OCR
Oxford Cambridge and RSA

Friday 10 January 2020 – Morning

Level 1/2 Cambridge National Award/Certificate in Principles in Engineering and Engineering Business

R101/01 Engineering principles

Time allowed: 1 hour

8291431662

You must have:
- a scientific or graphical calculator
- a ruler (cm/mm)

R101O1O1

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.

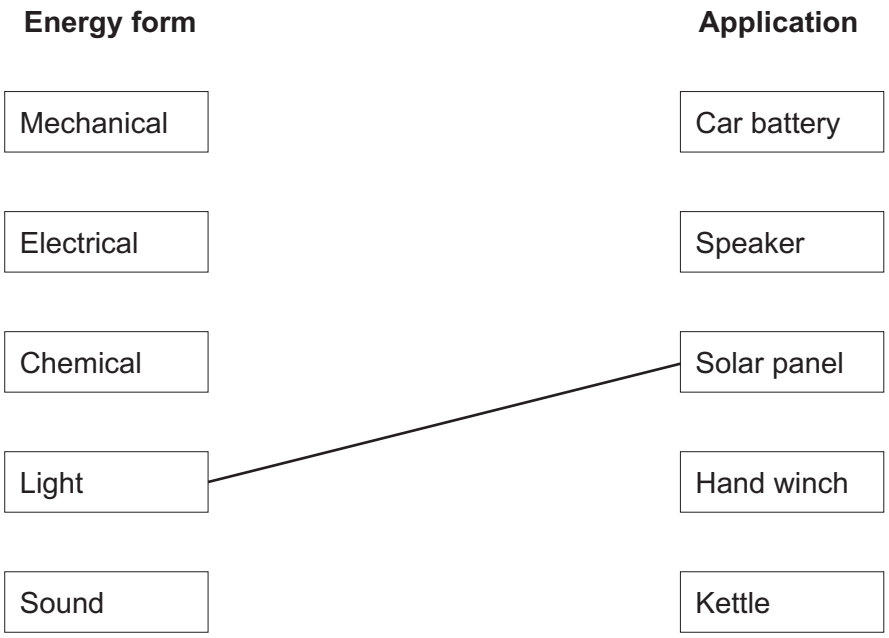
INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of written communication will be assessed in questions marked with an asterisk (*).
- This document has **12** pages.

ADVICE
- Read each question carefully before you start your answer.

Answer **all** the questions.

1 **(a)** Energy is available in a number of different forms.

(i) Draw lines to link the energy form with the appropriate application.
One has been done for you.



[4]

(ii) Give **one** other application that uses mechanical energy power sources.

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

(b) Give **two** forms of energy conversion that take place when a piston engine is operating.

1 ..... energy to ..... energy.

2 ..... energy to ..... energy.

[4]

(c) State the meaning of the term ‘kinetic’.

.....

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

2 Fig. 1 shows an incomplete circuit.

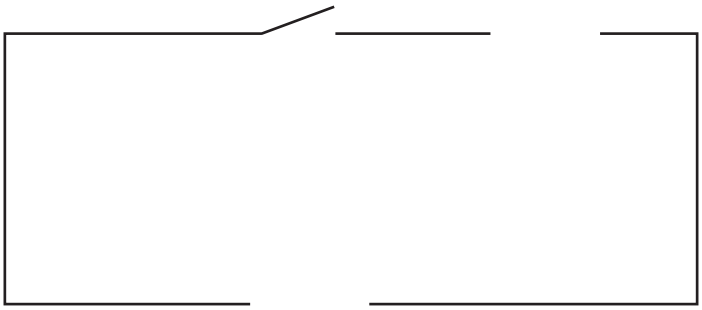


Fig. 1

(a) (i) Add the circuit symbols for a 9 V battery and a lamp to complete the circuit shown in Fig. 1. **[2]**

(ii) Calculate the current that will flow in the circuit shown in Fig. 1 using a 3 W lamp, with the switch closed.

.....

.....

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

(iii) The lamp is replaced with a 5 W lamp.
State **two** effects this has on the operation of the circuit.

1 .....

2 .....
[2]

(b) The following passage describes how electrical values can be measured.
Complete the passage using the terms given below.

series **power** **voltmeter** **current** **parallel**

The potential difference in a circuit can be measured by placing a

..... in ..... with a component.

The ..... can be measured by placing an ammeter in

..... with a component.

