

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
LEVEL 1/2
R101/01
CAMBRIDGE NATIONAL
AWARD/CERTIFICATE IN PRINCIPLES
IN ENGINEERING AND ENGINEERING
BUSINESS

Engineering principles

WEDNESDAY 9 JANUARY 2019: Morning

DURATION: 1 hour

plus your additional time allowance

MODIFIED ENLARGED

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

A calculator may be used

READ INSTRUCTIONS OVERLEAF



INSTRUCTIONS TO CANDIDATES

Use black ink. HB pencil may be used for graphs and diagrams only.

Complete the boxes on the first page with your name, centre number and candidate number.

Answer ALL the questions.

Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.

INFORMATION FOR CANDIDATES

The total number of marks for this paper is 60.

The number of marks for each question is given in brackets [] at the end of each question or part question.

Dimensions are in millimetres unless stated otherwise.

Your quality of written communication will be assessed in questions marked with an asterisk (*).

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Answer ALL the questions.

1 Fig. 1 shows a hammer used as a lever.

- (a) (i) Add TWO labels TO Fig. 1 to show the position of the Effort and the position of the Load. [2]**

Fig. 1



- (ii) State the class of lever represented by the hammer being used in Fig. 1.**

_____ [1]

- (iii) Give TWO ways to improve the efficiency when using a hammer to remove nails as shown in Fig. 1.**

1 _____

2 _____

[2]

(iv) Explain how the hammer used as a lever is different to a wheelbarrow used to carry a load.

[2]

(b) (i) Explain what is meant by the term ‘mechanical advantage’.

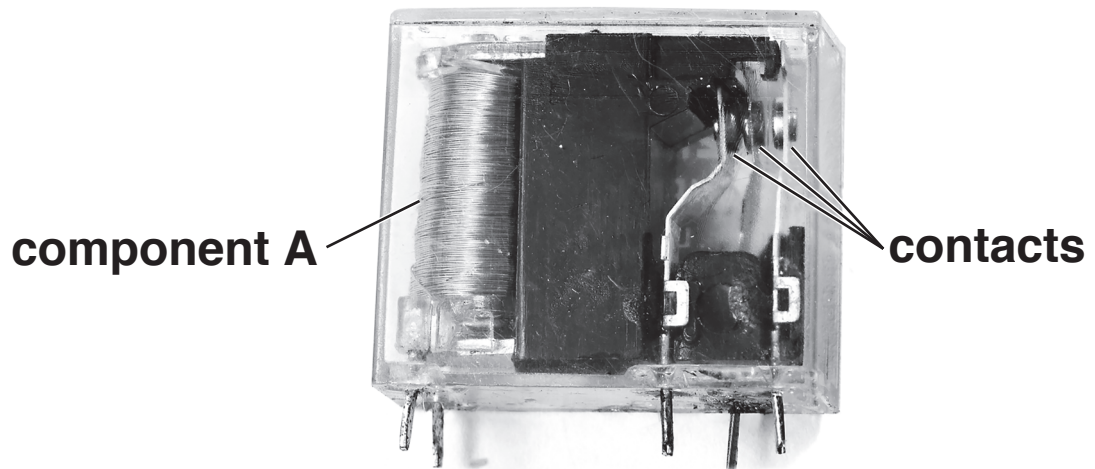
[2]

(ii) Give ONE application, other than a hammer, of a hand tool used to give mechanical advantage.

[1]

- 2 (a) Fig. 2 shows a direct current (DC) electro-mechanical relay.

Fig. 2



- (i) Name component A shown in Fig. 2.

_____ [1]

- (ii) Component A has an operating voltage of 12 V and a resistance of 60 ohms.
Calculate the current draw of component A.
State the unit in your answer.

_____ [3]

(iii) Explain what happens when a current is applied to component A.

[3]

(iv) Give TWO reasons why the device shown in Fig. 2 would be used in a circuit.

