



**0171-515 JUNE 2019**

**Level 3 Advanced Technical Extended Diploma in Land-Based Engineering (1080)**

Level 3 Land-Based Engineering – Theory exam (1)

If provided, stick your candidate barcode label here.

**Tuesday 18 June 2019**  
**09:30 – 11:30**

Candidate name (first, last)

First

Last

Candidate enrolment number


Date of birth (DDMMYYYY)

Gender (M/F)

Assessment date (DDMMYYYY)

Centre number

Candidate signature and declaration\*

- If additional answer sheets are used, enter the additional number of pages in this box. 
- Before taking the examination, **all candidates** must check that their barcode label is in the appropriate box. Incorrectly placed barcodes may cause delays in the marking process.
- Please ensure that you staple additional answer sheets to the **back** of this answer booklet, clearly labelling these with your full name, enrolment number, centre number and qualification number in BLOCK CAPITALS.
- All candidates need to use a **black/blue** pen. **Do not** use a pencil or gel pen, unless otherwise instructed.
- If provided with source documents, these documents **will not** be returned to City & Guilds, and will be shredded. Do not write on the source documents.

**\*I declare that I had no prior knowledge of the questions in this examination and that I will not divulge to any person any information about the questions.**

**You should have the following for this examination**

- a pen with blue or black ink
- a non-programmable calculator

**General instructions**

- Use black or blue ball-point pen.
- The marks for questions are shown in brackets.
- This examination contains 10 questions. Answer **all** questions.
- Answer the questions in the spaces provided. Answers written in margins or on blank pages will **not** be marked.
- Cross through any work you do not want to be marked.



- 1 Figure 1 shows a resistor which is supplied with a range of voltages. The voltage and current flowing through it is recorded using an ammeter.

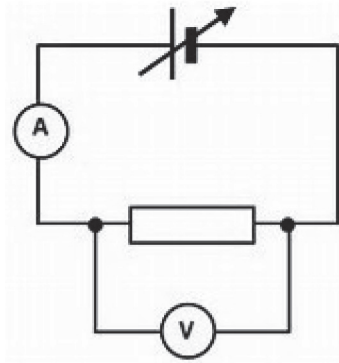


Figure 1

The readings taken are shown in Table 1.

Supply voltage	0	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
Voltage drop	0	0.3	1.1	2.2	3.1	4.2	5	6	6.5	7.5
Current	0	0.06	0.21	0.42	0.6	0.75	0.9	1.1	1.3	1.5

Table 1

- a) Using the results in Table 1, calculate the value of the resistor. Show all your workings with the correct units. (3 marks)

- b) State the electrical theory which relates to 1a). (1 mark)

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- c) Explain the relationship between the **three** units used in the calculation in 1a). (3 marks)

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2 a) State the unit used to measure the fuel consumption of an agricultural tractor. (1 mark)

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b) Explain why the unit given in 2a) is **not** realistic when comparing differing tractor fuel consumptions. (2 marks)

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c) Explain the importance of g/kWh in relation to fuel consumption measurement in an agricultural tractor. (2 marks)

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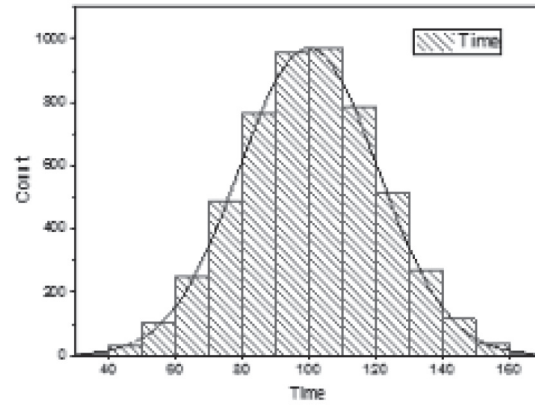
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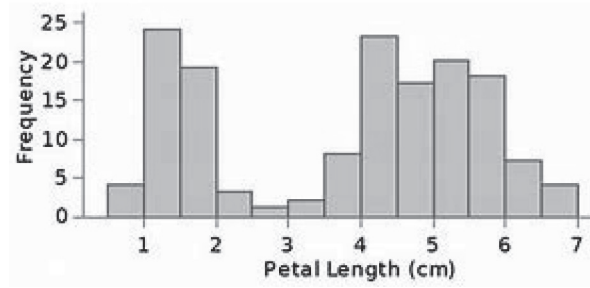
3 a) Name the **two** types of bar chart in Figures 2 and 3.

(2 marks)



www.originlab.com

**Figure 2**



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**Figure 3**

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- b) Using the information in Table 2, calculate the mean of the lead acid battery cell readings correct to **two** decimal places. Show all your workings. (2 marks)

Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
1.265	1.273	1.256	1.260	1.269	1.274

**Table 2**

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- 4 The following engine components have a range of settings. Calculate the minimum and maximum ranges for **each**.
  - a) Nut securing compressor gear:  $125 \pm 19$  Nm (2 marks)

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- b) Bolts securing timing gear:  $36 \pm 4$  Nm (2 marks)

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- c) Unions securing piston lubrication nozzles:  $15 \pm 3$  Nm (2 marks)

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- 5 State the formula for torque **and** state the metric units used. (2 marks)

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6 a) State what **each** of the following abbreviations stands for.

i) EGR

(1 mark)

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ii) DEF

(1 mark)

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iii) DPF

(1 mark)

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b) Explain the principle of operation for **each** system in 6a), in relation to engine emissions.

EGR

(3 marks)

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DEF

(3 marks)

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DPF

(3 marks)

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- 7 a) Explain the **main** function of **each** of the following components in a 4-stroke petrol engine. (2 marks)
- i) Top piston ring.

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- ii) Crankshaft. (2 marks)

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- iii) Rocker arm. (2 marks)

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- b) Give **three** consequences of **not** applying a torque tightening sequence of the cylinder head. (3 marks)

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- 8 What is the function of an internal combustion engine? (1 mark)

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- 9 One of the **main** functions of a lubrication system in a typical land-based engine is to reduce friction. State **two** other functions of this system. (2 marks)

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