



**L-Università
ta' Malta**

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**SECONDARY EDUCATION CERTIFICATE LEVEL
2018 MAIN SESSION**

SUBJECT:	Engineering Technology
PAPER NUMBER:	Controlled – Unit 2
DATE:	28 th May 2018
TIME:	10:00 a.m. to 11:35 a.m.

**THIS PAPER SHOULD BE RETURNED TO THE INVIGILATOR
AFTER THE EXAMINATION.**

Name of candidate _____

I.D. number _____

School _____

Class _____

Answer **ALL** questions in the space provided. The use of non-programmable electronic calculators is allowed.

Scenario

A new space exploration craft is being designed using the most modern of material technologies. To be considered to be part of the team designing this space exploration craft you need to answer well the questions below.

Question 1

K4 (4 marks)

Smart materials are able to change their properties when externally stimulated. Describe the function of each smart material listed in Table 1 below.

Table 1 – Smart Materials

	Smart Material Type	Function
(a)	Self-healing materials	
(b)	Piezoelectric materials	
(c)	Magnetic shape memory materials	
(d)	Shape memory polymers	

(4)

Question 2

C2 (6 marks)

Goods and products are manufactured using different processes. Different materials also require different manufacturing processes.

(a) Explain the procedure for carrying out annealing in the metallurgical industry.

(1)

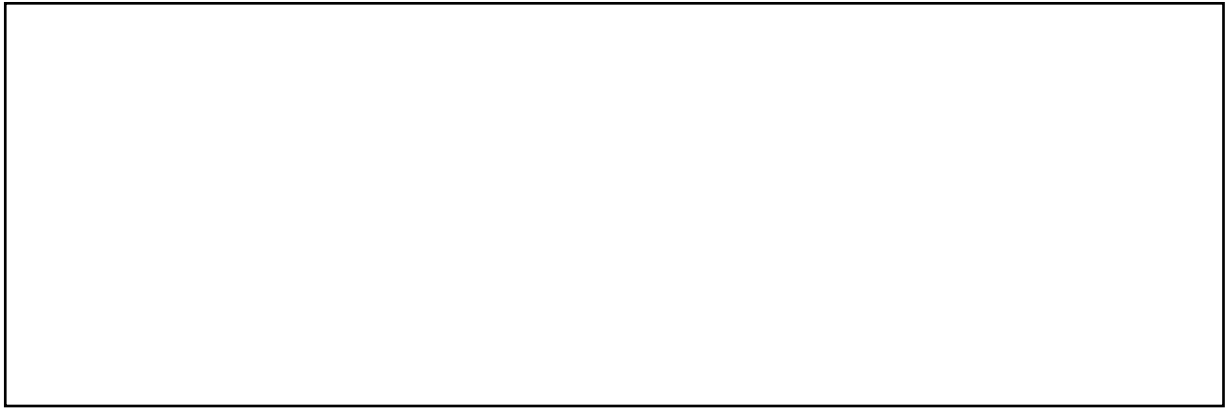
(b) Electroplating is an important process related to the production of metal parts.

(i) Explain how the process of electroplating is carried out.

(1)

This question continues on next page.

(ii) Draw a labelled sketch of a simplified setup in the box provided below.



(1)

(c) Mention and explain a process used to manufacture wooden furniture.

(1½)

(d) Explain briefly how thermoplastic products are produced using blow moulding.

(1½)

Question 3**K5 (4 marks)**

Material properties can be tested using different testing procedures. Complete Table 2 by outlining the procedure required to carry out the test properly. The first one has been done for you.

Table 2 – Tests carried out to measure material properties.

	Test	Outline of procedure required to carry out the test properly.
	Temperature of a liquid	Temperature can be measured by using a mercury thermometer. The thermometer is placed in the liquid and swirled around, without touching the container. This is continued until the temperature indication on the thermometer stops changing. At this point the level of the mercury inside the thermometer is read against a scale which indicates the temperature of the liquid.
(a)	Tensile test of an aluminium rod.	
(b)	Environmental degradation of a mild steel plate in a salty environment.	
(c)	Compression testing on a concrete cube.	
(d)	Shear testing of a steel bolt.	

(4)

Question 4

C3 (6 marks)

In manufacturing environments materials are continuously tested to ensure that their properties comply with the established standards. Table 3 below shows four scenarios of engineering situations. For each of these scenarios, state the test which is carried out and justify your selection by outlining the test carried out. The first one has been done for you.

