# **DESIGN AND TECHNOLOGY - GCSE SAMPLE PAPER 2**

#### **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

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#### **Section A**

Answer all the questions in this section

HELPFUL LINK <a href="http://www.technologystudent.com/pdf14/ratios1.pdf">http://www.technologystudent.com/pdf14/ratios1.pdf</a> Page 15

- **1.** The question is about alternative energy.
- **1a.** The total amount of renewable energy produced in 2016 was 90 Terawatt hours (Twh).

The ratio of hydroelectricity compared to other renewable energy forms was 1:12. What amount of energy was produced through hydroelectricity? *4 marks* 

HYDROELECTRICITY: OTHER RENEWABLE FORMS 1:12 EXPLANATION: http://www.technologystudent.com/energy1/hydr2.htm HELPFUL LINK **1b.** Write two **advantages** of using Hydro-power to produce electricity. 2 marks **1c.** Write two **disadvantages** of using Hydro-power to produce electricity. 2 marks HELPFUL LINK http://www.technologystudent.com/energy1/nuclear1.htm

friendly way of producing electricity. List one advantage and one disadvantage of nuclear power  2 marks	

2. This question is regarding smart materials.

2a. What is polymorph? Yo	ur answer must include a reference to a practical
application of polymorph.	3 marks

**HELPFUL LINK** 

http://www.technologystudent.com/joints/carfib1.html

**2b.** Explain why carbon fibre is a suitable composite material for the airframe of this jet fighter. Include a description of the structure of carbon fibre in your answer.

#### 2 marks



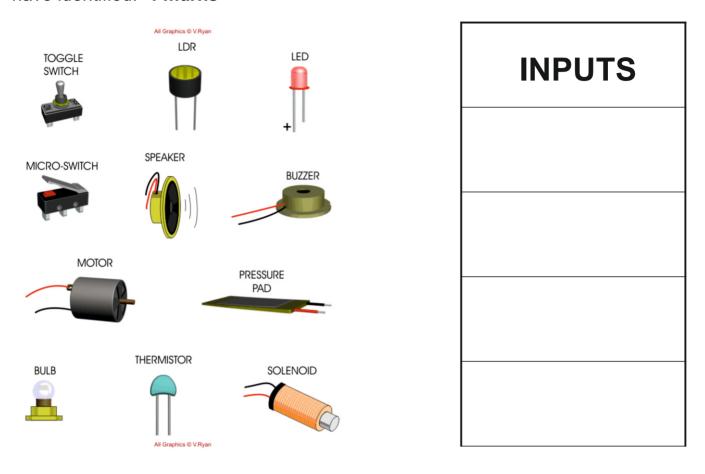
**2c.** When this greetings card is opened and the pigment inside scratched, it emits the scent of pine trees.

Explain how aroma pigments work. Include a diagram and a simple explanation **2** *marks* 



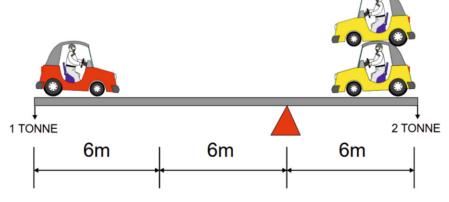
NOTES:		_ DIAGRAM			
	HELPFUL LINK	http://www.tecl	hnologystudent.com/joint	ts/aroma1.html	
<b>2d.</b> De	escribe another p	product that inc	cludes aroma pigmen	ts. <b>3 marks</b>	
Produc Descrip	t:otion and explana	ation:			

- 3. This question is regarding electronics, equilibrium and classes of lever.
- 3a. Study the components below. Using the blank the table, list four inputs that you have identified. 4 marks



**HELPFUL LINK** http://www.technologystudent.com/forcmom/force2.htm

3b. The diagram below displays a state of equilibrium. In the space below. show the calculation that confirms this. 4 marks



