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.
The questions to follow are multiple choice. Tick one answer for each question.

1. Which one of the following energy production systems is an alternative energy?
   
   A. Wind Power  
   B. Hydraulic Fracturing  
   C. Crude Oil  
   D. Coal  

   [ ] A. Wind Power  

   [ ] B. Hydraulic Fracturing  

   [ ] C. Crude Oil  

   [ ] D. Coal  

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

2. Which type of motion does the diagram below represent?
   
   A. Rotary  
   B. Reciprocating  
   C. Linear  
   D. Oscillating  

   [ ] A. Rotary  

   [ ] B. Reciprocating  

   [ ] C. Linear  

   [ ] D. Oscillating  

This link will help you answer this question:  
http://www.technologystudent.com/forcmom/motion2.html

3. A Foam Metal is:
   
   A. A dense metal, starting at the core and out to the exterior layer.  
   B. A metal that cannot be heated, as it will melt.  
   C. A solid structure, usually composed of a dense outer layer, with the inner portion in the form of a matrix of pores.  
   D. A composite metal, made up of several layers.  

   [ ] A. A dense metal, starting at the core and out to the exterior layer.  

   [ ] B. A metal that cannot be heated, as it will melt.  

   [ ] C. A solid structure, usually composed of a dense outer layer, with the inner portion in the form of a matrix of pores.  

   [ ] D. A composite metal, made up of several layers.  

Link to potential answer:  
http://www.technologystudent.com/joints_fish/metafoam1.html
4. From the list of woods, identify the natural wood.

A. Plywood  
B. MDF  
C. Mahogany  
D. Flexiply

5. Which of the following designers, designed the ‘Juicy Salif’ - Citrus Squeezer?

A. Charles Eames.  
B. Marcel Breuer  
C. Philippe Starck  
D. Robin Day

6. Which of the following statements describing ‘plywood’ is FALSE?

A. Plywood is a composite material.  
B. Plywood is composed of several layers of thin plies / veneers.  
C. Plywood is relatively weak, compared to other manufactured boards.  
D. Plywood is supplied in a variety of thicknesses.

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

A. The ability of a material to be twisted into a variety of shapes, without the need for heat.  
B. The ability of a material to resist a stretching force, without cracking.  
C. The ability of a material to return to its original shape, repeatedly.  
D. The ability of a material to be transformed from a solid state to a liquid state, due to the application of heat.
8. Which of the following statements is representative of Iterative Design?

A. A linear design process, whereby one stage follows another.
B. A process of continual improvement, of a concept, prototype, design or product, with model making, sketching, client feedback applied when required. 
C. Designing as a team, following a strict design process.
D. A systems approach - PROCESS - SYSTEM - OUTCOME.

[Link to potential answer](http://www.technologystudent.com/despro_flsh/iterative1.html)

8. A process of continual improvement, of a concept, prototype, design or product, with model making, sketching, client feedback applied when required.

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

A. An automated painting process.
B. Plastic coating of a metal surface, to increase its resistance to temperature.
C. A process that creates a ‘reflective’ coating on a range of polymers.
D. A process involving heating ‘plastic’ granules to liquid form and forcing the solution into a mould.

[Link to potential answer](http://www.technologystudent.com/equip1/inject1.htm)

9. A process involving heating ‘plastic’ granules to liquid form and forcing the solution into a mould.

10. What is the name of the area of circle labelled ‘A’, seen below?

[Link to potential answer](http://www.technologystudent.com/pdf14/maths4.pdf)

10. Sector
11. Give two reasons why Titanium is suitable for making turbine blades in jet engines.  

Reason 1:  

One mark per correct reason.  

Follow the link for possible answers  

Reason 2:  


12. Describe one potential practical application of Graphene. Include in your answer, why graphene is suitable for the practical application.  

Practical Application:  

One mark for each aspect of the question i.e. names practical application and suitability.  

Why suitable?:  


13. Nuclear Power Stations, produce electricity from radioactive fuel sources such as uranium. Give two reasons why some people are against this method of energy production.  

Reason 1:  

One mark per correct reason.  

Follow the link for possible answers  

Reason 2:  


14. Give two reasons why some people are in favour of Nuclear Power. 2 marks

Reason 1:

One mark per correct reason.

