DIRECTORATE FOR QUALITY AND STANDARDS IN EDUCATION
Department for Curriculum Management and eLearning
Educational Assessment Unit
Annual Examinations for Secondary Schools 2013

L

5 – 6 – 7

FORM 1 **DESIGN AND TECHNOLOGY** **TIME: 2 hrs**

Name: _____ **Class: _____**

---------- Note to student: ----------

You are required to answer all questions

Useful Formula

V=IR

FOR TEACHERS' USE ONLY DISTRIBUTION OF MARKS

	Marks for Written Exam.	Marks for Design Folio	Marks for Making Skills	TOTAL	**FINAL MARK**
Max. Marks	100	50	50	200	**%**
Student's mark					

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1. Re-arrange the following design stages in the correct sequence.

Initial Ideas	*Design brief*	*Development*	*Specifications*
Research	*Chosen Idea*	*Situation*	*Testing and Evaluatio*
Making	*Planning*		

(i) _____

(ii) _____

(iii) _____

(iv) _____

(v) _____

(vi) _____

(vii) _____

(viii) _____

(ix) _____

(x) _____ **½ mark x 10 = 5 marks**

THE DESIGN BRIEF BELOW WILL BE USED THROUGHOUT THE WHOLE PAPER.

Design and make a battery operated educational toy which makes use of the property of electrical conductivity of materials. The toy is to be used by pre-school children.

2a. Write down THREE keywords.

(i) _____

(ii) _____

(iii) _____

1 mark x 3 = 3 marks

b. List down TWO specifications that you would consider before designing the Educational Toy.

(i) _____

(ii) _____

1 mark x 2 = 2 marks

c. State TWO methods by which you can communicate your ideas about the educational toy to other persons.

(i) _____

(ii) _____ **1 mark x 2 = 2 marks**

3. Figure A shows one idea for this toy. It consists of a face-shaped casing which h
shaped hole where the child can put the play pieces made from different materials.
material inserted is a conductor of electricity, the light bulbs representing two eyes wi
up. The LED, symbolizing the nose, is an indicator for when the system is switched on.

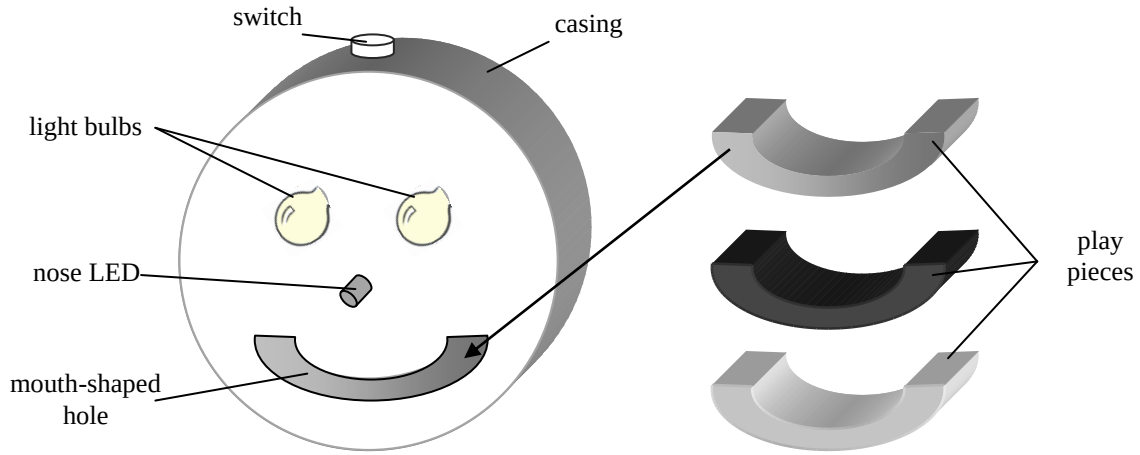


Figure A: One of the ideas for the toy

a. Make use of the space below and sketch ONE other idea for an educational toy. Your sketch must be clear and showing approximate overall sizes, materials, and any proposed finish or decoration. You are free to colour your sketches.

8 marks

b. Some of the play pieces are to be made of the following materials:

▪ MDF ▪ copper ▪ acrylic ▪ aluminium

i) Write down the TWO materials which conduct electricity.