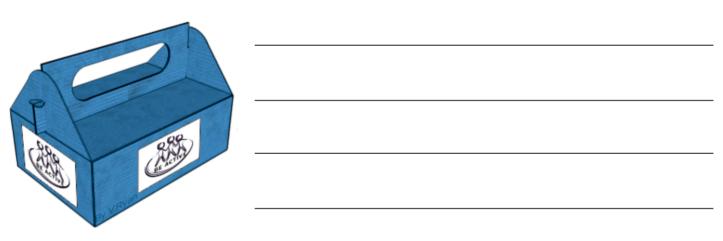
3c. What 'class' of lever is this? 1 mark	LOAD
What 'class' of lever is this? 1 mark	LOAD  EFFORT  FULCRUM
HELPFUL LINK http://www.techn	nologystudent.com/forcmom/lever1.htm
3d. What 'class' of lever does this diagram represent?  1 mark	LOAD EFFORT
<b>3e.</b> In the space below, draw a practical a identified in 3d (the previous question).	
NOTES	SKETCH

- 4. These questions are about materials
- **4a.** The material seen below is CORRUGATED PLASTIC (POLYPROPYLENE). Draw the recycling symbol that represents this plastic. **2 marks**



HELPFUL LINK http://www.technologystudent.com/despro\_flsh/charity10.html

**4b.** The charity collection box seen below, is manufactured from corrugated polypropylene. Why is this a suitable material? *3 marks* 



	HELPFUL LINK	http://www.technologystudent.co	m/despro2/crdpap2.htm	
4c. W	hat is duplex boar	d? Include a practical use.	2 marks	
4d. W	hat is foil lined boa	ard ? Include a practical use.	2 marks	

#### HELPFUL LINK http://www.technologystudent.com/joints/petevac4.html

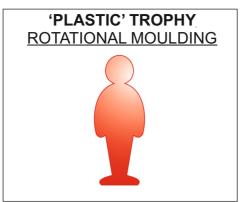
4. The products shown below have been manufactured from High Density Polyethylene (HDPE). 4e. Why is High Density Polyethylene (HDPE) ideal for their manufacture of the products? 3 marks HELPFUL LINK http://www.technologystudent.com/equip1/inject1.htm **4f.** Describe how the desk tidies can be manufactured by this equipment / process. Name the equipment / process in your answer. 3 marks EQUIPMENT / PROCESS NAME: HIPS, HDPE, LDPE, PP, Acrylic (PMMA), ABS **GRANULES** MOULD **DESCRIPTION:** HOPPER **ARCHIMEDEAN SCREW** 

# HELPFUL LINK http://www.technologystudent.com/joints\_flsh/metal2.html

g. A desk tidy of a similar design is to be manufactured from aluminium. The surface rill have an anodised finish. Describe the anodising procedure. 3 marks					
HELPFUL LINK	http://www.technologystudent.com/joints/poly3.html				
15	<b>4h.</b> The photograph shown opposite is of a typica disposable 'plastic' carrier bag. Why is polylactide a suitable material? <b>3 marks</b>				

