MARKING SCHEME

METAL TECHNOLOGY

GRADE: 10 (SENIOR SCHOOL)

SECTION A (30 MARKS)

1. **Introduction to Metal Technology (5 Marks)**

(a) Definition: PPE refers to protective clothing, helmets, goggles, or other garments/equipment designed to protect the wearer's body from injury or infection in the workshop. (2mks)

(b) Identification: Ball-peen Hammer. **Category:** Driving tool. (2mks)

(c) Business Opportunity: Welding and fabrication shop, scrap metal collection/recycling, tool hardware retail, or blacksmithing. (1mk)

2. **Workshop Safety and First Aid (5 Marks)**

(a) Identification: (X) Wear eye protection/goggles. (Y) Wear ear protection/muffs. (2mks)

(b) First Aid: Run cool (not cold) water over the burn for at least 10–20 minutes. Do not apply ointments or break blisters. Cover loosely with a sterile dressing. (2mks)

(c) True/False: FALSE. (1mk)

3. **Matching: Tools (5 Marks)**

(a) Try Square — **(ii)**

(b) Scriber — **(iv)**

(c) Outside Caliper — **(iii)**

(d) Odd-leg Caliper — **(i)**

(e) Centre Punch — **(v)** *(1 mark each)*

4. **Match** the tool shown in Column A with its correct name in Column B.

Q: Calliper

R: Try Square

S: Vernier Calliper

T: Scriber

U: Marking Gauge

5. **Material Supply and Drawing (10 Marks)**

(a) Forms: (i) Sheet/Plate, (ii) Round Bar/Rod, (iii) Rectangular Tube/Hollow Section. (3mks)

(b) Drawing Type: Isometric Projection. (2mks)

(c) Difference: Isometric uses 30∘ angles for both receding horizontal axes, making all sides equally foreshortened. Oblique uses a flat front face (0∘) and one receding axis usually at 45∘. (3mks)

(d) Importance: To provide precise measurements for cutting and assembly, ensuring the final product fits together correctly and reduces material waste. (2mks)

6. **(a) Identification:** Kamau (Aluminum). (1mk)

(b) Distinguish: Ferrous metals contain iron and are usually magnetic (e.g., steel); Non-ferrous metals do not contain iron and are non-magnetic (e.g., copper, aluminum). (2mks)

(c) Furnace: Blast Furnace. (2mks)

7. (a) Components: Workbenches, Tool storage (shadow board), Machine area, Welding bay, Emergency exits/First Aid station. (2mks)

(b) Welding Bay Safety: Use welding screens/curtains to protect others from "arc eye" (UV flash); Ensure proper local exhaust ventilation to remove toxic fumes. (4mks)

(c) Three Es:

Equipment: Tools must be in good condition, guarded, and used for their intended purpose.

Environment: The workshop should be well-lit, ventilated, and floors kept free of grease or scrap.

Engineering: Designing machines with safety switches, shields, and ergonomic layouts to prevent accidents. (6mks)

(d) Maintenance: Cleaning after use, oiling moving parts to prevent rust, sharpening cutting edges (e.g., chisels), and storing in a dry, organized tool rack. (3mks)

8.

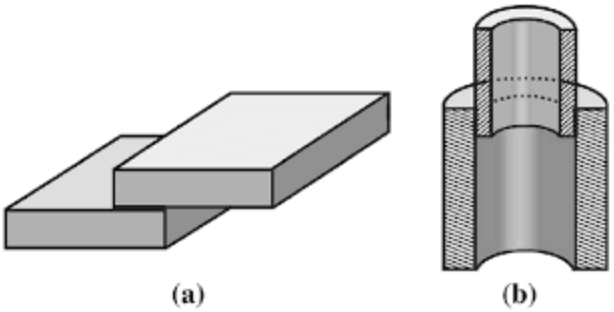
(a) Tool: Scriber. (1mk)

(b) Steps: Use a **Try Square** pushed firmly against a straight "datum" edge of the plate; mark the perpendicular line with a scriber. (4mks)

(c) Tool: Centre Punch. (2mks)

(d) Lap Joint: Sketch should show two pieces of metal overlapping.

Description: One piece of metal is laid over the other and joined (usually by riveting or welding). (5mks)



(e) Riveting Tools: Rivet set, Ball-peen hammer, Pop-rivet gun (if using blind rivets), or Drill bits. (3mks)

9.

(a) Raw Materials: Iron Ore (Haematite), Coke (fuel), and Limestone (flux). (3mks)

(b) Hot Air Blast: It reacts with the coke to produce heat and carbon monoxide, which acts as a reducing agent to remove oxygen from the iron ore. (3mks)

(c) Comparison: Mild Steel is ductile, tough, and can be easily welded/bent. **Cast Iron** is brittle, has high compressive strength, but will crack rather than bend under tension. (4mks)

10.

(a) Material: Galvanized Steel Sheets (to prevent rust) and Angle Iron (for the frame/support). (2mks)

(b) Edge Treatment: Hemming (folding the edge over itself). **Importance:** Removes sharp edges for safety and strengthens the rim of the bin. (4mks)

(c) Method: Welding. **Reason:** It provides a permanent, leak-proof, and extremely strong joint capable of handling the weight and rough handling of a waste bin. (4mks)