Follow the link for possible answers

Reason 2:

15. What is the circumference of the circle seen in the diagram.

You will gain marks for each stage of the calculation, written in the space below

4 marks

CALCULATION:

Two marks for each stage as outlined below

CIRCUMFERENCE = 2 \times \pi \times r

C = 2 \times \pi \times r

C = 2 \times 3.14 \times 100  \quad 2 marks

C = 628 mm  \quad 2 marks

FORMULA

\pi (\text{pi}) = 3.14
16. Select one of the materials listed above.

Name of Material

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

1 to 2 marks for a simplistic answer.

3 - 4 marks for reasonable detail

5 to 8 marks for detailed / very detailed notes and sketch(s), fully explaining the process

TO HELP YOU ANSWER THIS QUESTION
http://www.technologystudent.com/joints_flsh/metalfoam1.html
http://www.technologystudent.com/joints/plywood1.html
17a. Why is lacquer sometimes applied to a metal surface?  

2 marks

1 mark for basic answer

2 marks for increased detail

See links for detailed answer / relevant information

17b. Describe the process of applying lacquer to a metal surface?  

2 marks

1 mark for basic answer

2 marks for increased detail

See links for detailed answer / relevant information

18. Select one of the products shown below. Then, give two reasons, why the product is a good example of one off / single item production.  

2 x 2 marks

| BESPOKE CHAIR | HANDMADE JEWELLERY | THE EIFFEL TOWER |

Product must be identified for any marks from this question

REASON 1:  

1 mark for basic answer

2 marks for increased detail

See links for detailed answer / relevant information
19. Metals can be permanently joined in a number of ways. Using notes and sketches, describe/explain the industrial process called BRAZING.  

**TO HELP YOU ANSWER THIS QUESTION**

http://www.technologystudent.com/equip1/braz1.htm  
http://www.technologystudent.com/joints/braz2.htm

**THE INDUSTRIAL PROCESS CALLED BRAZING**

**INCLUDE NOTES AND A SKETCH(S)**

1 - 2 marks for an answer that displays a basic understanding of the process.

3 to 5 marks for increased detail. 5 marks awarded only for detailed sketch(s) and detailed notes. Teacher discretion required.
### 20a. What is the Lean Manufacturing system? 4 marks

1 mark for a single accurate statement

2 - 3 marks for increased detail which includes 2 / 3 accurate statements

4 marks for a detailed full answer.

Follow the links for guidance on the statements that can be regarded as correct.

<table>
<thead>
<tr>
<th>TO HELP YOU ANSWER THIS QUESTION</th>
<th>Follow the links below.</th>
</tr>
</thead>
</table>

### 20b. Name four international companies that utilise the Lean Manufacturing philosophy 4 marks

1 mark per company correctly identified.

Follow the links for a list of some of the international companies applying Lean Manufacture.
21a. What is Globalisation?  

What is Globalisation?  

1 mark for a single accurate statement

2 - 3 marks for increased detail which includes 2 / 3 accurate statements

4 marks for a detailed full answer.

Follow the links for guidance on the statements that can be regarded as correct.

21b. Select a manufactured product that is the result of globalisation, Describe the stages involved in it’s manufacture.  

What product?  

For any marks a product must be identified first.

Description:

1 mark for a single accurate statement

2 - 3 marks for increased detail which includes 2 / 3 accurate statements

4 marks for a detailed full answer.

Follow the links for guidance on the statements that can be regarded as correct.
PACKAGING OF PERFUMED PRODUCTS

The packaging seen below, has been designed to hold / store deodorant and perfume containers.
22. The packaging should have the following design features:

22a. Draw a typical symbol that should be found on the packaging and add a description/explanation of the symbol. 2 marks

1 mark for a correct symbol
1 mark for the description

22b. What is the advantage of using Expanded Polypropylene (EPP)?
2 marks  (Link for help http://www.technologystudent.com/prddes1/perfpk3.html)

1 to 2 marks depending on the level of detail.
Follow the link for potential answers

22c. Why is quality card also used in the manufacture of the packaging? 2 marks

1 to 2 marks depending on the level of detail.
Follow the link for potential answers

22d. The printing process called lithography is used to print the detail, images and colour on to the surfaces of the packaging. Draw a labelled diagram of lithography and included a written explanation. 4 marks  (Link for help http://www.technologystudent.com/designpro/prtpro5.htm)

Up to 2 marks awarded for the notes.

Up to 2 marks awarded for the diagram (1 mark for sketch and 1 mark for labels)
23a. List **FOUR** ways, in which the printed surfaces of packaging, helps in the promotion of a product?  

