

DESIGN AND TECHNOLOGY - GCSE SAMPLE PAPER 1

COMPONENT 1

Candidate Name	Centre Number					Candidate Number				

TIME ALLOWED - 2 HOURS

For examiner's use only			
Section A	1		10
	2		10
	3		15
	4		20
	5		20
Section B	6 - 10		25
Total			100

EQUIPMENT REQUIRED

Drawing and writing equipment, coloured pencils and a calculator

INSTRUCTIONS

You are to answer all questions 1 to 5. Select ONE question from Section B

This example examination paper can be duplicated and printed out if required but not edited in any way.

The links to www.technologystudent.com cannot be removed.

The PDF file can be stored on school / college systems and distributed electronically (NO EDITING ALLOWED)

PLEASE RESPECT THE COPYRIGHT - report infringers to techteacher@technologystudent.com
Not be distributed at courses or by course instructors / consultants

Section A

Answer all the questions in this section

HELPFUL LINK <http://www.technologystudent.com/pdf14/ratios1.pdf> Page 12

1. The question is about alternative energy.

1a. A local wind farm produces 4 terawatt hours of electricity over a year. At the same time, a solar farm produced 0.5 terawatt hours of electrical power. What is the ratio Wind farm : Solar Power ? **4 marks**

WIND FARM	:	SOLAR POWER
4	:	0.5

EXPLANATION: _____

HELPFUL LINK <http://www.technologystudent.com/energy1/wind8.htm>

1b. Write two **advantages** of using wind power to produce electricity. **2 marks**

1c. Write two **disadvantages** of using wind power to produce electricity. **2 marks**

1d. Some car manufacturers regard the use of **carbon neutral** energy sources (alternative energy) as being important. Describe an example of this approach.
2 marks

HELPFUL LINK <http://www.technologystudent.com/joints/photchrom1.html>

2. This question is regarding smart materials

2a. What are photochromic inks. Your answer must include a reference to a practical application of photochromic ink. **3 marks**

HELPFUL LINK <http://www.technologystudent.com/joints/kevlar1.html>

2b. Explain why a composite material is the most suitable for the bodywork of this Formula One racing car. Name the a suitable composite material in your answer. **2 marks**



HELPFUL LINK http://www.technologystudent.com/joints_flash/phosphor1.html

2c. The digital sports watch / timer is typical of many similar devices today. The wrist band includes a phosphorescent pigment.



Explain the reason(s) for the inclusion of a phosphorescent pigment, in the wrist band material.
2 marks

HELPFUL LINK http://www.technologystudent.com/joints_flash/phosphor1.html





2d. Describe another product that includes phosphorescent pigment and explain its inclusion. **3 marks**

Product: _____

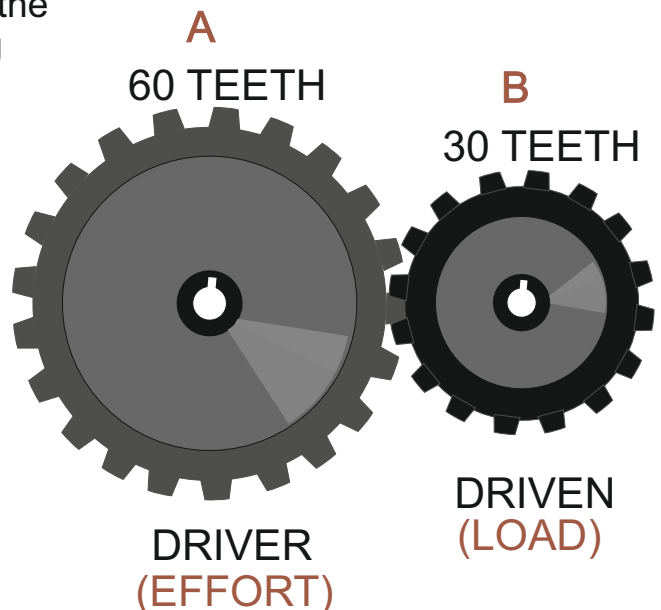
Description and explanation: _____

3. This question is regarding electronics, programmable circuits and mechanisms.

3a. Using a tick or a cross, identify each of the components, as either an 'input' or an 'output'. **4 marks**

COMPONENT	INPUT	OUTPUT
TOGGLE SWITCH 		
SPEAKER 		
MICRO-SWITCH 		
THERMISTOR 		

3b. Calculate the Velocity Ratio (Gear Ratio) for the spur gears seen opposite. Include your working out. **4 marks**



HELPFUL LINK <http://www.technologystudent.com/gears1/gears1.htm>

3c. What is a **driver** gear wheel? **1 mark**

What is a **driven** gear wheel? **1 mark**

HELPFUL LINK <http://www.technologystudent.com/pics/picgen1.html>

3d. Name one piece of software that is used to programme a PIC microcontroller.
1 mark

