



Gurukul Technicals Institute

Computer education · Robotics · Science projects · Delhi

FREE EBOOK

HARDWARE, NETWORKING AND REPAIR

Mobile Repairing Basics Study Book

The complete study notes, practice questions and glossary for Mobile Repairing Basics

INSIDE THIS BOOK

- Inside a Smartphone: The Main Parts
- Repair Tools and Workbench Safety
- Lithium-Ion Battery Safety
- Diagnosing Charging Faults
- Diagnosing Display and Touch Faults
- ...and 2 more chapters, practice questions and a glossary

Beginner

Students learning mobile phone repair

engineergurukul.com

+91 97116 99511

Mobile Repairing Basics Study Book

Learn the parts inside a smartphone, the tools and safety rules of a repair bench, lithium-ion battery safety, how to diagnose charging, display and software faults, and how to protect customer data.

WHO IT IS FOR	Students learning mobile phone repair
LEVEL	Beginner
SUBJECT AREA	Hardware, networking and repair
WHAT IS INSIDE	7 chapters, practice questions with answers, and a glossary

CONTENTS

1	Inside a Smartphone: The Main Parts	3
2	Repair Tools and Workbench Safety	5
3	Lithium-Ion Battery Safety	7
4	Diagnosing Charging Faults	9
5	Diagnosing Display and Touch Faults	11
6	Software Problems: Backups, Factory Reset and Flashing	14
7	Customer Data Privacy and Professional Practice	16
	Practice questions	18
	Answers	22
	Glossary	24

Free ebook: you may read, print and share it for learning; it may not be sold or changed. © 2026 Gurukul Technicals Institute. First edition, October 2026. Contact details are on the back cover.

Inside a Smartphone: The Main Parts

A smartphone is a small computer

A smartphone has the same building blocks as a PC: a processor, memory, storage, a screen, input devices and a power supply. The difference is that everything is packed into a few millimetres and held together with tiny screws, clips, flex cables and adhesive. Before you repair a phone, you must know what each part does and where it usually sits.

The main parts

Part	What it does	Common faults
Display assembly	Shows the picture and senses touch	Cracked glass, lines, black screen, touch not working
Battery	Stores the energy that runs the phone	Fast drain, swelling, sudden shutdowns
Charging port	Receives power and data through the cable	Loose fit, dust inside, no charging
Cameras	Rear and front cameras for photos and video	Blurry pictures, black camera screen
Earpiece and loudspeaker	Earpiece for calls held to the ear; loudspeaker for ringtones, media and speakerphone	Low or crackling sound
Microphones	Pick up your voice; extra microphones help reduce background noise	The other person cannot hear you
Motherboard (PCB)	Carries the processor, memory and control chips	Dead phone, no network, overheating

The display assembly

A phone screen is made of layers: the protective **cover glass**, a **touch layer** (often called the digitizer) and the **display panel**. Two panel types are common:

- **LCD**: needs a **backlight** behind the panel to light it up.
- **OLED** (including AMOLED): every pixel produces its own light, so no backlight is needed and black areas look truly black.

In most modern phones these layers are bonded together, so a cracked glass usually means replacing the whole display assembly, not just the glass.

The motherboard

The motherboard, also called the logic board or main PCB, is the heart of the phone. On it you will find:

- the **SoC** (System on a Chip), which combines the CPU, the graphics processor and other units in one chip;
- the **RAM** and the **storage chip**;
- the **power management IC (PMIC)**, which controls the power supplied to each section of the phone;
- the radio chips for the mobile network, Wi-Fi and Bluetooth.

Many phones also have a small **sub-board** at the bottom that carries the charging port and a microphone, joined to the motherboard by a flex cable.

Flex cables and connectors

Parts connect to the motherboard through thin, bendable **flex cables** that press onto tiny **board-to-board connectors**. These snap on like a press-stud button. They are fragile: lift them straight up with a plastic tool and never pull on the cable itself.

Other parts you will meet

- The SIM tray and, on some phones, a memory card slot
- The vibration motor
- Power and volume buttons on side flex cables
- The fingerprint sensor, proximity sensor and ambient light sensor
- Antenna lines built into the frame for network signals

Before opening any phone, note its exact model number from Settings (usually under About phone) or from the box. Spare parts that look similar often do not fit a different model.

KEY POINTS

- A smartphone has the same building blocks as a computer, packed into a small space.
- The display assembly bonds cover glass, a touch layer and an LCD or OLED panel together.
- LCD panels need a backlight; OLED pixels produce their own light.
- The motherboard carries the SoC, RAM, storage and power management chips.
- Flex cables snap onto board-to-board connectors and must be lifted straight up, gently.

TRY THESE EXERCISES

1. Find the exact model number of your own phone and, with their permission, of two family members' phones in Settings under About phone (Settings > General > About on an iPhone), and write down whatever it lists about RAM, storage and the processor.
2. Using a practice phone opened at the centre, or clear teardown pictures, draw a labelled diagram showing the display assembly, battery, motherboard, sub-board, charging port, cameras, earpiece, loudspeaker and flex cables.
3. Test the parts and sensors of your own phone: during a call, cover the top of the screen to see the proximity sensor switch the display off; with auto-brightness on, shade the top edge to see the light sensor dim the screen; and record a voice note to check the microphone and loudspeaker.

