

Friday 25 May 2018 – Afternoon

**GCSE DESIGN AND TECHNOLOGY:
ELECTRONICS AND CONTROL SYSTEMS**

A515/03 Sustainability and technical aspects of designing and making –
Mechanisms

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

- A calculator may be used for this paper.
- Pencil
- Ruler (cm/mm)

Duration: 1 hour 30 minutes



Candidate forename		Candidate surname	
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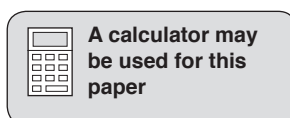
Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions in Section A **and** Section B.
- Read each question carefully. Make sure that you know what you have to do before starting your answer.
- 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 barcodes.
- Show all working out for calculations.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **80**.
- Your quality of written communication is assessed in questions marked with an asterisk (*).
- This document consists of **16** pages. Any blank pages are indicated.



SECTION A

Answer **all** the questions.

You are advised to spend 40 minutes on this section.

On questions 1-5 **circle** your answer.

- 1 The 6R reduce describes:
- (a) Making more products
 - (b) Making larger products
 - (c) Not using unnecessary materials or parts
 - (d) Buying a product that you never use
- [1]
- 2 Waste energy from a house can contribute to:
- (a) Global cooling
 - (b) Reducing energy bills for home owners
 - (c) Global warming
 - (d) Reducing the demand on power stations
- [1]
- 3 A product with a small eco-footprint is defined as:
- (a) Something that has a large environmental impact
 - (b) Something that has very little environmental impact
 - (c) Something that is heavy to transport
 - (d) Something lightweight and easy to move around
- [1]
- 4 A hybrid car uses:
- (a) Wind energy
 - (b) Solar power
 - (c) Fossil fuels only
 - (d) A combination of fossil fuels and electricity
- [1]
- 5 Carbon offsetting means:
- (a) Moving waste to another country
 - (b) Maximising profits from fossil fuel
 - (c) Using carbon credits to compensate for emissions
 - (d) Calculating how much natural gas is used
- [1]

6 Name the source of geothermal power.

..... [1]

7 State **one** non-sustainable method of product disposal.

..... [1]

8 Name the category of recycling where glass jars are cleaned and reused for the storage of components.

..... [1]

9 State the term used to describe products that fail after a set period of time.

..... [1]

10 State the term that describes how products are comfortable and easy to use.

..... [1]

Decide whether the statements below are **true** or **false**.

Tick [✓] the box to show your answer.

	True	False	
11 Photochromic inks change colour with varying temperatures.	<input type="checkbox"/>	<input type="checkbox"/>	[1]
12 Lead paint is suitable for all electronic products.	<input type="checkbox"/>	<input type="checkbox"/>	[1]
13 A biodegradable material will rot naturally.	<input type="checkbox"/>	<input type="checkbox"/>	[1]
14 Deforestation can harm the environment.	<input type="checkbox"/>	<input type="checkbox"/>	[1]
15 Ethical companies provide poor working conditions.	<input type="checkbox"/>	<input type="checkbox"/>	[1]

16 Fig. 1 shows a camera with its protective case, which is suitable for adventure sports.

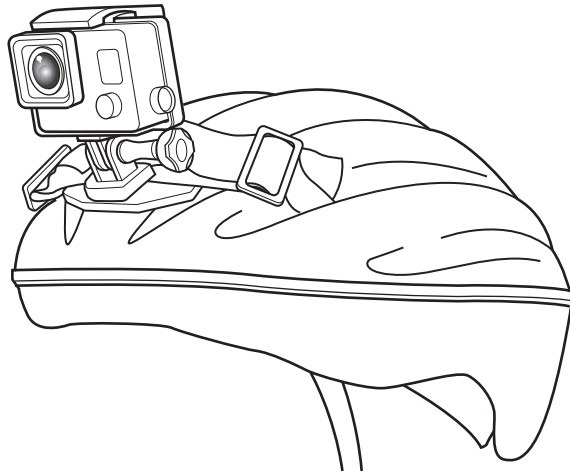


Fig. 1

(a) Give **three** design requirements for the camera casing shown in Fig. 1.

1.....

2.....

3.....

[3]

(b) The camera is powered by a rechargeable internal battery.

Give **two** environmental benefits of using rechargeable batteries to power portable products.

1.....

.....

2.....

.....

[2]

(c) Fig. 2 shows a range of fittings available for the camera shown in Fig. 1.

