Kaushal Vikas • Grade 9 Detailed Notes

Additional Vocational Notes

~ Notebook Index & Diagrammatic Practical Blueprint ~

★ Standard Industrial Workshop Protocol:

1. Accuracy: Measure twice, scribe once. Maintain tolerances within ±1mm.

2. Safety First: Eye goggles, cut-resistant gloves, and non-slip soles are mandatory.

3. Conservation: Reuse off-cuts, avoid chemical runoff, recycle clay and wood waste.

1. Sheet Metal Work

[Trade Module 1]

Concept: Sheet metal work involves shaping thin sheets of metals such as **galvanised iron (GI), steel, aluminium, and copper** into utilitarian products (e.g., dustpans, boxes, clamps) by cutting, bending, forming, and riveting.

🔑 TRADE KEYWORDS & DEFINITIONS

Forming: Shaping metal into contour bends without cutting

Burr: Sharp, rough, unwanted edge left after shearing

Rivet: Cylindrical permanent fastener heading both sides

Gauge: Standard numerical measurement of sheet thickness

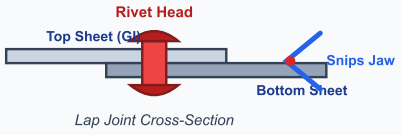

Fig 1.1: Sheared Lap Joint with Rivet Closure

Core Tool Applications:

- **Tin Snips:** Leveraged manual shears to cut 18–28 gauge metal sheets.
- **Scriber & Steel Rule:** Sharp hardened point creates permanent markings.
- **Flat Bastard File:** Removes hazardous jagged burrs from fresh cuts.
- **Wooden Mallet:** Bends seams cleanly over a stake without denting metal.

Stepwise Fabrication Process:

① **Scoping** (Select Item) → ② **Design** (Sketch Dims) → ③ **Prototype** (Cardboard) → ④ **Material** (Snips/Sheet) → ⑤ **Fabricate** (Cut/Form/Rivet) → ⑥ **Finish** (Deburr/Paint)

✔ Quality Parameters

- Accurate dimensions matching layout marks.
- Smooth edges: 100% burr-free & safely hemmed.
- Strong joints: secure riveting without looseness.
- Efficient material nesting to minimize scrap.

⚠ Workshop Safety Rules

- Always wear heavy leather safety gloves & goggles.
- Keep fingers clear of shear blades and folding jaws.
- Deposit metal slivers into labeled scrap bins.
- Never slide bare hands along cut sheet edges.

2. Plumbing Fundamentals [Trade Module 2]

Concept: Plumbing is the practical craft of installing, testing, and maintaining piping networks carrying pressurized clean water and sanitary drain wastes without leakage or pressure loss.

🔑 TRADE KEYWORDS & DEFINITIONS

Valve: Control unit to regulate, stop, or balance fluid flow

Joint: Interlocking union of pipes via threads, solvent, or compression

Flow: Continuous smooth volume transit through conduit lines

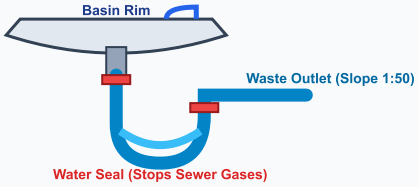

Fig 2.1: Sanitary Drainage Assembly with Water Seal P-Trap

Hardware & Sealing Practices:

- **Pipes:** PVC for gray-water, CPVC for hot-water, GI for structural water mains.
- **Thread Seal Tape:** Wrap Teflon tape 3–5 turns clockwise on male GI threads.
- **Pipe Wrench:** Dual serrated jaws provide grip on circular metal conduits.
- **Spirit Level:** Ensures uniform fall/gradient toward the drain outlet.

Plumbing Execution Sequence:

Execution Phase	Practical Operations & Checks
1. Scoping & Survey	Inspect leak origin, identify pipe material (PVC/GI/CPVC), shut off the main water valve.
2. Layout & Cut	Measure run with steel tape; cut pipe square using hacksaw/pipe cutter; ream internal burrs.
3. Joint Assembly	Dry-fit elbows/tees; apply solvent cement (PVC) or Teflon seal tape (GI); tighten with wrenches.
4. Hydro-Testing	Slowly turn on water valve, check joint seams under full pressure for moisture or weeping.

✔ Quality Criteria

- Zero weeping or leaks under full head pressure.
- Straight pipe runs supported firmly by pipe saddles.
- Free, quiet drainage flow with intact water trap seal.

⚠ Safety Protocols

- Always isolate water supply before disassembly.
- Keep handles clean and dry to avoid tool slippage.
- Mop floor dry to prevent dangerous slip falls.

3. Food Processing & Preservation

[Trade Module 3]

Concept: Transforming perishable harvests (fruits, vegetables, cereals, spices) into safe, shelf-stable foods through controlled cleaning, dehydration, pickling, roasting, and hermetic packaging.

🔑 TRADE KEYWORDS & DEFINITIONS

Raw Material: Harvested unprocessed produce (grain, veggies, fruit)

Processing: Deliberate modification to alter texture and stop decay

Preservation: Techniques to retard microbial growth & extend life

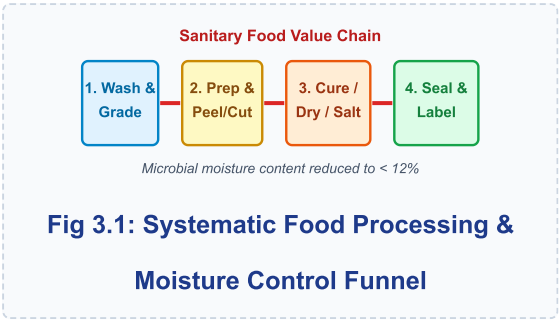

Fig 3.1: Systematic Food Processing & Moisture Control Funnel

Preservation Mechanisms:

- **Dehydration:** Sun/solar tray drying arrests bacterial spore growth.
- **Osmotic Curing:** Salt and mustard oil create anaerobic acidic shields in pickles.
- **Thermal Roasting:** Gelatinizes starch and extends storage longevity of grains.
- **Air-tight Packaging:** Inhibits oxidation, moisture reabsorption, and pests.

