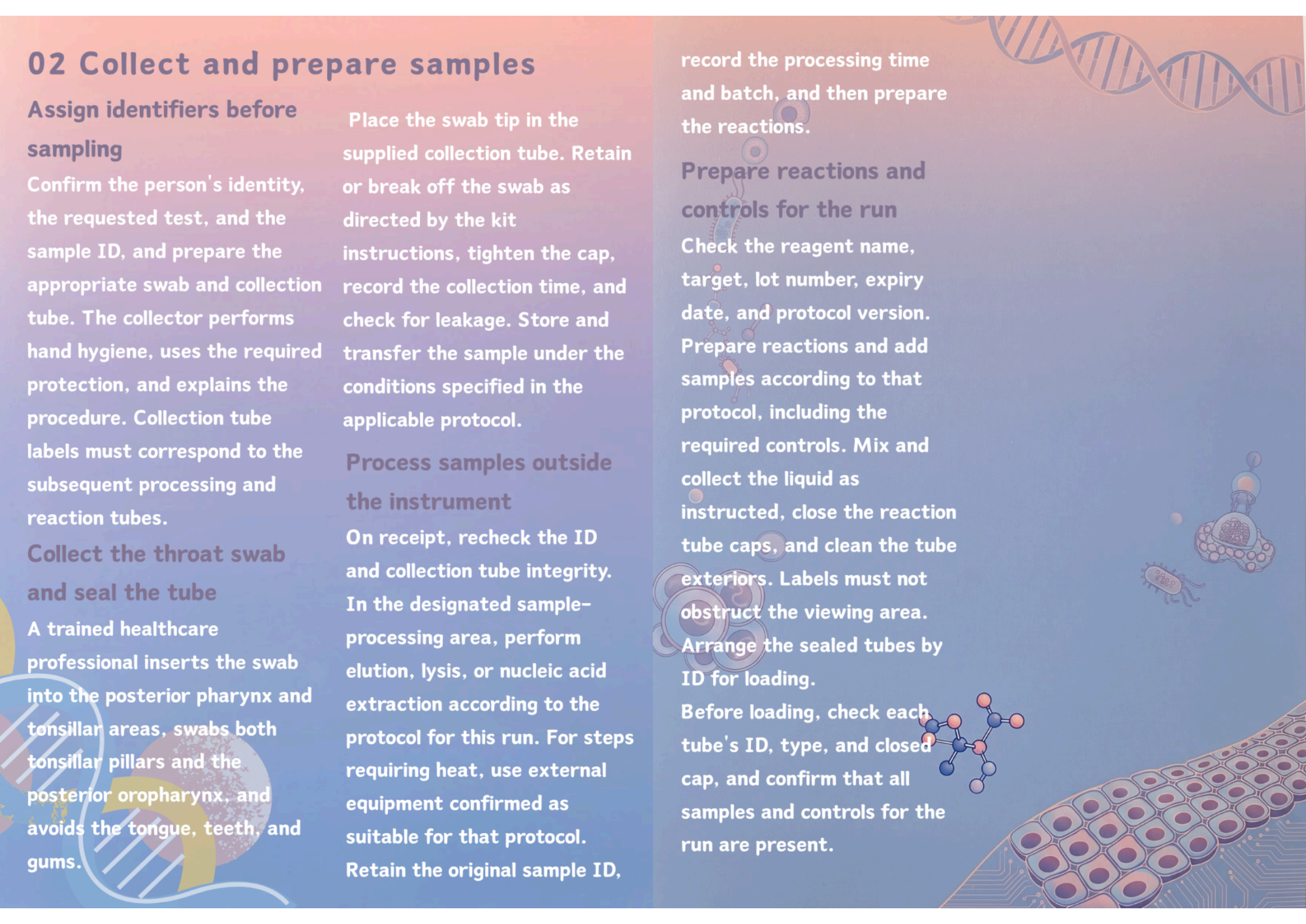
On receipt, recheck the ID and collection tube integrity. In the designated sample-processing area, perform elution, lysis, or nucleic acid extraction according to the protocol for this run. For steps requiring heat, use external equipment confirmed as suitable for that protocol. Retain the original sample ID,

record the processing time and batch, and then prepare the reactions.

Prepare reactions and controls for the run

Check the reagent name, target, lot number, expiry date, and protocol version. Prepare reactions and add samples according to that protocol, including the required controls. Mix and collect the liquid as instructed, close the reaction tube caps, and clean the tube exteriors. Labels must not obstruct the viewing area. Arrange the sealed tubes by ID for loading.