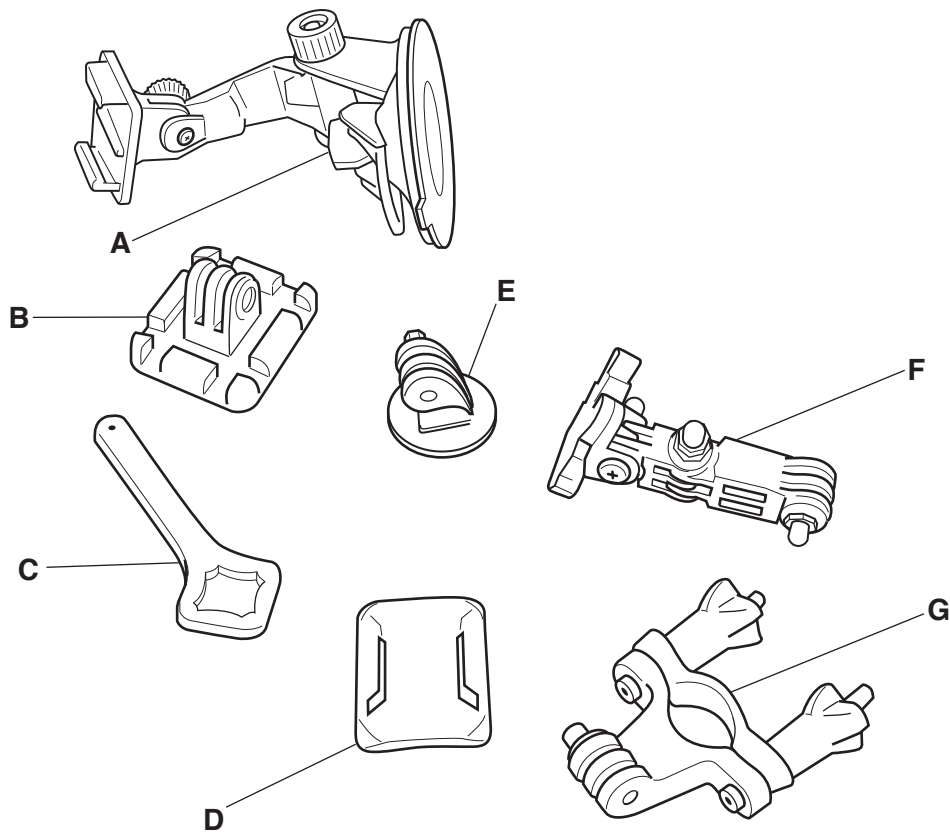


Fig. 2

Write the correct letter, **A B C D E F G**, to show which fitting would be the most suitable for mounting the camera shown in Fig. 1 in each situation given in the table below.

One has been completed for you.

Letter	Situation
E	Glued permanently to a flat surface
	On a flat piece of wood using elastic bands
	Internally on a car windscreen
	On a long round pole for use at arm's length
	On a flat surface but adjustable for different angles

[4]

(d) The cameras are expensive to buy.

State **one** way of safely retaining the camera if the fitting fails during use.

.....

.....

[1]

(e) A manufacturer wishes to make a hard-shell carrying case for the camera and fittings.

Use sketches and notes to design a hard-shell carrying case for a camera and fittings.

Your design must:

- include all materials used
- show all design features.

SECTION B

Answer **all** the questions.

You are advised to spend 50 minutes on this section.