_____ _____

1 mark × 2 = 2 marks

c. State which materials conduct electricity. _____

d. Give the name of TWO other materials which conduct electricity, apart from th mentioned above.

_____ _____ **1 mark × 2 = 2 marks**

4. The casing of the toy is planned to be made of the plastic high-density polythene (HDPE).

a. List FOUR products, apart from toys, that are made from plastic.

_____ _____

_____ _____ **½ mark × 4 = 2 marks**

b. High-density polythene can be reheating and reshaped.

i. What type of plastic is HDPE? _____ **1 mark**

ii. Name TWO other plastics which can be reheated and reshaped. Add ONE use for each.

NAME OF PLASTIC	USE

3 marks

c. Suggest TWO reasons why HDPE was chosen for the casing of this toy.

_____

_____

1 mark × 2 = 2 marks

5. The polythene casing is planned to be built up from five different layers. The front and back will be made from 3mm thick material, while the three central layers will be made up of 6mm thick material as shown in Figure B. The central layers are cut-out rings which allow space for the internal circuitry.

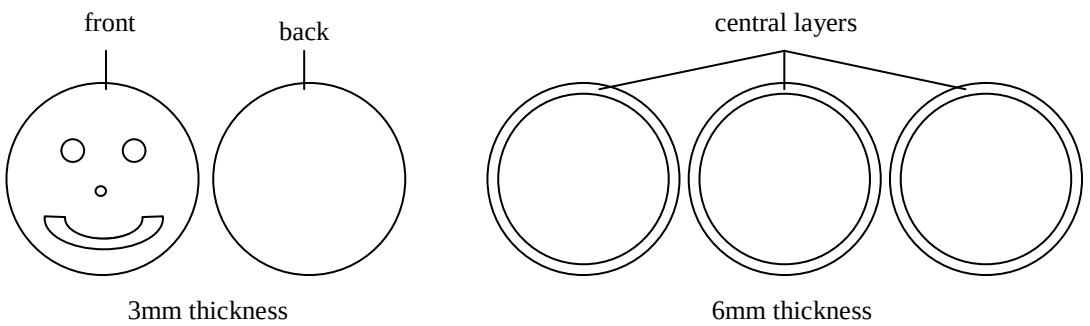
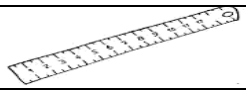
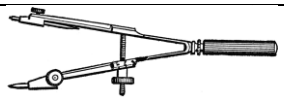


Figure B: Parts of the casing for the toy

a. The following table shows the list of tools used to form the different parts of the c drawn in Figure B. Fill in/sketch the missing information.

NAME OF TOOL	DIAGRAM	USE
Steel rule		measuring out
Pen		
		
		cutting out the outer diameter
		manually drilling holes
Twist drill		

6 marks

b. Choose TWO tools from the table above and jot down TWO safety precautions for each. All safety precautions should be different from each other.

TOOL	SAFETY PRECAUTIONS

½ mark × 4 = 2 marks

c. The following is a list of file profiles used to shape the casing of the toy:

▪ **triangular file** ▪ **flat file** ▪ **half-round file** ▪ **round file**

From the above list, suggest the most suitable file profile for smoothing down:

i. the outer diameter: _____

ii. the holes for the bulbs: _____

iii. the mouth-shaped hole corners: _____

iv. the mouth-shaped hole curved edges: _____

½ mark × 4 = 2 marks

d. Complete the following sentences by filling in the blanks.

i. The front and _____ parts need to be fixed together in a ... that is not easy to disassemble, therefore _____ should be use...

ii. The _____ part needs to be removed when the battery needs replacement, and therefore it should be joined with _____ to the central parts. **1 mark x 4 = 4 marks**

e. Draw ONE labelled diagram to explain how the different parts are to be joined to each other. Include thickness of material, part names and joining methods.