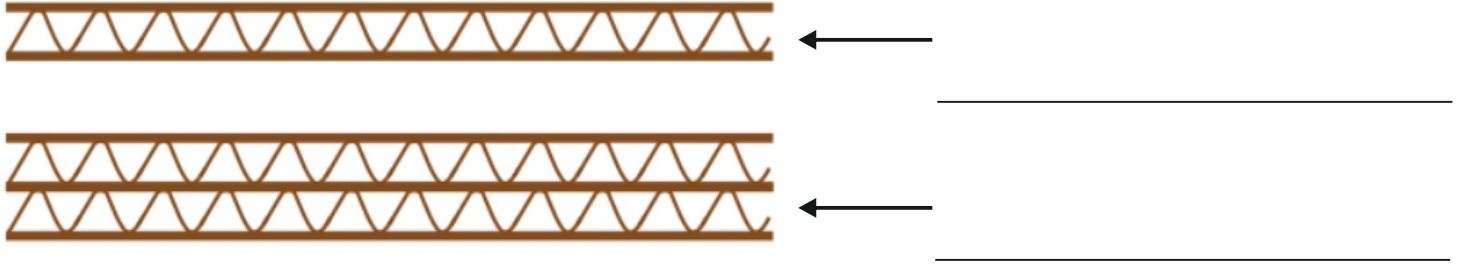
3e. How is a PIC circuit physically connected to a computer, for programming?
1 mark

3f. What is a PIC microcontroller (Programmable Interface Controller?) and what can it do? **3 marks**

HELPFUL LINK http://www.technologystudent.com/despro_flsh/charity9.html

4. These questions are about materials

4a. Study the images of two different types of corrugated card. Name each type. **2 marks**



HELPFUL LINK http://www.technologystudent.com/despro_flsh/laminate2.html

4b. What is laminated card? **1 mark**

4c. Name two products that have laminated card packaging? **2 marks**

HELPFUL LINK <http://www.technologystudent.com/despro2/crdpap2.htm>

4d. What is grid paper ? Include a practical use. **2 marks**

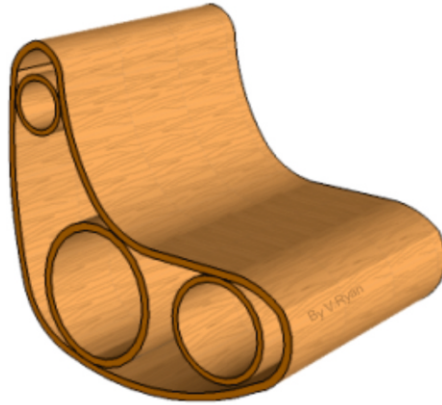
4e. What is layout paper ? Include a practical use. **2 marks**

4. The products shown below have been manufactured from flexi-ply.

MP3 STATION



ROCKING CHAIR



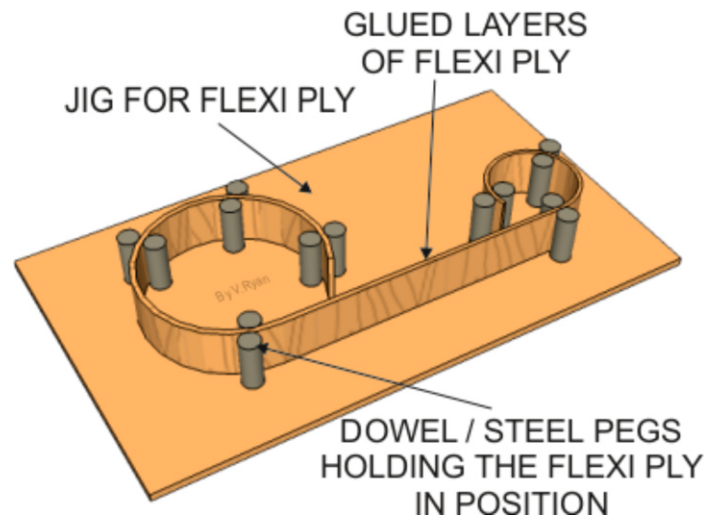
BOOKCASE



4f. Why is flexi-ply ideal for their manufacture of the products? **3 marks**

4g. Describe how a former similar to the one seen opposite, could be used to manufacture the sides of one the products displayed at the top of the page.

3 marks



HELPFUL LINK http://www.technologystudent.com/despro_flsh/finish2.html

4h. The surfaces of the three pieces of furniture shown in question 4, must be prepared carefully to receive a finish. This is achieved through sanding with glass paper. Describe the procedure. **3 marks**

HELPFUL LINK http://www.technologystudent.com/joints_flsh/nylon1.html



WATERPROOF CLOTHING

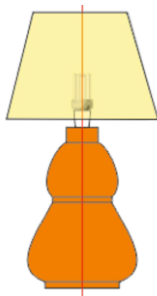
4i. The photograph shown opposite is of waterproof clothing. Why is nylon a suitable material? **3 marks**

5a. Select one of the products shown below. Then, describe two reasons, for it being suitable for manufacture in large numbers / mass production. **2 x 2 marks**

DESKTIDY
PEWTER CASTING



WOOD - LAMP
WOOD TURNING



POLYETHYLENE TEREPHTHALATE
VACUUM FORMED TRAY



TO HELP YOU ANSWER
THIS QUESTION

http://www.technologystudent.com/equip_fish/pewtt1.html
http://www.technologystudent.com/equip_fish/pewtt2.html
<http://www.technologystudent.com/equip1/woodturn1.html>
<http://www.technologystudent.com/equip1/woodturning2.html>
<http://www.technologystudent.com/equip1/wturning8.html>
<http://www.technologystudent.com/joints/pet1.html>
<http://www.technologystudent.com/joints/petevac1.html>

PRODUCT: _____

REASON 1: _____

REASON 2: _____

HELPFUL LINK http://www.technologystudent.com/prddes_2/crowd1.html

5b. Your chosen product is to be financed through crowd funding. What is crowd funding? **2 marks**

HELPFUL LINK <http://www.technologystudent.com/prddes1/remote1.html>

5c. The chosen product will be remotely manufactured. What is remote manufacturing? **4 marks**

HELPFUL LINK <http://www.technologystudent.com/despro2/focgrp1.html>

5d. What role would a focus group play in evaluating the product, before it goes on sale in the shops and on the internet? **2 marks**

HELPFUL LINK <http://www.technologystudent.com/prddes1/markrs1.html>

5e. Before your selected product is manufactured, it would be wise to carry out market research.

