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OUT OF LESSON WORK

TERM 1

DESIGN AND TECHNOLOGY

YEAR 9

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Activity sheet 3.13: Materials

Learning aim B: Provide a design solution for an engineered product against the needs of an engineering brief
Learning aim B1: Interpretation of a given brief for an engineered product

Investigate the materials used to make an engineering product.

The materials used in engineering products are selected for a reason. Usually, this is because they are the most suitable materials for that product, based on the material's properties and qualities, on the processes used in manufacturing, and/or the material cost.

1. Choose a product. Find out the various materials used in the product and what each material is used for. You will need to do some research to answer this accurately.

   Name of product: _____

   Record your results in the table below (an example is shown).

Part	Material
Outer casing of phone	Aluminium

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2. Research the properties of each material – for example, is it ductile or a good electrical conductor? Think about the properties that make the materials suitable for the product part.

   Record your findings – using bullet points is a good technique.

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3. For each of the materials you have identified, suggest alternative materials that will do the same function and have similar properties. For example, you could suggest replacing aluminium with stainless steel for a part that needs to be corrosion-resistant, as both materials have this property.

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Activity sheet 3.14: Manufacturing processes

Learning aim B: Provide a design solution for an engineered product against the needs of an engineering brief
Learning aim B1: Interpretation of a given brief for an engineered product

The selection of manufacturing processes for an engineered product are chosen based on whether they are the most suitable to make the component parts.

1. Using the product that you have already investigated for the selection of materials (on Activity sheet 3.13), investigate the manufacturing processes used.

   a) Cutting processes

   _____

   _____

   _____

   b) Shaping processes

   _____

   _____

   _____

   c) Forming processes

   _____

   _____

   _____

   d) Joining and fabrication processes

   _____

   _____

   _____

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2. Choose and research two contrasting processes from those used in the manufacturing of the product. Select one process from each of two of the four groups of manufacturing processes; for example, one cutting and one forming process, or one shaping and one joining process.

   Research these processes and makes notes below.

Extension task: Produce a short presentation that describes the two processes selected in the previous question.

Think about including the following.

- Images of the process being carried out.
- Images of components made by using the process.
- A step-by-step description of the process.
- Reasons why the process has been used in the product you have been investigating.

Try to limit the presentation to five or six slides for each of the processes.

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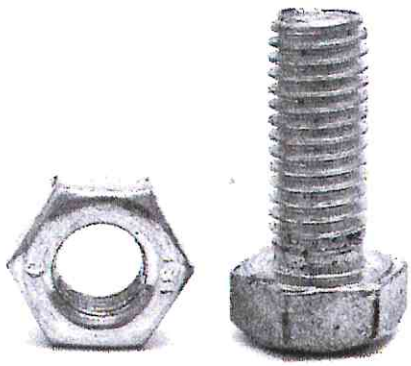
Activity sheet 3.15: 2D sketching

Learning aim B: Provide a design solution for an engineered product against the needs of an engineering brief
Learning aim B2: Redesign

It is important that you are able to sketch out ideas and features of designs so that they can be understood by others. One way to do this is using 2D sketching.

1. The images below show engineered components often used in both simple and complex engineered products. Sketch out 2D (flat) views of these components.



