

GAUTENG DEPARTMENT OF EDUCATION
SENIOR CERTIFICATE EXAMINATION

OCTOBER / NOVEMBER 2005
OKTOBER / NOVEMBER 2005

METALWORK SG
(Second Paper: Theory)

TIME: 2 hours

MARKS: 100

INSTRUCTIONS:

- Answer ALL the questions.
 - Sketches may be used to illustrate your answers.
 - Leave a line open and rule off after you have answered each question.
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QUESTION 1
MULTIPLE-CHOICE QUESTIONS

Various possible answers (A – D) are provided for each of the following questions. Indicate the correct answer by making a cross (X) over the appropriate letter next to the corresponding question number on the **answer sheet** on the **inside cover** of your **answer book**.

- 1.1 Flux used in brazing is _____ .
- A. zinc chloride
 - B. powdered chalk
 - C. borax
 - D. limestone
- 1.2 A thimble is a part of a/an _____ .
- A. surface gauge
 - B. external micrometer
 - C. angle plate
 - D. try square
- 1.3 Which type of furnace is used to produce steel?
- A. Puddling furnace
 - B. Cupola furnace
 - C. Arc furnace
 - D. Blast furnace

- 1.4 Outside callipers are used to _____ .
- A. determine lengths
 - B. determine outside diameters
 - C. determine inside diameters
 - D. measure angles
- 1.5 What type of coolant is used when drilling brass?
- A. Oil
 - B. Paraffin
 - C. Water
 - D. No cooling liquid
- 1.6 Which one of the following statements about the positioning of the cutting edge of a lathe tool is true?
- A. It must be at the centre height of the lathe.
 - B. It must be below centre height.
 - C. It must be above centre height.
 - D. The positioning of the cutting edge is not important.
- 1.7 Which one of the following metals is a non-ferrous alloy?
- A. High carbon-steel
 - B. Copper
 - C. Brass
 - D. Aluminium
- 1.8 When metal with a thickness of 3 mm is hard-soldered, the nozzle size used should be _____ .
- A. 1
 - B. 7
 - C. 47
 - D. 90
- 1.9 Malleability of a metal means the _____ .
- A. ability of the metal to be drawn into fine wire
 - B. ability to be stretched in all directions – either by rolling or hammering
 - C. resistance of the metal against wearing or scratching
 - D. ability to become fluid
- 1.10 In which one of the following situations should a three-jaw self-centering chuck be used in preference to an independent four-jaw chuck?
- A. When holding metal of square sections
 - B. When holding hexagonal bars
 - C. When holding work of irregular shape
 - D. When turning work off-centre

- 1.11 Both the temperatures of the electrical arc and the flame of an oxyacetylene blow-torch have a temperature of about _____ .
- A. 2 200°C
 - B. 3 500°C
 - C. 4 300°C
 - D. 1 500°C
- 1.12 The point of a centre punch is _____ .
- A. hardened
 - B. tempered
 - C. annealed
 - D. hardened and tempered
- 1.13 The oxyacetylene welding trolley is an example of a lever of the _____ .
- A. 1st class
 - B. 2nd class
 - C. 3rd class
 - D. 4th class
- 1.14 Flotation cells are used in the manufacturing of _____ .
- A. epoxy resin
 - B. mild steel
 - C. carbon steel
 - D. copper
- 1.15 Which of the following is an adhesive?
- A. Borax
 - B. Epoxy resin
 - C. Polythene
 - D. Soldering

Questions 1.16 – 1.20 require TRUE or FALSE answers. Use the **answer sheet** on the **inside cover** of your **answer book** to indicate your choice (**A** or **B**).

- 1.16 The screw-thread of the acetylene cylinder is anti-clockwise.
- A. True
 - B. False
- 1.17 Levers are used only to simplify the work.
- A. True
 - B. False
- 1.18 The engineer's trisquare is not calibrated.
- A. True
 - B. False

1.19 Mild steel can be tempered.

- A. True
- B. False

1.20 Annealing is a softening process.

- A. True
- B. False

[20]

QUESTION 2

2.1 Briefly discuss the file under the following headings:

- 2.1.1 Classification (3)
- 2.1.2 Cross-section profiles (6)
- 2.1.3 Draw filing (2)
- 2.1.4 Cross filing (2)

2.2 Explain, with sketches, how the accuracy of an engineering square may be determined.

(2)

2.3 Say which tool, accessory or aid is used in each of the following processes:

- 2.3.1 Finally finishing a seam in sheet metalwork
- 2.3.2 Finding the centres of square and round bars
- 2.3.3 Holding a small piece of sheet metal when drilling
- 2.3.4 Drawing circles and arcs on sheet metal
- 2.3.5 Removing a damaged nut (5)

[20]

QUESTION 3

3.1 Describe the manufacturing of carbon steel in an arc furnace under the following headings:

- 3.1.1 The elements forming the charge (6)
- 3.1.2 The charging process (4)
- 3.1.3 The melting process (7)

3.2 Name THREE methods according to which the finishing of metals can be classified.

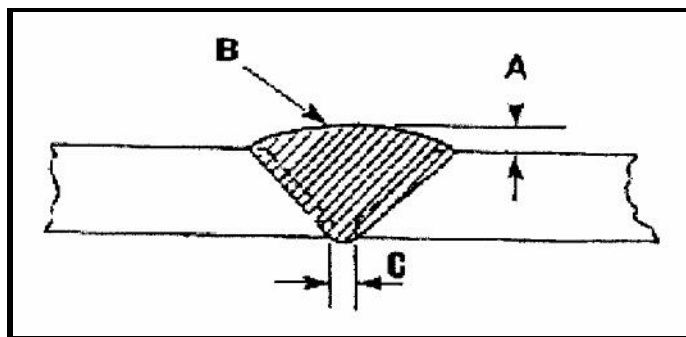
(3)
[20]

QUESTION 4

- 4.1 List, in the correct order, the EIGHT main events in the refining of copper from its ore. (8)
- 4.2 Give SIX working characteristics of copper. (6)
- 4.3 Which resin is used when working on fibreglass? (1)
- 4.4 Give FIVE working characteristics of fibreglass. (5)

[20]**QUESTION 5**

- 5.1 **Figure 1** shows a cross-section of a U-butt joint.

