GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

JUNE 2025 KAWLO **INTERMEDIATE LEVEL**

Specialty Name and Acronym	**AUTOMOBILE REPAIR MECHANICS - ARM**
Subject Title	**Material Technology and Workshop Processes**
Subject Code No.	**5130**
Paper No.	**2**

Duration: Two Hours Thirty Minutes

INSTRUCTIONS TO CANDIDATES

This Paper has **TWO** Sections

Section A: Answer Any **THREE** Questions

Section B: Answer Any **TWO** Questions

You are reminded of the necessity for good English and orderly presentation in your answers.

SECTION A
MATERIALS TECHNOLOGY
Answer Any THREE questions from this Section

1. **NON-FERROUS METALS**

a) What are non-ferrous metals? **(1 mark)**

b) Give any **THREE** properties **EACH** of the following non-ferrous metals making them to be widely used in vehicles:

i) Aluminium. **(0.25x3=0.75 mark)**

ii) Copper. **(0.25x3=0.75 mark)**

c) Copy in your answer booklet and complete the following table with information on aluminium: **(0.25x5=1.25marks)**

Symbol	Melting point	Density (ρ)	Crystal structure	Principal ore	Two alloying elements

d) Name **THREE** steps involved in the extraction of aluminium from its ore. **(0.5x3=1.5 marks)**

e) Name any **THREE** vehicle components that are made from aluminium alloy. **(0.5x3=1.5 marks)**

f) Copper (Cu) can be alloyed with other metals. Copy in your answer booklet and complete the table below with regard to this.

Copper alloy	Name of alloy (0.25x3=0.75marks)	Two examples of its use in vehicles (0.25x6=1.5marks)
CuSn 14		
CuZn 30		
Cu Al 11 Fe 3		

g) Name any other **FOUR** types of non-ferrous metals that you know. **(0.25x4=1 mark)**

2. FURNACES

Figure 1 below shows a type of furnace.

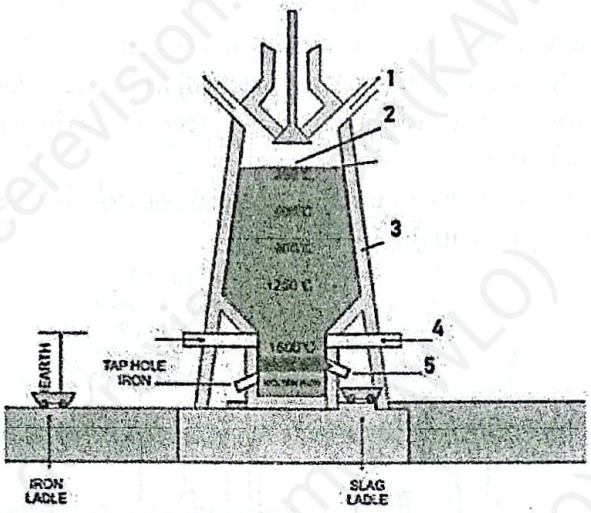

Figure 1

a) What is the name of the furnace above? **(1 mark)**
b) Name the numbered parts. **(5 marks)**
c) Explain how pig iron is being produced using the furnace above. **(4 marks)**

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3. CLASSIFICATION AND PROPERTIES OF MATERIAL TESTING

a) Testing of materials is generally classified in two categories. Name them. **(2 marks)**
b) Give four mechanical properties of metals. **(4 marks)**
c) Explain the following metal test methods: **(3 marks)**
   i. Indentation hardness test.
   ii. Brinell hardness test.
   iii. Impact test.
d) Name TWO universal material parameters achieved by engineering test. **(1 mark)**

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4. NON-METALLIC MATERIALS

a) With the help of a diagram, explain metallic coating technique of electroplating. **(2 marks)**
b) What are plastics? Name two broad classifications of plastics. **(3 marks)**
c) List FOUR automobile components made from plastics. **(2 marks)**
d) Give TWO common properties of plastics. **(1 mark)**
e) LIST TWO properties of Synthetic Rubber. **(2 marks)**

