

**Thursday 21 June 2012 – Afternoon**

**GCSE DESIGN AND TECHNOLOGY**

**Electronics and Control Systems: Mechanisms**

**A514/03** Technical Aspects of Designing and Making

Candidates answer on the Question Paper.

**OCR supplied materials:**

None

**Other materials required:**

- A calculator may be used

**Duration:** 1 hour 15 minutes



Candidate forename		Candidate surname	
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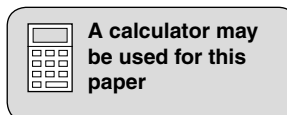
Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- 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 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).
- Show all your working out for calculations.
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Marks will be awarded for the use of correct conventions.
- Dimensions are in millimetres unless stated otherwise.
- Your Quality of Written Communication will be assessed in questions marked with an asterisk (\*).
- This document consists of **16** pages. Any blank pages are indicated.



Section A

Answer **all** questions.

1 Fig. 1 shows a mechanism used for steering a vintage traction engine.

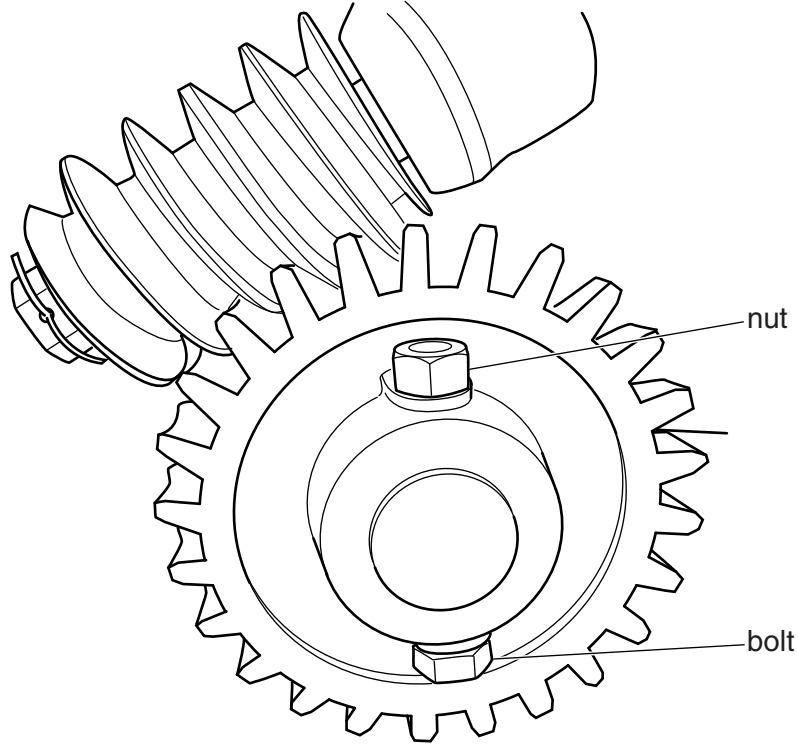


Fig. 1

(a) (i) Name the steering mechanism in Fig. 1

..... [1]

(ii) State **two** benefits of the steering mechanism shown in Fig. 1.

1 .....

2 ..... [2]

(iii) State the purpose of the nut and bolt labelled in Fig. 1.

..... [1]

(b) Fig. 2a and Fig. 2b show an oil-filled 'drip feed' device fitted to an engine.

