

18.0 METALWORK (445)



The 2009 KCSE examination for Metalwork consisted of two papers namely Paper 1 (theory) and Paper 2 (project). As in the previous years, Paper 1 was worth 60% of the overall mark while the project was worth 40% of the final mark.

18.1 CANDIDATES' GENERAL PERFORMANCE

The table below shows the candidates performance in Metalwork in the year 2009. The statistics for the previous two years have also been included for comparison.

Table 23: Candidates Overall Performance in Metalwork in the years 2009, 2008, and 2005

| Year | Paper | Candidature | Maximum Score | Mean Score | Standard Deviation |
|------|----------------|-------------|---------------|--------------|--------------------|
| 2005 | 1 | | 60 | 23.40 | 9.60 |
| | 2 | | 40 | 34.90 | 3.24 |
| | Overall | 311 | 100 | 57.74 | 12.00 |
| 2008 | 1 | | 60 | 23.62 | 6.95 |
| | 2 | | 40 | 35.62 | 4.57 |
| | Overall | 89 | 100 | 59.24 | 9.39 |
| 2009 | 1 | | 60 | 25.38 | 9.09 |
| | 2 | | 40 | 35.34 | 3.38 |
| | Overall | 231 | 100 | 58.74 | 13.32 |

From the table above, the following observations can be made:

18.1.1 The number of candidates rose significantly from **89** to **231**.

18.1.2 The general performance for the three years was almost the same but the standard deviation for Paper 2 went down probably due to the fact that the marking of the project was done by the teachers without the involvement of the Council assessors.

The questions which were reported to have been poorly done will be analyzed with a view to identifying the candidates' weaknesses and offer suggestions on some remedial measures to be taken in order to improve the performance in future. The questions for discussion include 3, 8, 10, 12 and 13 in Paper 1.

18.2 PAPER 1 (445/1)

Question 3

- (a) With reference to cutting external thread:
- name two types of dies used;
 - state two reasons for using cutting oil.
- (b) An M10 internal thread is to be cut in a mild steel plate. Given that the thread pitch is 1.5mm, determine the size of the drill to be used.

The first part of this question tested the candidates' mastery of thread cutting process while the second part (3b) of the question required the candidates to calculate the drill size to be used to drill a hole for threading. Question 3(a) was quite well done but most of the candidates found it very difficult to determine the required drill size.

Expected response

- Tapping diameter = Root diameter - pitch
= 10 - 1.5
= 8.5 mm

Question 8

Outline the differences between:

- (a) the oxygen set and the acetylene set in oxy-acetylene equipment;
- (b) brazing and gas welding.

The candidates were required to point out the differences between the acetylene set and the oxygen set in gas welding equipment and also distinguish between brazing and gas welding processes. The majority of the candidates could not tell the differences required in part (a) and (b) of this question.

Expected responses

There are distinct differences in colour, cylinder size, thread type and safety plugs between the oxygen set and the acetylene set which the candidates were required to point out. In part (b) the candidates should have indicated that in brazing the parent metal is not melted, the oxidizing flame is used, spelter and flux are required while in gas welding, the parent metals are melted to fuse, neutral flame is used and the filler rod of the same material as the parent metals is used.

Question 10

Figure 2 shows orthographic view of a component.

Sketch in good proportion the isometric views of the component.

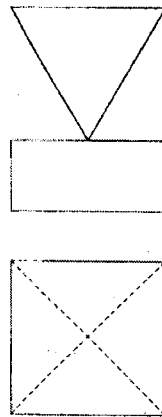
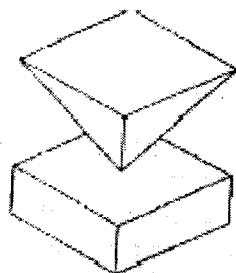


Figure 2

Candidates were required to convert the given orthographic views into an isometric drawing which most of the candidates fail to present accurately.

Expected response



Question 12

- (a) Name three methods of testing the quality of gas-welded joints.
- (b) Sketch the correct flame for welding brass and outline the procedure of setting the flame.

- (c) Use labelled sketch to show an appropriate technique for gas welding thick plate and give three reasons for using the technique.

The question required the candidates to list various methods of testing welded joints, sketch the oxidizing flame and illustrate the rightward welding technique. Apparently, from the responses given, most of the candidates had very vague ideas about the flame and the welding techniques required.

Expected responses

- (a) TESTING METHODS

Inspection
 Fluid or die penetration
 X - ray
 Magnetic
 Subjecting to stress

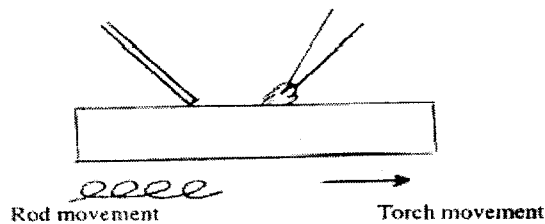
- (b) (i)



Oxidizing flame

- (ii) Open the acetylene cylinder half turn.
 Open the oxygen cylinder full turn.
 Open acetylene needle valve and set to required pressure.
 Open oxygen needle valve and set to required pressure.
 Open acetylene valve slightly and light the torch.
 Increase gas till flame is clear of soot.
 Open oxygen valve and set flame to oxidizing.

- (b)



REASONS FOR TECHNIQUE

Less gas used
 Cooling rate is lower
 Faster than leftward
 Better view of molten pool
 No bevel required

Question 13

- (a) With the aid of a sketch, explain the term piping as applied to forging and state how it can be avoided.
- (b) The end portion of a mild steel bar of cross-section 40 x 70mm is to be reduced to 20 x 70 by fullering. With the aid of sketches, outline the procedure of reducing the cross section naming the tools used in each step.

Candidates were required to explain what piping is and outline the procedure of fullering a mild steel bar to a smaller diameter. The answers given by most of the candidates portrayed lack of adequate knowledge on fullering and piping.

Expected response

(a) PIPING

(i) Hollow point developed at the tip of a bar when drawing down

(ii)



(iii) When drawing down:

- forge the cross-section to square
- forge the cross-section to octagon
- forge the cross section to round.

(b) FULLERING

Marking the portion to be forged.

Heat the portion to be forged to be right temperature.

Position the end between the fullers.

Hammer the top fuller to reduce the thickness.

Repeat steps 2, 3 and 4 until the required size is approached.

Use flatter to smmothen the surface and finish to size.

18.3 PAPER 2 (445/2)

This was a project paper where candidates were required to make a predesigned hand press under the supervision of their teachers. The skilled tested in this project included marking out, cutting, filing, forming, drilling, riveting, threading, chamfering, brazing and gas welding.

The teachers used a marking scheme provided by the KNEC to mark the projects, recorded the scores in manual marksheets provided and sent the candidates' marks to the Council for processing.