CHAPTER 2

Repair Tools and Workbench Safety

Setting up a safe workbench

A good repair bench is clean, well lit and organised. Phones contain tiny screws of different lengths, and a long screw put into a short hole can pierce the board or display beneath it. Keep a **magnetic screw mat** or a tray with compartments, and lay the screws out in the same pattern they came from.

Basic hand tools

Tool	Used for
Precision screwdriver set	Tiny Phillips, pentalobe (five-point), tri-point and Torx screws
Spudger	Plastic or nylon lever for prying clips and lifting connectors
Opening picks	Thin plastic picks slid into the gap to cut through adhesive
Suction cup	Lifts the screen or back glass to make a starting gap
Tweezers	Holding small screws, brackets and adhesive strips; antistatic tweezers are best
Magnifier or microscope	Inspecting connectors, ports and tiny components

Use the correct screwdriver tip and size. A worn or wrong tip strips the screw head and turns a five-minute job into an hour's struggle.

Never use metal tools to pry near the battery. A metal blade can puncture it.

Heat gun and hot air station

Many phones hold the display and the back glass in place with strong **adhesive**. A heat gun, a hot air station or a heating pad softens this adhesive so the part can be lifted safely. Use gentle, moving heat: too much heat in one place can damage the display, melt plastic parts or overheat the battery. A hot air station with a fine nozzle is also used in board-level repair to remove and refit small components.

Soldering station

A **temperature-controlled soldering station** joins wires and components with solder, for example when a charging port is soldered directly to a board. Basic rules:

1. Keep the tip clean and tinned (coated with a thin layer of solder).
2. Use flux to help the solder flow and make clean joints.
3. Rest the iron in its stand whenever you are not using it.
4. Work in a ventilated area so you do not breathe the fumes.
5. Wash your hands after soldering, especially if the solder contains lead.

Multimeter

A digital **multimeter** measures voltage, current and resistance, and has a **continuity** mode that beeps when two points are connected. Technicians use it to check whether a flex cable, a fuse or a track on the board is broken. Always select the correct mode and range before touching the probes to a circuit. A **USB power meter**, plugged in between the charger and the phone, shows the voltage and current the phone draws while charging.

Protecting the phone and yourself

- Work on an **antistatic (ESD) mat** and wear a grounded wrist strap, because static electricity can damage chips.
- After opening the phone, **disconnect the battery first**, before unplugging any other connector, to avoid accidental short circuits.
- Wear safety glasses when removing cracked glass, because splinters can fly.
- Keep liquids, food and loose metal objects away from the bench.
- Switch off the heat gun and the soldering station whenever you leave the bench.

KEY POINTS

- Keep screws organised, because a long screw in the wrong hole can damage the board.
- Use plastic tools near the battery and never pry with metal.
- Gentle, moving heat softens adhesive without damaging parts.
- A multimeter measures voltage, current and resistance and tests continuity.
- Disconnect the battery connector first, before any other connector.

TRY THESE EXERCISES

1. Lay out a practice bench with an ESD mat and a magnetic screw mat, identify the Phillips, pentalobe, tri-point and Torx bits in a precision screwdriver set by their tip shape, and sort a box of mixed practice screws by type and length.
2. Under supervision and in a ventilated area, practise on a scrap circuit board: tin a clean iron tip, use flux, solder five short wires to the pads, check each joint with a magnifier, then remove the wires again, rest the iron in its stand and wash your hands afterwards.
3. Set a digital multimeter to continuity mode and test a good wire and a broken one to hear the difference, then switch to the DC voltage range and measure the voltage of an AA cell and a 9 V battery.

CHAPTER 3

Lithium-Ion Battery Safety

What is inside a phone battery

Almost every smartphone uses a **lithium-ion** battery, usually a flat pouch cell that is often called lithium-polymer. A small **protection circuit** attached to the battery cuts off power if the cell is overcharged, drained too far, short-circuited or asked for too much current.

Battery capacity is written in **mAh** (milliampere-hours). Between two batteries of the same type, the one with the higher mAh rating can run the phone for longer.

Why batteries wear out

Every battery slowly loses capacity with each charge cycle and with age, and heat speeds up this wear. A phone that once lasted a whole day may, after a few years of daily use, need charging by lunchtime. Many phones show the battery's health or maximum capacity in their settings.

Signs of a dangerous battery

- **Swelling:** the back cover bulges or the screen lifts away from the frame.
- The phone becomes very hot while charging or doing light work.

- A sweet or chemical smell, hissing, or visible smoke.
- Physical damage such as dents, punctures or bending.

A swollen battery must never be charged, pressed flat or punctured. Stop using the phone, keep it away from anything that can burn and replace the battery promptly.

How a battery fire starts

If a cell is punctured, crushed, short-circuited, overheated or badly overcharged, a reaction called **thermal runaway** can begin. The cell heats itself, releases flammable and toxic gases and can burst into flames.

Safe handling during repair

1. Disconnect the battery connector before working on anything else inside the phone.
2. Never use metal tools near the battery; use plastic cards and picks.
3. If the battery is glued, use its pull tabs if it has them, or soften the adhesive carefully as the repair guide for that model describes. Never bend the battery to force it out.
4. A battery with a low charge stores less energy, so many technicians run it down before removing it.
5. Never leave a damaged battery lying on the bench; put it in a fireproof container.
6. Fit only a good-quality replacement made for that exact model. Very cheap batteries may have a false capacity rating or a poor protection circuit.

