

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA

SECONDARY EDUCATION CERTIFICATE LEVEL

MAY 2017

SUBJECT:	Engineering Technology
PAPER NUMBER:	Controlled – Unit 3
DATE:	4 th April 2017
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 _____

Scenario

An electronics manufacturing company is interested in expanding its operations. In view of this the company is interested in recruiting several employees. As part of the interview, the management is determining whether candidates applying for the posts are skilled in the area of electronics engineering and have the necessary experience with health and safety procedures. Answer questions 1 to 8 to demonstrate that you are a suitable candidate for a post within this electronics manufacturing company.

Question 1

C1 (6 marks)

The use of Personal Protective Equipment (PPE) is an essential means of protecting a person from injury while conducting work in a workshop. Different types of PPE are required to protect against the different hazards encountered. In Table 1 below fill in the column labelled as “PPE”. You need to mention only **ONE** item of PPE in each box. The first one has been done for you.

Table 1- PPE used for various tasks.

Task	PPE
a) Drilling of holes in PCB	Safety Eyeglasses
b) Handling of heavy boxes	
c) Working underneath an operational crane which is lifting equipment	
d) Handling of dangerous chemicals	
e) Working with electricity switched on	
f) Working in an area where there are dangerous fumes	
g) Working in a busy road	

(6)

Question 2

K2 (4 marks)

In the electronics manufacturing industry several procedures are used to prevent electrostatic discharge and protect the electronic circuits. An operator happens to be shifting electronic devices from one tray to another and packing the trays in a bag.

Fill in the column labelled as “Procedure” in Table 2 below by writing down four procedures which can be used to prevent damaging the electronic devices via electrostatic discharge. In the column labelled as “Definition of Procedure” define each procedure. The first example has been done for you.

Table 2- Procedures to prevent damaging the electronic devices via electrostatic discharge

Number	Procedure	Definition of Procedure
a)	Use wrist straps when handling electronic components.	The operator can work a special wrist strap. The wrist strap is connected to ground and keeps the operator and the workbench, which is also connected to earth, at the same potential. This does not allow electrostatic voltages to build up.
b)	(½)	(½)
c)	(½)	(½)
d)	(½)	(½)
e)	(½)	(½)

Please turn the page.

Question 3

K3 (4 marks)

- a) A Printed Circuit Board (PCB) taking up a total of 0.2 A at 12 V DC needs to be powered. Describe how a power supply would be used in the lab to power up such a PCB.

(2)

- b) Describe the function of a battery charger.

(1)

- c) State **ONE** typical use of a battery charger.

(1)

Question 4

K4 (4 marks)

Electronic circuits are built using various components. Two of the most important components are diodes and bipolar junction transistors. These components have different characteristic curves which show how they behave when different voltages and current values are applied to the device.

- a) Sketch the current-voltage (IV) characteristic curve of a diode in the space provided below.



(2)

- b) For a Bipolar Junction Transistor (BJT), sketch a characteristic graph showing Collector current (I_C) vs Collector Emitter voltage (V_{CE}) for various base current (I_B) values in the space provided below.



(2)

Please turn the page.

Question 5

K7 (4 marks)

The output of electronic circuits can be measured using instruments such as multimeters and oscilloscopes.

- a) Describe the main features of a multimeter by labelling Figure 1 below. A label has been filled for you.

