To be completed by the examiner			
Question	Mark	Question	Mark
1		14b	
2		14c	
3		15	
4		16	
5		17	
6a		18	
6b		19	
7		20	
8		21	
9		22a	
10		22b	
11a		22c	
11b		23a	
12		23b	
13		24	
14a			
		TOTAL MARK	

NCFE Level 1/2 Technical Award in Engineering (603/2963/4)

Unit 01 Understanding the engineering world

Paper number: Past Paper

Thursday 25 November 2021 9.00 am – 10.30 am

Time allowed: 1 hour 30 minutes

Learner instructions

- Use black or blue ink.
- Answer **all** questions.
- Read each question carefully.
- You **must** write your responses in the spaces provided.
- You may do rough work in this answer book. Cross through any work you do not wish to be marked.
- All of the work you submit **must** be your own.

Learner information

- The marks available for each question are shown in brackets.
- The maximum mark for this paper is 80.
- You may use a calculator.

Please complete the details below clearly and in BLOCK CAPITALS.

Learner name _____

Centre name _____

Learner number [ ] Centre number [ ]

Do not turn over until the invigilator tells you to do so.

You have been provided with a list of equations below.
These equations can be used during the assessment.

Equations for properties

Energy

Efficiency	efficiency (%) = (useful energy out ÷ total energy in) x 100
Power	power = energy ÷ time P = E ÷ t
Work done	work done = force x distance W = F x d

Forces and Motion

Speed	speed = distance ÷ time s = d ÷ t
Acceleration	acceleration = change in velocity ÷ time a = (v-u) ÷ t
Force	force = mass x acceleration F = m x a
Moment of force	moment = force x perpendicular distance from pivot m = F x d
Weight	weight = mass x gravity w = m x g
Momentum	momentum = mass x velocity p = m x v
Density	density = mass ÷ volume d = m ÷ v
Pressure	pressure = force ÷ area p = F ÷ A

Electricity

Power	power = voltage x current P = V x I
Voltage	voltage = current x resistance V = I x R
Current	current = power ÷ voltage I = P ÷ V
Resistance	resistance = voltage ÷ current R = V ÷ I

Geometric

Area

Square	length of side^2
Rectangle	length of side 1 x length of side 2
Triangle	(length of base x height of triangle) ÷ 2
Circle	π x radius^2

Volume

Cube	length of side^3
Pyramid	(1/3) x (base area) x height of pyramid
Cylinder	π x radius^2 x height of cylinder

Please turn over for the first question.

Answer **all** questions in the spaces provided.

Total available marks **80**.

1 Which of the following describes a feature of a pulley?

[1 mark]

A A block and chain

B A flywheel and brake

C A rotating worm gear

D A wheel with a groove

Answer _____

2 Integrated circuits use many different components in the control of systems and processes.

Which engineering discipline do integrated circuits belong to?

[1 mark]

A Communications

B Electrical

C Mechanical

D Software

Answer _____

3 Name **one** unit of measurement for current in a circuit.

[1 mark]

_____

4 Some workplace injuries must be reported to RIDDOR.

Describe **one** type of workplace injury that must be reported to RIDDOR.

[2 marks]

5 A mountain bike is travelling down a hill.

Calculate the momentum of the bike **and** state a common unit of momentum.

Use the following data:
The mass of the bike is 20 kg.
The velocity of the bike is 10 m/s.

Use the equations on pages 2 and 3.

Show your working.

[3 marks]

Momentum =

State a common unit of momentum:

6 (a) A drawing title block includes the system of measurement.

State **two other** items that a drawing title block includes.

[2 marks]

1. _____

2. _____

6 (b) Which **one** of the following is a three-dimensional projection method?

[1 mark]

A Axonometric

B First angle

C Orthographic

D Third angle

Answer _____

7 What type of alloy is solder?

[1 mark]

A Ferrous

B Non-ferrous

C Pure silver

D Thermoset

Answer _____

8 An oil seal needs to have chemical resistance and durability.

State **two** elastomers that could be used for an oil seal.