1

2

[2]

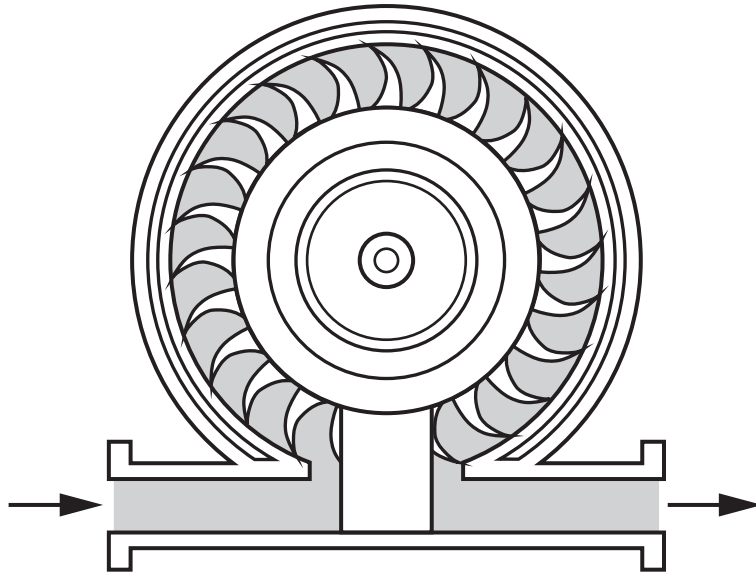
(v) Name ONE other DC electro–mechanical device.

[1]

3 (a) Fig. 3 shows a vacuum generator.

- (i) Add ONE label TO Fig. 3 to show the intake port. [1]**

Fig. 3



- (ii) Use the terms below to complete the statement describing the operation of the vacuum generator.**

Suction

ambient air pressure

friction

pressure drop

The pressure outside the vacuum is the

The turning fan creates a

in the area behind the fan, below

the pressure level outside the

vacuum generator. This creates

and a partial vacuum, inside the vacuum

generator. [3]

(b) Describe how a vacuum power source could be used in manufacturing, other than for cleaning.

[3]

(c) Give TWO benefits of using vacuum power in food manufacturing.

1 _____

2 _____

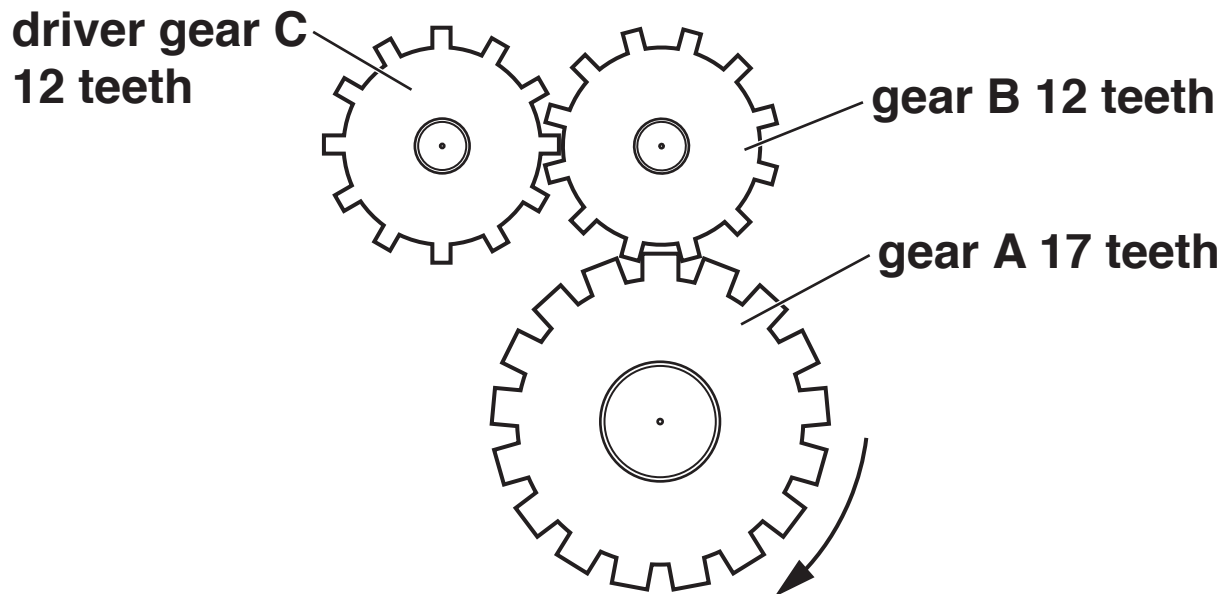
[2]

(d) Name ONE other power source used in engineering.

_____ **[1]**

4 Fig. 4 shows a gear train.

Fig. 4



(a) (i) State which gear, A, B or C, in Fig. 4 is the idler gear.

_____ [1]

(ii) State the purpose of the idler gear used in this example.

