

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**  
**DESIGN AND TECHNOLOGY**  
Industrial Technology  
Sustainable Design

**A542**

Candidates answer on the question paper.

**OCR supplied materials:**

None

**Other materials required:**

None

**Monday 17 January 2011**  
**Afternoon**

**Duration: 1 hour**



|                       |  |                      |  |
|-----------------------|--|----------------------|--|
| Candidate<br>forename |  | Candidate<br>surname |  |
|-----------------------|--|----------------------|--|

|               |  |  |  |  |  |                  |  |  |  |  |
|---------------|--|--|--|--|--|------------------|--|--|--|--|
| Centre number |  |  |  |  |  | Candidate number |  |  |  |  |
|---------------|--|--|--|--|--|------------------|--|--|--|--|

**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions **in Section A and Section B**.
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Your quality of written communication is assessed in questions marked with an asterisk (\*).
- This document consists of **16** pages. Any blank pages are indicated.

**Section A**

Answer **all** questions.

You are advised to spend 15 minutes on this section.

For questions 1-5 **circle** your answer.

- 1** A business that makes products in many different countries is called a:
- (a) World-wide distributor
  - (b) Global company
  - (c) World manufacturer
  - (d) Global player **[1]**
- 2** RoHS means:
- (a) Royal Housing Sustainability
  - (b) Restrictions on the use of Hazardous Substances
  - (c) Regulations of Housing Sustainability
  - (d) Rules of Hazard use Standards **[1]**
- 3** Nanotechnology is the development of:
- (a) Multi-functioning products
  - (b) Reliable and durable products
  - (c) Miniaturised products
  - (d) Easy to maintain and repair products **[1]**
- 4** The transportation of materials and products increases:
- (a) Carbon offsetting
  - (b) Carbon handshake
  - (c) Carbon deposits
  - (d) Carbon footprint **[1]**

- 5 What does a photovoltaic cell use as a source of energy?
- (a) Solar energy
  - (b) Wind energy
  - (c) Wave energy
  - (d) Tidal energy
- [1]

6 From designing, through making and distribution to the final disposal of an item is known as:  
..... [1]

7 The disassembly of products so that materials can be reprocessed and reused is called:  
..... [1]

8 What type of primary resource is iron ore?  
..... [1]

9 What material is a product made from if it is marked with the symbol shown?



..... [1]

10 A material that naturally rots in the environment is called:  
..... [1]

Decide whether the statement is **true** or **false**.

Tick (✓) the box to show your answer.

|  | <b>True</b>              | <b>False</b>             |                   |
|--|--------------------------|--------------------------|-------------------|
| <b>11</b> Thermosetting plastics can be recycled                 | <input type="checkbox"/> | <input type="checkbox"/> | <b>[1]</b>        |
| <b>12</b> A product that can be reused has built in obsolescence | <input type="checkbox"/> | <input type="checkbox"/> | <b>[1]</b>        |
| <b>13</b> Waste from production should be reduced                | <input type="checkbox"/> | <input type="checkbox"/> | <b>[1]</b>        |
| <b>14</b> Planting trees will offset carbon footprint            | <input type="checkbox"/> | <input type="checkbox"/> | <b>[1]</b>        |
| <b>15</b> Modular design is better for servicing and repair      | <input type="checkbox"/> | <input type="checkbox"/> | <b>[1]</b>        |
|  |                          |                          | <b>Total [15]</b> |

Section B

Answer **all** questions.

You are advised to spend 45 minutes on this section.

16 Fig. 1 shows a hammock.

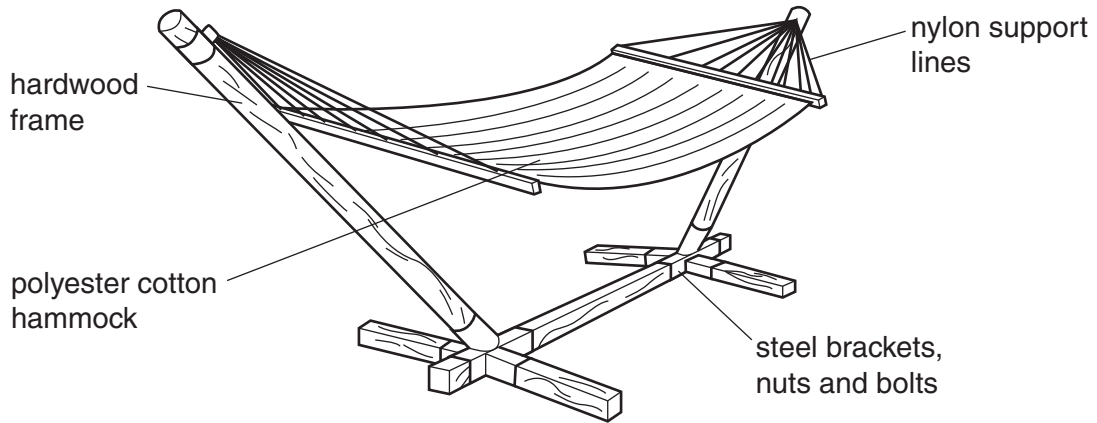


Fig. 1

(a) Using the hammock shown in Fig. 1 as an example, state the meaning of the following 6R terms.

Recycle the steel brackets

.....  
.....

Reuse the polyester cotton hammock

.....  
.....

Repair the hardwood frame

.....  
.....

Rethink the nylon support lines

.....  
.....