[2 marks]

1. _____

2. _____

9 **Figure 1**

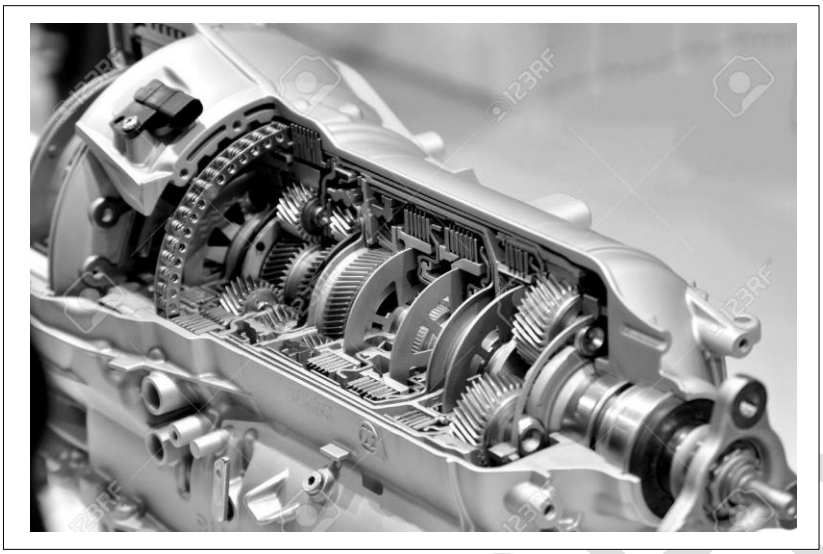

Figure 1 shows a gearbox.

Identify an engineering discipline that might use a component like the gearbox shown in **Figure 1 and** explain what a gearbox is used for.

[3 marks]

Engineering discipline:

Explanation:

Please turn over for the next question.

10 Developments in computer software applications have improved the design of engineering structures.

Explain how software applications benefit the engineering industry.

[9 marks]

Please turn over for the next question.

11 (a)

Figure 2

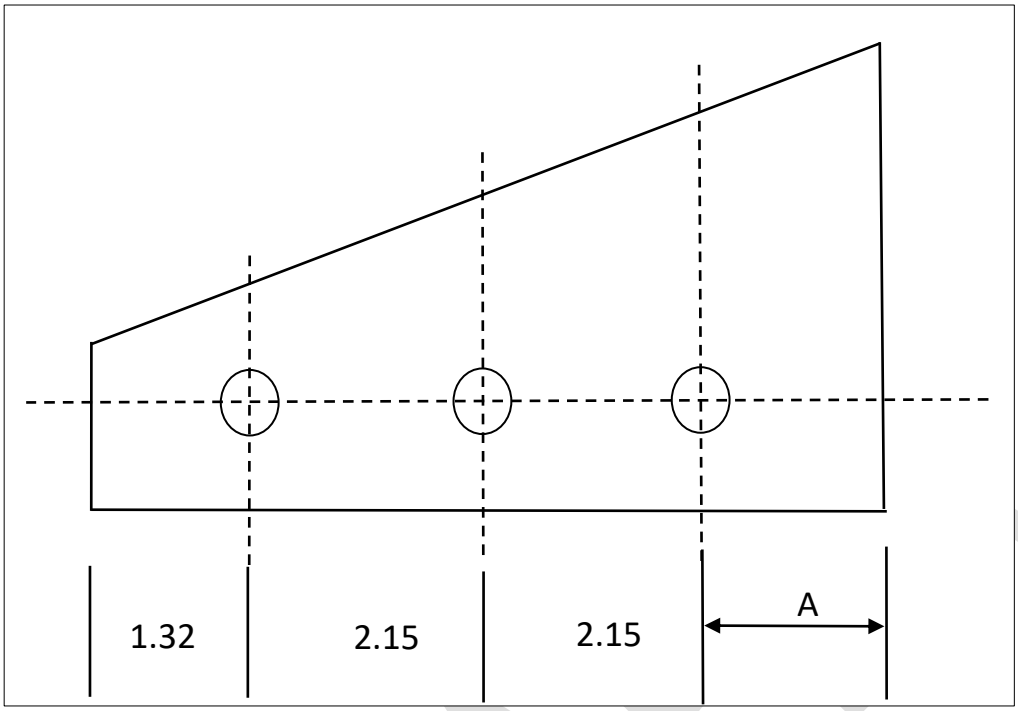

Figure 2 shows a support bracket for a car transporter's ramps.

Calculate dimension **A** shown in **Figure 2**.

All dimensions are in cm.

Overall length = 7.62 cm

Show your working.

[2 marks]

11 (b) Which **one** of the following is the name given to the dotted lines shown in **Figure 2**?

