DIRECTORATE FOR QUALITY AND STANDARDS IN EDUCATION
Department of Curriculum Management
Educational Assessment Unit

Annual Examinations for Secondary Schools 2014

FORM 3 (3rd Yr) DESIGN & TECHNOLOGY TIME: 2 hours

Name: _______________________________ Class: ____________

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

You are required to answer all questions.

Useful Formulae:

\[ V_{OUT} = \frac{R_2}{R_1 + R_2} \times V_{IN} \]

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FOR TEACHERS' USE ONLY

<table>
<thead>
<tr>
<th>Areas corrected</th>
<th>Marks for Written Exam.</th>
<th>Marks for Design Folio</th>
<th>TOTAL</th>
<th>FINAL MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>RM</td>
<td>E</td>
<td>F</td>
<td>T</td>
</tr>
<tr>
<td>Max. Marks</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

Student’s mark

Enter student’s mark obtained in every area of study in the above table.
D for Design, RM for Resistant Materials, E for Electronics, F for Food and T for Textiles

Design and Technology – Form 3 (3rd yr) Secondary – 2014
**SECTION A: Design Process**

Read the situation carefully. **Questions 1 to 6** refer to it.

**The Association for Athletes is going to celebrate its 50th anniversary by organising a run, a walk, and a cycle for its members. Each participant is invited to give a contribution of €5 and will be given a souvenir at the finish line. The association has asked you to design this souvenir to be distributed to the athletes on the day. The souvenir should be produced from either textiles or resistant materials.**

Choose the area you want to work in by ticking the desired box:

- [ ] Textiles
- [ ] Resistant Materials

1. **a.** Write a design brief for the given situation.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

   ___________________________________________________________________
   
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

   2 marks

   **b.** Find TWO keywords from your design brief.

   ____________________________________________________________
   ____________________________________________________________

   ½ mark × 2 = 1 mark

2. For your design ideas to be satisfactory, you first need to do research. You therefore decided to conduct some product analysis related to the above situation.

   **a.** Name TWO products that you would choose to analyse.

   ____________________________________________________________
   ____________________________________________________________

   ½ mark × 2 = 1 mark

   **b.** Write down THREE questions you would ask about the product you are analysing.

   - ____________________________________________________________
   - ____________________________________________________________
   - ____________________________________________________________

   1 mark × 3 = 3 marks

3. Give ONE reason why designers need a list of specifications before they start to generate ideas.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

   2 marks
4. Sketch ONE initial idea that will satisfy the design brief you wrote in Question 1. Remember that in order to communicate your ideas to others, it is important that your sketches are clear and give an indication of size, material, colour, finishing and any purposeful decorations.

5. Explain briefly how you choose the best idea after sketching your initial ideas.

______________________________________________________________________________
______________________________________________________________________________

2 marks

6. The Association for Athletes needs 2000 souvenirs.

a. State the method of production you would use to produce the souvenirs. Give TWO reasons for your answer.

METHOD OF PRODUCTION:

REASONS:

3 marks

b. Give TWO examples of products that could be produced as one-off for the celebrations mentioned in the situation above.

• __________________________________________________________________________

• __________________________________________________________________________

½ mark × 2 = 1 mark
A scientist was doing some experiments on mixing liquid chemicals and wanted to find out which of three mixtures heated up first by the chemical reaction. The mixing was done inside beakers which had a temperature sensor inside. These experiments involved a certain level of risk so an appropriate cubicle was designed as shown in Figure A.

7. The cubicle was made of materials which are thermal insulators.
   
   **a.** Define the term thermal insulators.
   
   ____________________________________________________________

   **1 mark**

   **b.** Identify TWO resistant materials which are thermal insulators.
   
   ____________________________________________________________  
   ____________________________________________________________

   **1 mark \times 2 = 2 marks**

8. The sides and back of the upper part of the cubicle were made from one whole plastic sheet having two 90° corner bends.

   **a.** Sketch the flat shape which was cut out from the plastic sheet to form the sides and back. Show the bending lines on your sketch.
b. i. Name the equipment which is used to bend plastic at an angle.

_____________________________________________________________  1 mark

ii. Briefly explain how the plastic is bent on this equipment.