If a battery starts smoking

Keep a metal bucket of **dry sand** in the workshop. If a battery starts smoking and it is safe to do so, use long pliers or tongs to move the phone or battery into the sand, away from people and anything flammable. Do not breathe the smoke, open the windows and move away. If a fire spreads, get everyone out and call the fire brigade.

Charging habits to teach customers

- Use a good-quality charger and cable, preferably from the phone's maker or a reputable brand.
- Do not charge a phone under a pillow, on a bed or in direct sunlight, because trapped heat harms the battery.
- When storing a phone for months, leave the battery partly charged rather than full or completely empty.

Disposal

Never throw lithium-ion batteries into household waste or into a fire. Hand them over to an authorised e-waste collector or a battery collection point.

KEY POINTS

- Phones use lithium-ion batteries fitted with a protection circuit.
- A swollen, dented or very hot battery is dangerous: stop using it and replace it.
- Puncturing, crushing or short-circuiting a cell can cause thermal runaway and fire.
- Use only plastic tools near the battery and fit replacements made for that model.
- Dispose of old batteries through authorised e-waste collection, never in household waste.

TRY THESE EXERCISES

1. Check your phone's battery health or maximum capacity where your model shows it, such as in the Battery section of an iPhone's Settings or under Battery or Device care on many Android phones, and note the battery's capacity in mAh from the phone's specifications.
2. Make a safety poster for the workbench that lists the four signs of a dangerous battery and the steps to follow if a battery starts smoking, including the metal bucket of dry sand and long pliers or tongs.
3. Under supervision, on a practice phone chosen by your instructor, open it the way the instructor shows for that model (from the back or through the display), disconnect the battery connector first using a plastic spudger, and point out the pull tabs or adhesive that hold the battery in place, without bending or removing the battery.

CHAPTER 4

Diagnosing Charging Faults

Ask before you open

Charging complaints are among the most common jobs in a mobile repair shop, and many of them need no parts at all. Start by asking the customer:

- Does the phone not charge at all, charge slowly, or charge only when the cable is held at an angle?
- Has it been dropped or got wet?
- Is the customer using a new or different charger or cable?

Step 1: Rule out the charger and cable

Test the phone with a **known-good** charger and cable from your bench, and test the customer's charger on another phone. Cheap or damaged cables are a very common cause of slow or no charging.

Step 2: Inspect and clean the port

Shine a torch into the charging port and look through a magnifier. Pocket lint and dust packed at the back of the port stop the plug from going in fully, so it connects only at an angle.

1. Switch the phone off.
2. Gently loosen the dirt with a wooden toothpick or a plastic tool. Never use a metal pin, which can short or bend the contacts.
3. A little isopropyl alcohol on a fine brush can lift sticky dirt; let it dry completely before charging.

Some phones show a warning that moisture has been detected in the port and stop charging until it is dry. Let it dry naturally; do not use an external heat source or push cotton buds or paper into the port.

Step 3: Check software and settings

- Restart the phone.
- Some phones have a battery protection feature that stops charging at around 80 percent to reduce battery wear. A customer may mistake this for a fault.
- Many phones pause charging when they are too hot, so check whether the phone is overheating.

Step 4: Measure with a USB power meter

Plug a USB power meter between the charger and the phone. It shows the voltage and the current flowing into the phone.

Reading on a phone with a low battery	What it suggests
Steady current that falls slowly as the battery fills	Charging is working
Very low current from the start	Dirty or worn port, poor cable, or the phone limiting charging
Zero current	Power is not reaching the battery: port, flex cable, charging circuit or battery connection

Standard USB charging starts at 5 volts. Fast-charging systems deliver extra power only after the charger and the phone agree on it; USB Power Delivery, for example, raises the voltage only after this agreement. So fast charging also needs a compatible charger and cable.

Step 5: Narrow down the hardware

- If the phone supports **wireless charging** and that works while cable charging does not, the battery and charging circuit are probably fine and the fault is likely in the port or its flex cable.
- On many phones the port sits on a small **sub-board** joined by a flex cable, so the whole sub-board can be replaced without soldering.
- If a new port or sub-board does not help, try a known-good battery.
- A fault that remains after that is usually in the motherboard's charging circuit, which needs board-level repair.

KEY POINTS

- Always test with a known-good charger and cable first.
- Lint in the port often causes charging only at an angle; clean it with non-metal tools.
- Battery protection settings and overheating can pause charging without any fault.
- A USB power meter shows whether the phone is actually drawing current.
- If wireless charging works but cable charging does not, suspect the port or sub-board.

TRY THESE EXERCISES

1. Inspect the charging ports of three phones with a torch and a magnifier, then switch one off and practise loosening lint from the back of its port with a wooden toothpick, never a metal pin.
2. Plug a USB power meter between a charger and a phone with a low battery and record the voltage and current every five minutes for twenty minutes; then swap in a different cable, read the current again straight away and compare it with your last reading on the first cable.
3. Write a step-by-step charging-fault checklist that runs from the questions to ask the customer to board-level repair, then use it on a practice fault set by your instructor, such as a damaged cable or a phone with battery protection set to stop charging at around 80 percent.

CHAPTER 5

Diagnosing Display and Touch Faults

Is it really the display?

When a customer says "the screen is dead", first find out whether the rest of the phone is working.

- Call the phone. Does it ring or vibrate?