3 marks

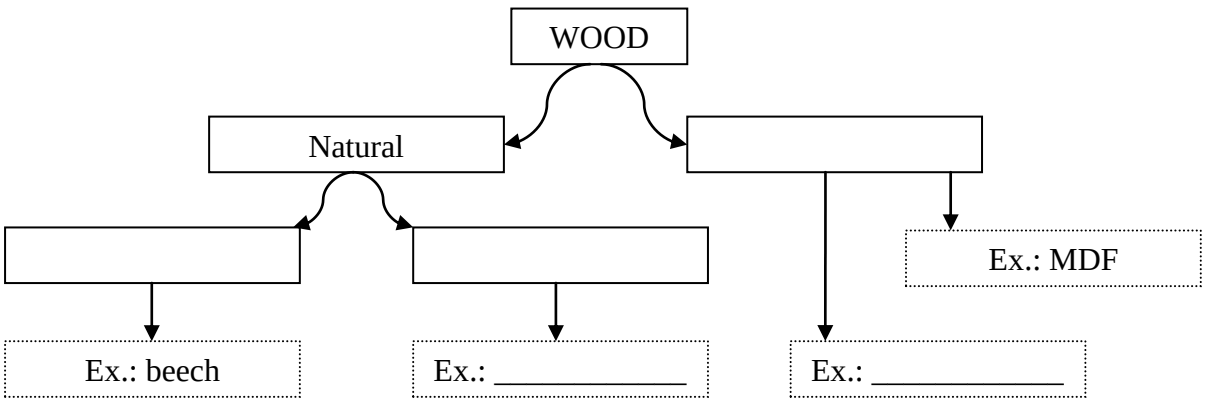
6. Another idea for the casing was to use beech for the central parts shown in Figure B.

a. Give ONE advantage and ONE disadvantage for using beech over HDPE.

ADVANTAGE	
DISADVANTAGE	

1 mark × 2 = 2 marks

b. Fill in the empty boxes.



1 mark × 5 = 5 marks

c. By means of labelled sketches, explain how you would construct the new sugge[illegible] with front and back parts still made of HDPE, but the central part made fro[illegible] Remember that natural wood can be found in larger thicknesses than plastics. I[illegible] sketches, show the joining method used.

3 marks

7. **Figure C** shows some of the electronic components used for the educational toy.

a. Fill in the following table by drawing the appropriate electronic symbol.

	SPST push type latched switch
	AA type battery
	1.5V screw type bulb
	3mm LED

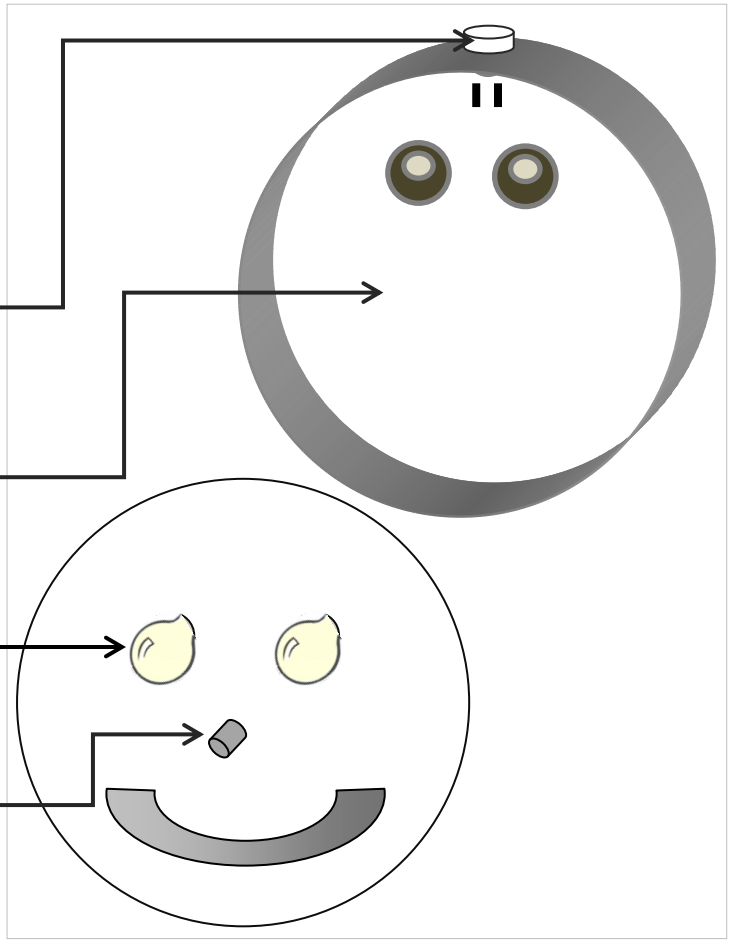


Figure C : Inside view of the educational toy

1 mark × 4 = 4 marks

b. Draw TWO AA type batteries connected in series. In your diagram use only [illegible] symbols.