_____________________________________________________________

_____________________________________________________________  2 marks

9. The top opening flap is joined to the back by appropriate hinges which were bolted to the plastic and secured with nuts.

a. Sketch a bolt and nut joint. Label the bolt head and nut.

2 marks

b. Holes need to be drilled in order to insert the bolts. State TWO safety precautions that should be observed when drilling holes in plastic.

*                                                                                                                1 mark × 2 = 2 marks

*                                                                                                                1 mark × 2 = 2 marks

c. The bolts and nuts used for these hinges were made of a ferrous alloy. Give a definition and ONE different example for each of the following terms:

<table>
<thead>
<tr>
<th>TERM</th>
<th>DEFINITION</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alloy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 mark × 4 = 4 marks

d. Suggest another joining method, other than bolts and nuts, which is suitable to secure the hinges in place.

1 mark
10. Assume that the base of the cubicle has the form of a simple box. Suggest ONE method by which to join the base with the upper part of the cubicle. Use sketches to explain your answer. The joining method chosen should withstand the required handling.

SECTION C: Electronics

11. Figure B shows the power source circuit used for the experiment cubicle described in the previous section. Tick the correct column to state whether the following sentences are TRUE or FALSE.

<table>
<thead>
<tr>
<th></th>
<th>TRUE</th>
<th>FALSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Figure B shows 4 batteries connected in series.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Figure B shows 2 batteries connected in parallel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. AA, AAA, C, D, and PP3 all refer to different types of batteries.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Primary type batteries are batteries that can be used more than once.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Secondary type batteries are more environment-friendly than primary type batteries.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. An ammeter is used to measure the total voltage supplied by the circuit in Figure B.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ \frac{1}{2} \text{ mark } \times 6 = 3 \text{ marks} \]
12. **Figure C** shows the idea for the electronic system of the same experiment cubicle.

![Diagram of electronic system](image)

**Figure C**

a. What do we call the diagram shown in **Figure C**?

_____________________________________________________________________

1 mark

b. SPST switches were used for both the main switch and safety switch. In the space provided show how the TWO SPST switches are connected in series. In your answer use only electronic symbols.

_____________________________________________________________________

1 mark

c. A latched type switch was used for the main switch and a non-latched type switch was used for the safety switch. Give ONE reason why:

i. a latched type switch was used for the main switch.

_____________________________________________________________________

1 mark

ii. a non-latched switch was used for the safety switch.

_____________________________________________________________________

1 mark
13. **Figure D** shows a potential divider circuit used for the temperature sensors found in the electronic system of the experiment cubicle. **Table 1** shows part of the data sheet for Component A.

<table>
<thead>
<tr>
<th>Data for Component A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
</tr>
<tr>
<td>35°C</td>
</tr>
<tr>
<td>30°C</td>
</tr>
<tr>
<td>25°C</td>
</tr>
<tr>
<td>20°C</td>
</tr>
<tr>
<td>15°C</td>
</tr>
<tr>
<td>10°C</td>
</tr>
</tbody>
</table>

![Table 1](image)

**Figure D**

---

a. Name Component A labelled in **Figure D**.

__________________________ 1 mark

b. Decide whether Vout increases or decreases when the temperature rises. Give a reason for your decision.

__________________________________________________________________________

__________________________________________________________________________

2 marks

c. Refer to **Table 1** to calculate Vout when the temperature is 35°C.

2 marks

d. i. Place the potential divider shown in **Figure D** on the strip board in **Figure E**.

1 mark

ii. Using lines, show how to connect the mains power supply to the potential divider you have just drawn on **Figure E**.

1 mark

iii. On **Figure E**, draw lines to show how the digital multimeter (DMM) should be connected to measure Vout on the strip board.

1 mark
14. **Figure F** shows the incomplete electronic circuit used for the temperature sensor.

   a. On **Figure F** show how the potential divider circuit shown in **Figure D** is to be connected to turn the transistor on.  
      
      [Diagram of potential divider circuit showing direction of tracks]
      
      1 mark

   b. On **Figure F** show how an LED is to be connected so that it lights when the transistor is turned ON. Note that the LED needs 2.1V; 30mA.  
      
      [LED circuit diagram]
      
      1 mark

15. The transistor was replaced by a Darlington pair transistor so as to light a light bulb instead of the LED.

   a. Connect the TWO transistors shown in **Figure G** to form a Darlington pair transistor.  
      