[1 mark]

A Construction

B Continuous

C Dashed

D Hidden

Answer _____

12 Identify **two** properties of stainless steel **and** give a benefit of **each** property.

[4 marks]

Property 1: _____

Benefit: _____

_____

_____

Property 2: _____

Benefit: _____

_____

_____

Please turn over for the next question.

13 **Figure 3**

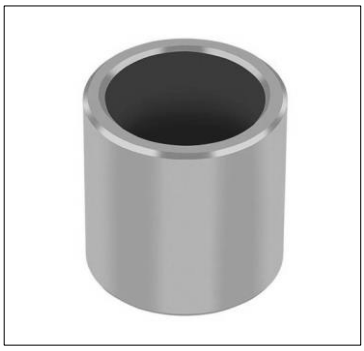

Figure 3 shows a wheel bearing.

Calculate the total volume of material needed to make the wheel bearing in **Figure 3.**

Use the following data:
Volume of void = 30.77 cm^3
Height = 5 cm
Outside diameter = 3.8 cm
π = 3.14

Use the equations on pages 2 and 3.

Show your working.

[2 marks]

14 (a) Identify a feature that shows an engineering drawing has been produced using imperial dimensions.

[1 mark]

14 (b) **Figure 4**

Figure 4 shows an engineering drawing.

What is the name for the horizontal line with arrows at either end in **Figure 4**?

[1 mark]

A Dimension

B Hidden

C Measured

D Pointing

Answer _____

14 (c) Complete **Table 1** by answering the questions below.

i. How is the person who created an engineering drawing identified on it?

ii. When is a sheet number included in an engineering drawing?

iii. How is a scale specified in an engineering drawing?

[3 marks]

Table 1

Question	Answer
i.	
ii.	
iii.	

15 An engineer must specify a material for a power station chimney.

Explain why concrete is a suitable material for a power station chimney.

[3 marks]

16 A car review website is testing the performance of a new car.

Calculate the vehicle's acceleration in m/s² **and** average speed in m/s.

Use the following data:
Starting velocity = 30 m/s
Finishing velocity = 100 m/s
Time = 30 s
Distance travelled = 500 m

Use the equations on pages 2 and 3.

Show your working.

[5 marks]

Acceleration:

Average speed:

Acceleration: ____ m/s²

Average speed: ____ m/s

Examiner use only

17 Electric power producers in the UK now rely less on fossil fuels.

Discuss the ways that engineering has reduced the impact of power generation on the environment.

[9 marks]

DO NOT WRITE IN THIS SPACE

18 Which **one** of the following is a type of motion?

[1 mark]

A Change in velocity

B Distance covered

C Moment of force

D Work done

Answer _____

19 Which **one** of the following describes the heat of combustion?

[1 mark]

A The amount of fuel used

B The height of the flame produced

C The temperature of the flame

D The total amount of energy released

Answer _____

20 Which **one** of the following describes the mechanical property of plasticity?

[1 mark]

A Bending force

B Elastic strength

C Low flammability

D Permanent deformation

Answer _____

21 Which **one** of the following is a unit of electrical resistance?

[1 mark]

A Amps

B Ohms

C Volts

D Watts

Answer _____

22 (a) **Figure 5**

Figure 5 shows a joining tool.

Name the joining tool shown in **Figure 5 and** describe **one** application for this tool.

[2 marks]

Tool: _____

Application: _____

_____

22 (b) There are many different joining tools used in Engineering.

Identify a **different** joining tool from the one shown in **Figure 5.**

[1 mark]

_____

Please turn over for the next question.

22 (c)

Figure 6

Figure 6 shows a power tool.

Identify the tool shown in **Figure 6 and** describe how you would use it.

[3 marks]

Tool:

Description of use:

23 (a) A product sometimes needs a polished finish to look attractive or reflective.

Identify **one** engineering material that can have a polished finish **and** give **one** example of where this polished material might be used effectively.

[2 marks]

Material: _____

_____

Example: _____

_____

23 (b) Identify **one** material where oxidation occurs **and** give a reason why oxidation should be prevented.

[2 marks]

Material: _____

_____

Reason: _____

_____

Please turn over for the next question.

24 Engineering is replacing telephone lines with fibre.

Explain how replacing telephone lines with fibre is changing our lives.

[9 marks]

This is the end of the external assessment.

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