Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel Level 3 GCE

Wednesday 7th June

Afternoon (Time: 2 hours 30 minutes)

Paper reference **9DT0/01**

Design and Technology (Product Design)

Advanced

COMPONENT 1

You must have:
a calculator and a ruler.

Total Marks

Instructions

- Use **black** ink or ball-point pen (HB pencil may be used for questions that require drawing and sketching).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- For questions requiring mathematics, you must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 120.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 7 2 9 7 6 A 0 1 2 8

Pearson

Answer ALL questions. Write your answers in the spaces provided.

1 Figure 1 shows a wardrobe that is supplied in flat-pack form for self-assembly at home.

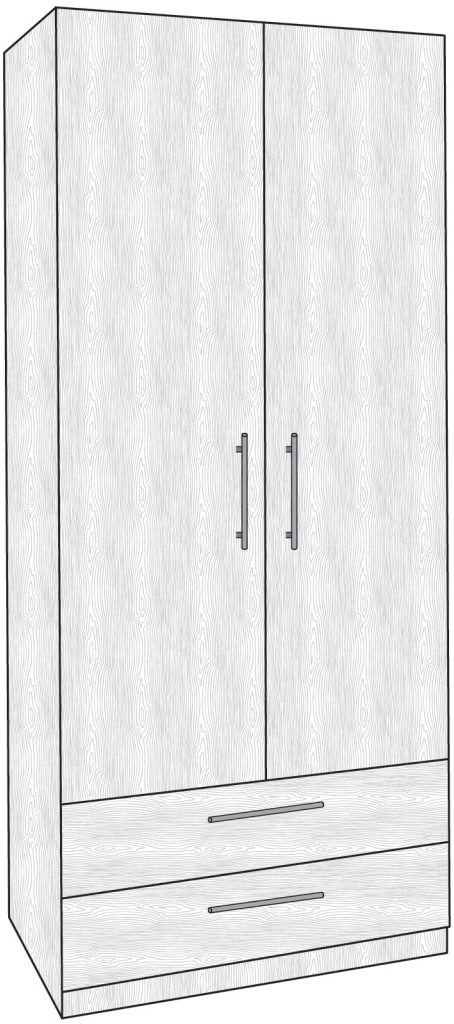

Figure 1

(a) Knock-down fittings will be used during the home assembly of the flat-pack wardrobe.

Name **two** knock-down fittings that could be used for assembling the flat-pack wardrobe.

(2)

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(b) The wardrobe is made from chipboard. A thin veneer of hardwood has been applied to the surface of the chipboard.

Explain **two** characteristics of veneered chipboard that make it a suitable material for flat pack wardrobes.

(4)

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(c) Explain one **disadvantage** of using veneered chipboard for the wardrobe.

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(Total for Question 1 = 9 marks)

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2 Figure 2 shows a packing case used in the transportation and delivery of consumer products.

The packing case is folded from a single piece of board in the form of a net.

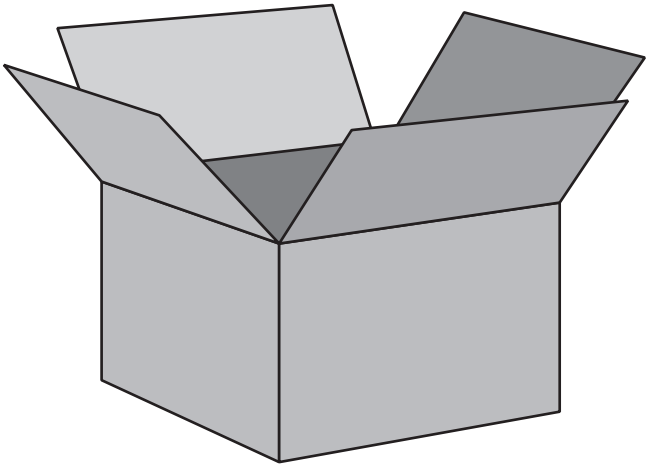

Figure 2

(a) State **two** types of board that would be suitable for making the packing case.

