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Oxford Cambridge and RSA

Tuesday 23 May 2017 – Morning**LEVEL 1/2 CAMBRIDGE NATIONAL AWARD/CERTIFICATE IN
PRINCIPLES IN ENGINEERING AND ENGINEERING BUSINESS****R101/01** Engineering principles

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

- A calculator may be used

Duration: 1 hour

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- 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.
- 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.

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 the 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 (*).
- This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

1 (a) Energy can be produced in many different forms.

(i) Draw lines to link the energy form to the correct example.
One has been done for you.

Energy form	Example
Mechanical	Solar panel
Heat	Radiator
Sound	Battery cell
Light	Turning gears
Chemical	Vibrating drum

[4]

(ii) Give **one** application of spur gears in use.

..... [1]

(iii) Describe **one** example of how electrical energy is used to perform a mechanical task.

.....

 [2]

(b) (i) Describe how energy conversion is achieved using a wind up torch light.

.....
 [2]

(ii) A pendulum at the highest point of its swing is an example of potential energy.
Give **one** other example of potential energy.

..... [1]

2 Fig. 1 shows a fishing rod used as a simple lever.

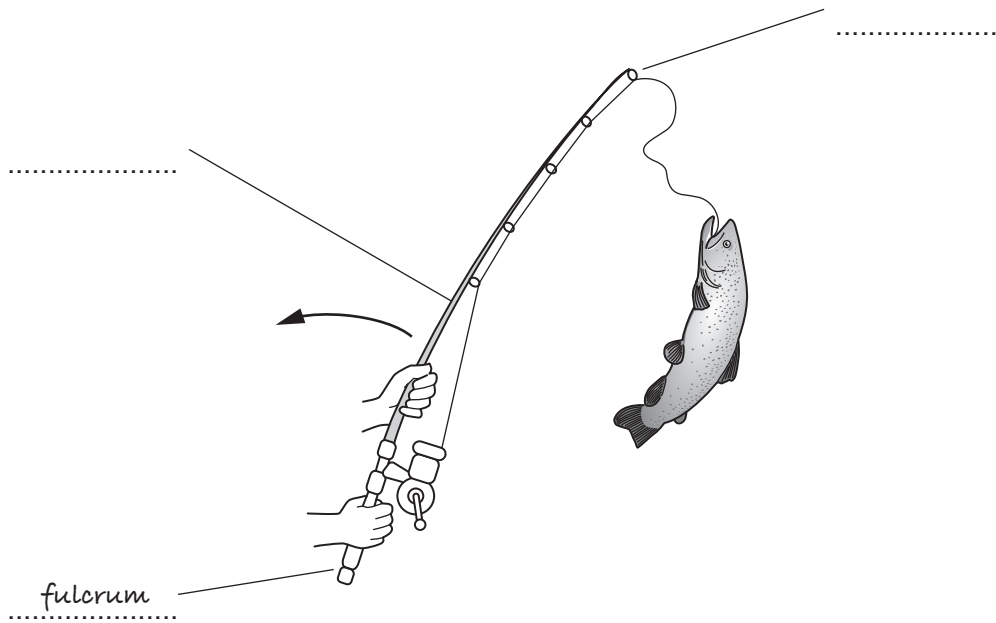


Fig. 1

(a) (i) Complete the labels on Fig. 1 with the correct parts of the lever. One has been done for you. [2]

(ii) State what class of lever is represented by the fishing rod.

..... [1]

(iii) Explain how the use of the fishing rod as a lever is different from the use of a pair of scissors.

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

(b) Fig. 2 shows a charging device for handheld electrical equipment.



Fig. 2

(i) State **two** ways that the input voltage differs from the output.

- 1
 -
 - 2
 -
- [2]

(ii) Give **two** benefits of using rechargeable DC electrical devices.

- 1
 -
 - 2
 -
- [2]

3 (a) An engine-driven pulley is used to drive a generator.

The driver pulley has a diameter of 180 mm and the driven pulley has a diameter of 90 mm.

(i) Calculate the velocity ratio of the pulleys.

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

(ii) State the speed of the generator when the engine is turning at 1000 revolutions per minute.

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

(iii) Give **two** advantages of using a pulley and belt system.

1

.....

2

..... [2]

(iv) A hydraulic pump is also driven by the engine.
Give **one** application for the hydraulic pump.

..... [1]

(v) Pulley systems are one way of driving ancillary equipment such as generators and pumps.
Give **one** other method that could be used.

..... [1]

(b) Fig. 3 shows an engine-driven generator.