What is market research? **2 marks**

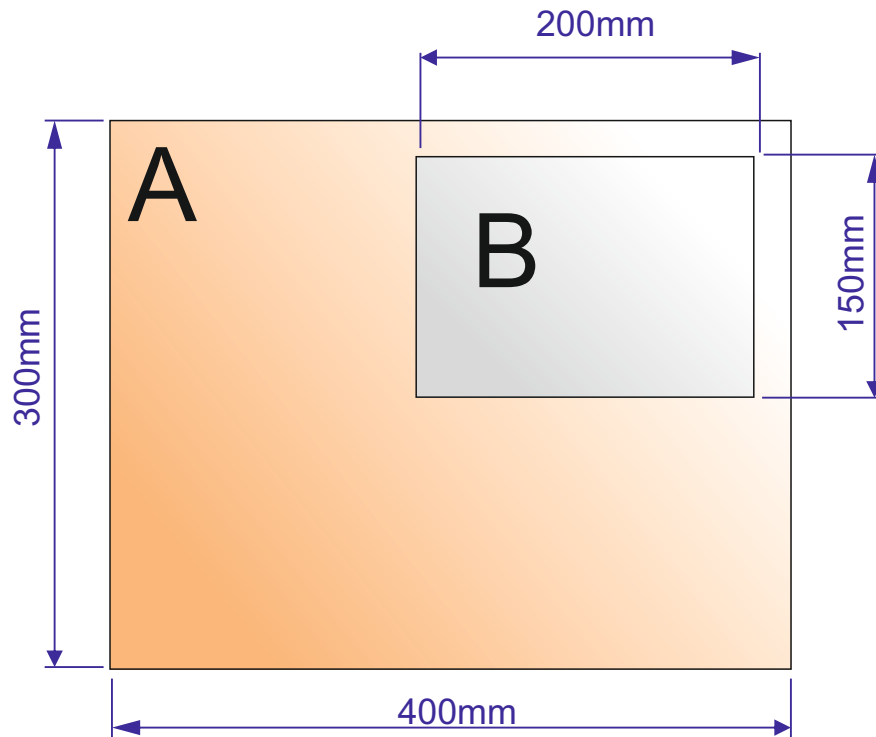
Describe ONE aim of marketing. **1 mark**

A rectangular acrylic window for an Art project seen below, is composed of two rectangular pieces, accurately cut to size on a laser cutter. They fit perfectly together.

5f. Calculate the total area of piece A, before 'B' is removed **2 marks**

5g. Calculate the area of piece B. **2 marks**

5h. Calculate the area of A, after 'B' is removed. **1 mark**



SECTION B

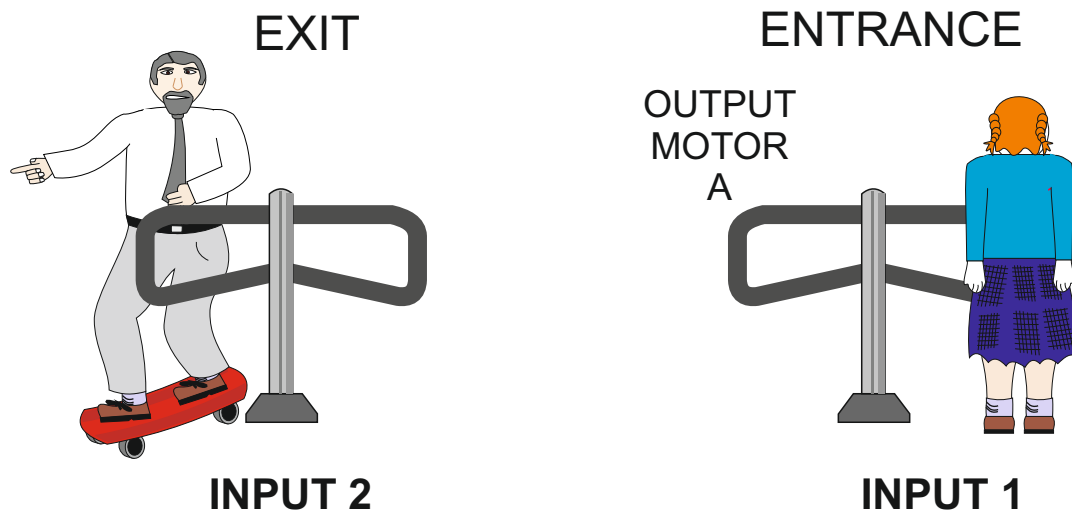
Electronics and Systems

ANSWER ONLY ONE QUESTION

HELPFUL LINK <http://www.technologystudent.com/sysprp08/quest15.html>

6. The turnstile system continually calculates the number of people who have entered the theme park and the number of people leaving. This is to ensure that the total never exceeds the legal limit.

A Technology pupil has devised a simple model to test his/her programming. The maximum number of people allowed through the entrance for the test run is ten. The program must calculate those entering the park and balance it with those leaving the park. The total number of those in the park must not exceed ten.



The sequence of events are as follows;

The system is switched on.