- Connect it to a computer. Is it detected?
- On an LCD phone, shine a torch at an angle onto the screen. A faint picture means only the **backlight** has failed.

If the phone rings and is detected but shows nothing, the fault is probably the display, its connector or its flex cable. If it shows no sign of life at all, check the battery, charging and motherboard first.

Common display symptoms

Symptom	Likely cause
Cracked glass, but picture and touch work	Cover glass broken; on most modern phones the whole display assembly is replaced
Lines or coloured patches across the screen	Damaged display panel, or a loose or damaged display connector
Black or purple ink-like patches that spread	OLED panel damaged by a drop or pressure
Faint picture visible only with a torch	LCD backlight failure
Phone taps and types by itself ("ghost touch")	Damaged touch layer, a poor-quality replacement screen or a faulty charger
Faded shapes of the keyboard or status bar always visible	OLED burn-in caused by static images

Check the simple things first

1. Restart the phone and check the brightness setting. Remove a cracked or badly fitted screen protector, which can stop touch working in some spots.
2. After opening the phone and disconnecting the battery, **resseat the display connector**. A drop can loosen it.
3. Connect a known-good **test display** before ordering a part. This confirms the diagnosis and shows that the motherboard's display circuit works.

Replacing a display assembly

Every model is different, so follow a repair guide for that exact model. The general outline is:

1. Power off the phone and note any existing damage on the job card.
2. Soften the adhesive with gentle heat.
3. Lift a corner with a suction cup and slide in opening picks to cut the adhesive, keeping the picks shallow near flex cables.
4. Open the phone slowly, remembering that the display flex is still attached.

5. Disconnect the **battery first**, then the display connectors.
6. Move across any parts the new display does not include, such as the earpiece, front sensors or brackets.
7. Connect the new display and **test it before sealing**: touch across the whole screen, brightness, the front camera, the proximity sensor during a call, and an in-display fingerprint sensor if the phone has one.
8. Fit new adhesive and close the phone.

Replacement quality

Replacement displays come in different qualities. For OLED phones, some cheaper replacements use LCD technology, which can look different, be slightly thicker and use more battery power. Explain the options honestly before ordering and write the customer's choice on the job card.

Never press hard on an OLED panel or fold its flex cable sharply. A display that worked during testing can be cracked inside by pressure while the phone is being closed.

KEY POINTS

- First check whether the phone works: call it, connect it to a computer, try the torch test.
- On most modern phones, cracked glass means replacing the whole display assembly.
- Reseat the display connector and try a known-good test display before ordering a part.
- Test touch, sensors and the front camera before sealing the phone.
- Explain the quality of replacement displays honestly to the customer.

TRY THESE EXERCISES

1. Write the three "is it really the display?" checks on a card (call the phone, connect it to a computer, try the torch test on an LCD), use them on a faulty phone provided by your instructor, and record whether the fault is the display or somewhere else.
2. Make a chart of the six display symptoms in this lesson, describe each in your own words with its likely cause, then sort a set of photos or practice phones into those categories.
3. On a working phone, carry out the test you would do before sealing a repair: drag a finger slowly over every part of the screen in a drawing app, change the brightness from lowest to highest, try the front camera, and check that the screen turns off near your ear during a call.

Software Problems: Backups, Factory Reset and Flashing

Software or hardware?

Many "repairs" are really software problems: a slow phone, apps that keep crashing, storage that is full, or a phone stuck at the logo or restarting again and again (a **boot loop**). Always try the gentle fixes first and move to the drastic ones only when they are needed.

From gentle to drastic

1. **Restart** the phone. If it is frozen, use the forced-restart button combination for that model.
2. **Free up storage**. A nearly full phone becomes slow and apps can crash. Move photos and videos to a computer or cloud storage.
3. **Update** the operating system and the apps, which often fixes known bugs.
4. **Clear an app's cache**. On Android, open Settings, then Apps, choose the app and open its Storage section. Clearing the cache is safe; clearing the app's **data** or storage resets the app and can delete its information.
5. **Safe mode** (Android). It starts the phone with only the pre-installed apps. If the problem disappears in safe mode, a downloaded app is the cause.
6. **Factory reset**, only after a backup.
7. **Reinstall the firmware** (flashing), when the phone cannot start normally.

Back up first

A factory reset or a flash usually erases everything on the phone. Before either step, back up:

- **Contacts**: check they are saved to the Google account or iCloud, not only to the phone or the SIM.
- **Photos and videos**: to Google Photos, iCloud or a computer.
- **WhatsApp chats**: WhatsApp has its own backup in its chat settings (to Google Drive on Android and to iCloud on iPhone).
- **Documents** in the downloads folder and any other important files.

Ask the customer to take the backup, or take it only with their written consent. Chats and files that were never backed up cannot be recovered after a reset.

Factory reset

A factory reset returns the phone to its out-of-the-box software and erases the user's apps and data. It can be started from Settings, or from **recovery mode** using a button combination when the phone will not start normally.

After a factory reset, especially one started from recovery mode, an Android phone can ask for the Google account that was on it before it can be used (Factory Reset Protection). An iPhone erased without first turning off Find My asks for the owner's Apple Account (Activation Lock). These features protect stolen phones. A technician must never try to bypass them; only the owner can sign in.

Flashing firmware

Flashing means rewriting the phone's operating system software (its firmware), usually with a computer and the maker's own tool or recovery method. It can rescue a phone that will not start because its software is damaged.