(2)

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(b) The graphics on the packing case will be printed using black ink.

Each packing case requires 2.5 ml of ink.

Ink is supplied in 1.5 litre containers.

The manufacturer needs to print graphics on 3,500 packing cases.

The manufacturer buys sufficient full containers of ink to complete the print run.

Calculate how many extra packing cases the manufacturer could print before running out of ink.

(5)

Answer ..... cases

(Total for Question 2 = 7 marks)

3 Figure 3 shows an organiser that has been vacuum formed.

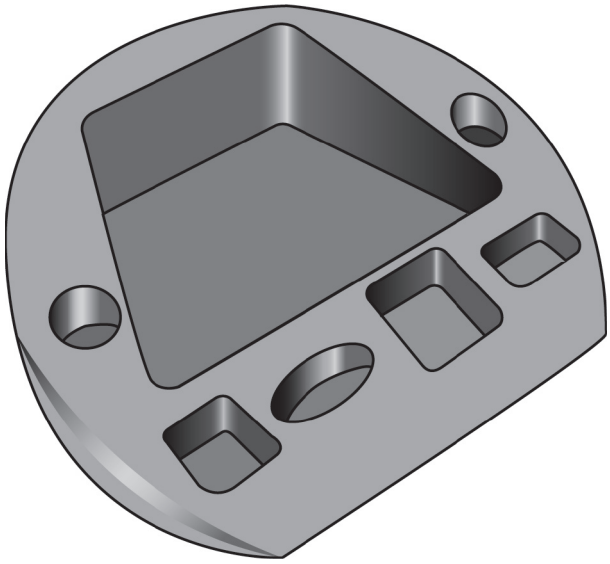

Figure 3

Vacuum forming requires a mould, in the form of the finished product, to be made for use in the manufacturing process.

One feature of the mould is that there are no undercuts that would lock the plastic around the mould and prevent its removal.

(a) Explain **one** other feature of the mould that improves/aids productivity and quality.

(2)

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(b) Describe the vacuum forming process, using annotated sketches.

(4)

(c) Explain two **disadvantages** of the vacuum forming process.

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(Total for Question 3 = 12 marks)

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4 Manufacturers use project management strategies such as scrum when designing and developing new products and production systems.

(a) Give the **three** roles within the scrum team.

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(b) Outline the key features of the scrum process.

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(c) Products need to be protected to prevent other manufacturers making exact copies of the form and function of the product.

Give **two** methods of protecting the form and function of the product.

(2)

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(d) Discuss how the design and manufacture of consumer products can minimise the impact of the products on the natural environment.

(9)

(Total for Question 4 = 20 marks)

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QUESTION 5 BEGINS ON THE NEXT PAGE

5 Figure 4 shows a table of sales for different styles of car.

Style	Hatchback	Saloon	SUV
Frequency	155	83	167

Figure 4

The information is to be presented in the form of a pie chart.

(a) Calculate the sector angle for the three car types.

You must show your answer correct to 1 decimal place.

(6)

Sector angle hatchback ..... °

Sector angle saloon ..... °

Sector angle SUV ..... °

(b) The prices of the cars are:

Hatchback – £ 24,500

Saloon – £ 32,400

SUV – £ 43,900

Calculate the mean sales price for the car sales shown in Figure 4.

(2)

Answer £ .....