The total of people in the park is set at 0.

input 1 and 2 are continually checked.

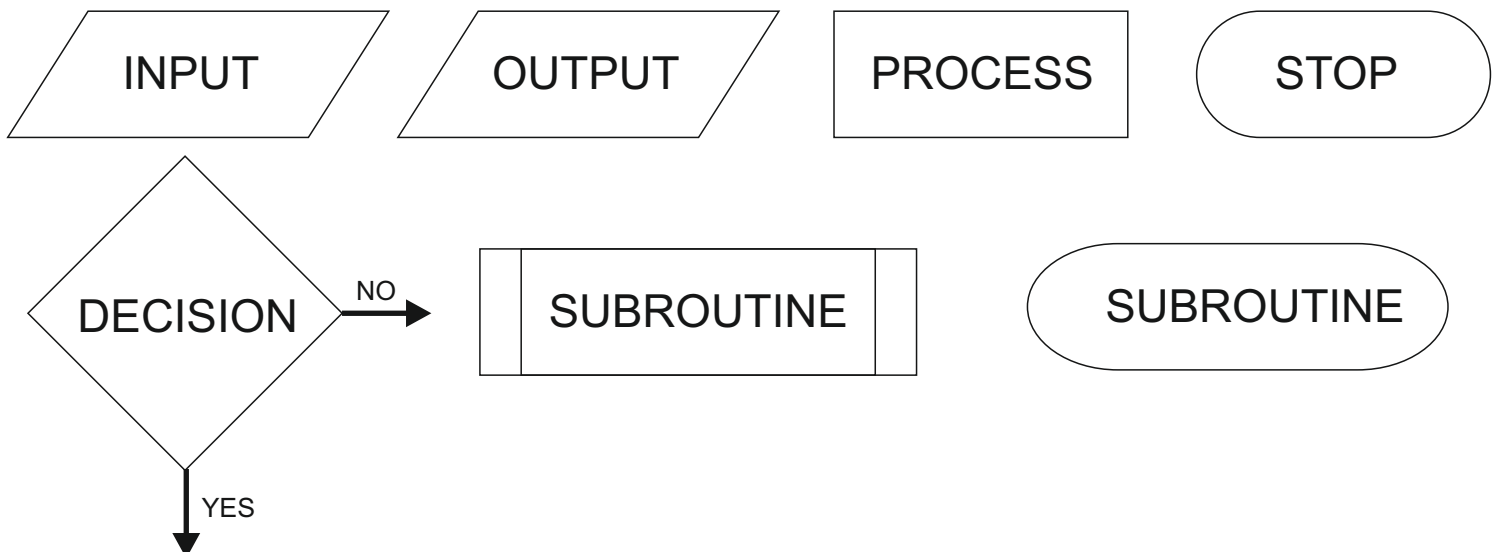
If input 1 detects a person entering the park then 1 is added to the total.

If input 2 detects a person leaving the park 1 is subtracted from the total.

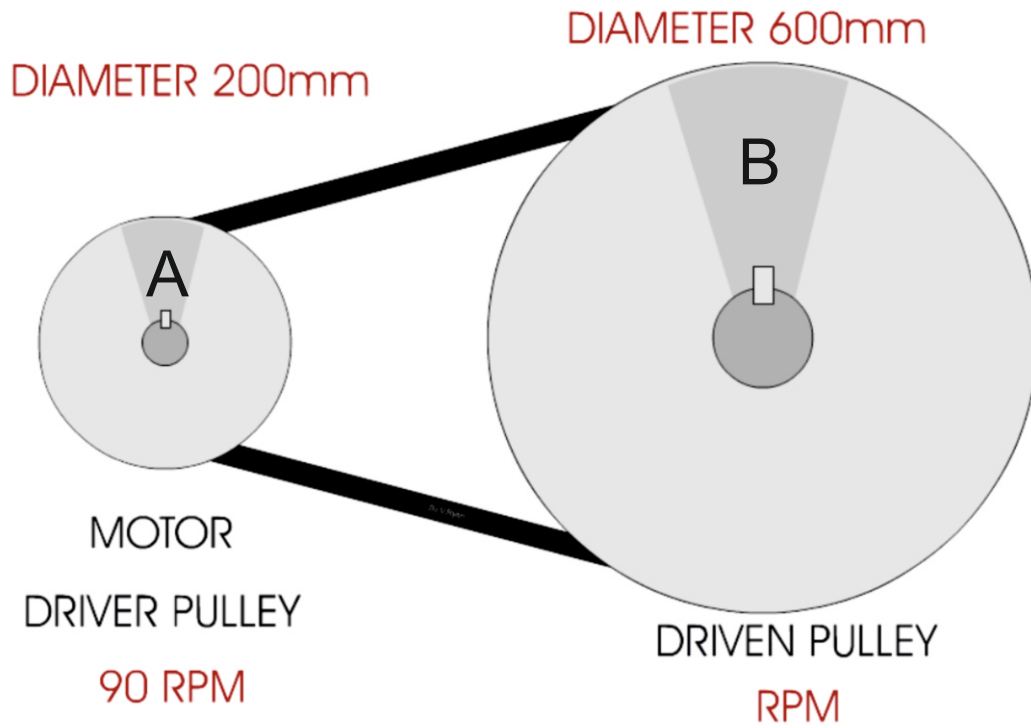
If the total number of people in the park reaches 10 a solenoid locks the entrance turnstile (this stops more people entering the park)

WORLD ASSOCIATION OF TECHNOLOGY TEACHERS <https://www.facebook.com/groups/254963448192823/> www.technologystudent.com © 2017 V.Ryan © 2017

6a. Write flow chart to represent the programmed sequence of events. Use the following the process / systems boxes shown below. Complete your work on the following page **4 marks**



6. The turnstile system is to be updated again, so that it works automatically the through a system of pulleys (shown in the diagram below).