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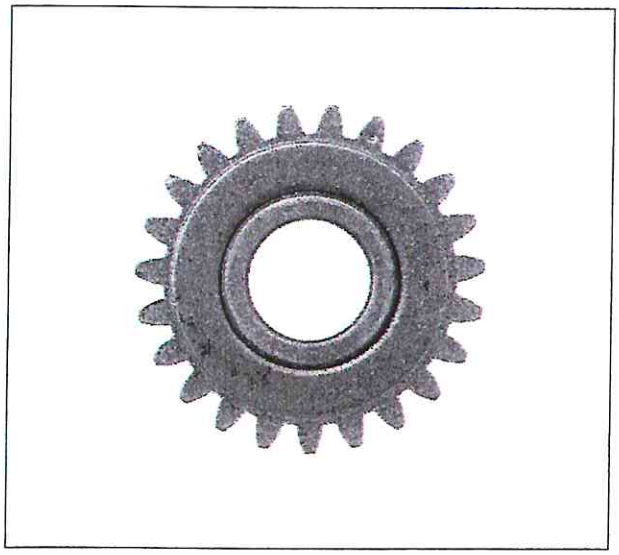
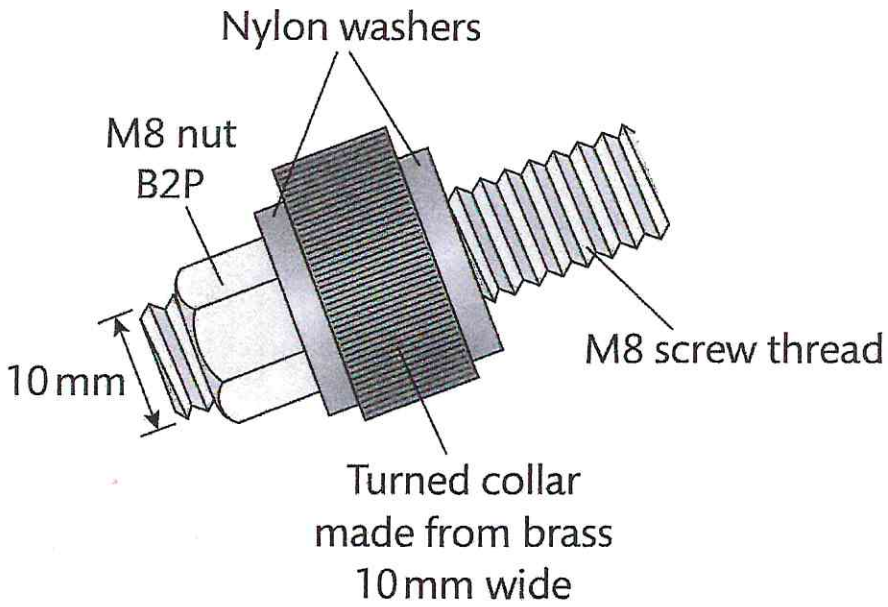


2. Look at the example below to get an idea of the type of sketch that would be suitable for typical engineering components. Add some annotations to your sketches to explain the features of the components.



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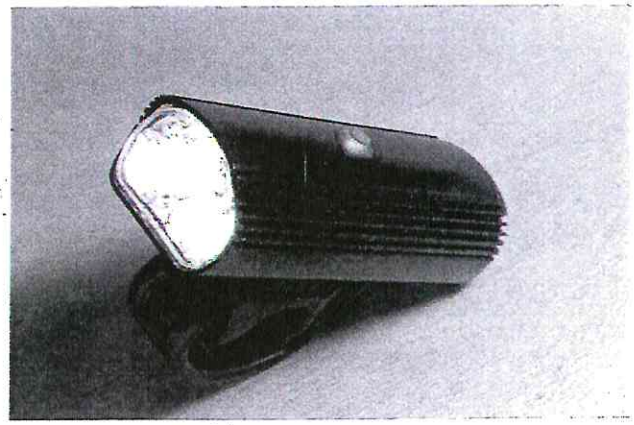
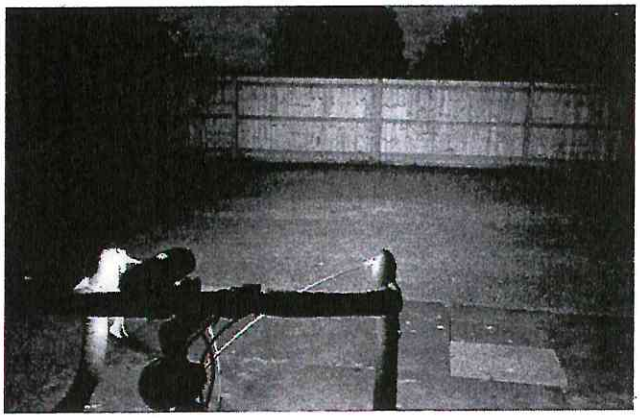
Activity sheet 1.18: The design process 3

Learning aim B: Explore engineering skills through the design process
Learning aim B1: The design process

Here are two pictures of a high-performance bike lamp and how it performs.





Analyse this product in terms of the following five criteria:

1. Physical requirements

2. Aesthetics

3. Size

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4. Function

5. Performance requirements

Extension task: Research the meaning of the following terms:

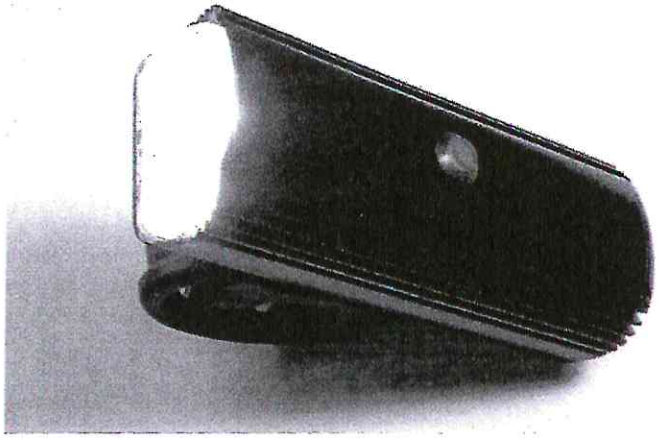
Tolerance:

Ergonomics:

Activity sheet 1.19: Engineering brief

Learning aim B: Explore engineering skills through the design process
Learning aim B1: The design process

Here is a picture of a high-performance bike lamp along with its specification.



