City & Guilds Level 3 End-point Assessment for Maintenance and Operations Engineering Technician (9320-301)

Mechanical Technician

Standard: ST0154
EPA Plan: Version 1.1/1.4

March 2025 Version 1.2

Sample Knowledge Test

Sample paper, multiple choice mark sheet and mark scheme

Contents

Version and date	Change detail	Section
V1 June 2020	Document created	
V1.2 March 2025	ST0154/AP02 removed from the title. ST0154/AP02 added to the front page.	Throughout Front page

1 Introduction

What is in this document

This document contains the Sample Knowledge test for the City & Guilds End-point Assessment for Maintenance and Operations Engineering Technician (9320-301) – Multiple Choice Knowledge test.

How to use the forms

The following documents are included;

- Sample question knowledge test
- Multiple choice answer sheet
- Mark scheme

Apprentices should be provided with the sample questions and the answer sheet.

The mark scheme is to be used by employers/training providers/tutors to mark the completed tests.

9320-301 End-point Assessment – Knowledge test (sample)

Version 1.2 – March 2025

You should have the following for this test

- a pen with black or blue ink
- multiple choice questions answer sheet
- non programmable calculator

Read the following notes before you answer any questions:

- Attempt all questions
- If you find a question difficult, leave it and return to it later

This paper contains 30 multiple choice questions worth 1 mark each.

The time allowed for this test is 45 minutes.

The drawings are not to scale.

This question paper is the property of City & Guilds

How to complete the multiple choice answer sheet

Each multiple choice question shows four possible answers (lettered 'a', 'b', 'c' and 'd'); only one is correct.

Decide which one is correct and mark your answer on the answer sheet with your pen.

For example if you decide 'b' is correct, mark your answer with a cross like this:

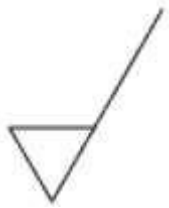
1 a ☐ b ☒ c ☐ d ☐

If you change your answer, cancel your first choice by filling in the box then put a cross in the answer which you have now decided is correct like this:

1 a ☐ b ■ c ☒ d ☐

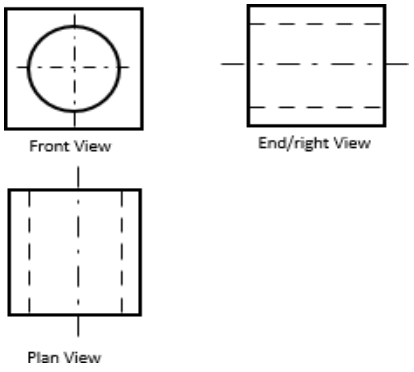
9320-301 End-point Assessment - Sample Knowledge Test Mark Sheet

1. What is the meaning of this symbol on an engineering drawing?



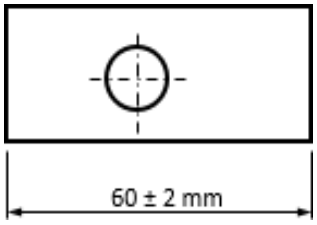
a Material removal not allowed
b Welded joint
c Thread size
d Surface to be machined

2. What type of orthographic projection is shown in this picture?



a First angle
b Second angle
c Third angle
d Isometric

3. What is the maximum acceptable length of the part in this drawing?

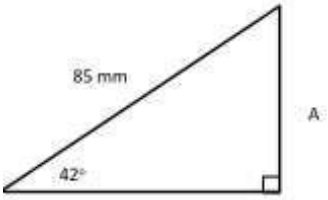


a 58 mm
b 60 mm
c 61 mm
d 62 mm

4. An engineer is selecting a material for the inside of a furnace used for heat treatment, which will operate at temperatures up to 1200°C. Which material would be the **most** suitable for this application?
   a Aluminium alloy
   b Cast iron
   c Ceramic
   d thermosetting plastic

5. Which of these statements defines the 'Principle of Moments'?
   a When an object is in equilibrium, the sum of anticlockwise moments about any point is greater than to the sum of clockwise moments about the same point
   b When an object is in equilibrium, the sum of anticlockwise moments about any point is equal to the sum of clockwise moments about the same point
   c When an object is in equilibrium, the sum of anticlockwise moments about any point is less than to the sum of clockwise moments about the same point
   d When an object is not in equilibrium, the sum of anticlockwise moments about any point must equal the sum of clockwise moments about the same point

