

2502/106

2503/106

2509/106

**WORKSHOP TECHNOLOGY, MATERIALS
AND METALLURGY**

Oct./Nov. 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** classes of fire, a material involved and a suitable extinguisher in each case. (8 marks)
- (b) (i) State **three** reasons of observing safety in the workshop.
(ii) State **two** methods of controlling a machine in an emergency. (5 marks)
- (c) (i) State **two** defects found in soldered joints.
(ii) Explain the procedure of joining **two** plates by soft soldering method using a hatched stake. (7 marks)
2. (a) (i) State **four** forms of supply of engineering materials.
(ii) State **two** characteristics of each of the following:
- plain carbon steel.
- aluminium. (8 marks)
- (b) (i) Distinguish between **ferrous** and **non-ferrous** metals citing an example in each case.
(ii) Explain the following workshop tests and results on copper and cast iron:
- ringing;
- spark;
- bending. (8 marks)
- (c) Explain **four** methods of disposing waste. (4 marks)
3. (a) (i) Define the term 'quality control in engineering';
(ii) State **four** factors that contribute to the marketability of a product;
(iii) Explain **two** advantages of good workmanship. (8 marks)

- (b) (i) State **two** maintenance and care activities carried out on inspection tools.
- (ii) Illustrate the following:
- angle plate;
- odd leg callipers;
- centre punch.
- (8 marks)
- (c) Explain the terms:
- (i) routine maintenance.
- (ii) planned maintenance.
- (4 marks)
4. (a) (i) Illustrate the following hand tools:
- mallet
- anvil
- swage.
- (ii) Name a material from which each of the tools in 4(a)(i) is made of.
- (9 marks)
- (b) Define the following terms with reference to limits and fits.
- (i) Tolerance.
- (ii) Upper limit.
- (4 marks)
- (c) (i) Explain the following finishing processes
- varnishing.
- polishing.
- (ii) Explain three methods of caring and maintaining finishing processes tools, equipment and products.
- (7 marks)

SECTION B: MATERIALS AND METALLURGY

Answer any TWO questions from this section.

5. (a) (i) State four bearing materials.
(ii) Explain four properties of bearing materials. (6 marks)
- (b) (i) Explain the term heat treatment.
(ii) Describe how the following heat treatment processes are carried out:
(I) nitriding;
(II) case hardening. (6 marks)
- (c) (i) Explain two types of corrosion.
(ii) Explain two ways of preventing corrosion in engineering materials. (8 marks)
6. (a) (i) Differentiate thermoplastics from thermosetting plastics. *melts when exposed to heat*
(ii) Illustrate the structure of wood. *do not melt* (7 marks)
- (b) (i) State two types of adhesives.
(ii) Describe the method of production copper citing two of its applications. (9 marks)
- (c) (i) State two alloying elements in steels.
(ii) Differentiate the following steels
- Austenitic.
- Martensitic. (4 marks)
7. (a) State four properties of cast iron. (4 marks)
- (b) (i) Explain two casting defects in cast iron.
(ii) State three types of charging materials in furnaces. (5 marks)
- (c) Explain the operation of a Bessemer furnace using a labelled diagram. (11 marks)

THIS IS THE LAST PRINTED PAGE.

*ଅର୍ଥାତ୍ କାର୍ଯ୍ୟକାରୀ
କାର୍ଯ୍ୟକାରୀ ମୂଲ୍ୟ
ପରିଷ୍କୃତ ଲୁଗା*