[4]

(b) The following materials are used when packaging the hammock.

| Packaging Material    | Item/Purpose                     |
|-----------------------|----------------------------------|
| polythene bags        | steel brackets, nut and bolts    |
| polythene shrink wrap | hardwood frame and hammock       |
| polystyrene block     | prevent movement in box          |
| paper                 | assembly and safety instructions |
| corrugated cardboard  | box to contain all items         |

(i) Explain how the packaging could be reduced.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) Other than reducing the amount of packaging, describe a more sustainable method of packaging the hammock.

.....

.....

.....

..... [2]

(c) Packaging often uses polythene and polystyrene.

(i) State **three** ways in which the **manufacture** of polythene and polystyrene packaging materials impacts on the environment.

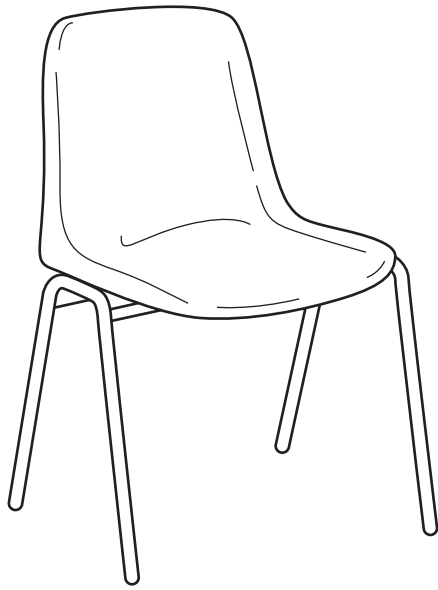
- 1. ....  
.....
- 2. ....  
.....
- 3. ....  
..... [3]

(ii) Explain the environmental impact of the **disposal** of polythene and polystyrene packaging materials.

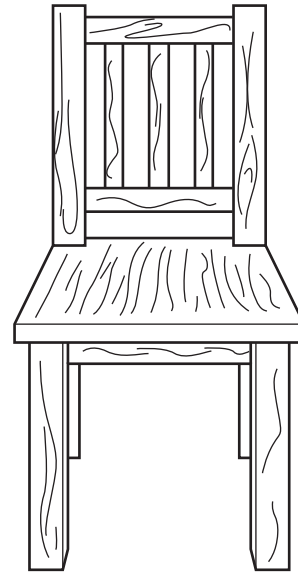
- .....
- .....
- .....
- .....
- .....
- .....
- ..... [3]

**Total [15]**

17 Fig. 2 shows two different types of chair. Chair **A** is made from polypropylene with a steel frame. Chair **B** is made from hardwood.



Chair **A**



Chair **B**

Fig. 2

- (a) (i) State which chair is manufactured from renewable materials.  
..... [1]
- (ii) State **two** manufacturing processes used when making chair **A**.  
1. ....  
2. .... [2]
- (iii) The seat of chair **A** has been designed using the measurements of people.  
State the name given to these measurements.  
..... [1]
- (iv) The strength of chair **A** has been tested according to BS 4875.  
State what BS stands for.  
B ..... S ..... [1]



(b) The hardwood chair **B** is made from sustainable sources.

Describe what is meant by the term 'sustainable sources'.

.....

.....

.....

..... [2]

(c) The polypropylene and steel chair **A** has a seat made from recycled materials.

Describe what is meant by the term 'recycled materials'.

.....

.....

.....

..... [2]



18 Fig. 3 shows a wind up LED torch. The torch uses a rechargeable battery.

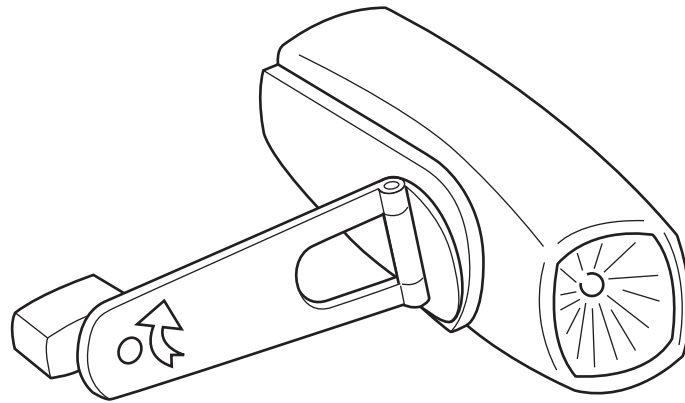


Fig. 3

(a) State the type of energy used when winding the handle to recharge the battery.

..... [1]

(b) State **two** benefits of using a rechargeable battery.

1. ....

.....

2. ....

..... [2]

- (c) Give **three** specification points that the designer might have considered relating to the sustainability of materials used in making the torch.

An example has been done for you.

Material specification

- 1 The materials should be non-toxic and non-hazardous to humans and the environment.
  - 2 .....
  - 3 .....
  - 4 .....
- ..... [3]

- (d) The body of the torch is made by injection moulding.

Explain why injection moulding is a sustainable manufacturing process.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(e) The energy used in manufacturing and operating has an impact on the torch's carbon footprint.

(i) Describe how **manufacturing** the torch has an impact on its carbon footprint.

.....  
.....  
.....  
..... [2]

(ii) Describe how the **operation** of the torch has an impact on its carbon footprint.

.....  
.....  
.....  
..... [2]

(f) At the end of its life cycle the torch will be disposed of.

Describe a responsible way in which the torch can be disposed of.

.....  
.....  
.....  
..... [2]

**Total [15]**

14  
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