**Figure 1**

- 5.1.1 What is the most probable cause of part **B** having a much rounded profile? (1)
- 5.1.2 What would be the most probable cause of part **B** having a hollow profile? (2)
- 5.1.3 Why is the gap at **C** essential? (1)
- 5.1.4 What welding defect may develop if the joint is not chamfered? (1)
- 5.1.5 Would this chamfering be necessary if the metals were 4,5 mm thick and the arc welding process was used? (1)
- 5.2 Draw the following types of joints which are applicable to arc welding:
- 5.2.1 A U-butt joint
- 5.2.2 An edge joint
- 5.2.3 A corner joint
- 5.2.4 A X-butt joint
- 5.2.5 A half V-joint
- 5.2.6 A double U-butt joint (6)

- 5.3 **Figure 2** below shows a representation of the protection arc shield in the arc welding process.

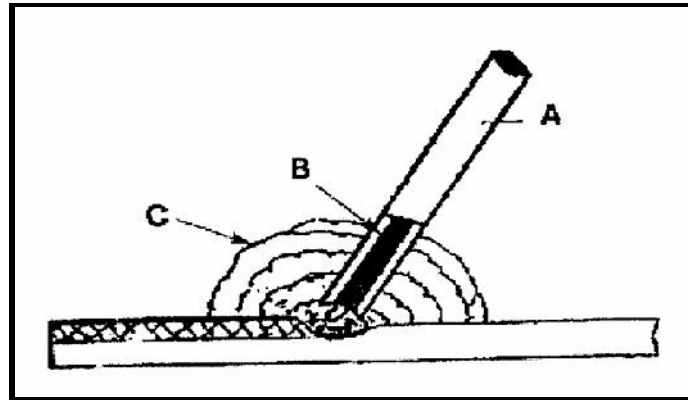


Figure 2

- 5.3.1 What are the functions of part **A** (the pasty outer layer)? (5)
- 5.3.2 What are the functions of part **B** (the metal core)? (2)
- 5.3.3 What are the functions of part **C** (the smoke shield)? (1)
- [20]**

QUESTION 6

- 6.1 Describe point by point, how you will set the gas pressure of the gas welding equipment, light the gas welding torch and adjust it to a neutral flame.
Note: The apparatus is already assembled and both the cylinder valves are shut. (10)
- 6.2 Name THREE visible differences between the oxygen and acetylene cylinders. (3)
- 6.3 Describe point by point, how high carbon steel can be hardened and tempered in the metal work centre. (7)
- [20]**

QUESTION 7

- 7.1 Write the formula for determining pulley speeds and declare each symbol. (5)
- 7.2 Name the FIVE general bolt heads. (5)
- 7.3 Write down FIVE differences between soft-soldering and hard-soldering. (5)
- 7.4 Name THREE factors that would ensure a good soldering joint. (3)
- 7.5 State TWO reasons why copper is used in the manufacturing of soldering bits. (2)
- [20]**

QUESTION 8

- 8.1 State the FIVE aspects that make up a cutting list. (5)
- 8.2 List the FIVE basic principles of design. (5)
- 8.3 Write down the following list of names one beneath the other. Next to each name, write whether it is a flux, a coolant or a lubricant.
- 8.3.1 Oil
 - 8.3.2 Turpentine
 - 8.3.3 Paraffin
 - 8.3.4 Resin
 - 8.3.5 Soap water
 - 8.3.6 Salammoniac
 - 8.3.7 Borax
 - 8.3.8 Washing soda (8)
- 8.4 Explain briefly the difference between a flux and a lubricant. (2)
- [20]**

QUESTION 9

- 9.1 Explain briefly what a **steel alloy** is. (3)
- 9.2 Name the FOUR types of metals of which the alloy, high-speed steel is made. (4)
- 9.3 List the handtools that are used to cut
- 9.3.1 internal threads. (2)
 - 9.3.2 external threads. (2)
- 9.4 List four reasons why a lubricant (oil) should be used while cutting thread. (4)
- 9.5 Discuss in logical order, the procedures that you will follow when you tap a M6 mm internal thread through a 20 mm thick plate. Name all steps and procedures. (5)
- [20]**

QUESTION 10

- 10.1 Name the **THREE** safety measures that must be kept in mind when you are using a buffing machine. (3)
- 10.2 Make a sketch of a lathe tool bit and clearly indicate the following clearance angles:
- 10.2.1 Front clearance angle
- 10.2.2 Tool angle
- 10.2.3 Top rake angle (3)
- 10.3 Give **SIX** points to be remembered when changing an Emery wheel on a bench grinder. (6)
- 10.4 Name **THREE** apparatus or machines in the metalwork centre where a left-hand thread is used. (3)
- 10.5 Name **FIVE** processes which can be done on a metal lathe. (5)

[20]

TOTAL: 100

END