

## higher education & training

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

# NATIONAL CERTIFICATE

# METAL WORKERS' THEORY N1

(11022061)

**21 July 2014 (Y-Paper)**  
**13:00–16:00**

**Drawing instruments are required.**

**Calculators may be used.**

**This question paper consists of 6 pages and 1 addendum.**

**DEPARTMENT OF HIGHER EDUCATION AND TRAINING**  
**REPUBLIC OF SOUTH AFRICA**  
NATIONAL CERTIFICATE  
METAL WORKERS' THEORY N1  
TIME: 3 HOURS  
MARKS: 100

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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. Keep ALL the subsections of questions together.
  5. Show ALL the calculation steps where calculations should be done.
  6. QUESTION 3 must be answered on ADDENDUM A and then be handed in.
  7. Use  $\pi = 3,142$
  8. Write neatly and legibly.
-

**QUESTION 1**

- 1.1 Define an accident. (2)
- 1.2 State the legislation act that caters for safety in the workplace. (3)  
[5]

**QUESTION 2**

- 2.1 State the hand tool that will be used for the following:
- 2.1.1 Cutting square or rectangular grooves into metal
  - 2.1.2 For lining up the holes for bolting or riveting work
  - 2.1.3 To grip pipes or badly worn nuts
  - 2.1.4 For removing waste or excess metal and cutting rods, bars or plates.
  - 2.1.5 For filing softer metals such as brass and copper (5 x 1) (5)
- 2.2 Describe the angle of presentation with reference to chisels. (2)
- 2.3 Describe the function of each of the following marking-off tools:
- 2.3.1 Scriber
  - 2.3.2 Inside callipers
  - 2.3.3 Trammels
  - 2.3.4 Chalk line
  - 2.3.5 Steel folding rule (5 x 1) (5)
- 2.4 A right-angled gusset steel plate is to be manufactured using the following measurements:
- The vertical side = 250 mm
- The horizontal side = 164 mm
- Calculate the length of its hypotenuse side. (3)
- HINT:  $R^2 = H^2 + V^2$  [15]

**QUESTION 3**

Use FIGURE 1 ADDENDUM A (attached) to answer this question. Drawing instruments must be used.

FIGURE 1 shows a T- piece between two unequal diameter steel pipes.

- 3.1 Draw the line of penetration between the two pipes. (2)
- 3.2 Calculate the circumference of the 33 mm diameter pipe. (2)
- 3.3 Develop the shape of the hole in the main pipe. (2)
- 3.4 Develop the pattern of the branch pipe. (4)

HINT:  $C = 3,142 \times D$

Hand in ADDENDUM A on completion.

[10]

**QUESTION 4**

- 4.1 State the meaning of the following abbreviations:
  - 4.1.1 UB
  - 4.1.2 O/D
  - 4.1.3 SOP

(3 x 1) (3)
- 4.2 Define the following metal properties:
  - 4.2.1 Hardness
  - 4.2.2 Toughness
  - 4.2.3 Elasticity

(3 x 1) (3)
- 4.3 Describe the nature of the mild steel with reference to the following:
  - 4.3.1 Colour (1)
  - 4.3.2 Carbon content (1)
  - 4.3.3 Uses (2)
- 4.4 Calculate the back mark of a 220 mm x 80 mm rolled steel channel in reference to its flange. (2)

[12]

**QUESTION 5**

5.1 Name FIVE safety precautions that should be considered before and during the use of each machine stated below:

5.1.1 Pedestal grinding machine (5)

5.1.2 Guillotine (5)

[10]

**QUESTION 6**

6.1 Draw the front and top views of a double riveted lap joint with the snap head rivet in position. (3)

6.2 Define the following terms as applicable to assembly work:

6.2.1 Pitch (1)

6.2.2 Landing (1)

6.3 Calculate the length of a black bolt that will be used for assembling THREE 12 mm thick steel plates. The maximum diameter of the hole to be drilled is 18 mm. (3)

6.4 Explain the use of the countersunk bolt during assembly work. (2)

[10]

**QUESTION 7**

7.1 State the function of each of the following gas apparatuses:

7.1.1 LP-Gas cylinder

7.1.2 Welding hose

7.1.3 Oxygen pressure gauge

7.1.4 Acetylene flash back arrestor

7.1.5 Welding torch

(5 x 1) (5)

7.2 Describe the following oxy-acetylene gas flame settings and its function:

7.2.1 Neutral (2)

7.2.2 Oxidising (2)

7.3 Name FOUR causes of back fire during gas cutting. (4)

7.4 Explain how to extinguish the flame in the oxy-acetylene welding process. (2)

[15]

**QUESTION 8**

8.1 Define the following welding terms:

8.1.1 Insulators (1)

8.1.2 Earthing (2)

8.1.3 Tungsten inert gas welding (2)

8.2 State THREE reasons why electrodes should be coated. (3)

8.3 Describe FOUR advantages in using direct current welding machine. (4)

8.4 Draw free-hand sketches to explain the following welding joints:

8.4.1 Corner-to-corner

8.4.2 Single-V-butt

8.4.3 T-Joint

(3 x 1) (3)  
[15]

**QUESTION 9**

9.1 The internal diameter of a cylinder is 670 mm made out of a 6 mm thick steel plate. The cylinder is secured with a 10 mm thick stiffening ring.

9.1.1 Calculate the length of the material required to form the cylinder. (4)

9.1.2 Calculate the length of a round bar to form a stiffening ring (4)  
[8]

**TOTAL: 100**

ADDENDUM A

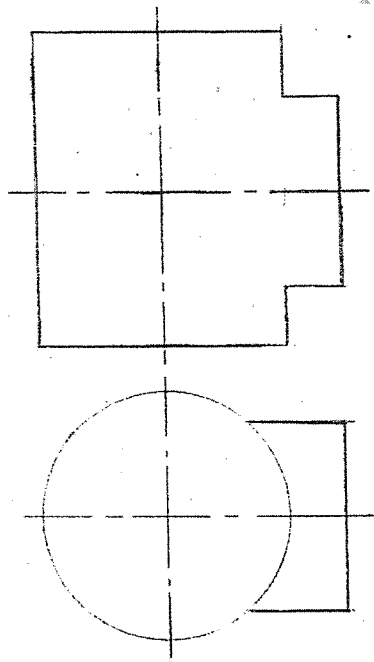


FIGURE 1

FIGURE 1