Before loading, check each tube's ID, type, and closed cap, and confirm that all samples and controls for the run are present.



03 Load reaction tubes and start the test

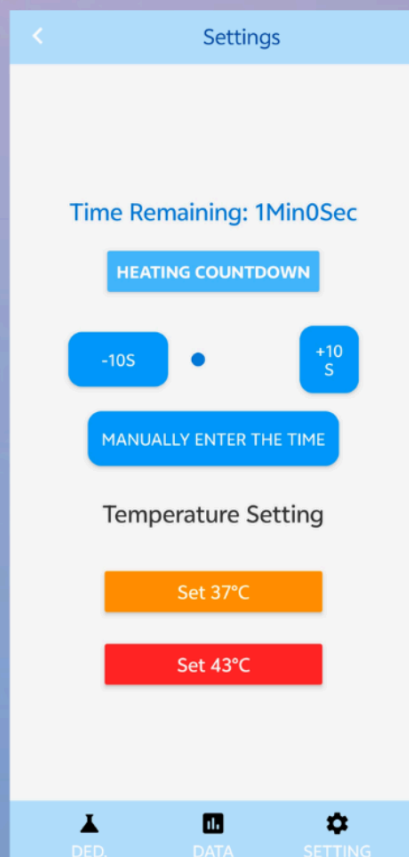
Match each tube to its fixed position

Assign a run ID and record the sample ID, target, and actual position of each reaction tube, including controls. Once the instrument has stopped and loading is permitted, open the loading lid and seat each sealed tube securely in its assigned position and orientation. Do not force or stack tubes, and keep labels clear of the imaging area. Check the arrangement and close the lid.

Set reaction parameters in the app

Keep the phone connected. Open Settings, set the target temperature required by the protocol in Temperature Setting,

and enter or adjust the run time in the time area. Check the entries against the reagent protocol for this run. Default values and temperature shortcut buttons are interface aids; they do not replace verification of the run parameters.



Complete the final checks before starting

Confirm that tubes are seated, position records are correct, controls are complete, lids are closed, the connection is working, and temperature and time settings are correct. If the app requires preheating or positioning first, complete the required step for this instrument before starting the sample run.

Start the run and confirm operation

Start the current test in the app. Check that run status, Current Temp readings, or Heating countdown update as specified by the program. Record the start time and the program's defined timing reference, distinguishing warm-up time from effective reaction time.

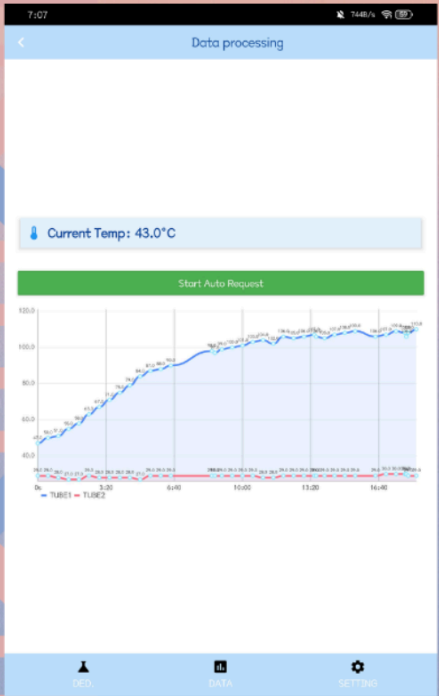
If there is no response, check the connection and device status first; do not repeatedly tap start.

04 Monitor the run and capture images

Keep the instrument stable and check status

Maintain the phone's network connection to the instrument throughout the run. Keep the lids closed and vents unobstructed. Do not move the instrument, remove tubes, or adjust optical components. Keep tubes in their original fixed positions so that images remain comparable over time.

App display	What to check
Current Temp	Check that readings continue to update and meet the temperature requirements for this run.
Heating countdown	Check that timing follows the program. When the countdown reaches zero, still verify run and heating status.
Data or curve area	Check that data have been returned and curve timestamps match this run. If no curve appears, first check the acquisition stage and connection.



Capture images of fixed positions

At the acquisition stage specified by the protocol, capture images using the mode configured in the current app. In automatic mode, wait for the image to update. In manual mode, trigger acquisition once and wait for the image. Check that tubes are fully visible, the image is clear, the timestamp has updated,

and displayed positions match the loading record.