_____ [1]

(iii) Calculate the velocity ratio of the gear train in Fig. 4.

_____ [2]

- (b) (i) State what is meant by the term 'compound gear'.

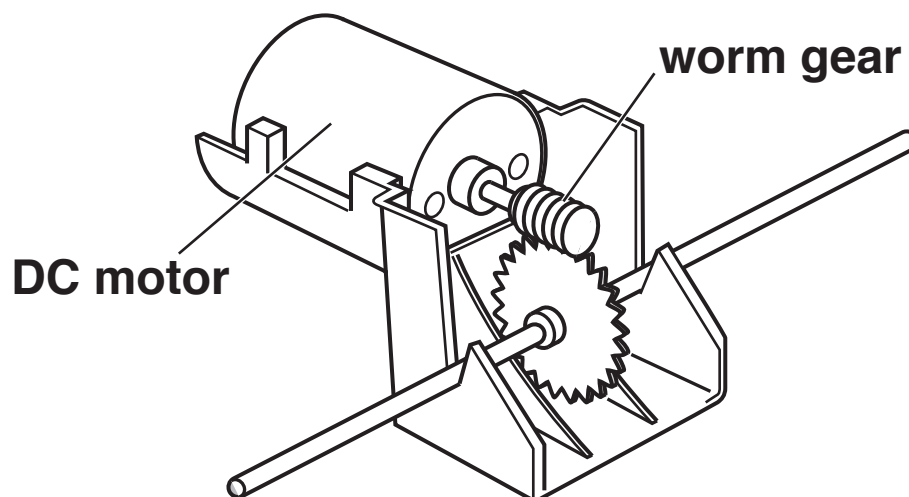
_____ [1]

- (ii) Give ONE application that could use compound gears.

_____ [1]

- (c) Fig. 5 shows a gearbox for a toy car driven by a direct current (DC) motor using a worm gear.

Fig. 5



- (i) Give ONE advantage of using this arrangement to make the toy car move.

_____ [1]

- (ii) State the energy conversion that takes place to make the toy car move.

to _____ [2]

(iii) State how the direction of the motor can be reversed.

_____ **[1]**

5 Fig. 6 opposite shows a pneumatic door system used on a bus.

(a) (i) Name components A and C.

A _____

C _____

[2]

(ii) Explain how components B and C are used to control the operation of the door.

_____ **[4]**

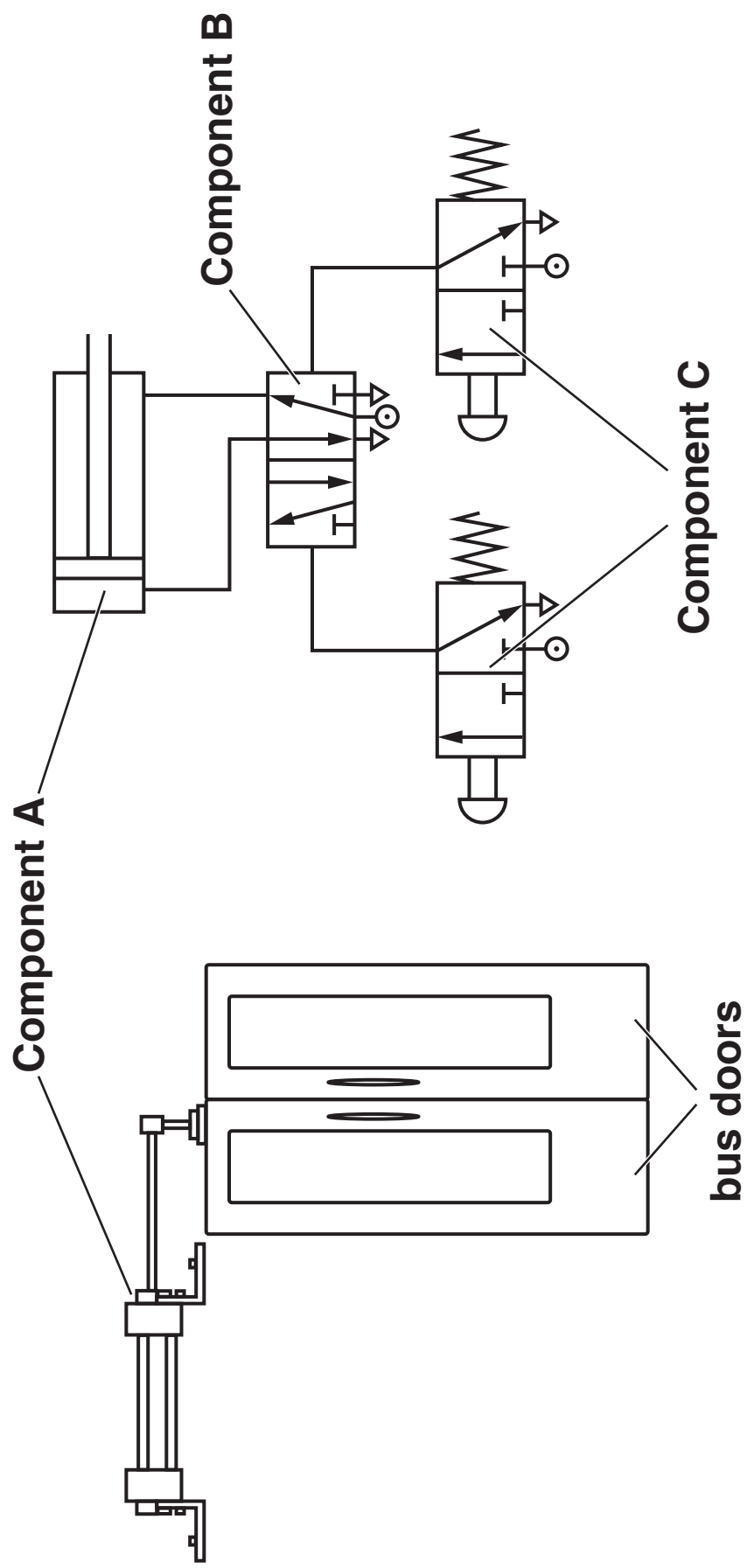
(iii) Explain why component A does not use a return spring.