      1 mark

   b. On **Figure G** label the collector, base and emitter of TR1.  
      
      1 mark

   c. Complete the sentences below by underlining the correct answer from the brackets.

      i. A Darlington pair transistor is used to ( amplify / store / decrease) the current.

      ii. The transistors used for the Darlington pair in **Figure G** were ( PNP / NPN / NNP ) type.

      \[ \frac{1}{2} \text{ mark} \times 2 = 1 \text{ mark} \]
SECTION D: Food

16. Underline the correct answer from the brackets for each of the following statements.
   b. Cheese is a good source of (fibre / calcium / iron).
   c. (Carbohydrates / Vitamins / Minerals) give us energy.
   d. The temperature of the fridge should be set between (0°C and 5°C / 5°C and 63°C / 63°C and 132°C).
   e. It is not safe to consume food after its (best before / use by / manufactured on) date.

   1 mark × 5 = 5 marks

17. a. Name the THREE methods of heat transfer in cooking shown in the pictures below.

   ![Heat Source](image1)
   ![Heat Source](image2)
   ![Heat Source](image3)

   1 mark × 3 = 3 marks

   b. State TWO reasons why food is cooked.

   • _____________________________________________
   • _____________________________________________

   1 mark × 2 = 2 marks

18. State whether the following statements on microwave cooking are TRUE or FALSE.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cooking is done quickly so there is no wastage of energy.</td>
<td></td>
</tr>
<tr>
<td>b. There is a great loss of nutrients.</td>
<td></td>
</tr>
<tr>
<td>c. Microwave leakages do not cause physical abnormalities.</td>
<td></td>
</tr>
<tr>
<td>d. Flavours do not change when reheating food.</td>
<td></td>
</tr>
<tr>
<td>e. The colours in the vegetables are retained.</td>
<td></td>
</tr>
<tr>
<td>f. Cookware used should be microwave safe.</td>
<td></td>
</tr>
<tr>
<td>g. Thawing can be done in minutes or seconds.</td>
<td></td>
</tr>
<tr>
<td>h. All food can be cooked in a microwave oven.</td>
<td></td>
</tr>
</tbody>
</table>

½ mark × 8 = 4 marks
19. Genetically Modified (GM) food is when a gene from one food is transferred into another. There is controversy over this issue although scientists claim that these foods are beneficial to consumers. State TWO benefits and ONE disadvantage of these GM foods.

<table>
<thead>
<tr>
<th>BENEFITS:</th>
<th>DISADVANTAGE:</th>
</tr>
</thead>
</table>

2 marks × 3 = 6 marks

SECTION E: Textiles

20. Knitted fabrics are widely used in today’s clothing market.

a. Identify TWO properties of knitted fabrics that make them suitable for clothing.
   * ___________________________________________  
   * ___________________________________________  

   1 mark × 2 = 2 marks

b. Give TWO advantages of using cotton knitted fabrics.
   * ___________________________________________  
   * ___________________________________________  

   1 mark × 2 = 2 marks

21. When using equipment, it is important to be safe.

a. State TWO safety checks you would carry out before using a sewing machine.
   * ___________________________________________  
   * ___________________________________________  

   1 mark × 2 = 2 marks

b. State TWO precautions you should observe when using dyes.
   * ___________________________________________  
   * ___________________________________________  

   1 mark × 2 = 2 marks
22. Textiles products manufacturers include after-care labels in their products.
   a. Mention TWO different pieces of information included on such labels.
      * ________________________________________________________________
      * ________________________________________________________________
      1 mark × 2 = 2 marks
   b. Why are symbols used on these labels instead of written instructions?
      ________________________________________________________________
      2 marks

23. In the space provided, sketch the plain seam. You may use colour to enhance your sketch.

24. Give TWO reasons why it is necessary to neaten the edge of a seam allowance.
   * ________________________________________________________________
   * ________________________________________________________________
   1 mark × 2 = 2 marks

25. The steam iron is a tool commonly found in a Textiles Lab. List TWO uses of the steam iron.
   * ________________________________________________________________
   * ________________________________________________________________
   1 mark × 2 = 2 marks