[4]

3 Fig. 2 shows a magnetic core that is turned inside a coil and frame.

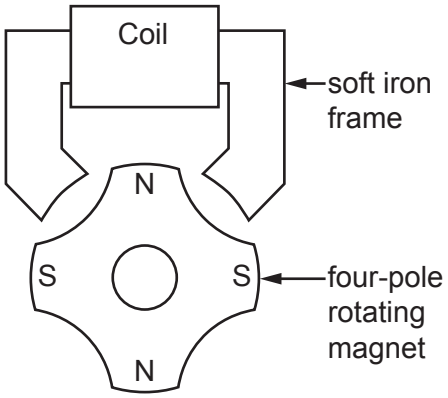
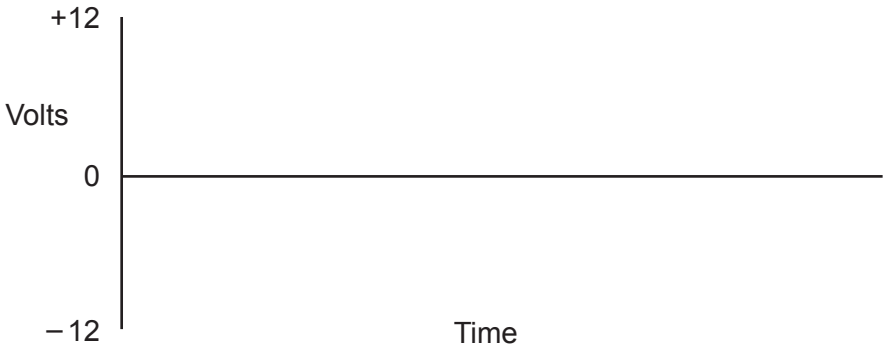


Fig. 2

(a) (i) Give **one** application that uses this principle.

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

(ii) Draw a line on the graph below to show the current output caused by turning the four-pole rotating magnet through one rotation.



[3]

(iii) Describe how the operation of the device shown in Fig. 2 is different to a motor.

.....

.....

.....

..... **[3]**

(iv) Describe how the device in Fig. 2 could be driven by a piston engine and rotated faster than the speed of rotation of the engine.

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..... **[3]**

Turn over for the next question

4 Fig. 3 shows a lifting platform that uses a hydraulic operating system.

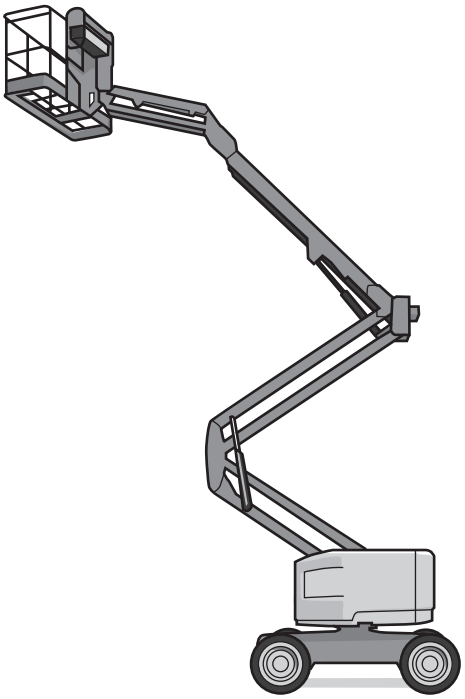

Fig. 3

(a) (i) Give **two** benefits of using hydraulics in this type of application.

1 .....

2 .....

[2]

(ii) Give **one** symptom that will show in the operation of the machine as a result of a hydraulic leak in the system.

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

(b) (i) Explain how pressure is maintained in a hydraulic system.

.....

.....

.....

..... **[3]**

(ii) Describe how a hydraulic system could be used to provide power and control for a digger bucket.
Use the terms given below.

control valve **receiver** **double acting cylinder** **compressor pump**

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..... **[4]**

5 Fig. 4 shows an electro pneumatic component.

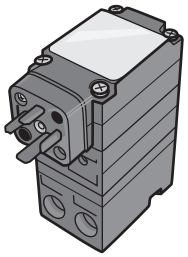

Fig. 4

(a) (i) State what is meant by the term 'electro pneumatic'.

.....

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

(ii) A bus driver can use an electro pneumatic system to control the changing of gears when the gearbox is located at the rear of the vehicle.
Give **one** benefit of using electro pneumatics in this application.

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

(iii) Give **one** different electro pneumatic application.

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

(iv) Name **three** components usually found in an electro pneumatic system.

1 .....

2 .....

3 .....
[3]

(b) State **two** hazards or safety considerations when working with pneumatics.

1 .....

2 .....
[2]

(c) Give **one** example of an electro mechanical application.

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

6 Fig. 5 shows a double pulley system required to lift a load a vertical distance of 1 m.

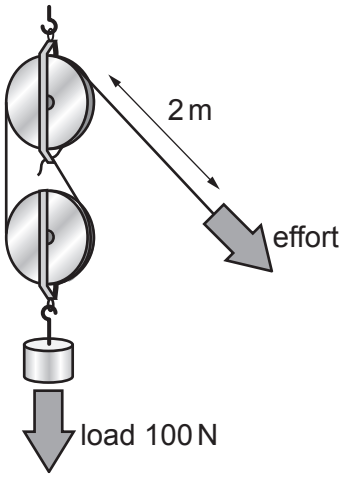

Fig. 5

(a) (i) Describe how the two pulleys reduce the effort required to lift the load.

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.....

..... **[3]**

(ii) Give **one** change to the system shown in Fig. 5 that could further reduce the user effort.

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

(b)* Discuss the differences in using pulley drive systems compared to geared drive systems.

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

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).