6 Calculate the length of side A, rounding to the nearest whole number



a 49 mm
b 57 mm
c 63 mm
d 77 mm

7. Normalising typically increases which property of a heat treated carbon steel?
   a Corrosion resistance
   b Hardness
   c Ductility
   d Tensile strength

8. What is the definition of friction?
   a The heat generated between two surfaces in contact with each other
   b The force pulling two surfaces together
   c The resistance that a surface encounters when moving over another surface
   d The amount of material worn away from a surface

9. Micrometers are normally calibrated. In this context, what does calibration mean?
   a Recording where the micrometer was purchased and the products that it has been used to measure
   b Using the micrometer to measure products to ensure they are within tolerance
   c Collecting documentary evidence that measurements carried out in production maintain the desired level of accuracy at all times
   d Ensuring that the micrometer gives the same measurement as a device of known accuracy

10. Which piece of legislation details the requirements for reporting dangerous occurrences and accidents?
   a PUWER
   b RIDDOR
   c COSHH
   d HASAW

11. Which type of fire extinguisher should be used to extinguish an electrical fire?
   a Carbon dioxide
   b Foam
   c Water
   d Wet chemical

12. An environmental condition that could lead to accidents in the workplace is:
   a Workers not wearing the provided PPE
   b Appropriate ventilation
   c Lack of management control of the workforce
   d Inadequate lighting

13. What does the colour blue mean on a safety sign?
   a The activity shown is prohibited
   b The instruction shown is mandatory
   c The sign provides information about an emergency exit
   d It is a warning sign

14. What is the purpose of the ISO14001 standard?

a To help companies document the elements needed to maintain an efficient quality system
b To specify the requirements for environmental management systems
c To ensure that all machines and processes in the workplace do not affect the environment
d To ensure that workplaces are safe and accidents are reported to appropriate authorities

15. A worker is lifting parts to put them into a machine. Each part weighs 10 kg. What would be an appropriate item of personal protective equipment to reduce the risks associated with this activity?

a Safety boots
b Ear muffs
c Hard hat
d Glasses

16. During maintenance, what is meant by system isolation?

a Removing a machine or process from the workshop, so it cannot interfere with other activities
b Working independently on a machine without assistance from other engineers
c A safety document that permits certain people to carry out specific work within a specified time frame
d A safety procedure that ensures machines are shut off and cannot be started up again prior to the completion of work

17. What type of gear is shown in this picture?

a Bevel
b Rack and pinion
c Spur
d Worm

18. What type of bearing is shown in this image?

a Ring bearing
b Roller bearing
c Thrust bearing
d Uniaxial elliptical bearing

19. What feature is indicated by the arrow in this image of a shaft?

a Keyway
b Helical gear
c Lubrication channel
d Spline

20. An engineer needs to measure the internal diameter of a drilled hole to an accuracy of ± 0.1 mm. What would be the **most** suitable item of equipment to make this measurement?

a Micrometer
b Engineering rule
c Vernier Callipers
d Feeler gauge

21. Which part is commonly a 'lifed' item in a product?
    a Housing (casing)
    b Bevel gear
    c Seal
    d Electric motor

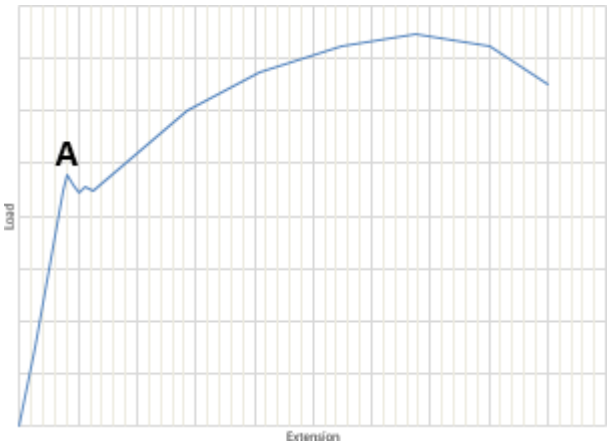
22. What is the SI base unit for capacity?
    a Litre
    b Gallon
    c Metre
    d Kilogram

23. What is measured in units of kg m-3?
    a Power
    b Density
    c Capacity
    d Conductivity

24. A simple gear train consists of an input gear, an idler gear and an output gear. What is the **main** purpose of an idler gear in this arrangement?
    a To make the output gear turn in the same direction as the input gear
    b To make the output gear turn in the opposite direction to the input gear
    c To allow the gears to be disengaged from the power transmission system
    d To allow the gears to change speed without being disengaged from the power transmission system

