2 HOURS ALLOWED

Materials required for this examination:

- normal writing and drawing instruments
- a calculator
- a protractor.

Instructions to candidates:

- Use black ink or black ball-point pen. Use pencil only for drawing.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the spaces provided. Do not write on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

Information

- The marks for questions are displayed.
- The maximum mark for this paper is 131.
- There are 22 marks for Section A, 37 marks for Section B and 72 marks for Section C.

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1. Which one of the following energy production systems is a fossil fuel?

A. Wind Power
B. Hydraulic Fracturing  ✔
C. Nuclear Power
D. Hydroelectricity

This link will help you answer this question
http://www.technologystudent.com/energy1/engex.htm

2. The character below is standing still. What is this type of load?

A. Dynamic
B. Resting
C. Static  ✔
D. Shear

This link will help you answer this question
http://www.technologystudent.com/forcmom/force1.htm

3. A thermosetting plastic is:

A. Once 'set' these plastics cannot be reheated to soften, shape and mould.  ✔
B. These plastics can be reheated up to four times, but no more.
C. These plastics can be re-heated and therefore shaped in various ways.
D. This is a composite plastic, made up of several layers.

Link to potential answer
http://www.technologystudent.com/designpro/plastic1.htm
4. From the list of materials, identify the material that includes chromium in its composition.

A. Copper
B. Nylon
C. Stainless steel
D. Lead

5. Which of the following names means, ‘materials on a very small scale’, on a scale of three atoms?

A. Small scale.
B. Micro-material
C. mini-substance
D. Nano

6. Which of the following statements describing ‘torsion’ is true?

A. Torsion is a ‘twisting’ force.
B. Torsion occurs when a material is stretched in a straight line.
C. Torsion is the ‘impact’ when two materials are knocked together.
D. Torsion is the term used to describe a rise in temperature of a material.

7. Which of the statements below is the definition of the physical property ‘Ductility’?

A. A ability of a material to resist impact when dropped .
B. The ability of a material to resist a stretching force.
C. The ability of a material to return to its original shape.
D. The ability of a material to change shape (deform) usually by stretching along its length.
8. Which of the following statements is representative of crowd funding?

A. A group of designers fund the manufacture of a new product
B. The person / company seeking funding, sets up a 'page' on a website and asks for financial support.
C. A number of companies directly sponsor a designer, in exchange for advertising.
D. The Government funds a designer through taxes.

Link to potential answer
http://www.technologystudent.com/prddes_2/crowd1.html

9. Which of the following is the process called ‘etching’?

A. A process whereby paint is sprayed onto the surface of a material.
B. A process that changes the colour of the surface of a metal.
C. A process that creates a long-lasting protective coating on a metal.
D. Acid is used to slowly remove the unprotected surface of a metal, for a decorative finish.

Link to potential answer
http://www.technologystudent.com/joints_flsh/etching1.html

10. What is the area of the square shown below?

A. 1000mm²
B. 10000mm²
C. 1100mm²
D. 10100mm²

Follow the link to a potential answer.
11. Give two reasons why Flexi-ply is suitable for making ‘curved’ products such as furniture. 2 marks

Reason 1: Flexi-ply ‘is ‘flexible’ allowing easy manufacture of curved surfaces. It does not splinter even when set to extreme curves. It is strong when glued in position. Sometime does not need a jig OR a simple jig is suffice.

Reason 2: 1 mark for each reason. See link for detailed answers.

12. Describe one practical application of polylactide (PLA). Include in your answer, how the environment will benefit from the use of this material 2 marks

Practical Application: 1 mark for practical application and I mark for environmental benefit.

Environmental Benefit: See diagram following links for practical application and environmental benefits.

13. Hydraulic Fracking is a method of extracting oil and gas from rocks below the earth’s surface. Give two reasons why some people support this technique. 2 marks

Reason 1: 1 mark for each reason.

Reason 2:
14. Give two reasons why some people are not in favour of hydraulic fracking. 2 marks

Reason 1:

1 mark for each reason.

Follow link for arguments for and against fracking

Reason 2:

15. This question is about using ratios to scale drawings?
What is the ratio of height to length of the rectangle?
You will gain marks for the calculation and your written explanation of the calculation.

4 marks

Teacher discretion:

Full 4 marks for all working out and correct answer
SECTION B - Specialist Technical Principles

16. Select one of the materials listed above.

Name of Material

For any marks the material must be named

Describe your chosen materials manufacture. Include notes and a labelled sketch(s)
8 marks

1 mark for a basic diagram
1 mark for a basic written answer
2-4 marks for reasonable written answer and sketch
4 - 8 marks for good to detailed answers including text and sketch.

Teacher discretion required.
17. Describe two processes that help to smooth / enhance the edge of a piece of 6mm thick acrylic. Use notes and a sketch. 2 x 2 marks

Process 1:
1 mark for naming the process and 1 mark for description
follow links for detailed answers

Process 2:
1 mark for naming the process and 1 mark for description
follow links for detailed answers

18. 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

| DESK TIDY | PEWTER CASTING |
| WOOD - LAMP | WOOD TURNING |
| POLYETHYLENE TEREPHTHALATE | VACUUM FORMED TRAY |

For any marks product must be named

PRODUCT: ____________________________

REASON 1: ____________________________
1 mark for basic answer
2 marks for more detail.
Follow the link for detail
19. For the product you selected in question 18 - describe / explain the industrial process used in its manufacture. The industrial process is listed under the product name. 5 marks

TO HELP YOU ANSWER THIS QUESTION

USE THE SAME LINKS AS QUESTION 18

INDUSTRIAL PROCESS: __________________________

DESCRIPTION OF MANUFACTURING PROCESS
INCLUDE NOTES AND A SKETCH(S)

For any marks the industrial process must be named.

