To observe bacterial survivability before and after a weather balloon flight, you’ll need several basic microbiology tools.

A **compound light microscope** capable of 1000x magnification (with an oil immersion lens) is essential for examining bacterial cell structure and any visible damage. These microscopes are commonly found in school or university labs, but they can be costly if you're buying one—though decent second-hand models or educational microscopes are often more affordable. You’ll also need **microscope slides and coverslips**, along with **immersion oil** for high-magnification viewing, all of which are relatively inexpensive.

To improve visibility and assess bacterial health, you’ll need **staining kits**. Basic stains like Gram stain or methylene blue are widely available and low-cost. More advanced stains, like live/dead kits using SYTO 9 and Propidium Iodide, are excellent for assessing viability but can be expensive and may require storage in cold conditions. If you have access to a **fluorescence microscope**, it can help visualize these stains better, but these microscopes are usually only found in research labs and can be very expensive—so they may not be realistic unless you're partnering with a university or institution.

For culturing bacteria, you'll need **sterile petri dishes** with a nutrient-rich agar like LB agar. These are fairly inexpensive and easy to prepare. **Sterile swabs or inoculation loops** are also low-cost and essential for transferring bacteria. An **incubator** set to around 37°C is helpful for growing many bacteria, but if you’re using environmental strains (like soil or skin bacteria), they may grow slowly even at room temperature—so an incubator is helpful but not strictly necessary.

You’ll also need **sterile sample containers or tubes** to carry the bacteria before and after the flight. These are easy to get and not expensive, but it’s important they seal tightly to avoid contamination or leakage. To ensure accurate comparison, maintain a **control group** on the ground under the same conditions as your flight samples.

After the flight, you'll compare bacterial colony growth to assess survivability. A **colony counter** can make this faster, but it's not essential—you can count manually using a pen and grid. A **notebook or camera** is useful for documenting results, and both are easy and low-cost tools.

If available, a **spectrophotometer** can be used to measure bacterial growth in liquid cultures by assessing turbidity. These are usually found in labs and can be expensive, so this is an optional tool. Similarly, a **scanning electron microscope (SEM)** can provide ultra-detailed images of bacteria and surface damage but is very advanced, expensive, and usually only available in specialized research facilities—so it's more of a bonus than a requirement.

Essential and low-cost items typically range from $1 to $50 each, including nutrient agar ($10–$30), sterile petri dishes ($10–$25), sterile swabs/inoculation loops ($5–$15), slides and coverslips ($5–$20), staining reagents like Gram stain or methylene blue ($10–$30), sample tubes/containers ($5–$15), and manual colony counting (free). Medium-cost items range from $50 to $500, such as a compound light microscope ($100–$400), immersion oil ($10–$25), a small incubator ($100–$300), and a USB microscope camera ($50–$150). High-cost, lab-only equipment includes a fluorescence microscope ($3,000+), spectrophotometer ($500–$3,000+), and scanning electron microscope (SEM) ($100,000+).

Nutrient agar (LB agar):

Petri dish:

<https://www.amazon.co.uk/ADFEN-Transfer-Pipettes-Experiment-Microbiology/dp/B08PV2VB5D/ref=sr_1_2?c=ts&dib=eyJ2IjoiMSJ9.rqNINIDYKVKOE_U17dJFvW5t5lrdH9mmS1iHhhtNXeRxJtHWz1mBAYZuZibzFnxS-6ddh_GSjKvlf24WlFyJUyQRExTIqaW-8bCByvygQ6KYnyZS5JyRa8PPie89Q7LE2wu-hsp0cbMH3oaEvy8FC5IcCBi6QIoWzbBCDHl8PdsgtQPpi7XkwcS-WkLWJdNE.OGO3YIEb7uAQ7m5_JUzO4FIoo_XSCHRDiuUSJXhCpko&dib_tag=se&keywords=Lab+Petri+Dishes&qid=1744609625&refinements=p_n_feature_fourteen_browse-bin%3A16204324031&s=industrial&sr=1-2&ts_id=6284561031>

Sterile swabs/inoculation loops: Already have / inoculation loops cost too much

Slides and Overslips: Already have

Staining reagents: <https://www.top-bio.com/syto-9-qpcr-2x-master-mix-2> (syto 9).

Sample tubes and contaioners: Wont need them/ they cost too much

Compund light microscope: Already have one

Microscope immersion oil: <https://www.amazon.com/dp/B007PD4IZS/ref=sr_1_1_sspa?dib=eyJ2IjoiMSJ9.tgrW_Wgxsaq8INYtOTUO0fMAY9b1LrH5SCVWEnQQlp3gL3H1oI7hPUX3Gq3BgPJLNU_yVSXrMXFje1oti5-ofiGvMDAByiMMaFI4Iedo6OuhcVN-3zMhiJ1_ZEKjDNe6vzsLPo0TRzha2VFHZOerdiIrW4ubkrc7Xe1a_Vh893xDJtsPrsRQ6Gc6n-Mf_xn5-zm0a8qL4J69BLln9jdGbWVqDeoLX8rwtKp3bbUft4g.lyMPS6pSZo3lQjmhzKyyDpAAko5izf9cId2kYL1Mt00&dib_tag=se&keywords=immersion+oil&qid=1744610268&sr=8-1-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1>

Incubator (small)! (very important for sporulation): We could make one ourselfs because even little ones are out of our budget ngl.