**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* 







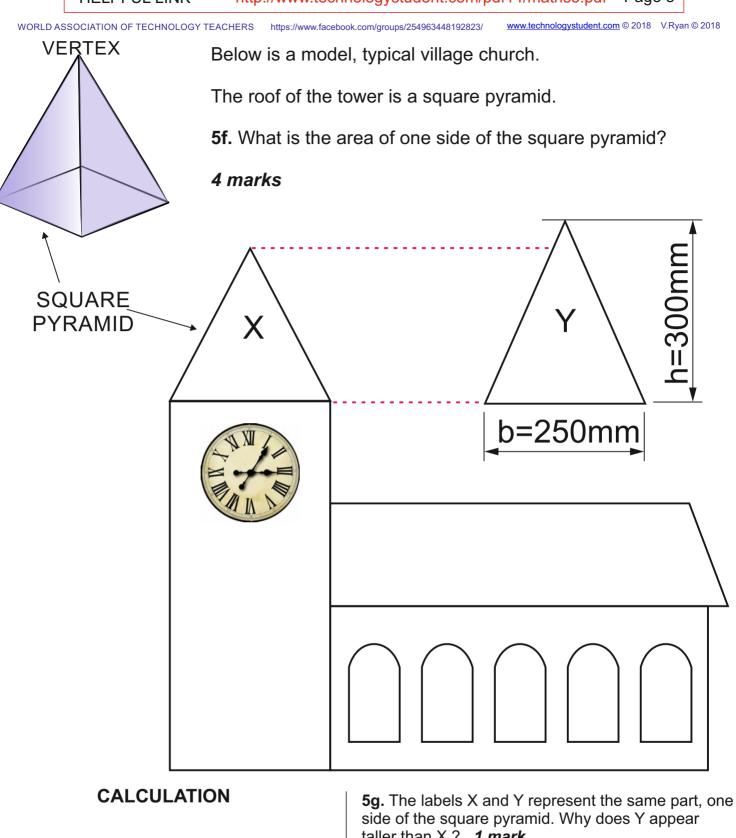
TO HELP YOU ANSWER THIS QUESTION

http://www.technologystudent.com/joints/desk8.htm http://www.technologystudent.com/prddes1/rotate2.html http://www.technologystudent.com/gprep07/vac2.html

	:	
REASON 1	:	
REASON 2	). 	
	HELPFUL LINK	http://www.technologystudent.com/prddes_2/crowd1.html
	neen product is t	to be financed through a cooperative. What is a
<b>5b.</b> Your cho		to be illianced tillough a cooperative. What is a

HELPFUL LINKS http://www.technologystudent.com/despro\_3/lean1.html http://www.technologystudent.com/despro\_3/lean2.html

chosen product will be manufactured through a system called Lean cturing. What is Lean Manufacturing? <i>4 marks</i>
HELPFUL LINK http://www.technologystudent.com/prddes1/advert2.html
oduct such as a desk tidy may need advertising. What is the purpose of ng? 2 marks
HELPFUL LINKS http://www.technologystudent.com/prddes1/advert1.html http://www.technologystudent.com/prddes1/advert2.html
ribe one method of advertising, that you think would be successful in g a desk tidy. 3 marks.



taller than X? 1 mark

#### **SECTION B**

# Electronics and Systems

### ANSWER ONLY ONE QUESTION

HELPFUL LINK http://www.technologystudent.com/sysprp7/sysq8.html

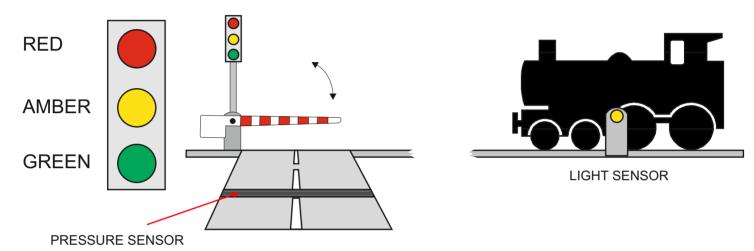
**6.** A technology student has developed an automatic traffic control system for a level crossing.

A pressure sensor detects when a car passes over it. The sensor is connected to INPUT 1 of the control system.

A light sensor detects the presence of a train close to the crossing. The light sensor is connected to INPUT 2 of the control system.

When a car is detected the control system checks if a train has passed the light sensor. Then the traffic lights run through a sequence of changes, eventually changing the lights from red to green, raising the barrier and allowing the car to cross the railway line safely.

If a train is present the traffic light stays on red and the barrier remains lowered / closed.

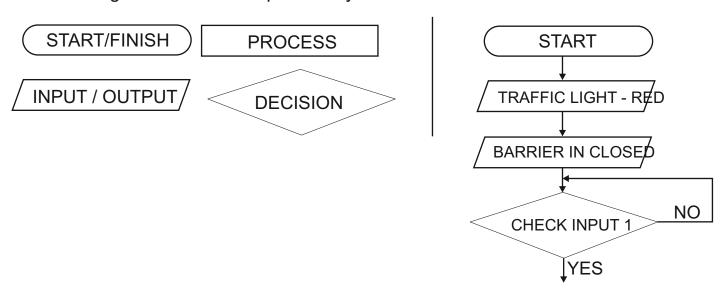


**6a.** The sequence of events are listed below. However, they are in the wrong order. Write the correct sequence of events in the available space. The first three stages have been completed. **4 marks** 

