

GAUTENG DEPARTMENT OF EDUCATION  
SENIOR CERTIFICATE EXAMINATION

METALWORK SG  
(Second Paper: Theory)

TIME: 2 hours

MARKS: 200

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**INSTRUCTIONS:**

- Answer ALL the questions.
  - Sketches may be used to illustrate your answers.
  - Leave a line 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 relevant question number on the **answer sheet** on the **inside cover** of your **answer book**.

- 1.1 This acid is used to make zinc chloride.
- A. Sulphuric acid
  - B. Hydrochloric acid
  - C. Nitric acid
  - D. Acetic acid
- 1.2 An example of acrylic sheeting is \_\_\_\_\_ .
- A. epoxy resin
  - B. perspex
  - C. fibreglass
  - D. polythene
- 1.3 Which one of the following is used as an adhesive?
- A. Synthetic resin
  - B. Polyvinyl acetate
  - C. Epoxy resin
  - D. Acrylic resin

- 1.4 The correct grinding angle of a tinman's snips is \_\_\_\_\_ .
- A.  $60^{\circ} - 65^{\circ}$
  - B.  $70^{\circ} - 77^{\circ}$
  - C.  $55^{\circ} - 58^{\circ}$
  - D.  $80^{\circ} - 87^{\circ}$
- 1.5 A bastard file has the following number of teeth per 25 mm.
- A. 26
  - B. 32
  - C. 40
  - D. 44
- 1.6 This chisel is used to clean out inside corners.
- A. Half-round chisel
  - B. Flat chisel
  - C. Diamond-point chisel
  - D. Cross-cut chisel
- 1.7 The enclosed angle of metric screw thread is \_\_\_\_\_ .
- A.  $29^{\circ}$
  - B.  $30^{\circ}$
  - C.  $55^{\circ}$
  - D.  $60^{\circ}$
- 1.8 The process of annealing means \_\_\_\_\_ .
- A. making brittle
  - B. softening
  - C. hardening
  - D. toughening
- 1.9 The joining of metals can only be \_\_\_\_\_ .
- A. permanent
  - B. temporary – permanent
  - C. temporary
  - D. All of the above.
- 1.10 The poll of a ballpene hammer is made from \_\_\_\_\_ .
- A. cast iron
  - B. case-hardened mild steel
  - C. high-carbon steel
  - D. mild steel

- 1.11 A morse twist drill is ground at \_\_\_\_\_ degrees.
- A. 90°
  - B. 147°
  - C. 118°
  - D. 100°
- 1.12 Different profiles are found at \_\_\_\_\_ .
- A. pliers
  - B. files
  - C. saws
  - D. hammers
- 1.13 The metal which is most generally used in the centre is \_\_\_\_\_ .
- A. cast steel
  - B. cast iron
  - C. steel alloy
  - D. mild steel
- 1.14 The carbon content of mild steel is \_\_\_\_\_ .
- A. 4%
  - B. 2,5%
  - C. less than 0,5%
  - D. more than 1,5%
- 1.15 Stainless steel does not rust because it contains \_\_\_\_\_ .
- A. copper
  - B. chrome
  - C. aluminium
  - D. bromine
- 1.16 From which of the following ores is copper extracted?
- A. Hematite
  - B. Bauxite
  - C. Sulphides
  - D. Galena
- 1.17 What is the name of the tool used to remove a damaged nut?
- A. Ring spanner
  - B. Socket spanner
  - C. Flat spanner
  - D. Stillson wrench

- 1.18 Clogging of a file is caused by \_\_\_\_\_ .
- A. the filing of mild steel
  - B. the bending of teeth
  - C. the filing of cast iron
  - D. the filing of aluminium
- 1.19 Copper ore is found at \_\_\_\_\_ .
- A. Witbank
  - B. Phalaborwa
  - C. Pretoria
  - D. Thabazimbi
- 1.20 The driving pulley of an electric motor has a diameter of 60 mm and rotates at 2 400 r.p.m. The driven pulley rotates at a speed of 4 000 r.p.m. The diameter of the driven pulley is \_\_\_\_\_ .
- A. 48 mm
  - B. 36 mm
  - C. 72 mm
  - D. 56 mm

20x1= **[20]**

**QUESTION 2**

- 2.1 Indicate whether each of the following statements is **TRUE** or **FALSE**.
- 2.1.1 If a red-hot piece of metal is placed close to a leaking acetylene welding tip, it can ignite the gas.
  - 2.1.2 The thimble of a micrometer is divided into 50 equal divisions.
  - 2.1.3 The elasticity of a metal will determine whether that metal can be drawn into a fine wire.
  - 2.1.4 Tungsten gives high-speed steel a property that allows it to cut at a high temperature.
  - 2.1.5 When metal is galvanized it means that the metal is covered with a layer of tin.
  - 2.1.6 Metals can be mixed or alloyed in a melted form.
  - 2.1.7 Brass is an alloy of copper and tin.
  - 2.1.8 The rod used for brazing consists of copper and zinc.
  - 2.1.9 Outside callipers are used for testing diameters of holes.
  - 2.1.10 The travelling steady on a lathe is there to support long, thin shafts. (10)
- 2.2 Explain the following processes:
- 2.2.1 Annealing
  - 2.2.2 Hardening
  - 2.2.3 Case hardening (6)

- 2.3 Why is the hammer face hardened while the middle is left soft? (1)
- 2.4 Name any THREE tempering colours. (3)
- [20]**