1 mark for basic sketch
2 marks for basic sketch and basic description
3-5 marks for increased detail.

Follow the links for sample answers.
20a. What is the difference between batch production and continuous production?  

Follow the link for sample explanation of each system

1 mark for very simplistic answer
for higher marks pupil must show an understanding of batch being a ‘numbered’ amount whilst continuous is 24 hours - every day of the week

Teacher discretion required.

20b. Briefly describe the stages involved in the batch manufacture of a product of your choice  

Follow the links for two sample answers.

For any marks the product should be named / identified.

1-2 marks for basic description/explanation

3-4 marks - stages should be clearly described / explained.
21a. What is Computer Integrated Manufacture (CIM)?  4 marks

Follow link for clear description.

I mark per characteristic of CIM

21b. Select a product that could be manufactured through Computer Aided Manufacture (CIM) and describe the stages involved in its manufacture  4 marks

PRODUCT:  
For any marks the product must be named. Teacher discretion required.

DESCRIPTION:  

Follow link for a sample product description.

I mark per stage of CIM
The packaging seen below, has been designed to hold / store six ‘plastic’ bottles containing a natural fruit soft drink.
22. The packaging should have the following design features:

22a. Explain why the packaging should be sustainable. 2 marks

Follow link for detailed answers.
1 mark for one fact
2 marks for two facts

22b. Explain why it would be an advantage for the packaging to be educational. 2 marks

Follow link for detailed answers.
1 mark for one fact
2 marks for two facts

22c. Explain why the use of colour and images on promotional packaging, is an important design feature. 2 marks

Follow link for detailed answers.
1 mark for one fact
2 marks for two facts

22d. The packaging should allow ease of stacking on a supermarket shelf and during transport. 2 marks

Follow link for detailed answers.
1 mark for one fact
2 marks for two facts

22e. The packaging should promote a healthy diet. 2 marks

Follow link for detailed answers.
1 mark for one fact
2 marks for two facts
23a. How is packaging used to promote products?

4 marks

1 mark per fact / point

Follow link for sample answers

23b. How could a QR code (Quick Response Code) be used to promote a product?

4 marks

1 mark per fact / point

Follow link for sample answers
24a. With the aid of a diagram, explain how packaging can be printed through the process of lithography?  

5 marks

1 mark for basic sketch and 1 mark for basic explanation
2 - 3 marks for reasonable sketch and basic explanation
4-5 marks for detailed sketch and explanation

Follow the link for sample answer.

24b. Give three reasons why the use of biodegradable ink, is beneficial when printing on packaging.  

3 marks

REASON 1:

Follow link for detailed information.

1 mark per reason.

REASON 2:

REASON 3:
25a. These questions are related to British Standards and European Standards (8 marks in total)

What is the British Standards Institute? 2 marks

Follow link for detailed information
1 mark per fact / point.

25b. What is the British Standards Institute Kite Mark? Include a sketch. 2 marks

Follow link for detailed information
1 mark per fact for explanation and 1 mark for sketch.

25c. What is the Conformite European Symbol? Include a sketch of the symbol. 2 marks

Follow link for detailed information
1 mark for description and 1 mark for sketch.

25d. How do the two standards differ? 2 marks

Follow link for detailed information
1 mark per fact / point.
Designers need an understanding of Quality Control and Quality Assurance

26a. What is meant by the term Quality Assurance?  
4 marks

Follow links for detailed information.

! mark per correct fact / point

26b. What is meant by the term Quality Control?  
4 marks

Follow links for detailed information.

! mark per correct fact / point
27. Below is a model of a typical village church. The roof of the tower is a square pyramid.

A. What is the area of one side of the square pyramid?

\[ \text{AREA} = \frac{1}{2} \times \text{BASE} \times \text{HEIGHT} \]

\[ \text{AREA} = \frac{250 \times 300}{2} \]

\[ \text{AREA} = \frac{75000}{2} \]

\[ \text{AREA} = 37500 \text{mm}^2 \]

Up to 4 marks for the working out, in addition 2 marks for correct answer.
28a. Designers need an understanding of smart materials. Aroma Pigments have many practical applications. What are aroma pigments? 2 marks

Follow link for full explanation.
1 mark for basic explanation 2 marks for full explanation

28b. Describe two practical applications of aroma pigments. 2 x 3 marks

PRACTICAL APPLICATION 1:

1 mark for basic description
2 marks for reasonable description (two points included)
3 marks for detailed answer (three points included)

Follow the link for sample answers.
29a. Designers invest time and effort, testing and evaluating a prototype. Why do designers test and evaluate?  

*Follow link for sample answers / detail.*

1 mark for basic answer  
2 marks for full answer

29a. Describe two features / aspects of a design, that designers evaluate.  

*Follow link for detailed information.*  

1 mark for one fact / point  
2 marks for two facts / points  
3 marks for three facts / points

Feature/aspect 1:

*Follow the link for detailed information.*  

1 mark for one fact / point  
2 marks for two facts / points  
3 marks for three facts / points

Feature/aspect 2:

*Follow the link for detailed information.*  

1 mark for one fact / point  
2 marks for two facts / points  
3 marks for three facts / points
30. This is a simple pencil sharpener.

An two point perspective drawing of the sharpener has been started below.

Complete the outline of the sharpener.  
3 marks

Add appropriate pencil shading, to enhance the final finish.  3 marks

Follow the link for a sample answer.

Up to 3 marks for the drawing (1 mark for basic drawing, 2-3 marks according to detail)

In addition - Up to 3 marks for shading (1 mark for basic shading, 2-3 marks according to detail / level of shading)