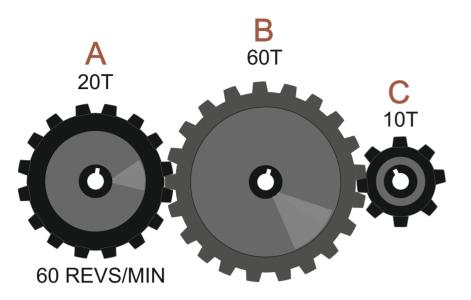
TRAFFIC LIGHTS - AMBER OFF	TRAFFIC LIGHT - RED
BARRIER IN CLOSED POSITION	BARRIER IN CLOSED POSITION
CHECK INPUT 2	CHECK INPUT 1
TRAFFIC LIGHTS GREEN ON	<u> </u>
TRAFFIC LIGHTS - AMBER AND	
RED ON	
WAIT 5 SECONDS	
TRAFFIC LIGHTS RED + AMBER	
ON CHECK NIBUT 4	
CHECK INPUT 1	
BARRIER OPENS	
WAIT 5 SECONDS	
TRAFFIC LIGHTS - GREEN OFF	
BARRIER LOWERED.	
TRAFFIC LIGHTS - AMBER ON	
WAIT FIVE SECONDS	
WAIT 60 SECONDS	
TRAFFIC LIGHTS - RED +	
AMBER OFF	
TRAFFIC LIGHT - RED	

HELPFUL LINK http://www.technologystudent.com/sysprp7/sysq8.html

**6b.** Convert your sequence into a flow chart using the boxes also shown below. The first four stages have been completed for you. **5 marks** 



6. The diagram below shows a gear train, composed of three gear wheels.



6c. Gear A revolves at 60 revs/min in a clockwise direction.

What is the output in revolutions per minute at Gear C? 3 marks

In what direction does Gear C revolve? 2 marks

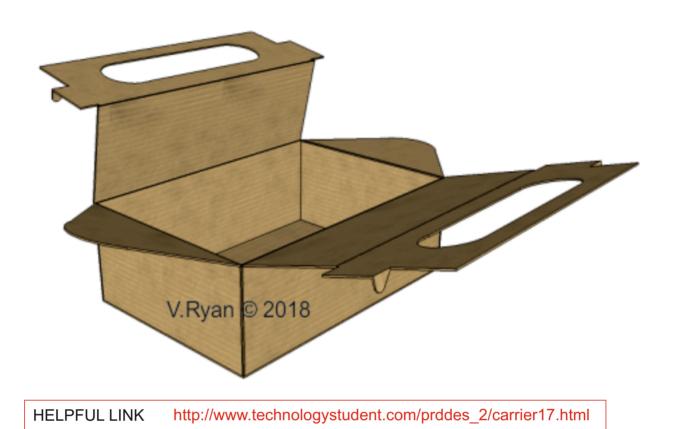
GEAR A	GEAR B	GEAR C
20 teeth	60 teeth	10 teeth
60 rpm	?	?

# HELPFUL LINK http://www.technologystudent.com/prddes1/plannedob1.html

<b>6d.</b> With referend 5 <i>marks</i>	•	•	·	-		
e. Explain why	planned obsol	lescence ca	n be bad fo	or the enviro	onment. 3	marks
<b>6f.</b> 'Planned obs safety reasons'.						products fo

## **Paper and Boards**

7. The photograph shows a disposable food carrier / lunch box.



**7a.** Corrugated card has been used for the manufacture of the food carrier shown above. Explain why this material has been used. **2** *marks* 

7b. Sketch the recycling symbol for card 1 mark

h carrier is to had. What is UV v	. , ,		oplied to a	quality card l	id, which v	will be
HEI DELII I INK	http://www.tec	hnologystu	dent com/des	enro fleh/subni	rint1 html	

**7d.** The product will be sold with a free gift, a coffee cup (shown below). Sublimation printing has been used to apply graphics to the cup's surface. What is sublimation printing. Use notes and a sketch(s) in your answer. **4 marks** 