Specification

Maximum light output: 1500 lumens

Weight: 345 g

Recharge time: 6 hours

Lamps: 3 ultra-bright LEDs

Ultra-rugged and pliable rubber mounting strap

1. Using the information above, create a brief for the high-performance bike lamp.

_____

_____

_____

2. If you were the customer for this product, which two specification points would you consider to be most important, and why?

_____

_____

_____

3. If you were the brief receiver (designer/manufacturer), how would you suggest that the target weight of just 345 g could be achieved?

Extension task: Using the internet, find the specification for a product, e.g. a car or a TV. From this, write what you think would have been the original design brief for this product.

Activity sheet 1.27: Final design solutions

Learning aim B: Explore engineering skills through the design process

Learning aim B1: The design process

1. Common drawing styles used in engineering are listed in the table below. Research each and write an example in the table, then explain how each type of drawing is used in engineering.

Drawing style	Example	How this style of drawing is used in engineering
Oblique		
Isometric		
Perspective		
Assembly drawing		
Circuit diagram		
Parts list		
Component drawing		
Exploded drawing		

Extension task: Draw a simple cube:

a) in oblique

b) in two-point perspective.

Activity sheet 1.30: Materials

Learning aim B: Explore engineering skills through the design process

Learning aim B1: The design process

1. In the table below, give an explanation of the properties, and a specific example, of each of the listed engineering material categories.

Engineering material category	Explanation/Properties/Example
Ferrous metals	
Non-ferrous metals	
Thermosetting polymers	
Thermoforming polymers	

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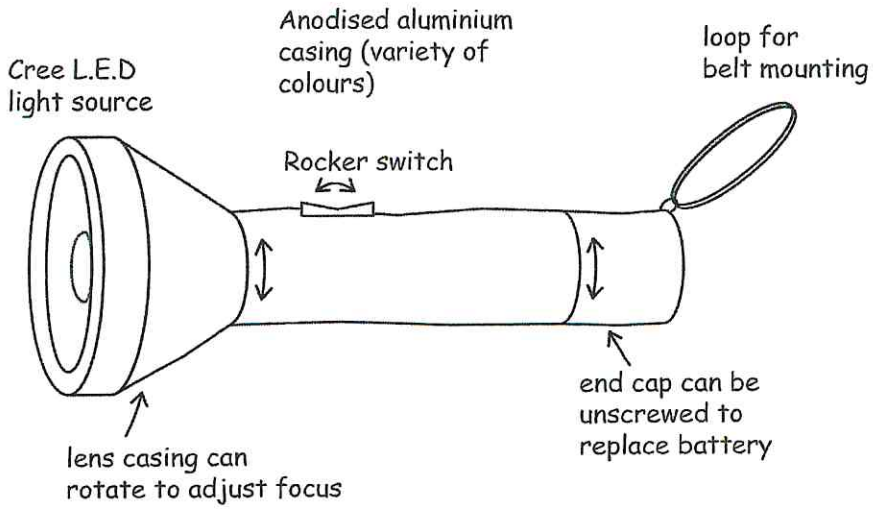
2. Here is the design sketch for a simple flashlight you saw earlier in this component.



Discuss with your partner the suitability of using the following materials for the body of the flashlight. Consider the main advantages/disadvantages, manufacturing method and cost.

a) A ferrous metal

b) A non-ferrous metal

c) A thermosetting polymer

d) A thermoforming polymer

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Activity sheet 1.31: Making final design solution decisions on making techniques

Learning aim B: Explore engineering skills through the design process
Learning aim B1: The design process

Working in pairs, look at the all-terrain bicycle shown below and answer the questions that follow.

1. The frame of the bicycle could be manufactured in steel, aluminium or carbon fibre composite. In the table below, outline the advantages and disadvantages of each manufacturing method.

	Advantages	Disadvantages
Steel		
Aluminium		
Carbon fibre		

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2. Choose one material for the bicycle frame and write a justification of your selected manufacturing method that you could give to a customer. This should clearly explain to them why you have selected that manufacturing method instead of other possible options.

3. Titanium is often used for high-quality bicycle frames. Why is this material a suitable choice? Why is it not used for all bicycles?