_____ **[2]**

(iv) Give the meaning of the term ‘main air’.

_____ **[1]**

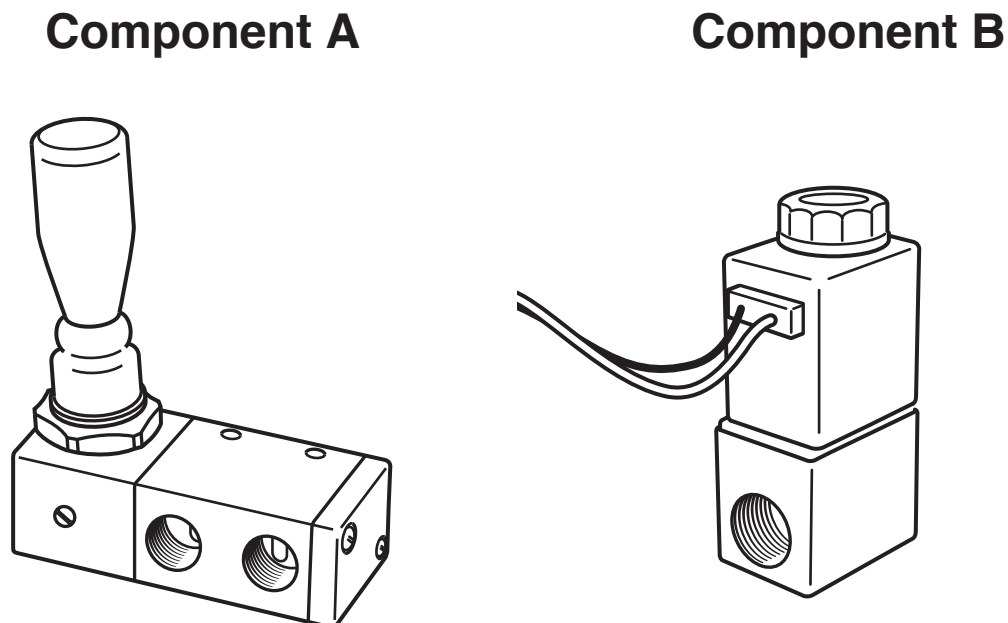
Fig. 6



- (v) Add ONE label TO the pneumatic circuit in Fig. 6 to show ONE of the main air ports. [1]**

- 6 Fig. 7 shows two components used to control flow in fluid power systems.

Fig. 7



- (a) (i) State the method of operation each of the components uses to control flow.

Component A _____

Component B _____ [2]

- (ii) Give ONE hydraulic application that could use component A.

_____ [1]

- (iii) Name ONE component that could be used to control component B.

_____ [1]

[illegible]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).



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