NOTES	SKETCHES
	-
	-
	-
	-
	-
	-
	-

7. The shape and form of the packaging is to be changed, to the one shown below.

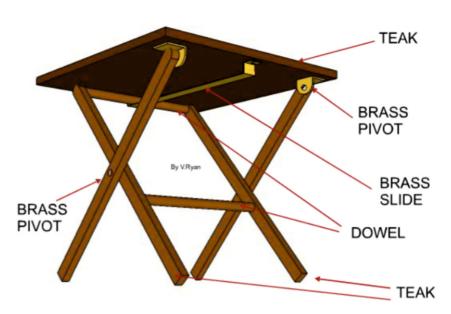
WORLD ASSOCIATION OF TECHNOLOGY TEACHERS https://www.facebook.com/groups/25	7e. It is based on a rectangular prism, with a small section folded internally, given the impression that a smaller rectangular prism has been removed.  What is the volume of the finished 3D shape? Explain your working out.  5 marks  www.technologystudent.com © 2017 V.Ryan © 2017

# HELPFUL LINK http://www.technologystudent.com/prddes1/plannedob1.html

<b>7f.</b> With reference 5 <i>marks</i>	p. 0 a a a c	,	- 2, 3, pioni			
<b>'g.</b> Explain why p	lanned obsole	scence can	be bad for	the environr	ment. 3 m	arks
<b>7h.</b> 'Planned obsessafety reasons'. I						oducts fo

# Natural and manufactured timber

**8.** Study the teak, folding outdoor table / picnic table shown opposite.

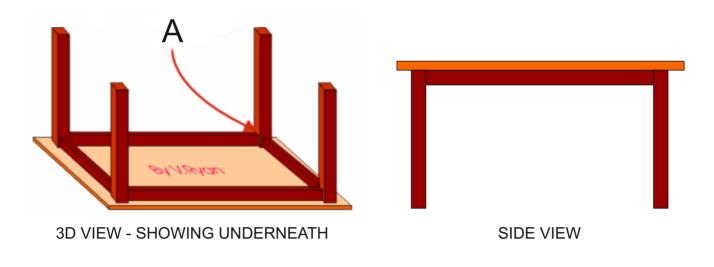


HELPFUL LINK

http://www.technologystudent.com/rmprep08/prod1.html

<b>Ba.</b> Why	is teak a suitable material for the outdoor table? 2 marks
	HELPFUL LINK http://www.technologystudent.com/despro_flsh/finish6.html
	outdoor table has been 'finished' with teak oil. Why can this be considered a choice? <b>2</b> marks
	HELPFUL LINK http://www.technologystudent.com/despro_flsh/finish6.html
<b>8c.</b> Nam	e one alternative finish, that could be applied to the table. <i>1 mark</i>

The table design has been updated to a 'knock-down' piece of furniture (seen below).



HELPFUL LINK http://www.technologystudent.com/joints/tableft1.htm

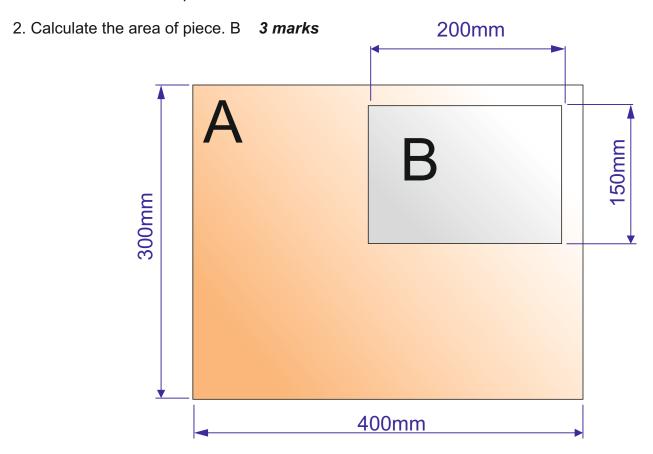
**8d.** Name and sketch a suitable KNOCK-DOWN joint for 'A', as shown on the drawing above. *4 marks* 

NAME:			
	SKETCH		

WORLD ASSOCIATION OF TECHNOLOGY TEACHERS https://www.facebook.com/groups/254963448192823/

8e. The table top is to be updated. An acrylic insert, is to be set into the table top. The table top is composed of two rectangular pieces, accurately cut to size on a laser cutter. They fit perfectly together.