- Use only the **official firmware for that exact model** and region. Wrong firmware can leave the phone unable to start, which technicians call "bricked".
- Flashing normally erases user data.
- Unlocking the bootloader or installing unofficial software can weaken the phone's security and may affect its warranty, so do it only with the owner's informed consent.

Example

Sneha's phone kept restarting after she installed a free photo-editing app from outside the Play Store. In safe mode the restarting stopped, so the technician uninstalled that app.

KEY POINTS

- Try gentle fixes first: restart, free storage, update, clear cache, safe mode.
- Back up contacts, photos, chats and files before any reset or flash.
- A factory reset erases user data and returns the phone to its factory software.
- Never bypass Factory Reset Protection or Activation Lock; only the owner can sign in.
- Flash only the official firmware for the exact model.

TRY THESE EXERCISES

1. Back up your own phone: check that your contacts are saved to your Google account or iCloud, turn on photo backup, and run a WhatsApp backup from its chat settings, noting the date and size of the backup.
2. On an Android phone, open Settings > Apps, choose one app and clear its cache from its Storage section, noting how much space was freed, then find out how your model starts in safe mode (on many phones, by touching and holding the Power off option).
3. On a practice phone provided by your instructor that holds no personal data, remove the Google account, perform a factory reset from Settings, set the phone up again, and write down each step in order.

CHAPTER 7

Customer Data Privacy and Professional Practice

A phone holds a person's life

A customer's phone contains photos, chats, banking and UPI apps, emails, contacts and documents. When they hand it to you, they are trusting you with all of it. A technician who respects that trust earns loyal customers; one who breaks it can lose the business and face legal trouble.

Receiving the phone: the job card

Fill in a job card or service register entry for every device:

Field	Why it matters
Customer name and mobile number	To contact them and to return the phone to the right person
Brand, model and IMEI	Identifies the exact phone; dialling <code>*#06#</code> shows the IMEI
Fault described by the customer	Records the problem in the customer's own words
Condition on arrival	Notes existing scratches, cracks, dents and missing screws
Items received	SIM, memory card, cover or charger left with the phone
Estimate and approval	Avoids surprises when the bill is made
Data consent	Whether data may be lost, and whether a backup was taken

Before taking the phone, ask the customer to back up their data and to remove the SIM and memory card.

Passcodes and testing

Most repairs need the phone to be tested afterwards. Good practice:

- Test together with the customer at the counter, with the customer unlocking the phone.
- If you must test it alone, ask the customer whether they can switch off the screen lock or set a temporary passcode for the repair, and change it back afterwards.
- Never ask for a UPI PIN, a banking password or an OTP. No repair ever needs them.

Rules for handling customer data

1. **Do not look** at photos, messages, emails or files. Open only what a test needs, such as the camera or the dialler.
2. **Do not copy** anything from the phone unless the customer has asked for a backup in writing, and delete your copy once the phone is returned.
3. **Delete test photos and recordings** made while checking the cameras and microphones.
4. **Keep devices secure** in a locked cupboard when the shop is closed.
5. **Never share** a customer's data or pictures, and never post their phone or details on social media.

Selling or exchanging a phone

When a customer sells a phone or gives it in exchange, help them to:

1. Back up their data.
2. Remove their Google account, or turn off Find My and sign out of their Apple Account, so the next owner is not locked out.
3. Factory reset the phone.
4. Take out the SIM and memory card.

When you buy a used phone, check that the IMEI shown on the screen matches the box and the bill.

Returning the phone

Test everything in front of the customer: calls, microphones, speakers, cameras, charging, Wi-Fi, touch and the fingerprint or face unlock. Give a proper bill listing the parts and labour; a GST-registered shop issues a GST invoice. Write down any warranty on the parts fitted.

A professional technician returns a phone exactly as private as it was when it came in.

KEY POINTS

- Record the model, IMEI, condition, accessories and data consent on a job card.
- Ask customers to back up and to remove the SIM and memory card first.
- Never look at, copy or share customer data, and delete test photos.
- Never ask for a UPI PIN, banking password or OTP.
- Before a phone is sold, remove the accounts, reset it and match the IMEI to the bill.

TRY THESE EXERCISES

1. Design a job card on paper or in Word or Excel with every field listed in this lesson, then fill it in while role-playing a customer and a technician with a classmate, including the condition on arrival and the data consent.
2. Dial *#06# on your phone to display its IMEI, write it down, and check that it matches the IMEI printed on the box or the bill.
3. Write a one-page privacy checklist for a shop counter that covers the five rules for handling customer data and the four steps before selling or exchanging a phone, and practise explaining it to a classmate playing the customer in under two minutes.

CHECK YOURSELF

Practice questions

Choose the best answer for each question. The answers, with a short explanation, are in the next chapter.

