higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

MATERIAL TECHNOLOGY
NQF LEVEL 3

(6021013)

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09:00–12:00

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
MATERIAL TECHNOLOGY
NQF LEVEL 3
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Use only a black or blue pen.
5. Write neatly and legibly.

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QUESTION 1

1.1 Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–L) next to the question number (1.1.1–1.1.6) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.1.1	Material that is made up of two or more metals or a metal and a non-metal	A	malleability
		B	elasticity
1.1.2	Can be pressed or hammered into shape without breaking or cracking	C	ductility
		D	brittleness
1.1.3	The ability of a material or metal to resist breaking when placed under pressure	E	compressive strength
		F	conductivity
1.1.4	The ability of a material to resist breaking when placed under torsion	G	tensile strength
		H	expansion
1.1.5	This property allows a material to be drawn out to a considerable length without breaking	I	hardness
		J	metallurgy
1.1.6	The ability of metal to resist surface wear, scratching and denting	K	alloying
		L	quenching

(6 × 1) (6)

1.2 Differentiate between the following terms:

1.2.1 Ferrous metals

1.2.2 Non-ferrous metals

(2 × 2) (4)

1.3 Name THREE types of ferrous metals. (3)

1.4 Name THREE uses of non-ferrous metals in the industry. (3)

1.5 Give FOUR reasons for alloying. (4)

1.6 Describe FIVE physical effects of alloying. (5)

[25]

QUESTION 2

2.1 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1.1–2.1.8) in the ANSWER BOOK.

2.1.1 The purpose of ceramic tiles on a space shuttle is to stop the metal underneath from melting.

2.1.2 Extrusion is a process in which one forces a material through an opening called a die, giving it the shape of that opening.

2.1.3 Boron, with the symbol Br, is a rare element in deep-red liquid form.

2.1.4 Charcoal is used to absorb and filter substances, as a fuel and in the manufacturing of gunpowder.

2.1.5 Tufnol is the commercial name of a composite consisting of woven linen impregnated with phenolic resin.

2.1.6 When mixing natural rubber with carbon, silicon behaves like thermosetting plastic with added elasticity.

2.1.7 A polymer is a substance made of long molecular chains.

2.1.8 An amorphous material has its atoms or molecules arranged in a regular pattern.

(8 × 1) (8)

2.2 Name FIVE types of non-metals. (5)

2.3 Explain FIVE characteristics of non-metals. (5)

2.4 Identify FIVE common applications of glass fibre. (5)

2.5 Boron is used in the form of borax and boric acid.

Name TWO uses of boron in the industry. (2)

[25]

QUESTION 3

3.1 Complete the following sentences by choosing a word or words from the list below. Write only the answer next to the question number (3.1.1–3.1.5) in the ANSWER BOOK.

carburising; tempering; limestone; combustion; reduction; furnace; allotropic; annealing; ladle; normalising

3.1.1 … elements can have more than one structure.

3.1.2 … is a chemical reaction that removes the oxygen from a substance.

3.1.3 The ingredients in the smelting process are iron ore, … and coke.

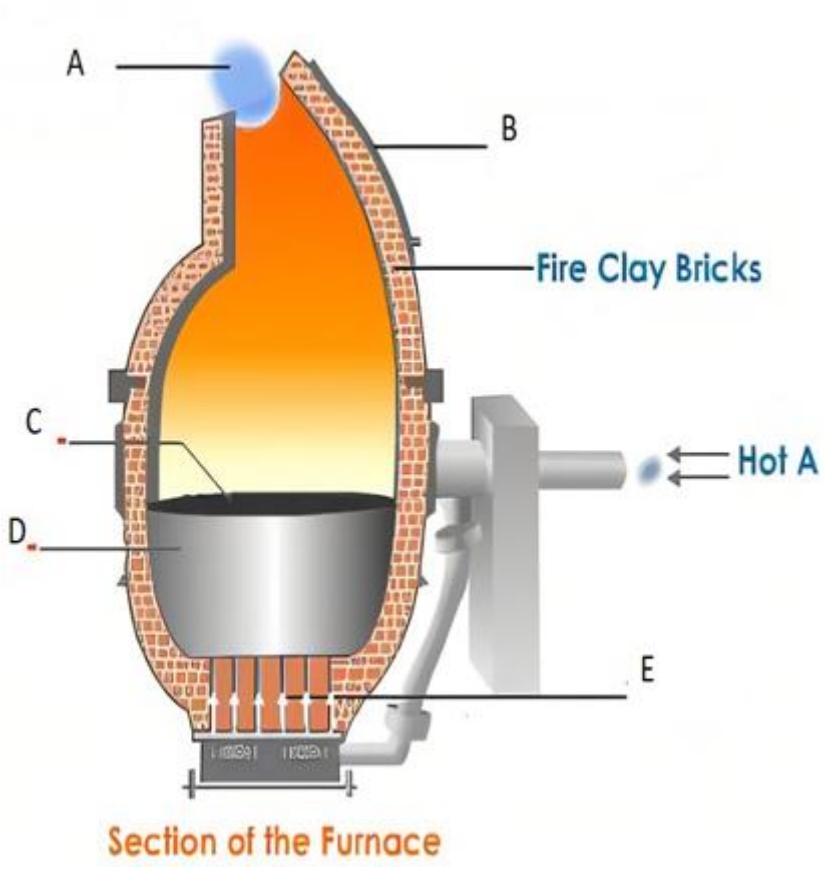
3.1.4 … is a technique mainly used to soften metals and usually results in a soft, ductile metal.

3.1.5 … is the process by which carbon is introduced into a metal.

(5 × 1) (5)

3.2 Describe the working principles of a rotor furnace. (5)

3.3 Label the diagram below. Write only the answer next to the letter (A–E) in the ANSWER BOOK. (5)



3.4 List FIVE advantages of cupola furnace. (5)

3.5 Explain the process of carburising. (5)
[25]

QUESTION 4

4.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (4.1.1–4.1.5) in the ANSWER BOOK.

4.1.1 A mark or cut left by pressing something into a surface:

A Indentation
B Analysis
C Calibration
D Comparison

4.1.2 A test for resistance to abrasive wear and penetration:

A Impact
B Hardness
C Bending
D Shear

4.1.3 A force that occurs when you use scissors to cut paper:

A Compression
B Torsion
C Shear
D Tensile

4.1.4 The change in length per unit length:

A Tensile
B Stress
C Elongation
D Strain

4.1.5 A straight line that touches a curve at some point:

A Circle
B Tangent
C Diameter
D Radius

(5 × 1) (5)

4.2 Discuss the method for conducting the following tests:

4.2.1 Bending test (5)

4.2.2 Tensional test (5)

4.3 Explain the process of conducting a torsion strength test. (5)

4.4 What information should be included in a report on the testing results of a compressive test? (5)

[25]

TOTAL: 100

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