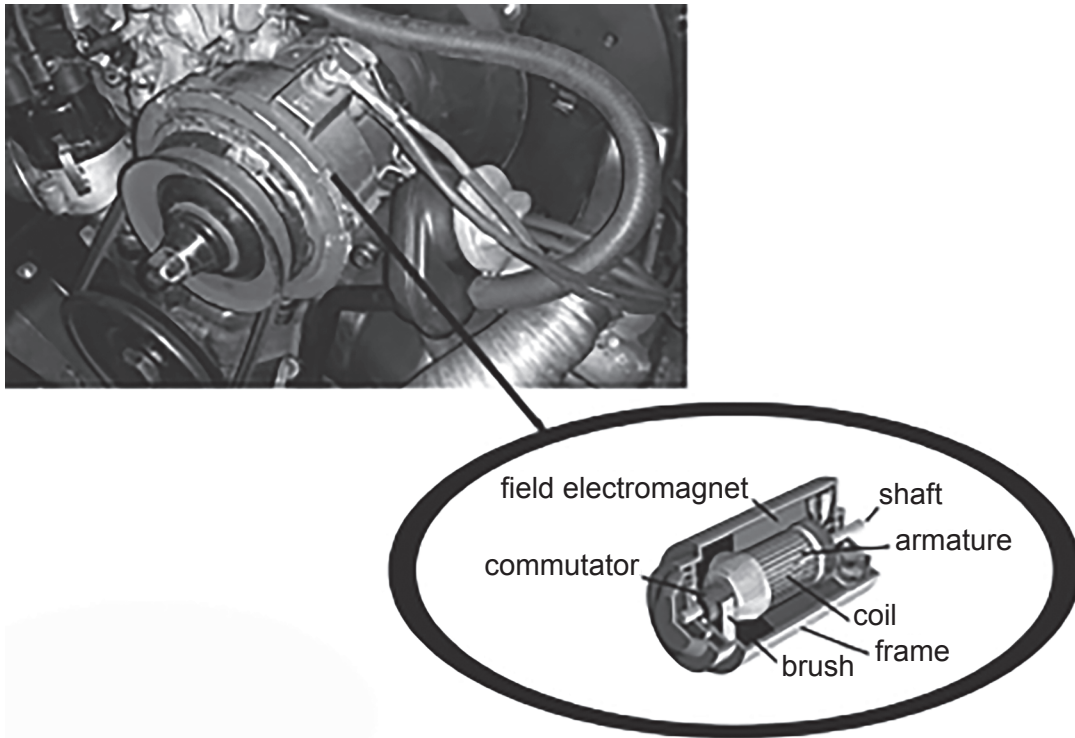


Fig. 3

Explain how the generator in Fig. 3 is used to produce electrical energy.

.....

.....

.....

..... [3]

4 (a) Fig. 4 shows two lighting circuits.

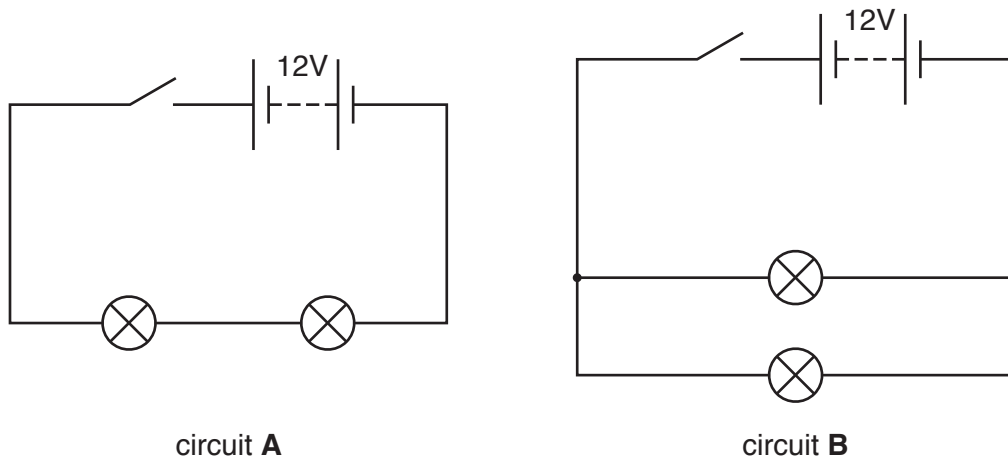


Fig. 4

(i) State the arrangement of circuit A.

..... [1]

(ii) Suggest why the arrangement in circuit B is usually used for lighting circuits.

.....
 [1]

(iii) State the name of unit that is used to give the power rating of the lamps.

..... [1]

(b) Complete the following statement using the correct terms from the list below.

- series resistor ammeter parallel**

To measure current, the is placed in
 with the component, while a voltmeter is placed in with the
 component to measure the voltage. [3]

(c) Each lamp filament in circuit A has a resistance of $2.6\ \Omega$.
 Calculate the total current flowing with the switch closed.

.....

 [2]

8

- (d) (i) Fig. 5 shows a multimeter.
Draw an arrow to show the dial position to measure the potential difference of the circuit.