1. Which type of phone display panel needs a backlight behind it to show a picture?

- a) OLED
- b) LCD
- c) AMOLED
- d) Super AMOLED

2. On a phone motherboard, what is the SoC?

- a) The SIM card holder that stores contacts
- b) The loudspeaker that plays ringtones and music
- c) A System on a Chip holding the CPU and graphics
- d) The small sub-board that carries the charging port

3. On most modern phones, the cover glass is cracked but the picture and touch still work. What is usually replaced?

- a) The whole display assembly
- b) The battery under the display
- c) The charging port sub-board
- d) The back glass panel

- 4. Which part produces the sound you hear when you hold the phone to your ear during a normal call?**
- a) The main microphone
 - b) The vibration motor
 - c) The proximity sensor
 - d) The earpiece speaker
- 5. What is the correct way to disconnect a board-to-board flex connector?**
- a) Lift it straight up with a plastic spudger
 - b) Pull it out by holding the flex cable
 - c) Twist it sideways with metal tweezers
 - d) Heat it with a heat gun until it falls off
- 6. What is a spudger mainly used for in phone repair?**
- a) Measuring the voltage of the battery
 - b) Prying clips and lifting connectors without damage
 - c) Melting solder when replacing a port
 - d) Softening the adhesive that holds the display glass in place
- 7. Why should screws removed from a phone be kept in the pattern they came out in?**
- a) Screws refitted in a different order change the phone's IMEI
 - b) Mixed-up screws make the phone lose its network signal
 - c) A long screw in a short hole can damage the parts beneath it
 - d) The phone will not switch on unless every screw is magnetised
- 8. Which multimeter mode beeps when two points are electrically connected?**
- a) Continuity mode
 - b) AC voltage mode
 - c) DC current mode
 - d) Frequency mode
- 9. After opening a phone, which connector should be disconnected first?**
- a) The display connector
 - b) The battery connector
 - c) The camera connector
 - d) The charging port flex
- 10. What is a heat gun or heating pad used for when opening many modern phones?**
- a) Recharging a battery that is completely flat
 - b) Blowing lint and dust out of the charging port and speaker
 - c) Softening the adhesive under the display or back glass
 - d) Measuring how much current the phone draws
- 11. Which sign suggests that a phone's battery has swollen?**
- a) The ringtone has become louder
 - b) The Wi-Fi signal has become stronger
 - c) The screen colours look brighter
 - d) The screen is lifting away from the frame
- 12. A customer brings in a phone with a swollen battery. What is the correct action?**
- a) Stop using and charging it, and replace the battery
 - b) Press the battery flat again and refit it
 - c) Charge it fully to bring it back to shape
 - d) Make a small hole in it to let the gas escape

13. What is thermal runaway in a lithium-ion battery?

- a) A fast-charging feature that fills the battery quickly
- b) A self-heating reaction in a damaged cell that can cause fire
- c) A setting that shows the battery's temperature
- d) A cooling system that protects the battery from heat while charging

14. Why must metal tools never be used to pry near a phone battery?

- a) They make the battery charge much more slowly afterwards
- b) They erase the phone's software and settings
- c) They are too heavy to use on small phones
- d) They can puncture or short the battery and start a fire

15. How should an old lithium-ion phone battery be disposed of?

- a) Put it in the household dustbin
- b) Give it to an authorised e-waste collector
- c) Burn it with other dry rubbish
- d) Bury it deep in the garden soil, away from plants

16. A customer says the phone will not charge. What should you try first?

- a) Replace the motherboard with a new one
- b) Flash new firmware using a computer
- c) Replace the display assembly
- d) Test it with a known-good charger and cable

17. A phone charges only when the cable is held at an angle. What is a common cause?

- a) Lint or dust packed inside the charging port
- b) A weak mobile network signal in that area of the city
- c) Internal storage that is nearly full
- d) A cracked lens on the rear camera

18. What is the safe way to remove lint from a charging port?

- a) Scrape it out with a metal safety pin while it is charging
- b) Blow hot air into the port with a hair dryer
- c) Switch it off and use a wooden toothpick or plastic tool
- d) Pour water into the port and then shake it

19. Wireless charging works on a phone but cable charging does not. Where is the fault most likely to be?

- a) The battery, which must be completely dead
- b) The charging port, its flex or its sub-board
- c) The display assembly and its connector
- d) The SIM card or the SIM tray

20. A phone with a nearly empty battery shows zero current on a USB power meter, using a known-good charger and cable. What does this suggest?

- a) A fault in the charging path, such as the port or flex
- b) The phone is fast charging and working normally
- c) The battery is already full and needs no more charge at all
- d) The screen brightness is set much too high

- 21. A phone's screen stays black, but the phone rings when called and a computer detects it. What is the most likely fault?**
- a) The SIM tray or the SIM card
 - b) The loudspeaker or the earpiece
 - c) The display, its connector or its flex cable
 - d) A battery that is completely dead
- 22. On an LCD phone with a black screen, a faint picture is visible when a torch is shone at an angle. What has probably failed?**
- a) The touch layer
 - b) The front camera
 - c) The charging port
 - d) The backlight
- 23. The faded shapes of the keyboard and status bar stay visible on an OLED screen all the time. What is this called?**
- a) Ghost touch
 - b) Backlight failure
 - c) Burn-in
 - d) A boot loop
- 24. What is the best way to confirm a display fault before ordering a new display?**
- a) Do a factory reset of the phone
 - b) Replace the battery with a new one
 - c) Connect a known-good test display
 - d) Update all the apps and the system
- 25. When should a newly fitted display be tested?**
- a) Only after the customer has taken the phone home
 - b) Only after the new adhesive has fully set for at least a week
 - c) Testing is not needed for a new display
 - d) After connecting it, before the phone is sealed with adhesive
- 26. A phone is slow and an app keeps freezing. Which step should be tried first?**
- a) Flash new firmware
 - b) Restart the phone
 - c) Do a factory reset
 - d) Replace the motherboard
- 27. An Android phone keeps crashing, but works normally in safe mode. What does this suggest?**
- a) A downloaded app is causing the problem
 - b) The display panel is faulty
 - c) The battery has started to swell
 - d) The firmware must be flashed again
- 28. In Android app settings, which option is safe and does not delete the app's saved information?**
- a) Clear cache
 - b) Clear data
 - c) Clear storage
 - d) Factory data reset
- 29. After a factory reset, an Android phone asks for the Google account that was on it. What should the technician do?**
- a) Use a tool to bypass the lock
 - b) Install unofficial firmware to remove it
 - c) Replace the motherboard
 - d) Ask the owner to sign in with that account