2 marks

c. Calculate the total voltage for the TWO batteries connected in series.

_____

_____ **2 marks**

d. Mention TWO other sources of electrical energy apart from batteries.

_____ _____ **1 mark × 2 = 2 mark**

e. Give the meaning of:

i. **PRIMARY BATTERIES** _____

ii. **SECONDARY BATTERIES** _____

1 mark × 2 = 2 mark

f. Add the following terms in the boxes provided on Figure D to complete the block diagram for the electronic system of the educational toy.

LED **Switch for nose** **Right eye bulb**

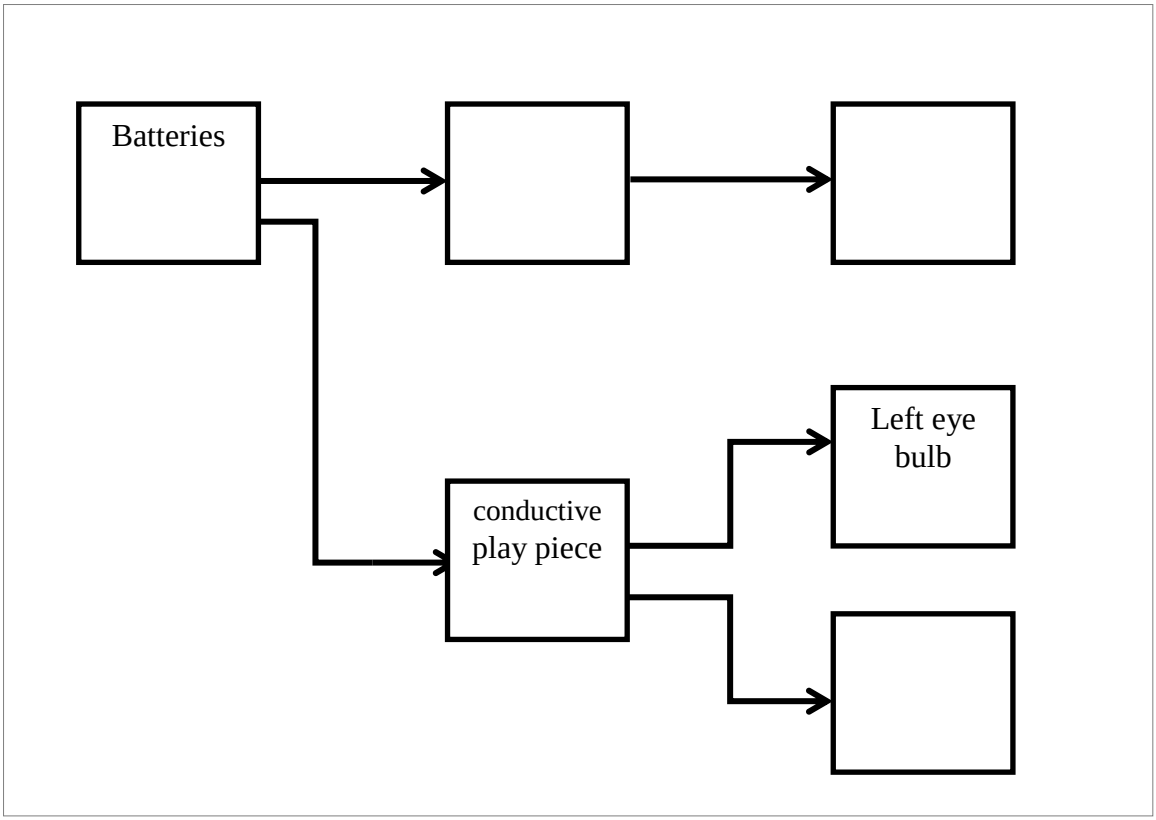
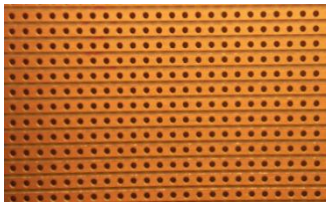


Figure D: Block diagram of the system

1 mark x 3 = 3 marks

8. Before the electronic circuit was assembled on a strip board, it was first [illegible] breadboard.

a. Label the **VEROBOARD** and **BREADBOARD** in the table provided

1 mark × 2 = 2 marks

b. Figure E shows a circuit which was used to test the function of the play piece as a switch to turn on the 1.5V bulbs. When a conductive play piece touches the conductive pins, the two bulbs light.