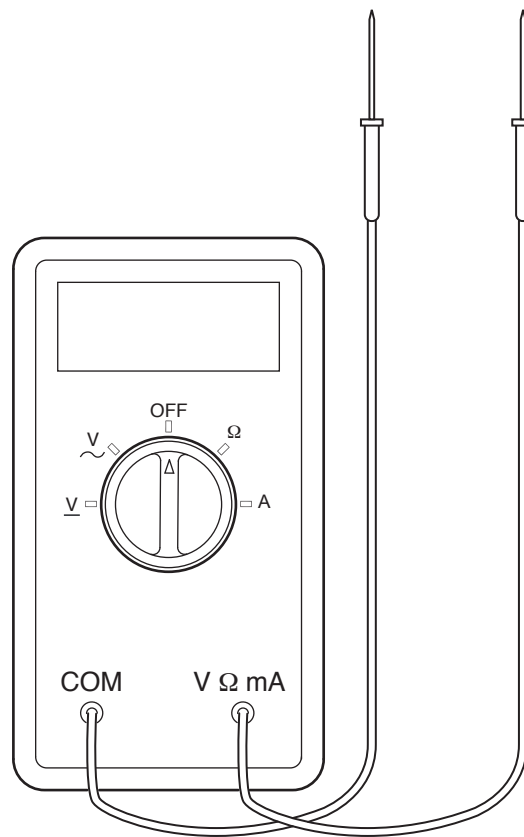


Fig. 5

[1]

- (ii) When measuring the potential difference, state the effect on the meter reading if the polarity of the probes is reversed.

.....

..... [1]

5 Fig. 6 shows a workshop compressor.

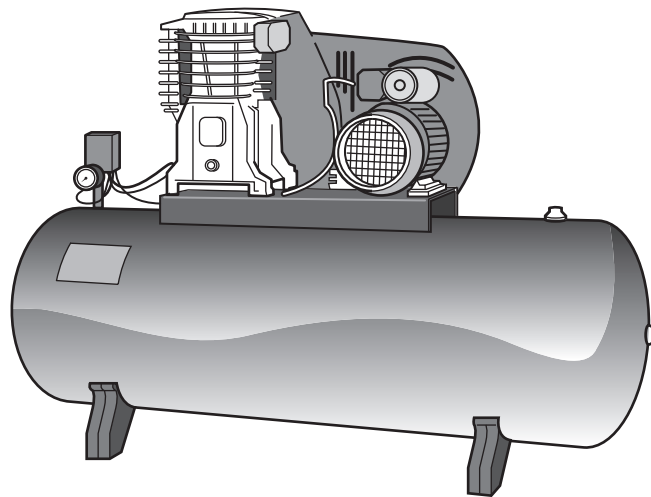


Fig. 6

(a) (i) Explain how the compressor is used to produce and store a source of power for a pneumatic system.

.....

.....

.....

.....

..... [3]

(ii) State how the pressure could be measured in a pneumatic or hydraulic system.

..... [1]

(iii) Give **one** reason why, when measured, the pressure in a pneumatic or hydraulic system may be lower than expected.

..... [1]

(b) Fig. 7 shows a hydraulic jack.

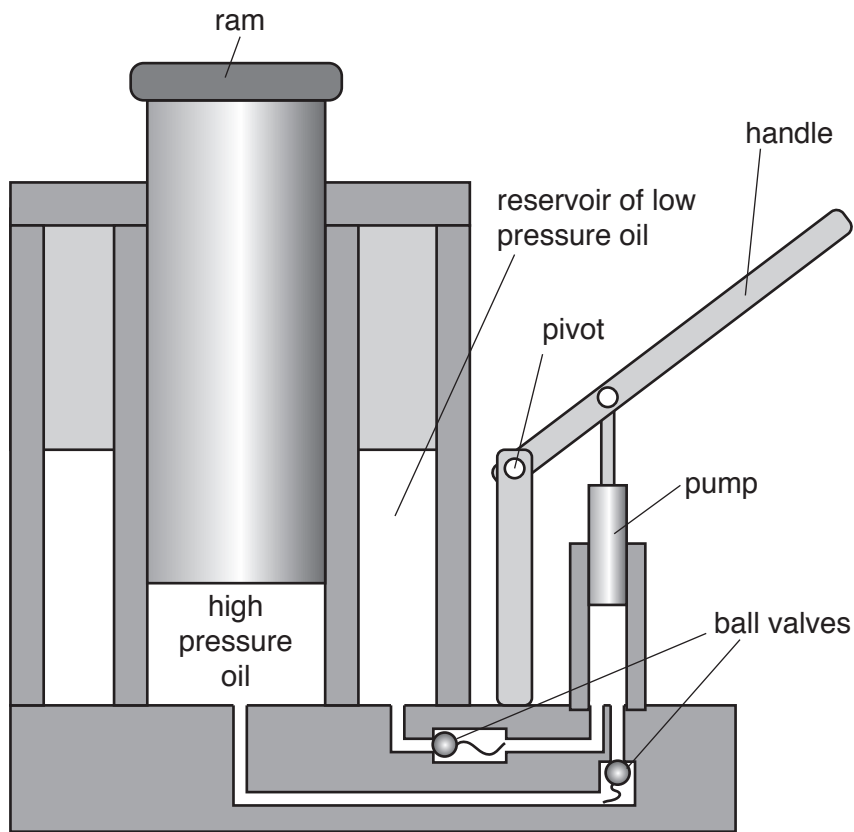


Fig. 7

(i) Explain in detail how effort from the operator is used to lift a load.

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.....

.....

.....

.....

.....

..... [4]

(ii) Give **one** other example of a hydraulic machine.

..... [1]

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