(Total for Question 5 = 8 marks)

6 Figure 5 shows a speedboat with a teak deck and a glass fibre (GRP) hull.

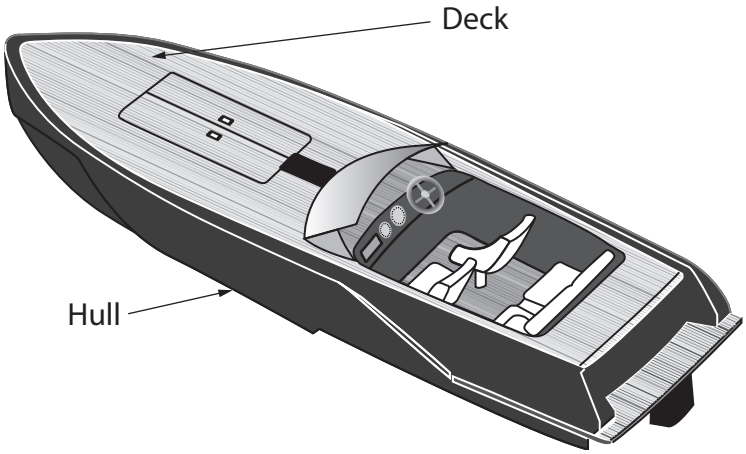

Figure 5

(a) The teak deck has been coated with a varnish.

Give **two** benefits of using varnish on the deck of the boat.

(2)

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(b) Explain **two** benefits of a boat hull that is made from GRP.

(6)

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(c) The speedboat is produced to order in a small modern manufacturing facility using one-off production methods.

Discuss the characteristics and applications of quality assurance and quality control as they would apply to the manufacture of the speedboat.

(6)

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Health and safety is very important to ensure the safety of the workforce.

(d) Name **two** key pieces of health and safety legislation that would protect the workforce during the manufacture of the speedboat.

(2)

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(e) The speedboat has undergone sea trials to test its performance and efficiency.

At its maximum speed of 90 km/hour the speedboat uses 13.62 litres of fuel per hour.

Calculate the cost of the fuel required for a 25 km journey at maximum speed.

Fuel costs £1.65 per litre.

(3)

Answer £.....

(Total for Question 6 = 19 marks)

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QUESTION 7 BEGINS ON THE NEXT PAGE

7 Figure 6 shows an isometric projection of a component.

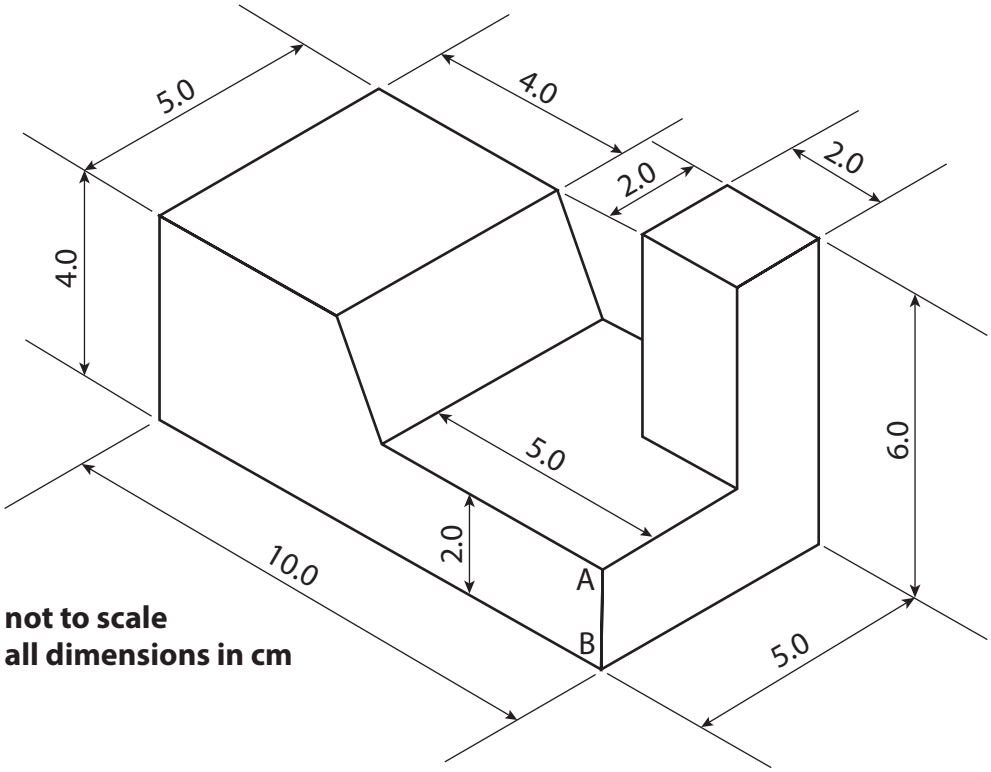


Figure 6

Isometric Projection

Designers use a range of different drawing techniques to convey their design ideas.