Table 3 – Scenarios for which testing is required

	Scenario	Which test is carried out	Justification and procedure of selected test.
	A metal is used to make a tool which is then used in a lathe to work on other metals. Testing is required to ensure that the material selected to make the tool will be able to last for a long time when in use.	Hardness testing	Hardness testing measures the resistance of the metal to suffer permanent shape changes with the application of a compressive force. The harder the material the more it will last when used as a tool on other materials.
(a)	Steel rods are used in concrete to reinforce it. The metal used to manufacture these rods needs to be tested to ensure that they are of the correct strength.	(1/2)	(1)
(b)	A sample of road surface needs to be tested to ensure that it is strong enough to support the vehicle loads.	(1/2)	(1)

(c)	Lamp posts fitted near the sea are exposed to salt spray which corrodes them. The material which is used to construct them needs to be tested to ensure that it is fit for purpose.	(1/2)	(1)
(d)	Steel rods are used to construct a bridge. The material used to build the bridge needs to be tested to determine how resistant it is when hit by other objects.	(1/2)	(1)

Please turn the page.

Question 5

K6 (4 marks)

Different materials are available in different forms of supply. Fill in Table 4 to identify a possible form of supply for **EACH** type of material. The first one has been done for you.

Table 4 – Forms of Supply

	Type of material	Possible form of supply
	Metals	Bars
(a)	Wood	
(b)	Wood	
(c)	Polymer	
(d)	Polymer	

(4)

Question 6

K9 (4 marks)

Power tools and machinery are used for different tasks in manufacturing workshops. Each tool has a different function and is used in different situations.

Complete Table 5 by outlining the functions of the different tools and machinery listed in the table. The first one has been done for you.

Table 5 – Functions of Power Tools/Machinery

Name	Function
Angle Grinder	An angle grinder is a handheld power tool. It is used for grinding, polishing and cutting by abrasive cutting.
(a) Lathe	
(b) Band Saw	
(c) Vacuum Former	
(d) Sanding machine	

(4)

Please turn the page.

Question 7

K10 (4 marks)

Tools need to be well maintained to ensure these work safely and effectively. Describe **TWO** points for the appropriate use, and **TWO** points for maintenance and care procedures for the tools given below.

(a) Power tools e.g. jigsaw.

(i) Use

(1)

(ii) Maintenance and Care

(1)

(b) Measuring tools e.g. Vernier Callipers.

(i) Use

(1)

(ii) Maintenance and Care

(1)

Question 8

C5 (6 marks)

For this question you are to select and answer only **ONE** of the options, **either** Option A **or** Option B.

Option A

The engineering component shown in Figure 1 needs to be manufactured as part of an engine gearbox.



Figure 1- Engineering Component.

Source: <http://www.globalsources.com>

Describe how this part would be manufactured by justifying the choice of tools used to manufacture this engineering component.

(6)

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Option B

The wooden toolbox shown in Figure 2 needs to be manufactured.

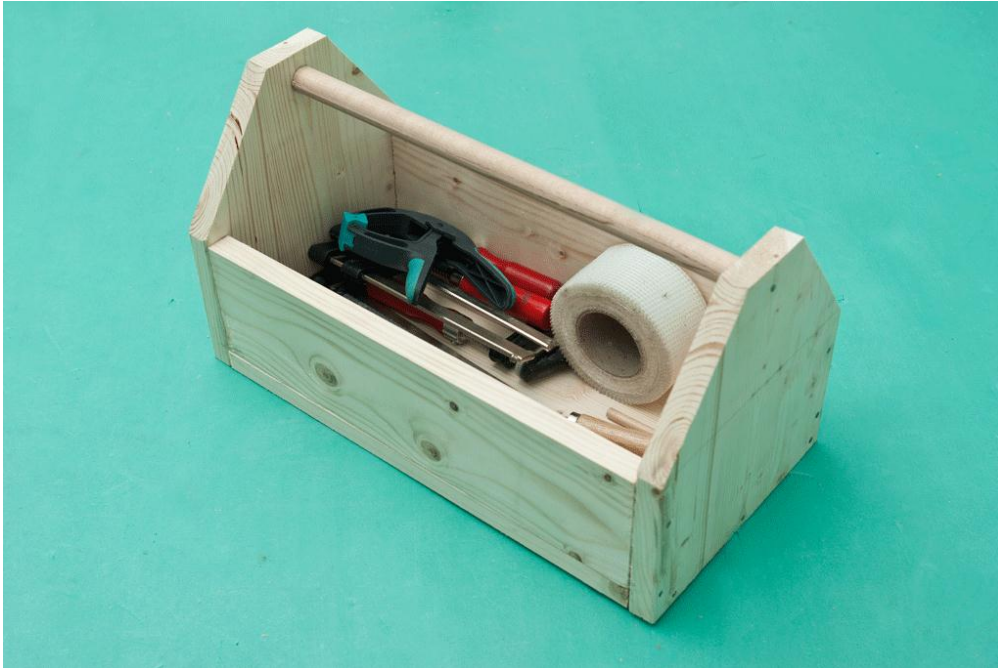


Figure 2- Wooden Toolbox

Source: <http://howtospecialist.com/>

Describe how this toolbox would be manufactured by justifying the choice of tools used to manufacture it.

(6)