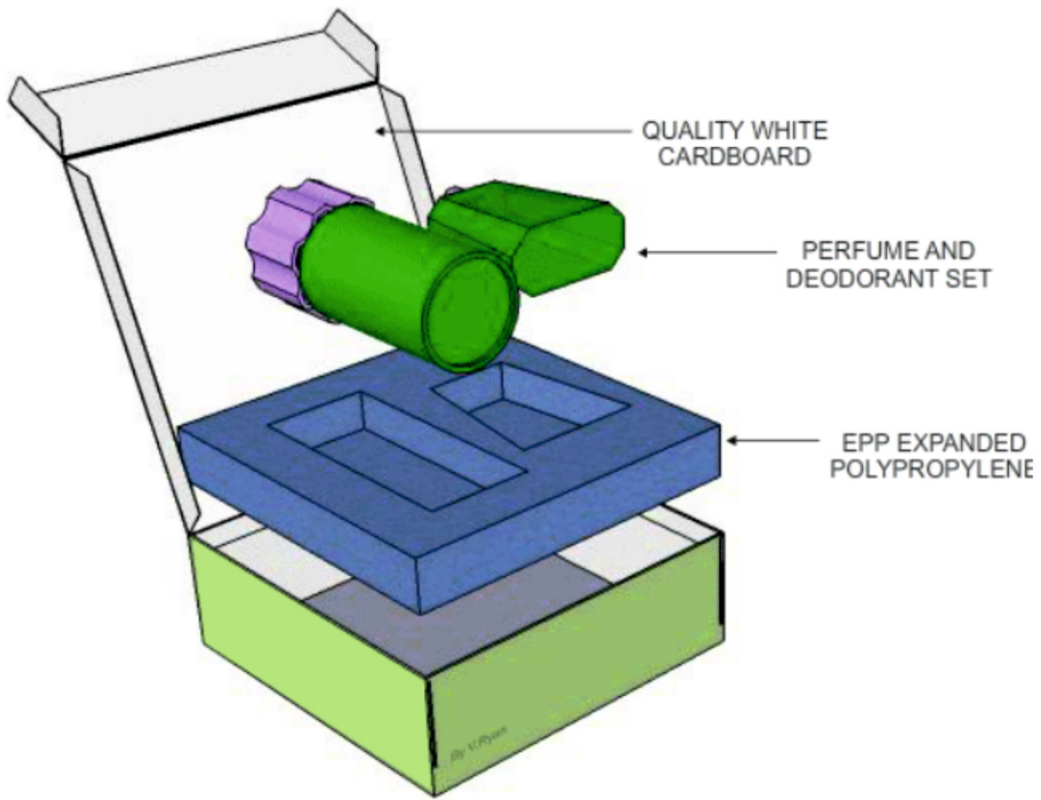


6c. Calculate the Velocity Ratio of the pulley system. Include all your working out **2 marks**

6d. Calculate the RPM of pulley 'B'. Include all your working out. **3 marks**

Paper and Boards

7. The photograph shows the packaging for a perfume product.



HELPFUL LINK <http://www.technologystudent.com/prddes1/perfpk4.html>

7a. Quality white card has been used for the manufacture of the box / package shown above. Explain why card has been used. **2 marks**

7b. Why do you think the packaging is 'cuboid' in shape? **1 mark**

7c. Why has Expanded Polystyrene (EPS) been used to manufacture the insert, that holds the product in position? **2 marks**

7d. The manufacturer intends to use the **foil blocking** technique, to produce quality gold printing on the top surface. Explain how foiling blocking could be used to produce the required finish. Include notes and sketches in your answer. **4 marks**



NOTES

SKETCHES

HELPFUL LINK <http://www.technologystudent.com/prddes1/packenv1.html>

7f. A large amount of packaging, used to protect food products, is discarded everyday, having a harmful impact on the environment. How can this harmful impact be reduced? **5 marks**

HELPFUL LINKS <http://www.technologystudent.com/prddes1/closetloop1.html>
<http://www.technologystudent.com/prddes1/closetloop2.html>

7. Designers need to consider environmental issues when designing products. Consequently, packaging is often designed to be recycled as part of a 'Closed Loop System'.

7g. What is Closed Loop Recycling? Include reference to how 'plastic' drinks bottles are recycled through this system. **6 marks**