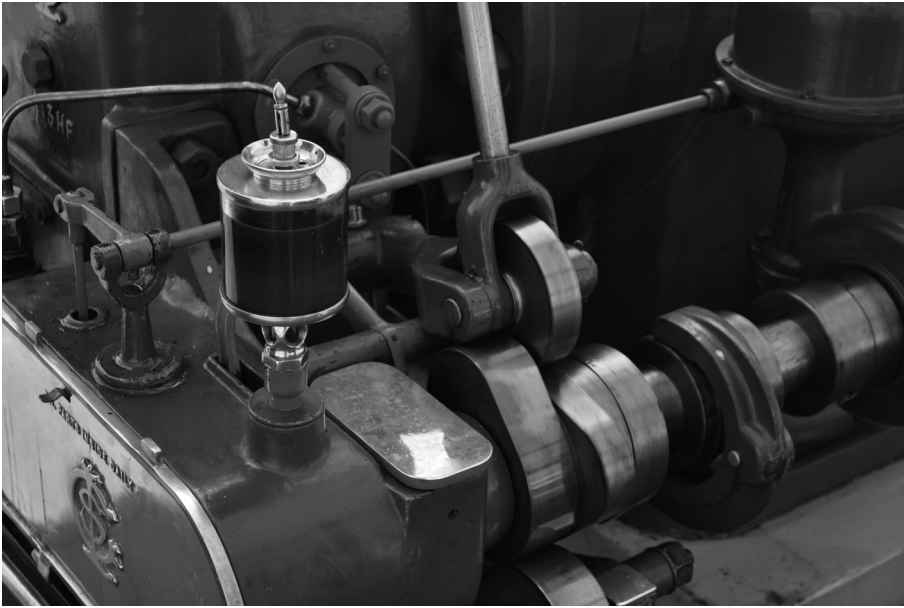


Fig. 2a



Fig. 2b

(i) Give **two** reasons why engines need oil.

- 1 .....
  - 2 .....
- ..... [2]

(ii) State why a drip feed is used to deliver the oil.

- .....
- ..... [1]

(c) Fig. 3 shows a water pump.

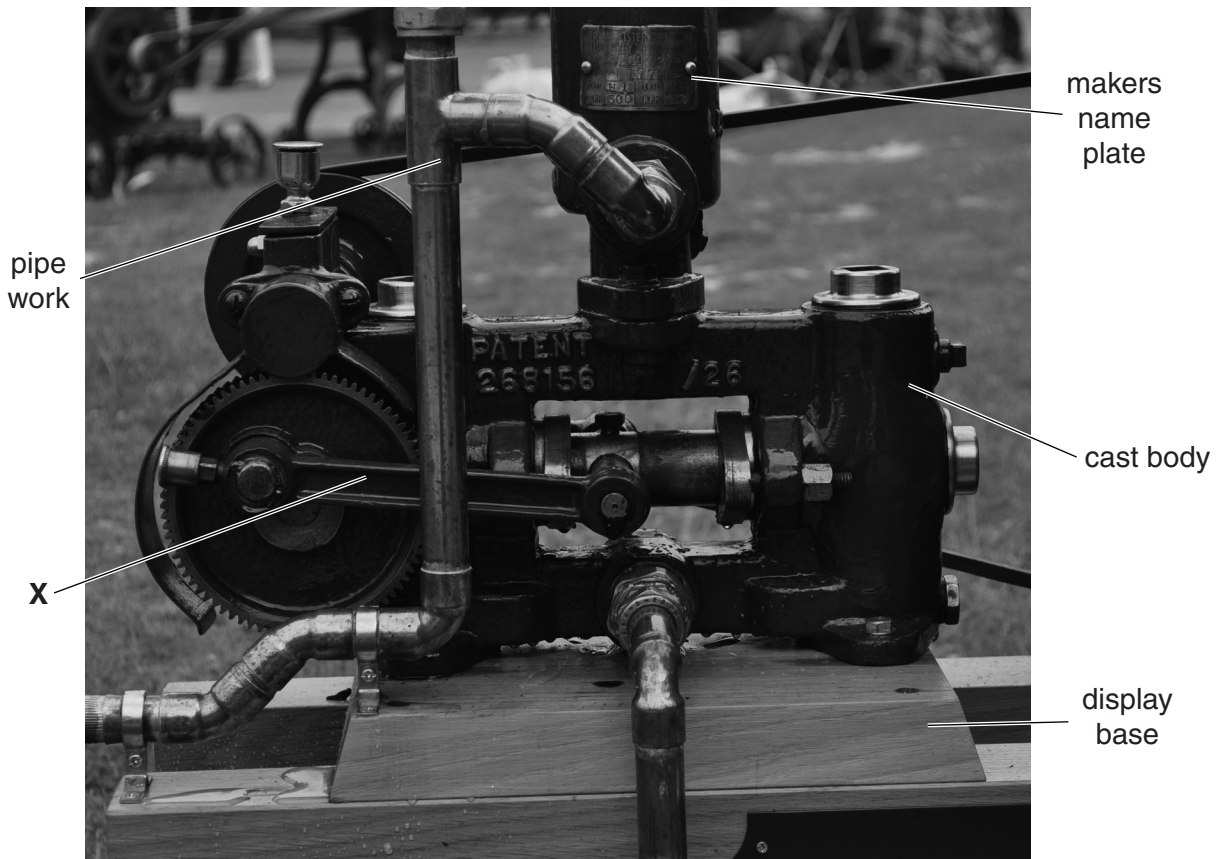


Fig. 3

(i) Name a specific material for each of the parts.

pipe work .....

makers name plate .....

cast body .....

display base ..... [4]

(ii) State the technical term for part X.