1. Calculate the area of piece A 2 marks

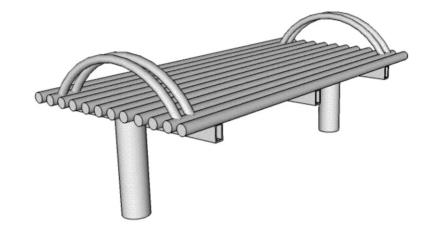


# HELPFUL LINK http://www.technologystudent.com/prddes1/plannedob1.html

marks						
<b>g.</b> Explain why	planned obso	olescence c	an be bad	for the env	vironment.	3 marks
<b>8h.</b> 'Planned obsafety reasons'						to products fo

# Ferrous and non-ferrous metals

**9.** This steel bench is manufactured from steel round section tube.



HELPFUL LINK

http://www.technologystudent.com/joints/steelbnch1.html

9a.	Why is steel tube suitable for the manufacture of the bench?	5 marks

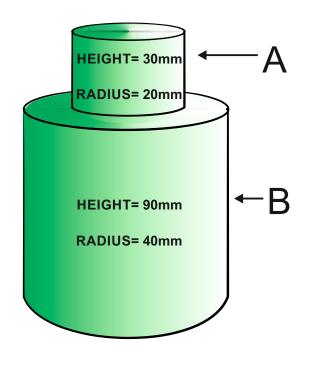
HELPFUL LINK	http://www.technologystudent.com/joints_	_flsh/metal6.html
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**9b.** Describe how the steel bench could be dry powder coated, producing a coloured, protective finish. Use notes and sketches. 4 marks

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**9e.** The solid steel object seen below, has been manufactured on an engineering centre lathe. It is one solid piece. Calculate the total volume. 5 marks



In order to calculate the entire volume of the engineered solid, it is treated as two separate parts. Part A is the smaller cylinder and part B is the larger cylinder.

# HELPFUL LINK http://www.technologystudent.com/prddes1/plannedob1.html

<b>9f.</b> With reference to a <b>5</b> <i>marks</i>	, , , , , , , , , , , , , , , , , , , ,	, - 1	,	
<b>9g.</b> Explain why planno	ed obsolescence	can be bad for	r the environmen	t. <b>3 marks</b>
<b>01</b> (D)		1 19 6 1		
<b>9h.</b> 'Planned obsoleso safety reasons'. Expla	cence is sometim ain this statement,	es deliberately , giving exampl	and openly built es. <i>3 marks</i>	into products to

# Thermosetting and thermoforming plastics

**10.** The product seen opposite, is a 'plastic' trophy, manufactured through the process called rotational moulding'



HELPFUL LINK

http://www.technologystudent.com/prddes1/rotate2.html

Da. Name a material suitable for this industrial process?  mark
<b>Db.</b> In the space below, explain the process of rotational moulding. Include a sketch anotes. <b>3 marks</b>

10. The products shown below have been manufactured from nylon.



HELPFUL LINK

http://www.technologystudent.com/joints\_flsh/nylon2.html

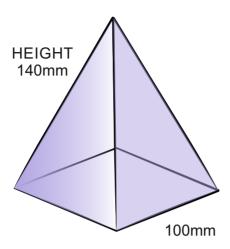
**10c.** Using notes and a sketch, explain how nylon is manuafctured. **5 marks SKETCH** 

**10d.** A solid polyethylene square pyramid has been manufactured by rotational moulding. What is the volume of the shape? *5 marks* 

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#### **FORMULAS**

AREA OF BASE = LENGTH<sup>2</sup>

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 LINK http://www.technologystudent.com/prddes1/plannedob1.html

<b>10e.</b> With reference to a product of your choice, explain planned obsolescence.  5 marks
<b>10f.</b> Explain why planned obsolescence can be bad for the environment. <b>3 marks</b>
10g. 'Planned obsolescence is sometimes deliberately and openly built into products for safety reasons'. Explain this statement, giving examples. 3 marks

# ADD YOUR OWN TEXTILES SPECIFIC EXAMINATION QUESTIONS