Open results after acquisition and analysis

After the image is returned, wait for automatic analysis or complete the verified analysis steps, as configured, before viewing results for the channels in use. An unchanged image, blank result, or absence of data does not indicate a negative result. If a problem occurs, refer to the troubleshooting instructions on the last page. Disconnecting the network, closing the app, or stopping automatic refresh does not stop heating. If the connection is lost, check the instrument's actual state first. After reconnecting, verify run and data completeness; do not simply restart the same run.

05 Check results and finish the run

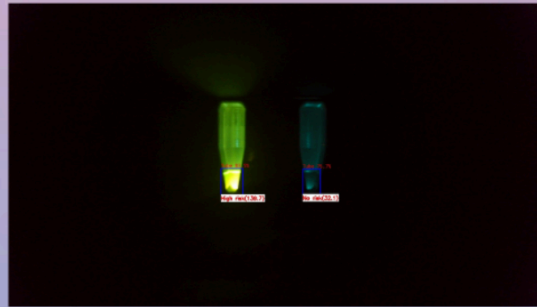
Match results to individual tubes

Match each Tube number in the app to the loading record. Confirm that the sample ID, target, and actual position agree. Read results only for positions used in this run. Mark unused positions as unused, not negative.

Confirm run validity before interpreting results

Review control results and check the run time, temperature, and acquisition records. Record sample results using the applicable interpretation rules only when the run meets the reagent protocol's validity criteria. If controls fail, data are missing, or the run is interrupted,

follow the protocol for handling or retesting. Image brightness alone, model confidence, or a risk label cannot replace a test conclusion.



Save test records

Record the run ID, sample-to-position mapping, run parameters, and test results. Save data or capture the results screen using the functions available in the current app. Check that saved content is clear and complete and that identifiers match this run. Record the reagent lot number and protocol version separately.

Stop the run and allow cooling

After recording, follow the instrument's end-of-run procedure and confirm that heating has stopped. Verify that the detection chamber is ready for tube removal. Do not open the lid and remove tubes merely because the countdown is zero or the app is closed. Do not touch heating components to judge their temperature.

Remove and account for all reaction tubes

Once tube removal is permitted, open the appropriate lid and remove tubes one by one according to the position record, keeping caps closed. Collect waste according to institutional rules. Check every used position for remaining tubes.

Complete the instrument's system shutdown, switch off the power, and disconnect the external supply.

Clean, store, and complete the record

After disconnecting power and allowing cooling, clean using a method compatible with the housing, metals, and optical materials. Do not spray liquid into the camera, fan, or connectors, or immerse the instrument. Once dry, close the lids for storage. Disconnect cables before moving it and support the housing securely. Record abnormalities and corrective actions for the next startup check.

Before ending the run, confirm: records are saved; the run and heating have stopped; all reaction tubes are removed; waste is collected; and the instrument is shut down and cleaned.

Troubleshooting

Problem	Action sequence
Cannot connect	Confirm that the instrument is ready, the phone is on the correct network, and Server IP and Port match the device configuration. Then reconnect.
Connection lost during a run	Restore the network and use Reconnect. Check whether the instrument is still running, image timestamps, and data completeness. Do not simply restart.
Temperature or countdown not updating	Check the connection and run status first. If heating status cannot be confirmed or the problem persists, stop the run and contact the person responsible for the instrument.
No curve or new image	Check that acquisition has begun, the network is working, and acquisition and analysis are complete. Blank or old data must not be treated as negative.
Abnormal image or incorrect position	Check the loading record and current view. Stop before checking loading and lids. Do not change exposure or thresholds to conceal a problem.
Liquid ingress or abnormal heating	Stop using the instrument immediately if there is smoke, an unusual odor, battery abnormality, or liquid ingress. Disconnect power when safe; do not continue charging or test-running it.

After resolving a fault, reassess the validity of the run record. If run time, temperature, or acquisition completeness was affected, decide on retesting according to the protocol. Do not automatically reuse results from before the fault.

Instrument configuration card

To be completed by the person responsible for the instrument and supplied with it. Update this card when the network or software changes. Test temperature and duration remain governed by the reagent protocol for each run.

Item	Instrument information
Device and software	Device ID_____ App version_____ Firmware version_____ Power rating_____
Connection	Wi-Fi name_____ Server IP_____ Port_____
Operating references	Protocol and version_____ Ready indication_____ Integration check date_____
Contact	Responsible person_____ Contact details_____

Keep each run ID and sample-position record so that the instrument, app, and test results can be linked.