Natural and manufactured timber

8. Study the mahogany desk tidy shown opposite.



HELPFUL LINK <http://www.technologystudent.com/rmflsh1/remote5.html>

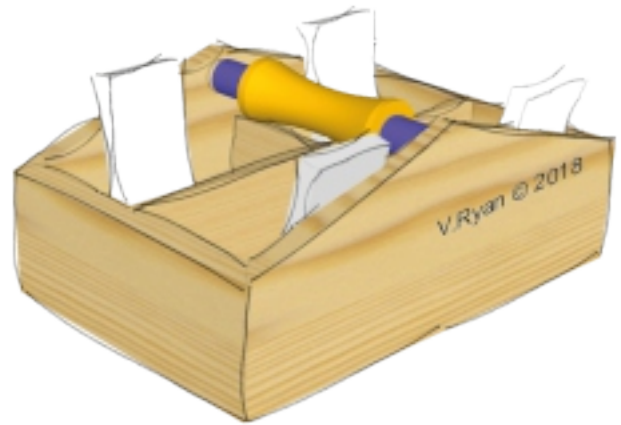
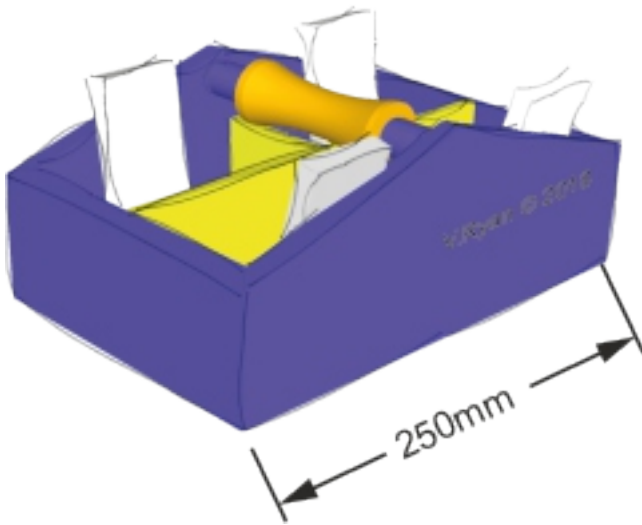
8a. Why is mahogany a suitable material for the desk tidy? **2 marks**

HELPFUL LINK http://www.technologystudent.com/despro_flnh/finish3.html

8b. The desk tidy has been 'finished' with water-based varnish. Why can this be considered a suitable choice? **2 marks**

8c. Name one alternative finish, that could be applied to the desk tidy. **1 mark**

The desk organiser seen below, is an updated design.

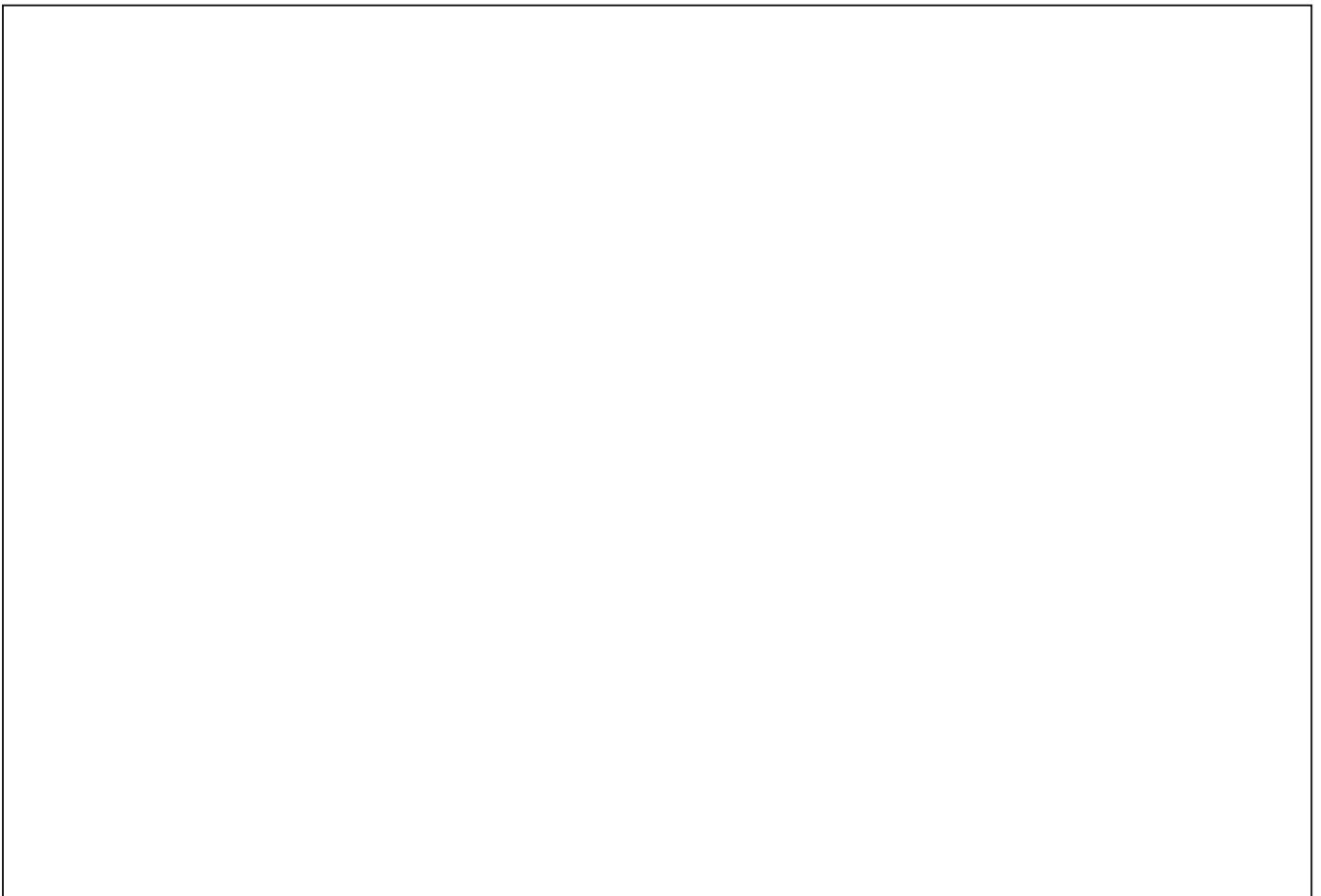


HELPFUL LINK <http://www.technologystudent.com/rmflash1/remote15.html>

8d. Name and sketch a suitable joint for the corners. **4 marks**

NAME: _____

SKETCH



HELPFUL LINKS

<http://www.technologystudent.com/prddes1/susenv1.html>

<http://www.technologystudent.com/joints/sustain1.html>

8g. Manufacturers of natural wood products are encouraged to source their materials from sustainable forests.