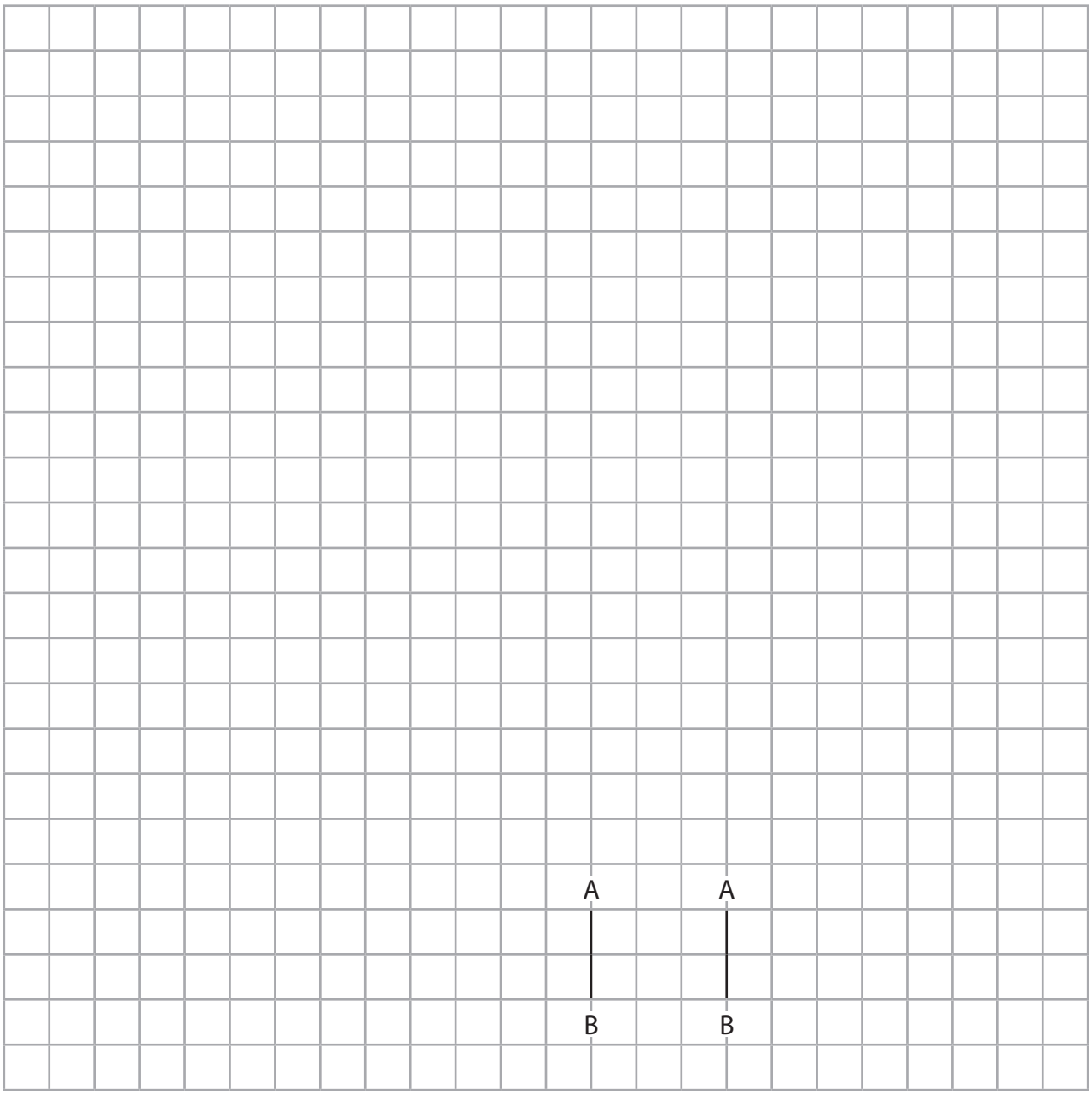
Draw an accurate 3rd angle orthographic projection of the component.

