1. Typically, a design team will involve a number of people with different expertise.

(a) Identify **four** different areas of expertise which team members might have. ***(4)***

(b) Describe the contribution that each of these team members will make to the design work. ***(8)***

2. As leader of the design team, the designer must communicate effectively with team members at various stages in the development of a product.

(a) Identify **three** areas of expertise the other team members might have. ***(3)***

(b) For each area suggest **two** examples of:

(i) why the designer would consult with them and ***(6)***

(ii) what sort of communication methods might be used. ***(3)***

4. There are many stages in designing a commercial product from the problem statement to the solution.

Five of these stages may be defined as:

- design brief
- design specification
- generation of design ideas
- synthesis
- prototype

Describe, using a diagram if necessary, each of these stages. ***(10)***

5. Describe the contribution made by the use of models, mock-ups and prototypes in the development of a design for a new product. ***(9)***

6. In designing a new product it would be a mistake to follow a rigid linear design process, only carrying out an evaluation at the end product stage. A more efficient model to follow would be a cyclic one where evaluation takes place at several stages in the process.

   Describe how evaluation is used at each of the following stages of a typical design process. You may use a design project from your own experience to illustrate your answer.

   (a) Analysis of the brief
   (b) Design specification
   (c) Generation of ideas
   (d) Synthesis
   (e) Prototype
   (f) Finished product ***(12)***

7. A digital camera is shown below. Most digital cameras in today's market have a variety of functions, some used more than others. With regard to digital cameras in general, write down their primary function and their likely secondary function(s).

(4)

8. An electric kettle is shown below.

Describe how functional factors have influenced the design of this product. ***(3)***

9. A camping stove and kitchen oven are shown below. The primary function of both products is similar; that they should provide a heat source(s) in order to cook. However, both clearly have different purposes for which they are designed and neither product could do the other products job.

Give **two** examples of other products with a similar primary function, which are fit for purpose but would perform or function badly if used in the wrong circumstance. For each product be clear about what the product should do, where it is likely to be used and who is likely to use it. ***(4)***

10. When designing products, designers are increasingly required to create and maintain a ***brand image.***

(a) Explain the importance of a brand image for a company. ***(2)***

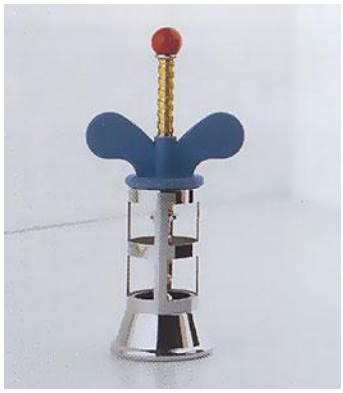
(b) Give an example of a company with a strong brand image and list some of their products. ***(2)***

A range of Alessi products by designer Michael Graves is shown below.

Bird Kettle

Oil Container

Water Jug



Corkscrew

(c) With reference to aesthetics, describe how the designer has created and maintained the brand image. ***(2)***

11. A MP3 player is shown below.

The designer would probably have been asked to include ***planned obsolescence*** in the design of the MP3 player.

(a) Describe what is meant by *planned obsolescence*. ***(3)***

(b) Explain the implications of planned obsolescence on:

(i) The environment. ***(1)***

(ii) The consumer. ***(1)***

(iii) The manufacturer. ***(1)***

12. The body of the adjustable spanner shown below is made by the process of drop forging.

(*a*) Explain why drop forging is a suitable process for producing the body of this adjustable spanner. 1

(*b*) State **two** features that would indicate that this product was made by drop forging. 2

(*c*) State a suitable material that could be used for the body of the spanner and give a reason for your choice. 2

(5)

13. The garden kneeler shown below allows the user to work in comfort.

The product has been manufactured using the process of blow moulding.

(*a*) **State** the name of a suitable material for the manufacture of the kneeler and justify your choice. 2

(*b*) State **two** features that would indicate that the kneeler was manufactured using the process of blow moulding. 2

(*c*) Justify why blow moulding was used for the manufacture of the kneeler. 1

(5)

14. Modelling is an important part of the design process.

For each of the modelling types below, describe the information that would be gathered from their use.

The three modelling types are:

- **Scale models** 2
- **Test models** 2
- **Prototypes.** 2

(6)

15. The Evac+Chair is used to transport a mobility impaired individual down stairs in a safe, smooth, and controlled way.

The consideration of ergonomic issues in the design of this product was vitally important.

With reference to the Evac+Chair, describe the ergonomic issues that may have been considered in terms of:

(*a*) Anthropometrics; 3

(*b*) Physiology; 3

(*c*) Psychology. 3

(9)

16. The car wheel shown below is a one-piece aluminium alloy sand casting.
It has been chrome plated.

(*a*) Justify the choice of sand casting for the manufacture of this wheel. 2

(*b*) Explain why additional machining was necessary after sand casting the wheel. 2

A product such as the alloy wheel shown above can also be manufactured by Pressure Die Casting.

(*c*) Explain the benefits gained by manufacturing the wheel using this process. 3

(*d*) Explain the benefits of using alloys rather than pure metals. 2

(9)

17. A table is shown below.

(*a*) Describe the benefits of using MDF with plastic laminate for the table top. 3

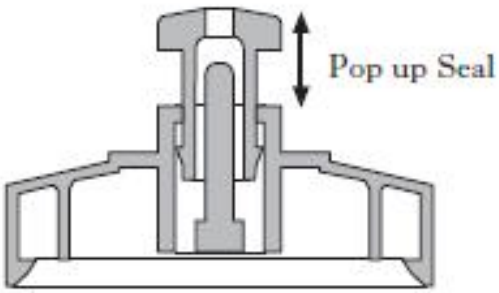
(*b*) Explain why a solid timber has been used for the legs and cross rails. 2

Parts of the table such as the edge profile on the top and shelf are manufactured using a CNC router.

(*c*) Describe the benefits of using this process when mass producing furniture. 3

(8)

18. A plastic bottle and lid for use on a bicycle is shown below.



The bottle was manufactured by the process of blow moulding and the lid components were manufactured by the process of injection moulding.

(*a*) Justify why **each** of these two processes was used to manufacture these components. **4**

(*b*) State and justify a plastic that could be used for the bottle or cap. **2**

The bottle is held onto a bicycle frame in the bottle cage shown below.

(*c*) Describe the issues that the designer would have to consider when designing the bottle cage. **2**

(8)

19. The body and side panels on the car shown below were manufactured using the process of press-forming.

(*a*) Explain why press-forming is a suitable process for the manufacture of these panels. **3**

Corrosion of car parts can be a problem.

(*b*) Describe how manufacturers attempt to reduce or eliminate this problem. **4**

"Just in Time" production is used by car manufacturers to reduce costs.

(*c*) With reference to car manufacture, describe "Just in Time" production. **3**

(10)

20. Prototypes are used during the design of products.

(*a*) Explain why it would be necessary to prototype products before manufacture. **3**

A strap with "snap-together" clip is shown below.

During the design and development process, a series of prototypes for the clip were made using rapid prototyping.

(*b*) Describe the benefits that **rapid prototyping** offers when developing this clip. **3**

(*c*) State the name of a rapid prototyping process that could be used to test the **final** design of the clip and **justify** its suitability. **2**

(8)