The 6 Processing Operations:

Operation Step	Practical Description & Process Monitoring
1. Scoping	Select a clear commodity: roasted grains, dehydrated leafy greens, papads, or mango pickle.
2. Recipe Formulation	Calculate accurate weights of produce, spices, salt, and edible oils using balance scales.
3. Sorting & Peeling	Wash in chlorinated water, reject bruised/rotted portions, slice uniformly with food-grade knives.
4. Processing Phase	Perform drying or heat treatment; vigilantly record color, aroma, and moisture level changes.
5. Consistency Test	Verify batch cleanliness, uniform texture, proper acidity (pH balance), and crispness.
6. Packaging & Label	Seal in moisture-proof containers; mark manufacture date, shelf-life, and net weight.

✔ Quality Benchmarks

- Uniform slice thickness and batch consistency.
- Zero mold or off-odor development.
- Clean hermetic seals with legible labels.

⚠ Hygiene & Personal Safety

- Wash hands thoroughly before food handling.
- Prevent cross-contamination between raw & ready food.
- Fire/stove usage strictly under teacher supervision.

4. Furniture Making & Carpentry

[Trade Module 4]

Concept: Furniture making combines carpentry mathematics and physical wood joinery to fabricate stable utility items—such as stools, storage units, desks, and shelves—utilizing seasoned timber, bamboo, and wood composites.

🔑 TRADE KEYWORDS & DEFINITIONS

Joinery: Interlocking wood connections (Mortise-Tenon, Lap, Halving)

Seasoned Wood: Lumber kiln/air-dried to < 12% moisture to avoid warp

Finishing: Sanding with grain, sealing with primer, polish, or varnish

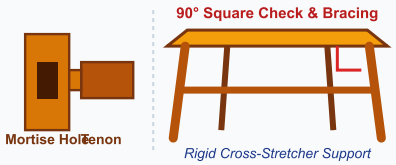

Fig 4.1: Mortise-and-Tenon Joint & Four-Leg Stool Framework

Core Carpentry Sequence:

- **Try Square:** Verifies critical 90° right angles across all edge cuts.
- **Tenon Saw & Chisel:** Cuts clean shoulders and pares mortise sockets.
- **Jack Plane:** Smooths coarse rough-sawn lumber faces parallel.
- **Sash Clamps:** Applies balanced pressure while wood glue cures.

Fabrication & Assembly Sequence:

Carpentry Step	Practical Operations & Checks
1. Product Scoping	Choose item: foot stool, tool tote, wall shelf, or chalk box.
2. Detailed Drawing	Draw orthographic sketches; mark dimensions; account for 2mm saw kerf loss.
3. Prototyping	Build scaled cardboard prototype to verify leg balance, clearances, and joints.
4. Shaping & Joinery	Rip/cross-cut timber stock; chisel clean joints; check squareness with try square.
5. Glue & Clamp	Apply wood adhesive, drive screws/nails flush, clamp and allow 24h curing.
6. Sanding & Finish	Progressive grit sanding (80➔120➔240 grit); apply stain, sealer, and varnish.

✔ Quality Criteria

- High load stability: zero wobble or corner racking.
- Hairline joint gaps tightly sealed.
- Silky surface free of machine marks or tear-out.

⚠ Woodshop Safety Rules

- Always cut and chisel stroke away from your body.
- Secure stock firmly in bench vice before sawing.
- Keep floors clean of wood dust to prevent slipping.

5. Pottery & Ceramic Art [Trade Module 5]

Concept: Pottery transforms natural earth clay into functional and decorative ceramic ware through clay kneading, shaping (pinching, coiling, throwing), slow drying, and thermal hardening inside kilns.

🔑 TRADE KEYWORDS & DEFINITIONS

Wedging: Rhythmic kneading to expel trapped air pockets

Firing: Heating clay to red heat (700°–1000°C) to vitrify body

Slip: Creamy liquid clay suspension used as ceramic glue

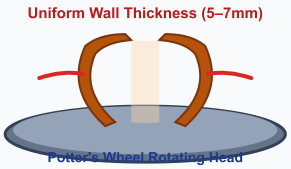

Fig 5.1: Wheel Throwing & Balanced Wall Cross-Section

Clay Conditioning & Forming:

- **Kneading & Wedging:** Eliminates air bubbles that burst inside kilns.
- **Grog/Sand Addition:** Controls shrinkage rate and stops hairline cracks.
- **Forming Techniques:** Pinching, coil building, slab rolling, or wheel throwing.
- **Scoring & Slip:** Cross-hatching edges with slip to fuse clay handles securely.

Stepwise Ceramic Craft Cycle:

① Clay Wedging (Purge Air) → ② Shaping (Pinch / Wheel) → ③ Join & Model (Score & Slip) → ④ Slow Shade Dry (Avoid Warping) → ⑤ Kiln Firing (Vitrification) → ⑥ Decorate (Glaze/Burnish)

✔ Quality Benchmarks

- Even wall thickness preventing differential shrinkage.
- Flat, level base that stands firmly without wobble.
- Thorough drying before firing to eliminate blowouts.

⚠ Studio Health & Safety

- Never inhale dry silica dust; clean surfaces with wet sponges.
- Strictly obey teacher supervision during kiln heating.
- Wash clay slurry off tools and hands to avoid slips.