Use the grid provided at a scale of 1 square = 1 cm.

You should start at line A-B which has been shown for both the front and side elevation.

You must include sufficient dimensions on your drawing to allow a 3rd party to produce the component.

(6)



(Total for Question 7 = 6 marks)

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8 Figure 7 shows a pencil sharpener designed by Raymond Loewy.

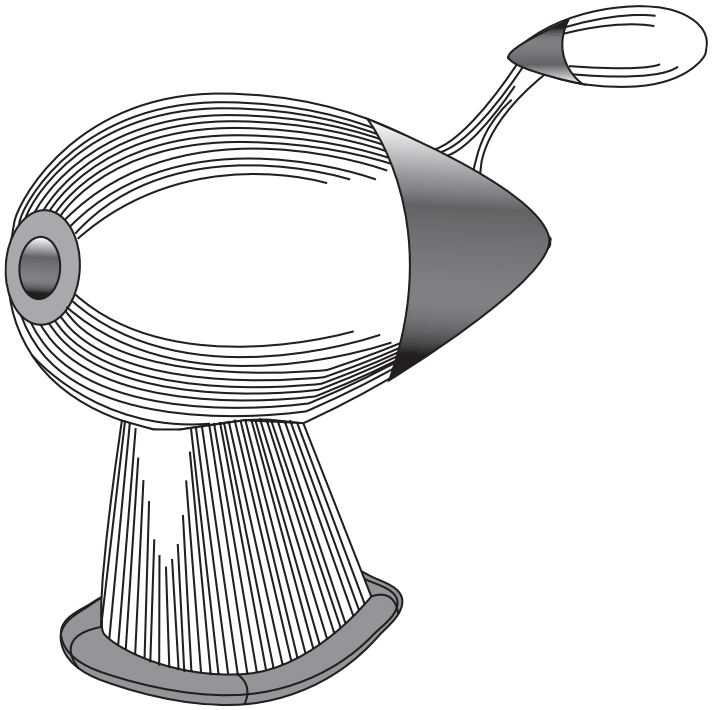

Figure 7

Discuss the style and design philosophy of the Streamlining Movement and how it may have influenced the design of the pencil sharpener in Figure 7.

(9)

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(Total for Question 8 = 9 marks)

9 Manufacturers utilise a number of systems when manufacturing consumer products.

Discuss the benefits to the manufacturer of quick response manufacturing (QRM).

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(Total for Question 9 = 9 marks)

10 Quantum tunnelling composites are now widely used as inputs to electronic products.

Explain **three** uses of quantum tunnelling composites in electronic products.

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(Total for Question 10 = 9 marks)

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QUESTION 11 BEGINS ON THE NEXT PAGE

