

2502/106

2503/106

2509/106

**WORKSHOP TECHNOLOGY, MATERIALS
AND METALLURGY**

June/July 2022

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN MECHANICAL ENGINEERING
(PLANT OPTION)**

**DIPLOMA IN AUTOMOTIVE ENGINEERING
DIPLOMA IN CONSTRUCTION PLANT ENGINEERING**

MODULE I

WORKSHOP TECHNOLOGY, MATERIALS AND METALLURGY

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet.

Drawing instruments.

*This paper consists of **TWO** sections: **A** and **B**.*

*Answer **FIVE** questions taking **THREE** questions from section **A** and **TWO** questions from Section **B**.*

Maximum marks for each part of a question are as indicated.

Candidates should answer the questions in English.

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

SECTION A: WORKSHOP TECHNOLOGY

Answer any **THREE** questions from this section.

1. (a) State **four** safety rules to observe when working in the workshop. (4 marks)
- (b) Explain **three** methods of waste disposal and state specific materials considered in each method. (6 marks)
- (c) (i) Describe the following limits and fits processes.
(I) Shrink fit;
(II) Force fit.
State an example of application in each case.
(ii) Explain the following types of tolerances giving an example.
(I) Bilateral tolerance;
(II) Unilateral tolerance. (10 marks)
2. (a) Illustrate the following gas welding joints:
(i) fillet;
(ii) butt;
(iii) corner. (6 marks)
- (b) Using sketches, explain the following gas welding techniques:
(i) leftward;
(ii) rightward. (8 marks)
- (c) Explain the principle of TIG welding process and state **two** precautions when carrying out the process. (6 marks)
3. (a) Explain the following sheet metal forming processes:
(i) raising;
(ii) beading;
(iii) punching. (6 marks)

(b) Explain the following finishing processes

- (i) lacquering;
- (ii) bluing;
- (iii) polishing.

(6 marks)

(c) (i) State **four** effects of heat treatment on metals.

- (ii) Describe the following heat treatment processes:
 - (I) hardening;
 - (II) tempering.

(8 marks)

4. (a) Explain the terms:

- (i) maintenance;
- (ii) routine maintenance;
- (iii) breakdown maintenance.

(5 marks)

(b) (i) State **three** functions of cutting fluids.

- (ii) Using a sketch, explain the steps involved in facing a round bar of steel.

(9 marks)

(c) Illustrate the following tools indicating the material each is made from

- (i) reamer;
- (ii) ball peen hammer.

(6 marks)

SECTION B: MATERIALS AND METALLURGY

Answer any TWO questions from this section.

5. (a) Describe the following heat treatment processes:

- (i) annealing;
- (ii) carburizing;
- (iii) hardening.

(6 marks)

- (b) (i) Explain **two** types of corrosion.
- (ii) Describe:
- (I) electroplating;
 - (II) painting.
- (10 marks)
- (c) Explain **four** properties of bearing materials. (4 marks)
6. (a) (i) State **two** types of rubber.
- (ii) Explain **two** methods of wood preservation. (5 marks)
- (b) (i) State **two** properties of aluminium alloy.
- (ii) Explain the method of production of aluminium stating **two** of its applications. (9 marks)
- (c) (i) State **two** heat resistant steels.
- (ii) Describe Nickel and state **two** of its applications. (6 marks)
7. (a) Explain **four** types of plain carbon steel and state an application of each. (8 marks)
- (b) Explain **two** types of iron ores. (2 marks)
- (c) (i) Explain the following terms citing an example of each:
- (I) mixture;
 - (II) compound;
 - (III) solid solution.
- (6 marks)
- (ii) Illustrate the following crystal structures:
- (I) body centered cubic;
 - (II) face centered cubic.
- (4 marks)

THIS IS THE LAST PRINTED PAGE.