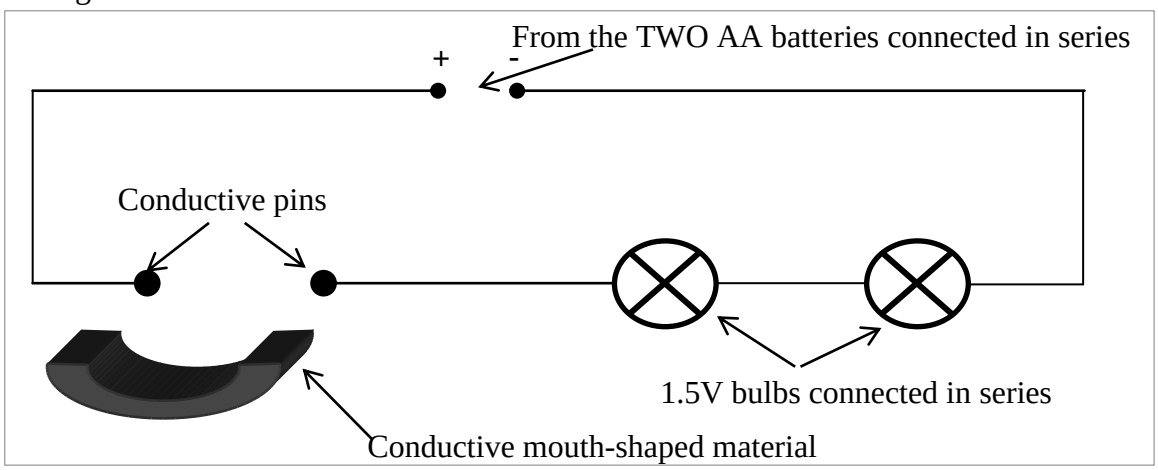


Figure E: Circuit diagram

On Figure F, connect the given components to form the electronic circuit shown in Figure E.

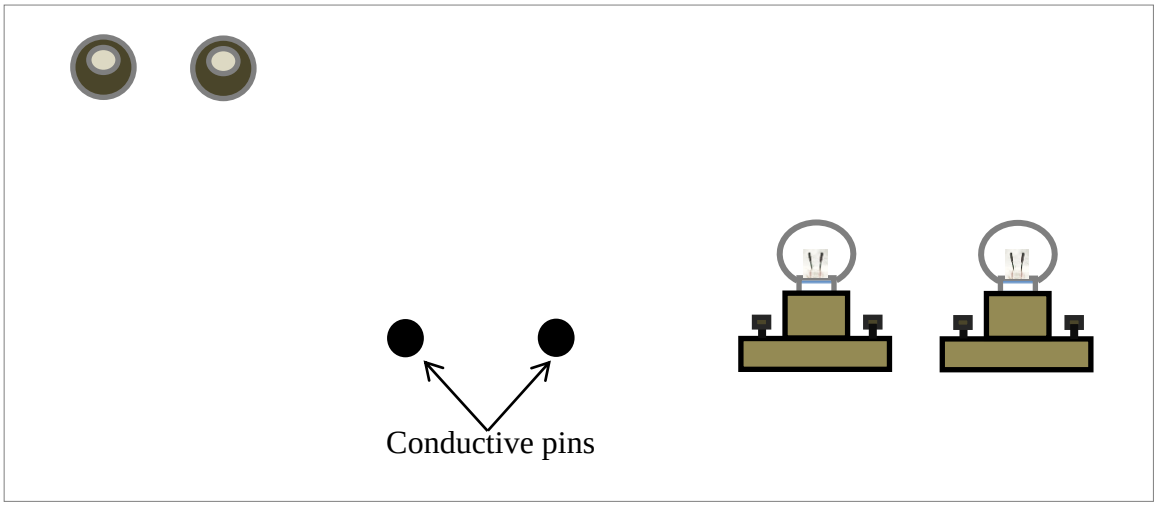


Figure F: Components of the circuit

5 marks

9. The circuit layout in Figure G is incomplete.

a. Complete the electronic circuit layout on Figure G to show how it is possible to conn TWO bulbs in series with the supply and conductive pins as shown in Figure E.