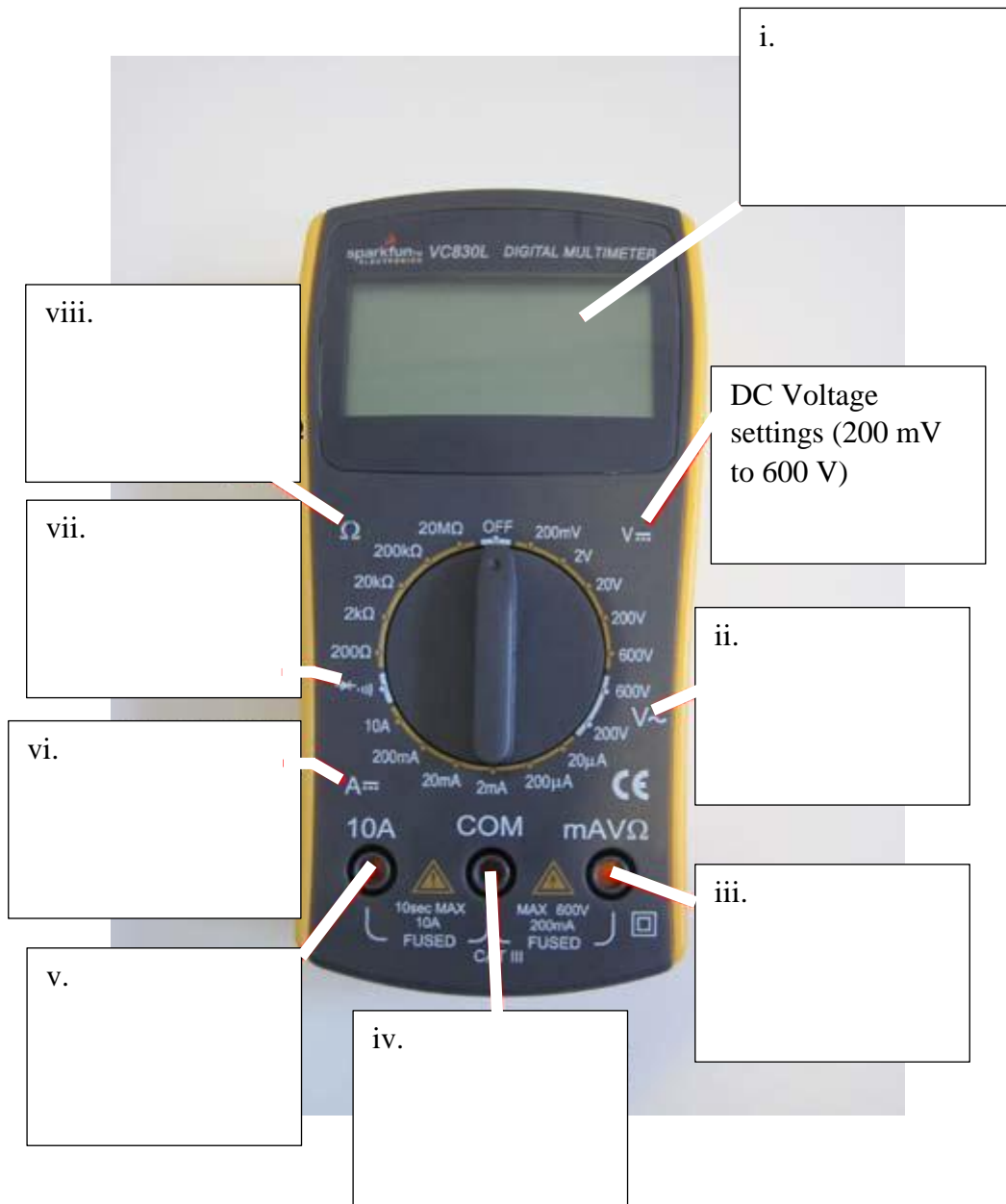


Figure 1- Multimeter

Source: http://www.cdn.sciencebuddies.org/Dirs/14/11/sparkfun-digital-multimeter-1_img.jpg

(2)

b) Oscilloscopes are essential instruments that are used to analyse signals obtained from electronic circuits. List **FOUR** important features (physical or setting knobs) of oscilloscopes.

(2)

Question 6

K9 (4 marks)

Electronic circuits are becoming more popular in today's world and their functions become more complex. There are several methods which can be used when constructing circuits.

a) List **THREE** methods that can be used to construct circuits.

(1)

b) Describe **EACH** method listed above.

Method 1:

Method 2:

Method 3:

(3)

Question 7

C3 (6 marks)

You are in an electronics workshop and have connected a power supply to your printed circuit board. This power supply is needed to provide a 12 V, 2 A DC supply to your circuit. Unfortunately when you turn the power supply on, nothing happens and the circuit board does not work. The indication lamps on the power supply do not turn on.

- a) Which test equipment should be used to determine if the power supply is operating correctly?

(2)

- b) Suggest a procedure to determine if the power supply is operating correctly.

(4)

Question 8

C4 (6 marks)

Different types of test equipment can be used to test functionality of electrical circuits and define their parametrical values. A circuit is built as shown in Figure 2 below.



Figure 2- Light bulb circuit.

After some time of operation the light bulb goes out.

- a) Identify the test equipment that is used for troubleshooting of this circuit.

(2)

- b) How is this equipment used to pinpoint the fault?

(4)

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