25. Which of these statements about friction is correct?
    a Kinetic friction is dependent on velocity
    b Friction depends upon the nature of the surfaces in contact
    c The coefficient of kinetic friction is always greater than the coefficient of static friction
    d Friction is proportional to the area of contact

26. This graph shows the results of a test to determine the strength of a low carbon steel. What value is represented by point A?



a Yield strength
b Ultimate tensile strength
c Compressive strength
d Compressive strength

27. What type of force is represented by the arrow in this image?

a Compression
b Shear
c Tension
d Torsion

28. A box of equipment is pushed 2 m along a flat surface by applying a force of 30 N. What is the work done when moving the box?

a 15 J
b 30 J
c 45 J
d 60 J

29. A metal bar is being used as part of a lifting rig. It is lifting a weight of 3600 N. The cross sectional area over which the stress is applied is 180 mm^2. What is the stress in the bar during the lifting operation?

a 0.5 N mm^{-2}

b 18 N mm^{-2}

c 20 N mm^{-2}

d 24 N mm^{-2}

30. A metal plate has a thermal conductivity of 75 W m^{-1} $^oC^{-1}$. It is 0.05 m thick and the area of heat transfer is 1 m^2. The temperature is 200^{o}C on one side and 50^{o}C on the other. Calculate the heat transfer through the plate.

Heat transfer Q = (k/s) A dT, where k is the thermal conductivity of the material, s is the material thickness, A is the area of heat transfer and dT is the difference in temperature.

a 1.5 kJ

b 56.25 kJ

c 112.5 kJ

d 225 kJ

9320-301 Knowledge Test Multiple Choice Answer sheet (Sample Test)

Test: | | | | | - | | | |

Candidate name: First name | Last name

(Please print)

Date of test: dd / mm / yy

1	a ☐	b ☐	c ☐	d ☐	16	a ☐	b ☐	c ☐	d ☐
2	a ☐	b ☐	c ☐	d ☐	17	a ☐	b ☐	c ☐	d ☐
3	a ☐	b ☐	c ☐	d ☐	18	a ☐	b ☐	c ☐	d ☐
4	a ☐	b ☐	c ☐	d ☐	19	a ☐	b ☐	c ☐	d ☐
5	a ☐	b ☐	c ☐	d ☐	20	a ☐	b ☐	c ☐	d ☐
6	a ☐	b ☐	c ☐	d ☐	21	a ☐	b ☐	c ☐	d ☐
7	a ☐	b ☐	c ☐	d ☐	22	a ☐	b ☐	c ☐	d ☐
8	a ☐	b ☐	c ☐	d ☐	23	a ☐	b ☐	c ☐	d ☐
9	a ☐	b ☐	c ☐	d ☐	24	a ☐	b ☐	c ☐	d ☐
10	a ☐	b ☐	c ☐	d ☐	25	a ☐	b ☐	c ☐	d ☐
11	a ☐	b ☐	c ☐	d ☐	26	a ☐	b ☐	c ☐	d ☐
12	a ☐	b ☐	c ☐	d ☐	27	a ☐	b ☐	c ☐	d ☐
13	a ☐	b ☐	c ☐	d ☐	28	a ☐	b ☐	c ☐	d ☐
14	a ☐	b ☐	c ☐	d ☐	29	a ☐	b ☐	c ☐	d ☐
15	a ☐	b ☐	c ☐	d ☐	30	a ☐	b ☐	c ☐	d ☐

Number of correct answers: / 30

Grade: Pass /Merit/Distinction/ Fail

Marked by:

Date: dd / mm / yy

9320-301 Knowledge Test Multiple Choice Mark Scheme (Sample)

Marks: 30 Pass: 60% (18 Marks) Merit:75% (22 Marks) Distinction:85% (25 Marks)

Question no	Key	Question no	Key
1	**d**	16	**d**
2	**a**	17	**c**
3	**d**	18	**c**
4	**c**	19	**d**
5	**b**	20	**c**
6	**b**	21	**c**
7	**c**	22	**a**
8	**c**	23	**b**
9	**d**	24	**a**
10	**b**	25	**b**
11	**a**	26	**a**
12	**d**	27	**d**
13	**b**	28	**d**
14	**b**	29	**c**
15	**a**	30	**d**

About City & Guilds

Founded in 1878 to develop the knowledge, skills, and behaviours needed to help businesses thrive, we offer a broad and imaginative range of products and services that help people achieve their potential through work based learning.

We believe in a world where people and organisations have the confidence and capabilities to prosper, today and in the future. So we work with like-minded partners to develop the skills that industries demand across the world.

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