30. Which firmware should be used when flashing a phone?

- a) Firmware for any model from the same brand
- b) The official firmware for that exact model and region
- c) Firmware for a different model that has a similar name
- d) The newest firmware found for any phone

31. Which code, dialled on most phones, shows the IMEI number?

- a) *121#
- b) #0000#
- c) *#06#
- d) *#21#

32. During a repair, a technician takes a test photo to check the camera. What should happen to it?

- a) Post it on the shop's social media page
- b) Copy it to the shop computer as proof
- c) Delete it before returning the phone
- d) Leave it in the gallery for the customer to find

33. Which of these should a phone technician never ask a customer for?

- a) A mobile number for the job card
- b) A description of the fault
- c) The phone's model name
- d) The UPI PIN

34. Before selling a phone, why should the owner remove their Google account or turn off Find My?

- a) So the phone runs faster for the next owner
- b) So the next owner is not locked out after a reset
- c) So the storage capacity of the phone increases
- d) So the phone's IMEI number is changed for the buyer

35. Why should scratches, dents and cracks be written on the job card when a phone is received?

- a) To avoid disputes about damage already there
- b) To add an extra charge for each scratch
- c) Because the IMEI number depends on the condition
- d) So the shop can sell the phone later on

ANSWER KEY

Answers

- 1. **(b) LCD.** An LCD panel does not produce light itself, so it needs a backlight; OLED panels, including AMOLED types, light each pixel on their own.
- 2. **(c) A System on a Chip holding the CPU and graphics.** SoC means System on a Chip: one chip that contains the CPU, the graphics processor and other processing units.

3. **(a) The whole display assembly.** The cover glass, touch layer and display panel are bonded together, so a cracked glass usually means replacing the complete display assembly.
4. **(d) The earpiece speaker.** The earpiece is the small speaker near the top of the screen used for calls held to the ear; the loudspeaker handles ringtones and speakerphone.
5. **(a) Lift it straight up with a plastic spudger.** These connectors snap on like a press-stud, so they are lifted straight up with a plastic tool; pulling the cable or using metal can tear or short it.
6. **(b) Prying clips and lifting connectors without damage.** A spudger is a plastic or nylon lever used to open clips and lift connectors safely.
7. **(c) A long screw in a short hole can damage the parts beneath it.** Phone screws come in different lengths, and a long screw driven into a short hole can pierce the parts below it.
8. **(a) Continuity mode.** Continuity mode beeps when there is a connection, which helps find broken flex cables, fuses and tracks.
9. **(b) The battery connector.** Disconnecting the battery first removes power from the board, which prevents accidental short circuits while other parts are handled.
10. **(c) Softening the adhesive under the display or back glass.** Gentle, moving heat softens the strong adhesive so the display or back glass can be lifted without cracking it.
11. **(d) The screen is lifting away from the frame.** A swelling battery pushes outward, so the back cover bulges or the screen lifts from the frame.
12. **(a) Stop using and charging it, and replace the battery.** A swollen battery is damaged and dangerous; pressing, charging or puncturing it can start a fire.
13. **(b) A self-heating reaction in a damaged cell that can cause fire.** In thermal runaway the cell keeps heating itself, releases flammable gases and can burst into flames.
14. **(d) They can puncture or short the battery and start a fire.** A punctured or short-circuited lithium-ion cell can go into thermal runaway, so only plastic tools are used near it.
15. **(b) Give it to an authorised e-waste collector.** Lithium-ion batteries can catch fire and contain harmful materials, so they go to authorised e-waste or battery collection.
16. **(d) Test it with a known-good charger and cable.** Faulty chargers and cables are a very common cause, and testing with known-good ones costs nothing.
17. **(a) Lint or dust packed inside the charging port.** Dirt at the back of the port stops the plug going in fully, so it makes contact only at an angle.
18. **(c) Switch it off and use a wooden toothpick or plastic tool.** A non-metal tool will not short or bend the contacts, and switching the phone off adds safety.
19. **(b) The charging port, its flex or its sub-board.** Because wireless charging works, the battery and charging circuit are probably fine, which points to the cable charging path.
20. **(a) A fault in the charging path, such as the port or flex.** A phone with a low battery should draw current; zero current means the charging path is broken somewhere.