What is a sustainable forest and why are sustainable forests important? **5 marks**

HELPFUL LINK

<http://www.technologystudent.com/joints/sustain1.html>

8h. The logo shown opposite is sometimes printed on timber and packaging.

Explain the meaning of this logo. **3 marks**



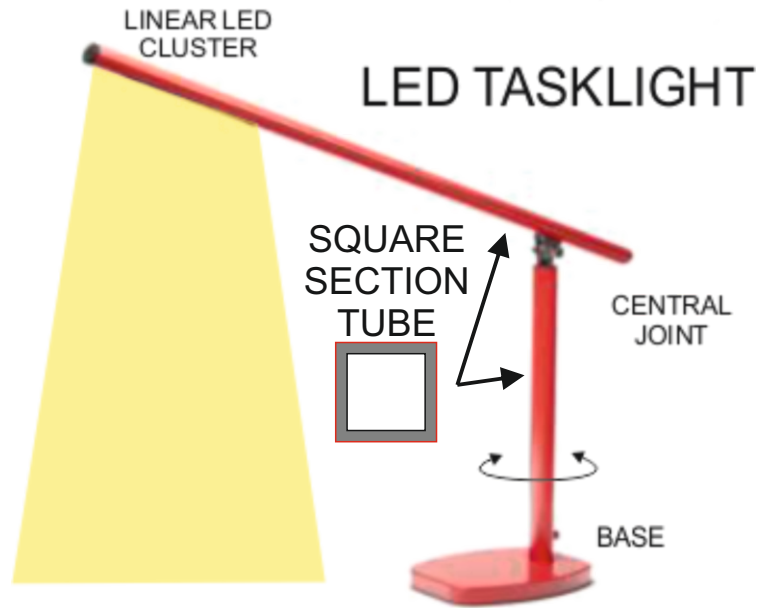
8i. The logo shown opposite is sometimes printed on timber and packaging.

Explain the meaning of this logo. **3 marks**



Ferrous and non-ferrous metals

9. This aluminium task light is supplied in a range of colours. It is adjustable and an LED cluster supplies the light. The base is manufactured from steel.



HELPFUL LINKS

http://www.technologystudent.com/joints_flsh/office4.html
<http://www.technologystudent.com/designpro/metals1.htm>

9a. Why is aluminium tube suitable for the 'arms' of the task light? **1 mark**

HELPFUL LINK

http://www.technologystudent.com/joints_flsh/metal2.html

9b. The aluminium has been anodised. What is anodising of aluminium? **2 marks**

HELPFUL LINK

http://www.technologystudent.com/joints_flsh/office4.html

9c. Give two reasons for using steel for the base of the task light. **2 marks**

HELPFUL LINK

http://www.technologystudent.com/equip_flsh/hacksw2.html

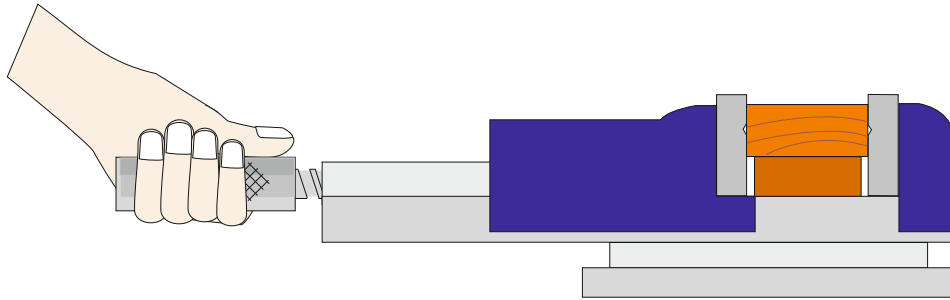
9d. Describe how the square section aluminium tube, would be cut to length, using tools commonly found in a school workshop. Use notes and sketches.

4 marks

9. A student measures the dimensions (measurements) for the 'round section' handle of a machine vice, that he intends to manufacture. The student measures the radius of an existing handle and finds it to be 25mm.

9e. What is the circumference of the handle? **3 marks**

9f. What is the area of the end of the handle? **2 marks**



FORMULA

$$\text{AREA} = \pi r^2$$

$$\pi (\text{pi}) = 3.14$$

FORMULA

$$\text{CIRCUMFERENCE} = 2 \times \pi \times r$$

$$\pi (\text{pi}) = 3.14$$

HELPFUL LINK

<http://www.technologystudent.com/joints/alloys1.html>

9g. The base of the task light is manufactured from the alloy, steel. What is an alloy?
2 marks

HELPFUL LINK

<http://www.technologystudent.com/joints/alloys1.html>

9h. Many bridges around the world are manufactured from steel, although during Victorian times, iron was used in bridge building. Why is steel used today?
3 marks

HELPFUL LINK

http://www.technologystudent.com/equip_flesh/galv1.html

One way of ensuring metal products have a reduced impact on the environment, is to prevent / reduce corrosion, lengthening their working life.

