

External assessment 2025

Multiple choice question book

# Engineering

## General instruction

- Work in this book will not be marked.

## Section 1

### Instruction

- Respond to these questions in the question and response book.
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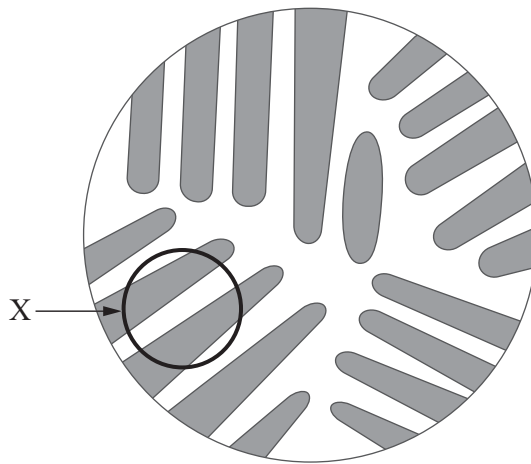
### QUESTION 1

Which industrial application uses medium carbon steel?

- (A) punches
- (B) train rails
- (C) wire products
- (D) seamless tubes

### QUESTION 2

A microstructure diagram for steel at room temperature is shown.



What is the composition in the circled area X?

- (A) ferrite
- (B) pearlite
- (C) austenite
- (D) cementite

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**QUESTION 3**

The diameter of the rear wheel of a bicycle is 725 mm. A gear with 50 teeth is attached to the rear wheel and driven by a pedal gear with 150 teeth. The pedals complete four rotations.

What is the distance travelled by the bicycle, rounded to one decimal place?

- (A) 3.0 m
- (B) 6.8 m
- (C) 8.7 m
- (D) 27.3 m

**QUESTION 4**

The truth table for a logic gate is shown.

Input A	Input B	Output X
0	0	1
0	1	1
1	0	1
1	1	0

Which logic gate corresponds to the table?

- (A) OR gate
- (B) AND gate
- (C) NOR gate
- (D) NAND gate

**QUESTION 5**

What is a suitable application for polylactic acid (PLA)?

- (A) drainage pipes
- (B) cable insulation
- (C) medical implants
- (D) laboratory equipment

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**QUESTION 6**

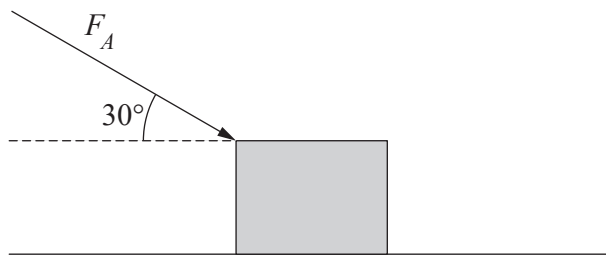
A car with a mass of 1620 kg brakes so hard that its tyres slide on a horizontal road. The coefficient of kinetic friction between the tyres and the road is 0.75.

What is the kinetic frictional force between the tyres and the road, rounded to one decimal place?

- (A) 1.2 kN
- (B) 2.2 kN
- (C) 11.9 kN
- (D) 21.2 kN

**QUESTION 7**

An object is pushed along a horizontal surface at a constant velocity by an applied force, as shown.



Which arrow best shows the direction of the frictional force acting on the object?

- (A)
- (B)
- (C)
- (D)

**QUESTION 8**

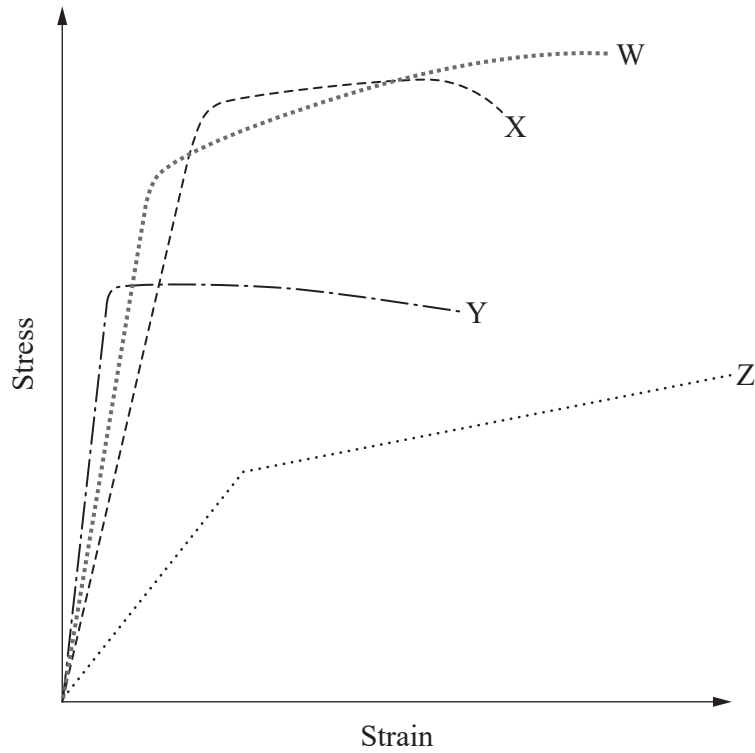
An object has a mass of 1500 kg. It starts from rest and accelerates uniformly at  $0.4 \text{ m/s}^2$  for a horizontal distance of 20 m.

What is the object's kinetic energy?

- (A) 12 kJ
- (B) 24 kJ
- (C) 192 kJ
- (D) 294 kJ

**QUESTION 9**

A stress–strain diagram for four aluminium alloys is shown.



Which aluminium alloy has the greatest toughness?

- (A) W
- (B) X
- (C) Y
- (D) Z

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**QUESTION 10**

A hydraulic jack connected to a motor is used to raise an entire car. The mass of the car is 1500 kg. The motor uses 1.2 kW of power to raise the car.

What is the time taken to raise the car 500 mm vertically, rounded to two decimal places?

- (A) 1.60 s
- (B) 6.13 s
- (C) 6.25 s
- (D) 12.25 s

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## References

### Question 9

Based on Fig 2 in Owolabi, G. , Thom, M. , Ajide, O. , Kumar, N. , Azimi, A. , Whitworth, H. and Warner, G. (2019) Fatigue Responses of Three AA 2000 Series Aluminum Alloys. *Journal of Materials Science and Chemical Engineering*, 7, 32-48. doi: 10.4236/msce.2019.73003. Licensed Creative Commons Attribution 4.0 International



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