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5. OXY-ACETYLENE WELDING

a) Define fusion welding. **(1 mark)**

b) State three safety measures require when dealing with acetylene. **(1.5 marks)**

c) Describe the procedure for lighting the blow pipe and adjusting the flame. **(2 marks)**

d) With the help of sketches, show the two main welding techniques (indicating the angle of the filler rod and blow pipe with the parent metal). **(2 marks)**

e) State three advantages of the rightward technique as compare to the leftward technique. **(1.5 marks)**

f) Which of the flame is used for cutting? **(0.5 mark)**

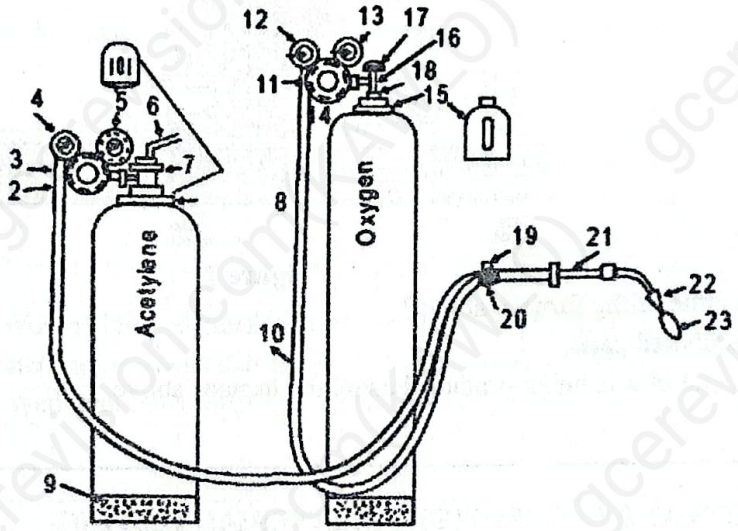

Figure 2

g) Copy the table below in your answer booklet and give the name of the numbered parts in figure 2 above. **(1.5 marks)**

S/N	Names	S/N	Names
4		19	
6		21	
15		22	

SECTION B
WORKSHOP PROCESSES
Answer Any TWO questions from this section

6. HEALTH, SAFETY AND THE ENVIRONMENT

a) Give any FOUR safety precautions that should be observed while working in the workshop. **(0.5x4 = 2 marks)**

b) Name TWO methods of extinguishing fire. **(2 marks)**

c) Copy and complete the table below regarding the classes of fire.

Class	Sources (0.5x3 = 1.5 marks)
class A	
Class B	
Class C	

d) Give any FOUR general safety precautions that should be observed to reduce the risk of fire in a mechanical workshop. **(0.25x4 = 1 mark)**

e) Name THREE types of portable fire extinguishers. **(0.5x3 = 1.5 marks)**

f) Give the meaning of each of the following safety sign. **(0.25x8 = 2 marks)**

							
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)

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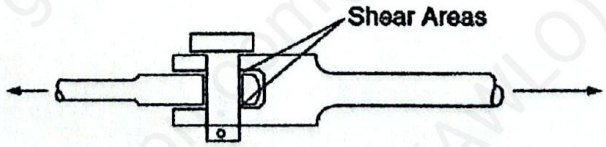
7. STRESS/STRAIN

a) State Hooke's Law **(2.5marks)**

b) The hand brake linkage shown in figure 3 below, carries a tensile force of 600N with 12mm in diameter and 200mm long.



Clevis Pin Double Shear

Figure 3

Calculate the following:

i. Shear stress in the Clevis pin. **(2.5 marks)**

ii. Strain when the linkage is stretched by 0.12mm during braking. **(2.5 marks)**

iii. Modulus of elasticity. **(2.5 marks)**

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8. CONSTRUCTION

After constructing a tank with the following internal dimensions; length 8m, width 5m, height 2m and the weight of the tank is 500N. The tank is filled with petrol having a density $\rho=8.8kg/m^3$. Four supports of diameter 32mm each and length of 1600mm.

Calculate

a) The volume of the tank. **(2 marks)**

b) The capacity of the tank. **(2 marks)**

c) Mass of the fuel in the tank when full **(2 marks)**

d) The total weight needed to be supported by a constructed steel support. **(2 marks)**

e) The tensile stress of the steel support when carrying the tank full of fuel. **(2 marks)**