21. (c) **The display, its connector or its flex cable.** Ringing and being detected show the phone is running, so the problem is in the display path.
22. (d) **The backlight.** The LCD is still forming a picture but nothing is lighting it from behind, which points to a backlight failure.
23. (c) **Burn-in.** Burn-in is permanent wear on OLED pixels caused by showing the same static image for a long time.
24. (c) **Connect a known-good test display.** A known-good test display confirms the diagnosis and shows that the motherboard's display circuit works.
25. (d) **After connecting it, before the phone is sealed with adhesive.** Testing before sealing means a faulty part or loose connector can be fixed without breaking the new adhesive.
26. (b) **Restart the phone.** A restart is the gentlest fix and often clears a software glitch without any risk to data.
27. (a) **A downloaded app is causing the problem.** Safe mode runs only pre-installed apps, so if the problem disappears there, a downloaded app is to blame.
28. (a) **Clear cache.** Clearing the cache removes only temporary files; clearing data or storage resets the app, and a factory reset erases the phone.
29. (d) **Ask the owner to sign in with that account.** Factory Reset Protection exists to stop stolen phones being reused, so only the owner should unlock it by signing in.
30. (b) **The official firmware for that exact model and region.** Wrong firmware can leave a phone unable to start, so only official firmware for the exact model is used.
31. (c) ***#06#.** Dialling *#06# displays the IMEI, which identifies the exact handset and should match the box and bill.
32. (c) **Delete it before returning the phone.** Test photos and recordings should be deleted so the phone goes back exactly as private as it came in.
33. (d) **The UPI PIN.** No repair needs a UPI PIN, banking password or OTP, and asking for one is a warning sign of fraud.
34. (b) **So the next owner is not locked out after a reset.** After a reset, these protections can ask for the previous owner's account, so it must be removed before the phone changes hands.
35. (a) **To avoid disputes about damage already there.** Recording the condition on arrival protects both the customer and the shop if questions come up later.

WORD LIST

Glossary

Activation Lock

An Apple security feature that asks for the owner's Apple Account before an iPhone erased without first turning off Find My can be set up and used again.

Backlight

The light source behind an LCD panel that makes the picture visible; OLED screens do not need one.

Board-to-board connector

A tiny press-stud style connector that joins a flex cable to the motherboard and must be lifted straight up with a plastic tool.

Boot loop

A fault in which a phone keeps restarting or stays stuck at the logo instead of starting normally.

Burn-in

Faint, permanent shadows of images such as the keyboard or status bar on an OLED screen, caused by showing the same static picture for a long time.

Digitizer

The touch layer of a phone display that senses where your finger touches the screen.

Factory reset

Returning a phone to its out-of-the-box software, which erases the user's apps, settings and data.

Factory Reset Protection (FRP)

An Android security feature that, after a reset the owner did not start from inside the unlocked phone, such as one from recovery mode, asks for the Google account that was on the phone before it can be used.

Flashing

Rewriting a phone's operating system firmware, usually with a computer and the maker's own tool or recovery method.

Flex cable

A thin, bendable ribbon cable that connects parts such as the display, buttons or sub-board to the motherboard.

IMEI

International Mobile Equipment Identity, a unique 15-digit number that identifies a mobile phone (dual-SIM phones have two), shown by dialling *#06#.

LCD

A liquid crystal display, a screen type that needs a backlight behind the panel to light up the picture.

Lithium-ion battery

The rechargeable battery type used in almost every smartphone, usually as a flat pouch cell with a protection circuit attached.

mAh

Milliampere-hour, the unit of battery capacity; between batteries of the same type, a higher figure means the phone can run for longer.

Multimeter

A meter that measures voltage, current and resistance and has a continuity mode that beeps when two points are connected.

OLED

Organic light-emitting diode, a display type in which every pixel makes its own light, so no backlight is needed and black areas look truly black.

Pentalobe screw

A five-point screw used on some phones, especially iPhones, that needs a matching pentalobe screwdriver bit.

PMIC

The power management integrated circuit (IC), the chip on the motherboard that controls the power supplied to each section of the phone.

Recovery mode

A special start-up menu, opened with a button combination for that model, used to factory reset or repair the software of a phone that will not start normally.

Safe mode

An Android start-up mode that runs only the pre-installed apps, used to find out whether a downloaded app is causing a problem.

SoC

System on a Chip, a single chip that combines the CPU, the graphics processor and other units of a phone.

Spudger

A plastic or nylon lever used to pry clips apart and lift connectors without scratching or shorting anything.

Sub-board

A small secondary circuit board, usually at the bottom of a phone, that carries the charging port and a microphone and joins the motherboard by a flex cable.

Thermal runaway

A dangerous chain reaction in a damaged or overheated lithium-ion cell, in which it heats itself, releases flammable gases and can catch fire.

USB power meter

A small meter plugged in between the charger and the phone that shows the voltage and current flowing into the phone while it charges.



Gurukul Technicals Institute

Computer education institute in Delhi, with authorised member centres, robotics classes and science projects, working models and DIY kits.

COURSES

Computer & Office Skills · Accounting & Business Software · Programming & Web Development · Design & Digital Skills · Hardware & Networking · Robotics & Coding · Other Programmes

PROJECTS AND KITS

Ready-made school projects · DIY and STEM kits · Robotics and coding · Components and spares · Engineering projects

CONTACT

Head office: A-10, Chief Commissioner Colony, opposite Rana Pratap Bagh, Delhi 110007

Phone: 011 2721 1512 · **Mobile and WhatsApp:** +91 97116 99511

Email: engineergurukul@yahoo.co.in

Website: engineergurukul.com · **Instagram:** [@science_projects_club](https://www.instagram.com/science_projects_club)

More free ebooks for computer courses, robotics and science projects: engineergurukul.com/resources/ebooks/

Free to read, print and share. Not for sale.