..... [1]

[Total: 12]

5  
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2 Fig. 4 shows part of the internal mechanism of a squeeze-action LED torch.

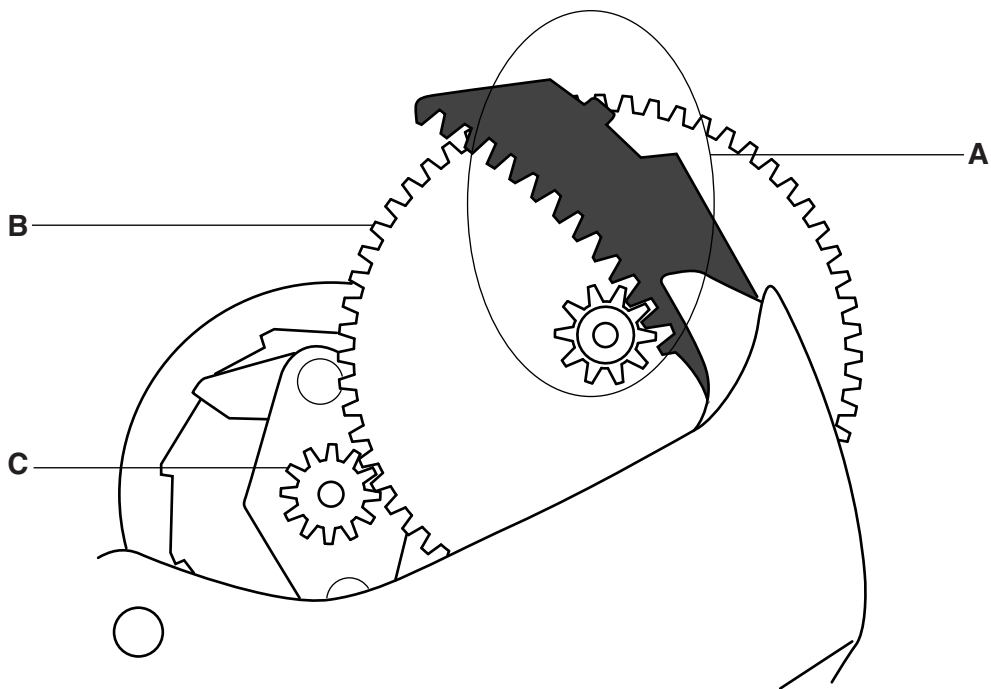


Fig. 4

(a) (i) Name the mechanism ringed at **A**.

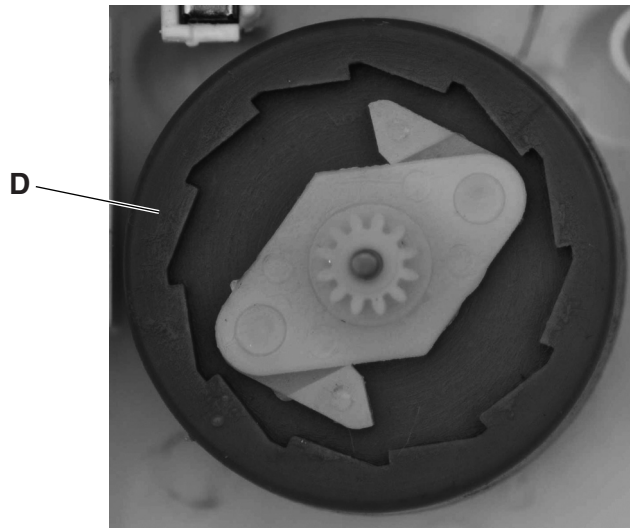
..... [2]

(ii) Describe the action of the mechanism you named in (i).

..... [2]

(iii) Draw arrows on Fig. 4 to show the direction of movement of parts **A**, **B** and **C**. [3]

(b) Fig. 5 shows part of the torch mechanism.



**Fig. 5**

(i) Name the mechanism shown in Fig. 5.

..... [1]

(ii) Describe the action of the mechanism shown in Fig. 5.

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

(iii) Component **D** shown in Fig. 5 has a flywheel action.

Explain what is meant by the term 'flywheel action'.

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

**[Total: 12]**

3 (a) Fig. 6 shows part of a hot air engine mechanism.