9i. Galvanising steel helps to prevent corrosion and rust. What is the galvanising process and how does it prevent corrosion?
3 marks

HELPFUL LINK

http://www.technologystudent.com/joints_fish/metal6.html

9j. Powder Coating is an alternative finish to metals. What is powder coating?

3 marks

Thermosetting and thermoforming plastics

10. The product seen opposite, is a warning light system, composed of a 'plastic' casing and an electronic circuit.



When the switch is 'on', the LEDs flash.

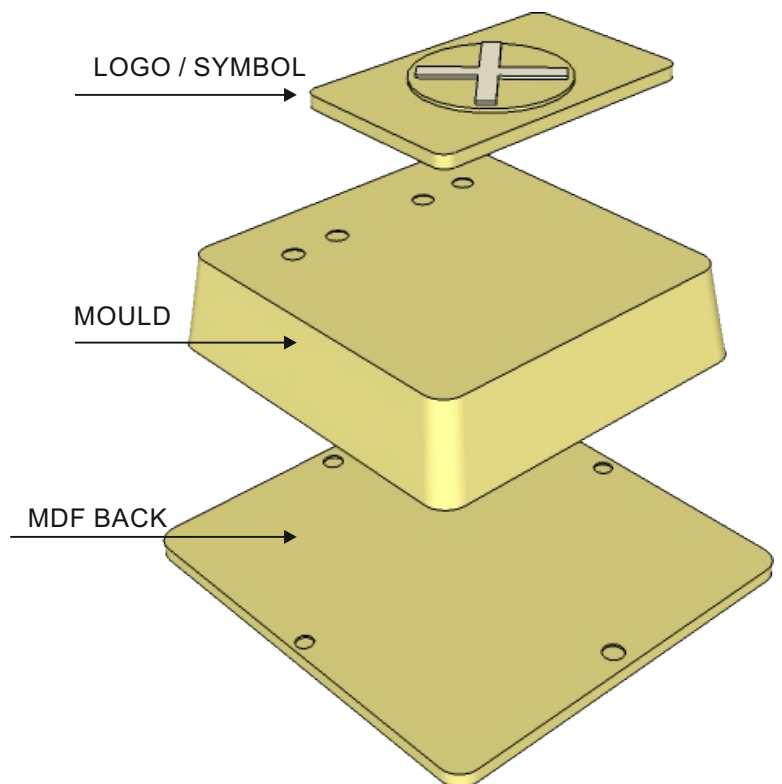
HELPFUL LINK <http://www.technologystudent.com/gprep07/vac2.html>

10a. What thermoplastic material, is most suitable for the manufacture of the casing?
1 mark

HELPFUL LINK <http://www.technologystudent.com/equip1/vacform1.htm>

10b. What is the name of the process, that results in the base being manufactured?
1 mark

10c. The mould for the casing is seen opposite. How is the mould finished, to ensure that it can be removed from the moulded 'plastic', after vacuum forming? **2 marks**



10d. A process called **extrusion** has been used to manufacture the profiles seen in the photograph opposite.



Why is extrusion a suitable process?

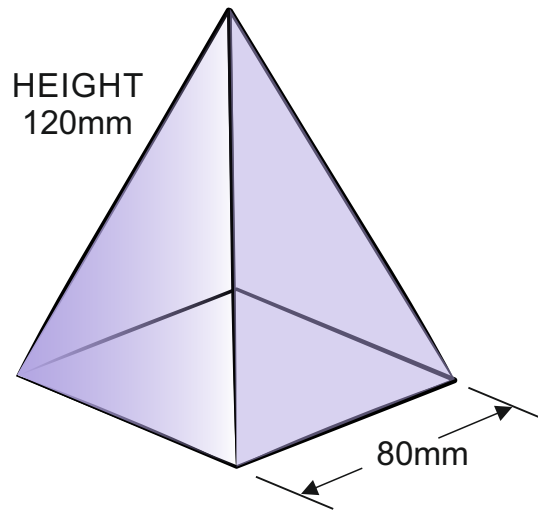
1 mark

10e. Using notes and a sketch, explain the extrusion process. **4 marks**

SKETCH

NOTES

10f. A 3D Printer has been used to manufacture a special casing for an electronic circuit. What is the volume of the shape (a square pyramid)? **5 marks**



FORMULAS

AREA OF BASE = LENGTH²

Volume = $\frac{1}{3}$ x Base x Height

$V = \frac{1}{3} \times B \times H$

Using the formulas opposite, calculate the volume of the square pyramid.

HELPFUL LINKS

http://www.technologystudent.com/prddes_2/global1.html
http://www.technologystudent.com/prddes_2/global2.html

10g. Numerous 'plastic' products, such as the casings for electronic pdevices, are manufactured cheaply because of 'Globalisation'. What is Globalisation?

5 marks

HELPFUL LINKS

<http://www.technologystudent.com/prddes1/closetloop1.html>
<http://www.technologystudent.com/prddes1/closetloop2.html>

9h. Designers need to consider environmental issues when designing products. Consequently, packaging is often designed to be recycled as part of a 'Closed Loop System'.

What is Closed Loop Recycling? Include reference to how 'plastic' drinks bottles are recycled through this system. **6 marks**

**ADD YOUR OWN TEXTILES
SPECIFIC EXAMINATION
QUESTIONS**