11 Figure 8 shows a bedside lamp.

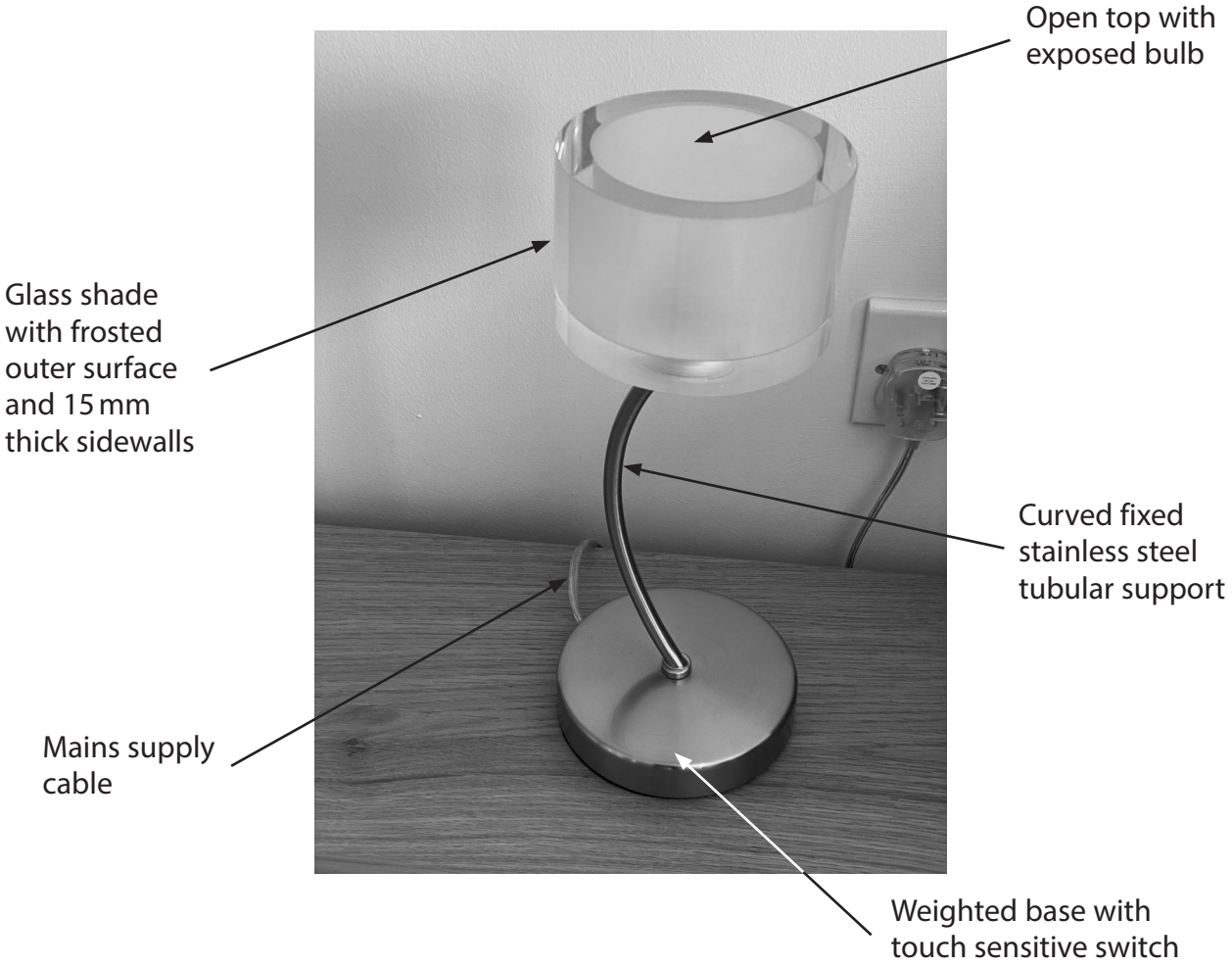

Figure 8

- The lamp can be switched on or off by touching either the base or tubular support.
- Three levels of lighting are available, by touching the base or support one, two, or three times.
- The lamp switches off after the fourth touch of the base or support.
- The lamp can use either LEDs or halogen bulbs.
- The base is made out of stainless steel and has rubber on the underside.
- The lamp weighs 2.7 kg.
- The overall height of the lamp is 330 mm.
- The diameter of the lamp base and shade is 130 mm.

Evaluate the functionality of the bedside lamp with reference to aesthetics and user requirements within a home setting.

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(Total for Question 11 = 12 marks)

TOTAL FOR PAPER = 120 MARKS

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