Lower Fifth

Summer Exam

Mark (75)

Name:

Teacher:

2018

INSTRUCTIONS

Use black ink. HB pencil may be used for graphs and diagrams only.
Complete the boxes above with your name, centre number and candidate number.
Answer all the questions.
The Insert will be found inside this document, it must be used when answering questions in Section B.
Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
Write your answer to each question in the space provided. Additional paper may be used if necessary, but you must clearly show your candidate number, centre number and question number(s).
Do not write in the bar codes.

INFORMATION

The total mark for this paper is 75.
The paper is 1 hour 30 in duration.
The marks for each question are shown in brackets [ ].
Quality of extended responses will be assessed in questions marked with an asterisk (*).
This document consists of 15 pages.

King's College School
Department of Design & Engineering

Section A

1. Polymers

The figures below show the prototype for a fruit juice bottle.
The three parts of the product are:

- Blow moulded bottle
- An injection moulded cap
- A printed label

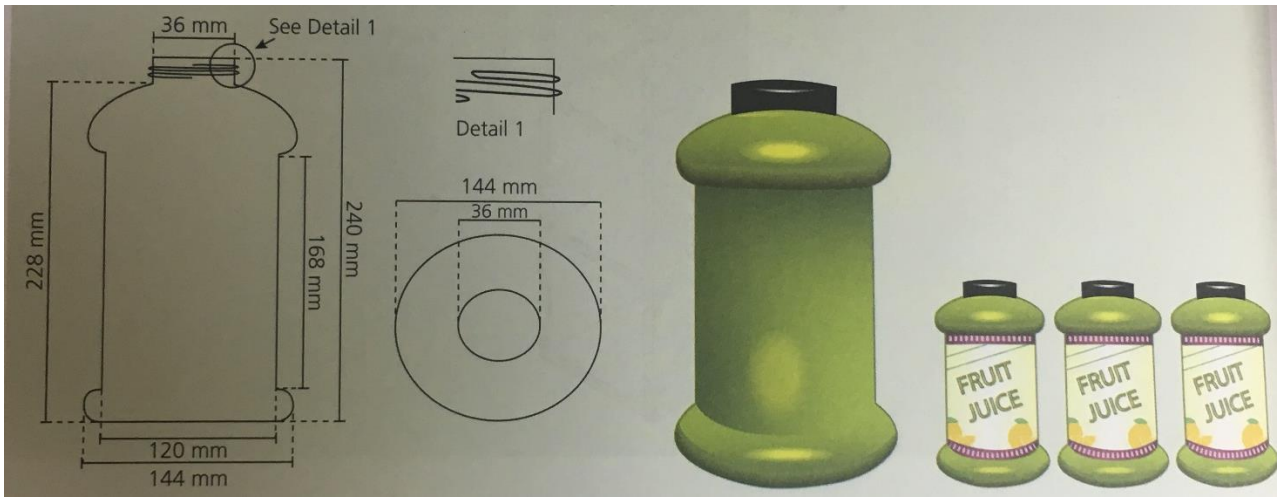


Fig. 1

a) The blow-moulded bottle is made from polyethylene terephthalate (PET).
Give **two** reasons why PET is suitable for this product.

……
……

……
……

(2)

b) Name a suitable polymer for the injection moulded cap

……

(1)

c) The printed label is made from paper. It goes all the way round the part of the bottle that is 120mm in diameter and overlaps by 10mm

a. State one reason why paper has been chosen for the label

……
……

(1)

ii. State one reason why the printed label overlaps

……
……

(1)

iii. Calculate the length of the label including the 10mm overlap

……
……
……
……
……
……

(3)

d) ‘Labels must inform and protect the customer.’ Discuss this statement in relation to the fruit juice bottle label. (*)

……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……

(6)

2. Design Engineering

Fig. 2 shows a solar light that is designed for the garden and uses an LED to illuminate a small space around it.

Fig. 2

a) Light – emitting diodes (LEDs) are often used instead of bulbs in many modern electronic devices. State **one** advantage and **one** disadvantage of using LEDs instead of bulbs in electronic devices

……

……

……

……

(2)

b) An LED is an example of an output component. Can you state another example of an **input** and an **output** component.

i) **input** component

……

(1)

ii) **output** component

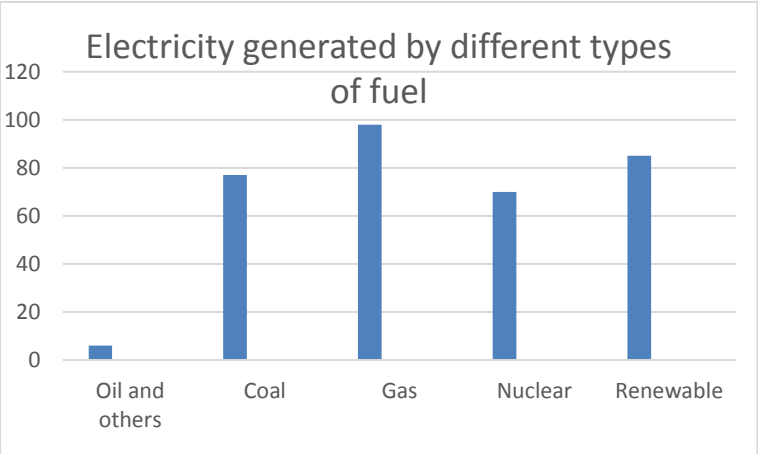
……

(1)

c) The solar light receives its energy from solar panels.