17 Fig. 3 shows part of an inkjet printer mechanism.

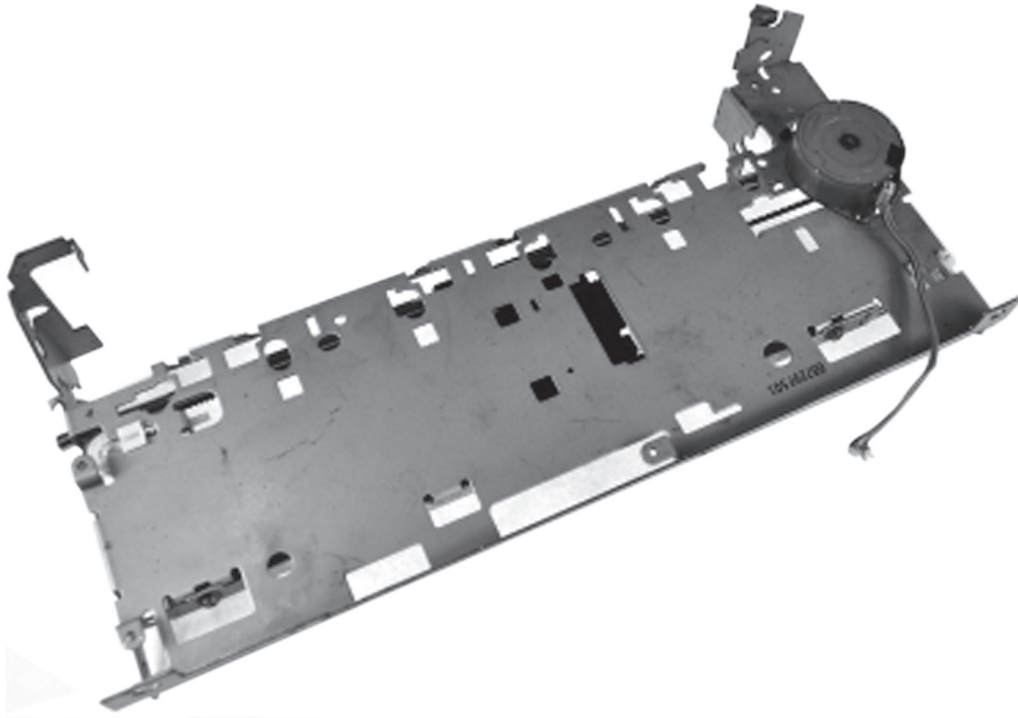


Fig. 3

(a) (i) On Fig. 3 circle the stepper motor. [1]

(ii) Give **two** benefits of using a stepper motor in a printer mechanism.

1

.....

2

.....

[2]

(b) Fig. 4 shows a print head drive mechanism.

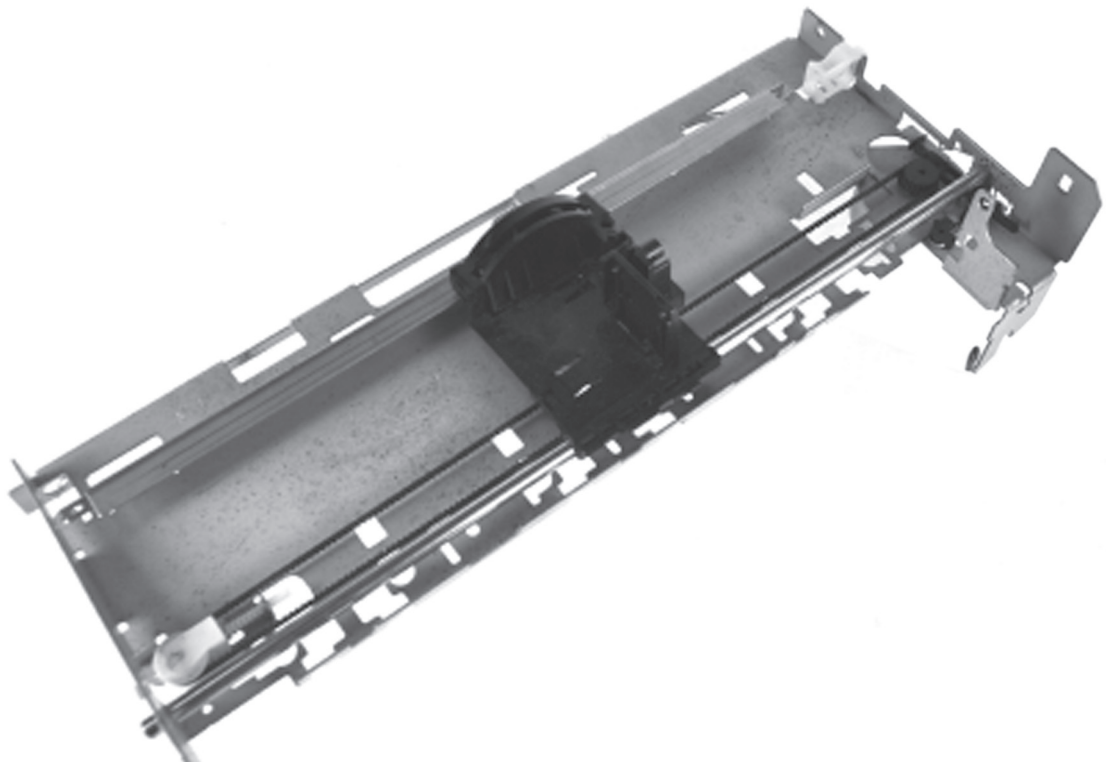


Fig. 4

(i) On Fig. 4 label the toothed belt. [1]

(ii) Describe the advantages of using a toothed belt in a mechanism.

.....

.....

.....

.....

..... [3]

(iii) The printer head runs back and forth on a hardened steel shaft.

Explain **one** benefit of using a hardened steel shaft for this part of the mechanism.

.....

.....

.....

..... [2]

- (iv) The chassis of the printer mechanism has been punched and folded from a malleable steel sheet.

State the meaning of malleable.

.....
 [1]

- (v) The steel chassis can be electroplated to prevent rusting.

State the name of a metal commonly used to prevent the rusting of steel parts.

..... [1]

- (c) Some of the bearings in the mechanism have been made from a plastics material.

State the name of a suitable plastics material for slow speed bearings.

..... [1]

- (d) Fig. 5 shows a number of gears driven by a stepper motor.



Fig. 5

Tick [✓] the **three** statements that apply to the gear train shown in Fig. 5.