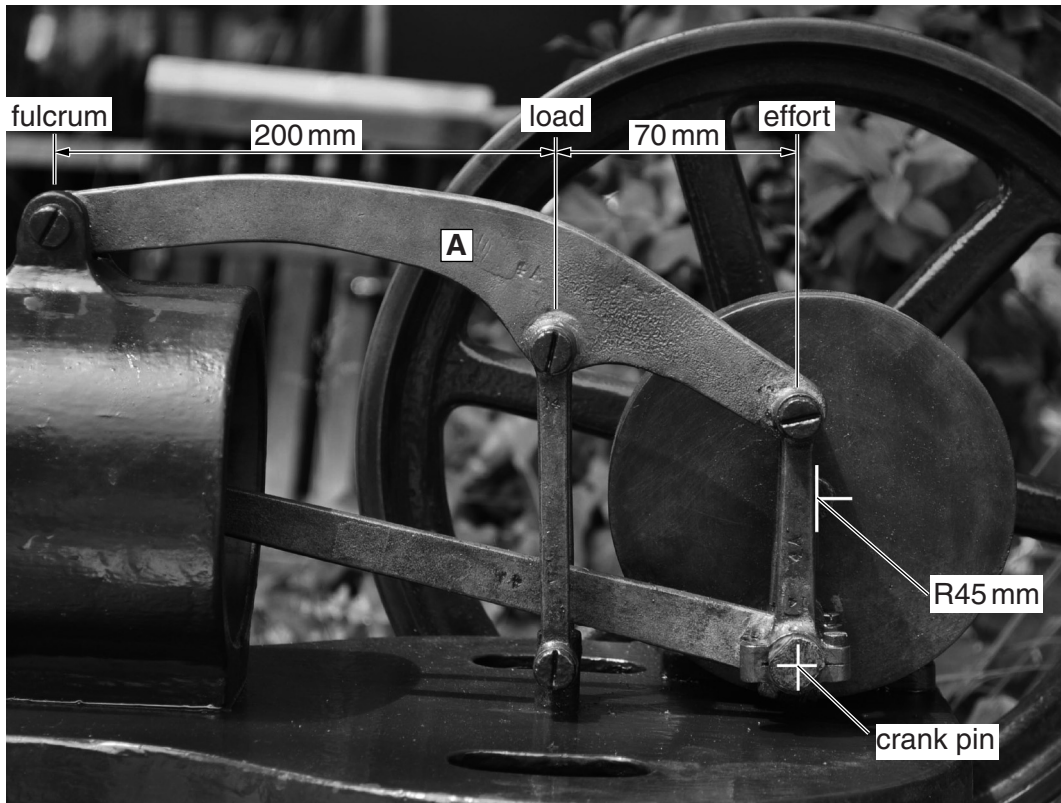


Fig. 6

(i) Complete the following sentence.

A crankshaft changes ..... motion into ..... motion. [2]

(ii) Using information shown on Fig. 6, state the throw of the crank pin shown.

..... [1]

(iii) Draw an arrow on Fig. 7 below to show the direction of movement of part A.

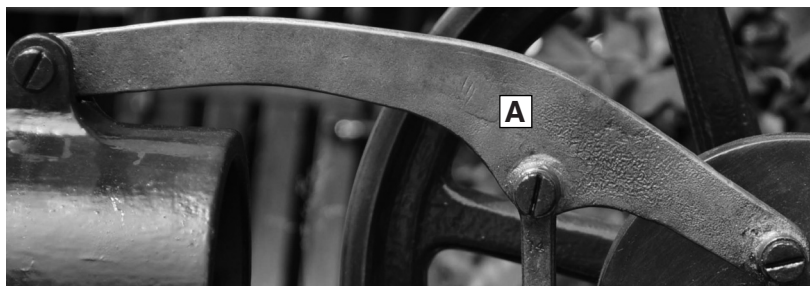


Fig. 7 shows part A of the hot air engine mechanism

[1]



(b) If the load exerts a force of 10 N, calculate the force applied to the crank pin.

Use the formula below.

Moment = force × distance

In equilibrium  $M_c = M_{ac}$

$M_c$  = clockwise moment  $M_{ac}$  = anticlockwise moment

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

(c)\* Explain how CAD/CAM can be used to test the design of mechanisms.

.....  
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..... [6]

[Total: 12]

Turn over

Section B

Answer **all** questions.

- 4 (a) Fig. 8 shows a toothed belt driving a pulley.