Fig. 3 shows a bar graph of the quantity of electricity generated by different types of fuel in the UK.

Total energy is measured in Terrawatt-hours (TWh)



Fuel	TWh
Oil and others	6
Coal	77
Gas	98
Nuclear	70
Renewable	84

Fig. 3

i. Calculate the fraction of total energy that is generated from renewable fuels. Give your answer as a fraction in its lowest form.

Fraction of renewable fuels = …… (1)

ii. Hydro-electricity is one type of renewable energy shown in Fig. 3.
The ration, hydroelectricity to other renewable energy is 1:12
Calculate the energy generated by hydroelectricity to the nearest decimal

Energy generated = ……..……. TWh (2)

3. Sustainability

a) Complete the table below to show a **suitable material** that could be used to manufacture the parts of the products listed

Product	Material used
Handle of a trowel	
Watering can	
Blade for a spade	

(3)

b) The seed packet is made from foil-backed paper. State **three** qualities of foil-backed paper that make it suitable for a seed packet.

1. ……
……

2. ……
……

3. ……
……

(3)

c) State **one** positive and **one** negative impact of planned obsolescence and explain your answer

……
……

……
……

(4)

Section B

For all questions in Section B you must refer to the insert, which contains images and information about products that you would find outdoors

4. Refer to page 4 of the insert

a) The trowel blades in **Image A** are made from metal and the handles are made from wood.

Give **two** reasons why high carbon steel is a suitable material for the blades.

1. ……

……

2. ……

……

(2)

b) The estate agent's sign in **Image B** are made from corriflute.

Give **one** advantage of using corriflute over cardboard in this context.

……..

……..

(1)

c) **Image C** on the insert shows a cyclist Fig. 4 shows a close up of the gear mechanism.

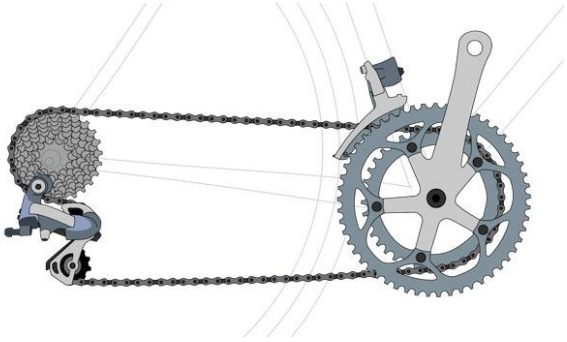


Fig. 4

i) State the type of motion that takes place when the cyclist turns the pedals.

…… (1)

ii) If the driver gear has 60 teeth and the driven gear has 12 teeth. Calculate the velocity ratio for this system.

…… (2)

d) The person in **Image D** is wearing a black coat made from a natural fibre.

i) Identify **one** natural fibre

…… (1)

ii) Explain **one** property of natural fibres that make them suitable for the coat shown

……
……
……

(2)

You need to answer questions **5 and 6** in relation to **one** of the products listed below covering an area you have studied in depth.

Information about the products is contained in the **Insert**

Before you choose a product, read all parts of questions 5 and 6.

You must tick **one** box below to indicate your chosen product.

☐ Product 1 - Polymers

☐ Product 2 - Timbers

☐ Product 3 - Metals

You should spend approximately 20 minutes on Question 5 (a).

5. Designers make prototypes to show their designs to key stakeholders.

a) Study and use the images and technical information about your chosen product given on the Insert.

Produce a step-by-step plan to explain the stages that you would take if you were making a final prototype of your chosen product in a school workshop.

You must include details of:

- Specific materials and components you would use to make the prototype
- The processes, techniques or skills you would use
- Tools you would use, including digital technology as appropriate
- How you would ensure accuracy when making the prototype
- How you would finish it to present it to stakeholders.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(12)

Designers use different approaches when designing to ensure stakeholder's opinions are considered.

b) What things might you do as a designer to keep your stakeholder involved in the design process, and how might this help?

.....
.....
.....
.....
.....
.....
.....

(3)

c) Discuss the advantages and disadvantages of using CAD modelling as a form of prototyping.

.....
.....
.....
.....
.....
.....
.....

(3)

d) It is said that we live in a ‘throwaway’ culture. Discuss the ways in which built-in product obsolescence contributes to a ‘throwaway’ culture. (*)

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

(6)

6. You should use the same product you chose for Question 5 to answer this question.

a) Materials need to be sourced and processed in order to be used to make products.

For **one** specific material from your chosen product:

- State the source of the material and
- Describe how it is processed into a workable form.

Specific material ……

Source of material …… (1)

Description ……

……
……
……
……
……
……
……

(3)

7. Discuss the positive and negative impacts on society of new and emerging technologies (*)

……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……

(6)