Compound gear train	Increases torque	Loose gear train	Worm and worm wheel	Can reduce speed	Can cause oscillations

[3]

18 A range of manufactured plastics are used in schools and industry.

(a) Identify a property, shaping process and product for each type of plastic shown below.

A different shaping process should be given for each plastic.

Polystyrene sheet:

Property

Shaping process

Product

Acrylic sheet:

Property

Shaping process

Product

ABS pellets or granules:

Property

Shaping process

Product

[9]

(b) (i) Timber composites make use of a potential waste product.

State the name of the waste product used in the manufacture of particle board (chipboard).

..... [1]

(ii) Give **one** benefit of using timber composite boards.

..... [1]

(c) In the space below, use sketches and notes to design a general purpose tool box.

Your tool box should be:

- made from a man-made timber product
- suitable for carrying the tools shown in Fig. 6 securely.

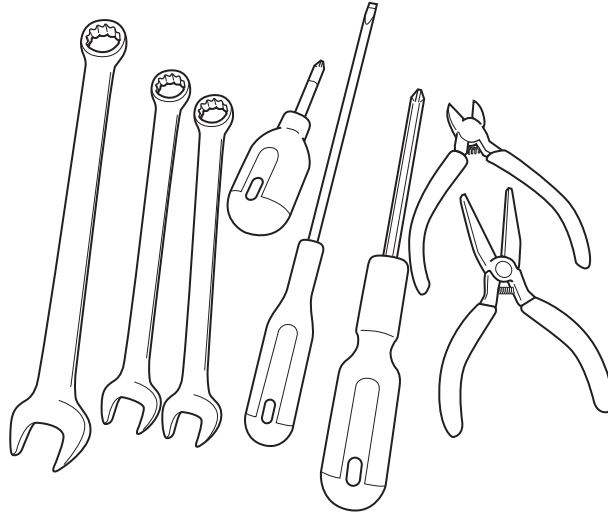


Fig. 6

(b) Aluminium is often alloyed with different metals.

Explain why this is done.

.....

.....

.....

..... [2]

(c) Fig. 7 shows a simple lever operated clamping device.

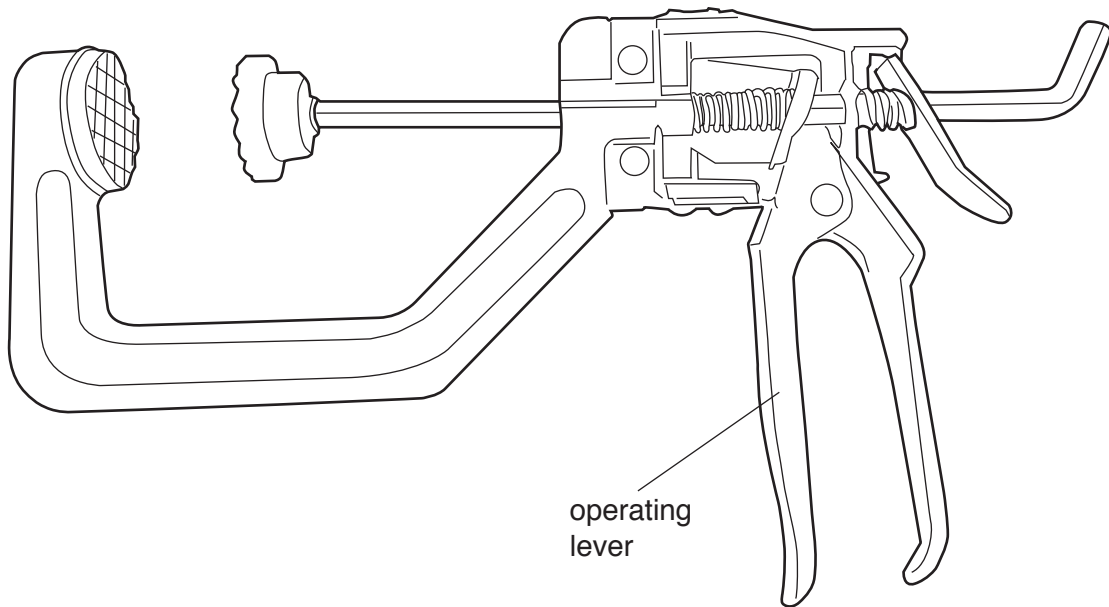


Fig. 7

(i) On Fig. 7 label the Fulcrum (F) Effort (E) and Load (L) of the operating lever.

[3]

(ii) The clamp is fitted with protective jaws manufactured from a plastics material.

Explain why this material is suitable for the jaws.

.....
.....
.....
..... [2]

(iii) Complete the following sentence.

The motion of the operating lever is converted to
..... motion in the jaws. [2]

END OF QUESTION PAPER

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