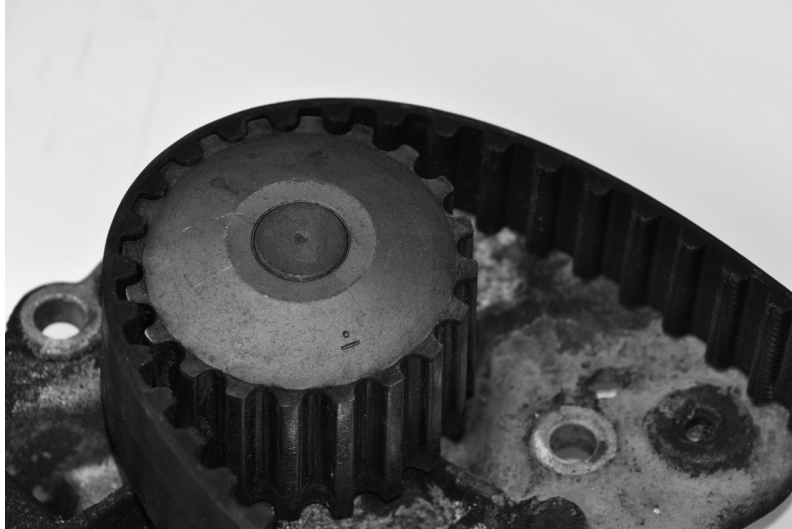


Fig. 8

- (i) State **two** benefits of using a toothed belt.

1 .....

.....

2 .....

..... [2]

- (ii) Give **two** reasons why car manufacturers recommend replacing toothed belts at regular intervals.

1 .....

.....

2 .....

..... [2]

- (iii) Give **one** reason why some car engine manufacturers use chain drives rather than a toothed belt.

.....

..... [1]

(b) Fig. 9 shows a ball bearing with its seal removed.



Fig. 9

Give **one** reason why grease is used in ball bearings rather than oil.

.....  
..... [1]



5 Fig. 10 shows part of a model of a twin propeller aeroplane.

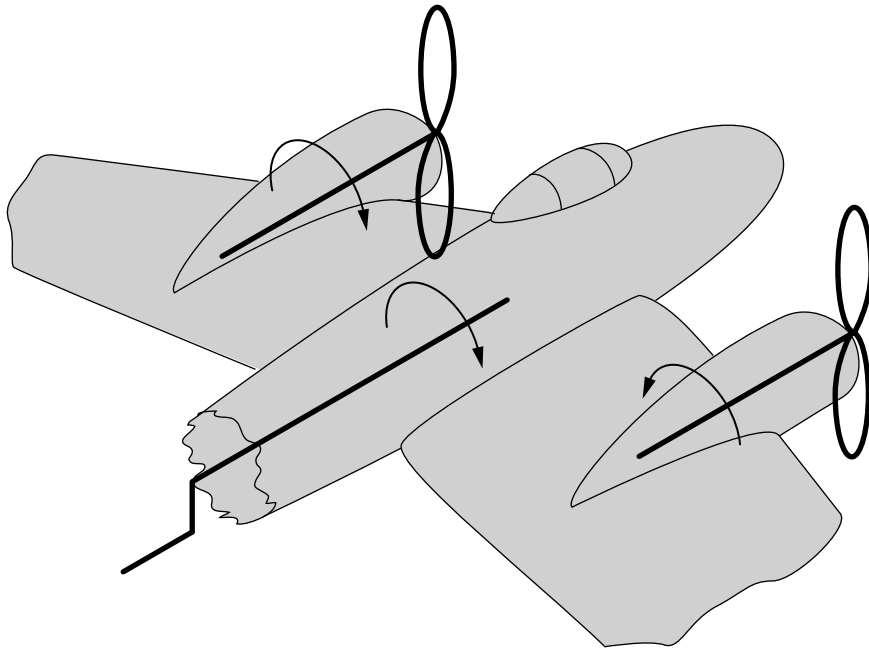


Fig. 10

(a) (i) Add sketches and notes to Fig. 10 to show a mechanism that rotates the two propellers in opposite directions when the handle is turned. [4]

(ii) Mechanisms can be modelled using software or construction kits. Explain why this might be helpful to a designer.

.....

.....

.....

..... [2]

(b) 'Polymorph' and 'Shape Memory Alloy' (SMA) are both smart materials.

(i) Describe what you understand by the term smart materials.

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

(ii) Complete the table below by describing the effect of heat and electricity on each material.

	Polymorph	Shape Memory Alloy (SMA)
Effect of Heat		
Effect of Electricity		

[4]

[Total: 12]

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