4 marks

1 mark awarded per correctly identified point regarding product promotion.

Follow the link for further guidance.

23b. How could the packaging be improved, if the target market was specifically aimed at teenagers?  

4 marks

1 mark awarded per point

e.g. Adding a sporting logo / symbol / theme. Use of celebrity endorsement. Change of shape. Increased environmental awareness etc.....
24a. The surface of the packaging is to be finished through the process of UV varnishing? Explain this process with a diagram and notes 5 marks

__________________________________________________________________________

__________________________________________________________________________

Up to 2 marks awarded for the notes.

__________________________________________________________________________

Up to 3 marks awarded for the diagram - dependent in detail.

__________________________________________________________________________

Follow the link for guidance.

__________________________________________________________________________

TO HELP YOU ANSWER THIS QUESTION Follow the link below.


24b. The packaging is in the form of a cuboid. Give three advantages of using this common shape 3 marks

REASON 1:

REASON 2: 1 mark awarded per correct reason.

Follow link for guidance and potential answers.

REASON 3:
25a. These questions are related to Brand Identity (8 marks in total)

What is a brand?  

2 marks

1 mark for a basic answer

2 marks for increased knowledge.

25b. Name a company that you think has reached brand status. Explain why you consider it has reached this status.  

2 marks

1 mark for a company name (teacher discretion required)

1 further mark for explanation.

25c. Describe / explain four characteristics of Brand Identity.  

4 marks

1 mark per characteristic.

Follow the link for potential answers.
Designers need an understanding of Market Research

26a. What is meant by the term Market Research?  

4 marks

1 mark per relevant statement.

Follow the link for potential answers / statements

26b. How can ICT specifically contribute to market research?  

4 marks

1 mark per relevant statement.

Follow the link for potential answers / statements
An acrylic panel for a storage unit is seen below.

27a. Calculate the area of the acrylic required, before it is cut to shape (the overall rectangle of acrylic required before it is cut into an L shape).  

3 marks

27b. Calculate the area of the final L shape  

5 marks

First, calculate the area of the uncut acrylic, by treating it as a rectangle 500mm x 400mm.

\[ \text{AREA} = \text{LENGTH} \times \text{HEIGHT} \]
\[ \text{AREA} = 500 \times 400 \]
\[ \text{AREA} = 200000 \text{mm}^2 \]

Now, calculate the area of the smaller rectangular piece to be cut away, during the shaping of the panel.

\[ \text{AREA} = \text{LENGTH} \times \text{HEIGHT} \]
\[ \text{AREA} = 250 \times 200 \]
\[ \text{AREA} = 500000 \text{mm}^2 \]

Now subtract the smaller area from the area of the uncut plywood.

\[ 200000 - 50000 = 150000 \]

\[ \text{AREA OF FINAL SHAPED PIECE IS} \ 150000 \text{mm}^2 \]
28a. Designers need an understanding of smart materials. Phosphorescent Pigments have many practical applications. What are Phosphorescent Pigments? 2 marks

1 mark awarded for a basic answer / one statement of fact.

2 marks for increased relevant detail.

28b. Describe two practical applications of Phosphorescent Pigments. 2 x 3 marks

PRACTICAL APPLICATION 1:

1 mark awarded for a basic answer / one statement of fact.

2 marks for increased relevant detail.

3 marks for full, detailed answer.
29a. Designers make models throughout the design and development of a product? Why is model making important?  

2 marks

1 mark awarded for a basic answer / one statement of fact.

2 marks for increased relevant detail.

Follow the link for relevant information / potential answers.

29b. Name two model making materials used by designers and describe the characteristics that make them suitable for model making.  

2 x 3 marks

Modelling Materials 1:

1 mark for a named modelling material and a basic description.

2 marks for increased detailed to the description.

3 marks for detailed and full answer.

Modelling Material 2:

1 mark for a named modelling material and a basic description.

2 marks for increased detailed to the description.

3 marks for detailed and full answer.
30. A local public bus, takes a route from Keighley to Bradford, as shown on the map below. The bus stops are indicated on the map

Draw a topological map, in the style of London Underground, in the available space. **6 marks**

**TO HELP YOU ANSWER THIS QUESTION**
http://www.technologystudent.com/despro_flsh/time15.html

**1 - 2 marks for a basic outline / answer with most places labelled.**

**3 - 5 marks for increased detail and accuracy of the labelled map and some colour.**

**6 marks for an accurate representation with London Underground map style.**