**QUESTION 3**

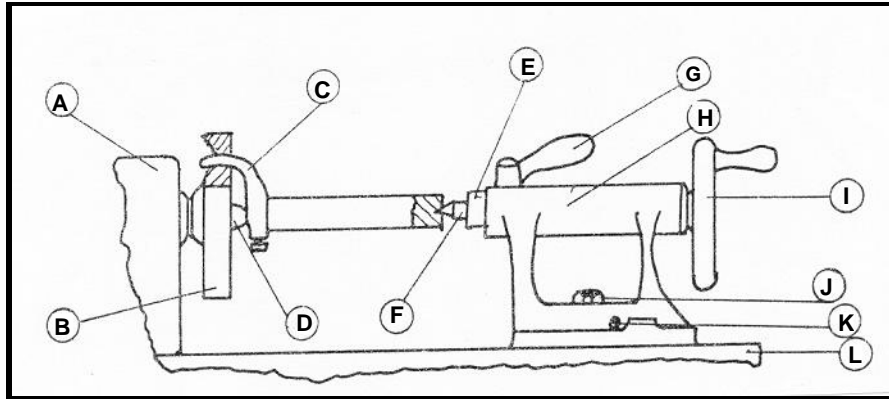
- 3.1 Distinguish between the **centre punch** and the **dot punch** by means of descriptions and sketches. (6)
- 3.2 What are the following pliers used for?
- 3.2.1 Combination pliers
  - 3.2.2 Round-nose pliers
  - 3.2.3 Flat-nose pliers
  - 3.2.4 Diagonal side-cutting pliers (4)
- 3.3 Say which tool, accessory or aid is used in each of the following processes:
- 3.3.1 Holding round stock when drilling
  - 3.3.2 Protecting jobs against damage when they are held in a vice
  - 3.3.3 The chisel which is used to remove the head **of a rivet**
  - 3.3.4 Holding a tap for cutting internal thread
  - 3.3.5 Pulling over a hole which has run off-centre
  - 3.3.6 Drawing circles and arcs on sheet metal
  - 3.3.7 Sharpening saw teeth
  - 3.3.8 Cleaning pinned file teeth
  - 3.3.9 Removing a damaged nut
  - 3.3.10 The hammer which is used for riveting (10)
- [20]**

**QUESTION 4**

- 4.1 Name and sketch FIVE different joints and seams used to join sheet-metal parts. (5)
- 4.2 Name and sketch SEVEN different rivet heads. (7)
- 4.3 Name and sketch FIVE different bolt heads. (5)
- 4.4 Name and sketch THREE types of screwheads found on metal screws. (3)
- [20]**

**QUESTION 5**

- 5.1 **Figure 1** shows a drawing of **part of** a metal lathe. Write down the letters from **A to L** in order, one below the other, and then write the name of the part which the letter indicates.



**Figure 1**

(12)

- 5.2 Give **SIX** points to be remembered when changing an emery wheel on a bench grinder. (6)

- 5.3 Name **TWO** elements used in the manufacture of grinding wheels. (2)

**[20]**

**QUESTION 6**

- 6.1 Discuss copper under the following headings:

6.1.1 Characteristics (4)

6.1.2 Working properties (4)

6.1.3 The various steps in producing copper (8)

- 6.2 The physical properties are of importance in distinguishing different metals. In a single term describe the following properties:

6.2.1 The ability of a metal to be drawn into a fine wire

6.2.2 The property of changing from a solid form to a liquid when heated

6.2.3 The property of metal to reflect light

6.2.4 The resistance the metal offers to being scratched, cut or filed (4)

**[20]**

**QUESTION 7**

- 7.1 Describe the manufacturing of mild steel in an electric arc furnace under the following headings:
- 7.1.1 The elements forming the charge (5)
  - 7.1.2 The charging process (3)
  - 7.1.3 The melting process (7)
- 7.2 Write the formula for determining pulley speeds and state the meaning of each symbol. (5)
- [20]**

**QUESTION 8**

- 8.1 Name TWO advantages of right-hand welding with gas as compared with the left-hand method. (2)
- 8.2 Various processes are used to join metals. These joints may be classified as permanent, semi-permanent and temporary. Give TWO examples of each. (6)
- 8.3 Draw and give the correct name of each flame setting used to do the following. Give the ratio of acetylene to oxygen for each process.
- 8.3.1 To do hard surfacing
  - 8.3.2 To join brass or copper
  - 8.3.3 To join stainless steel or mild steel
- (9)
- 8.4 Give the composition of a silver solder rod. (3)
- [20]**

**QUESTION 9**

- 9.1 Successful arc welding depends on various factors. Name TWO negative results of each, if the following are not taken into consideration:
- 9.1.1 The welding current is too high.
  - 9.1.2 The welding current is too low.
  - 9.1.3 The arc length is too long.
  - 9.1.4 The arc length is too short. (8)
- 9.2 Name the TWO parts of a welding electrode. (2)
- 9.3 What is meant by **arc welding**? (3)

- 9.4 Write down the question numbers and next to each a possible cause of the following problems which can occur during arc welding.
- 9.4.1 The electrode sticks to the work.
  - 9.4.2 The welding deposit does not bind with the basic metal, although a good arc has been formed.
  - 9.4.3 The electrode burns a hole through the work piece.
  - 9.4.4 Poor penetration is obtained.
  - 9.4.5 The electrode overheats.
  - 9.4.6 A weld with a globular profile is formed.
  - 9.4.7 The weld is too thin.

(7)  
**[20]**

**QUESTION 10**

- 10.1 Name FOUR phases in the design loop. (4)
- 10.2 What are the common names of the following solders?
- 10.2.1 50 – 50 solder
  - 10.2.2 60 – 40 solder
  - 10.2.3 40 – 60 solder (3)
- 10.3 What is the function of flux when soldering? (3)
- 10.4 State FIVE important factors in making a good soft-soldered joint. (5)
- 10.5 Explain briefly how to tin the tip of a soldering-iron. (5)

**[20]**

**TOTAL: 200**

**END**