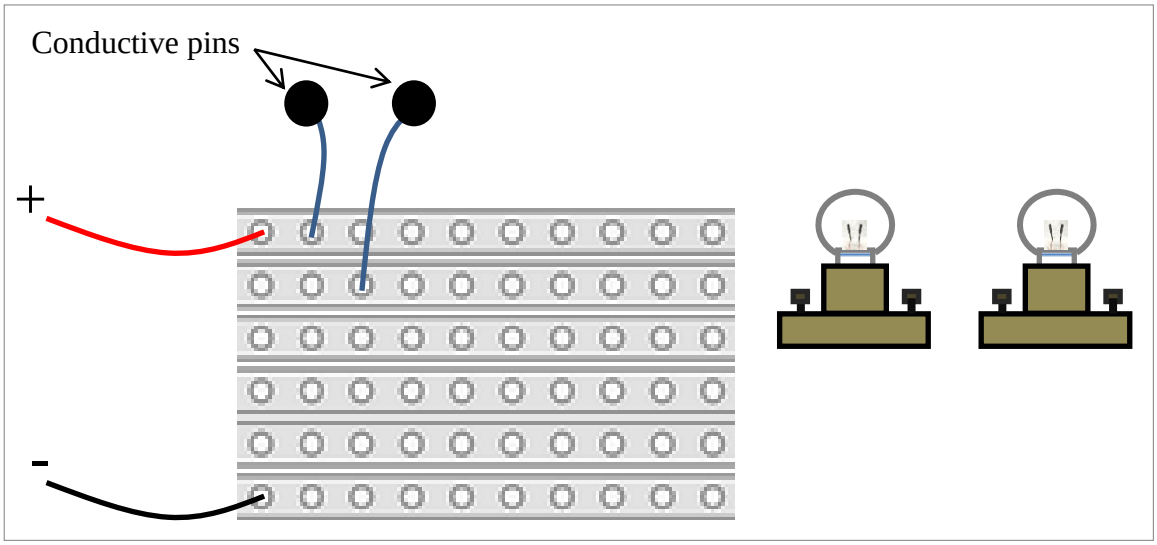


Figure G: Circuit layout

5 marks

b. Give the definition of :

i. **CONDUCTOR** _____

ii. **INSULATOR** _____

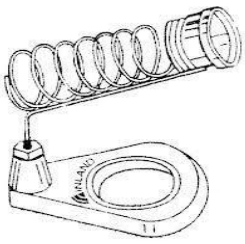
1 mark × 2 = 2 marks

c. Mention ONE safety precaution that must be observed during the making of electronic circuits in the design and technology laboratory.

_____

1 mark

d. Label the following resources which are used to construct electronic circuits. [illegible] function for each.

RESOURCE	NAME	FUNCTION
		
		
		

½ mark × 6 = 3 marks

10. Figure H shows the electronic circuit used to light up a 2.1V, 0.025Amps LED that represents the nose. It was noticed that when the switch was pressed, the LED burnt out.

a. In the space provided near Figure H, re-design the electronic circuit to show how you would solve this problem without changing the supply voltage.

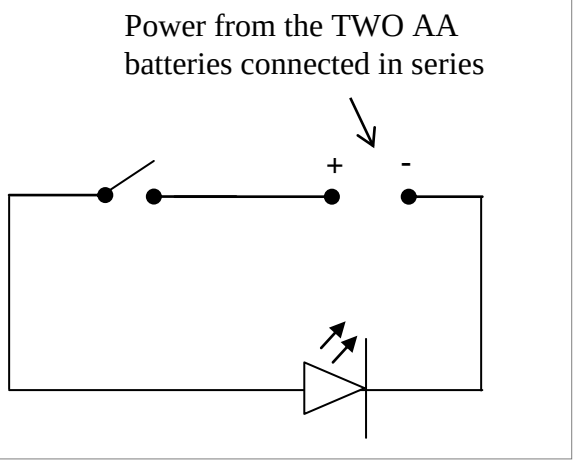


Figure H: Electronic circuit for nose LED

3 marks

b. Use proper calculations to find the value for the component/s you have added in the question 10a.

4 marks