External assessment 2021

Multiple choice question book

Engineering

General instruction

- Work in this book will not be marked.

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

Section 1

QUESTION 1

Conventional automotive torsion bars are manufactured using steel with a carbon content of 0.3% to 0.5%, which is

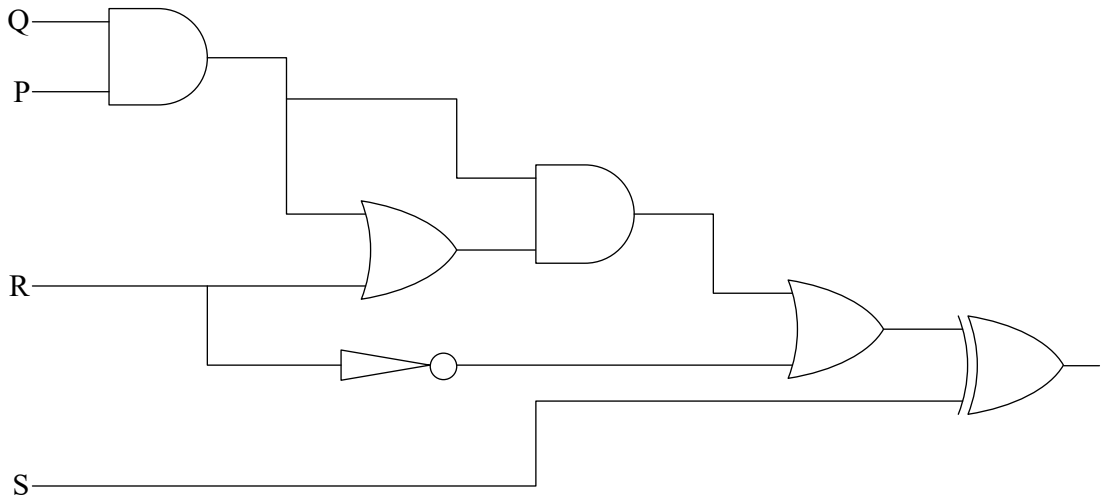
(A) low-carbon steel.

(B) high-carbon steel.

(C) mild-carbon steel.

(D) medium-carbon steel.

QUESTION 2



When the output from the logic circuit is 1, the input to the circuit is

(A)

P	Q	R	S
1	1	1	1

(B)

P	Q	R	S
0	1	1	1

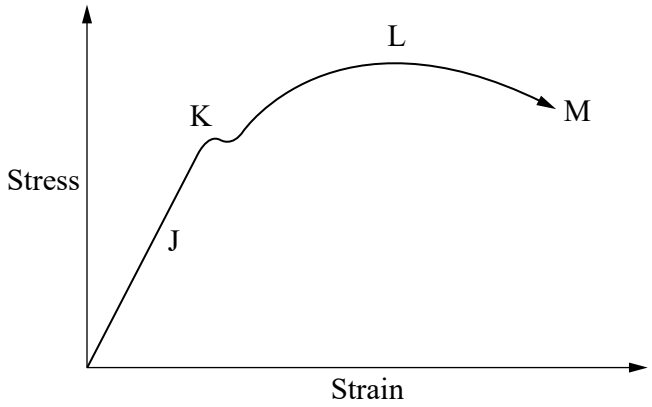
(C)

P	Q	R	S
1	1	0	1

(D)

P	Q	R	S
0	1	0	1

QUESTION 3



The stiffness of a material can be identified using which area of the stress–strain diagram?

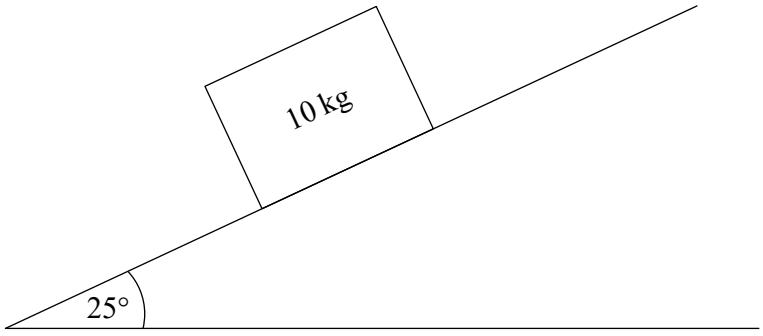
(A) J

(B) K

(C) L

(D) M

QUESTION 4



Not to scale

A box slides down a slope as shown. If the coefficient of friction between the box and the slope is 0.2, what is the acceleration of the box?

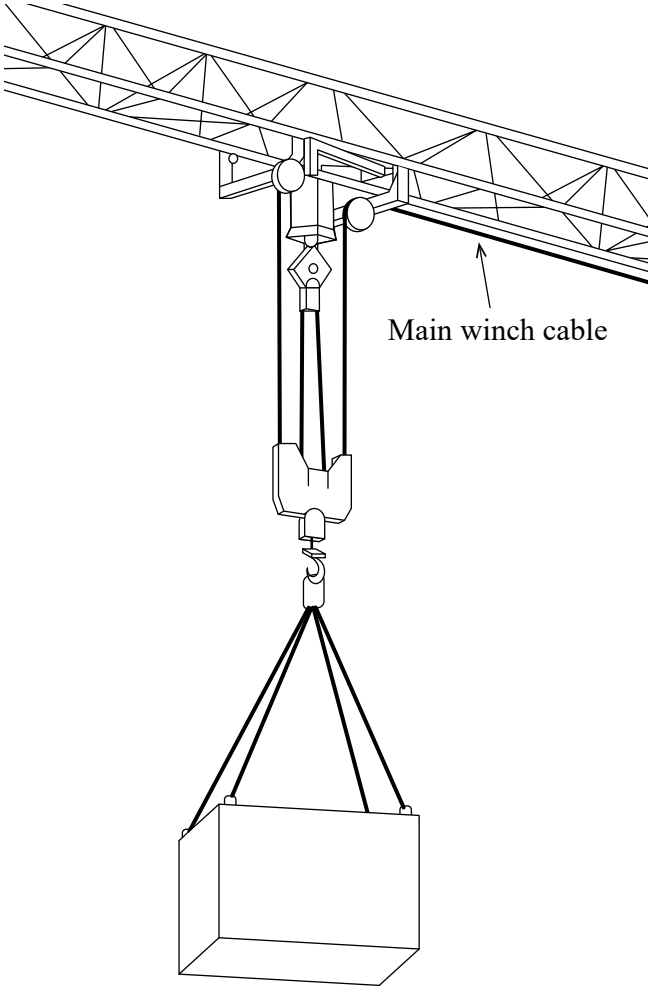
(A) 8.0 m/s^2

(B) 4.1 m/s^2

(C) 2.4 m/s^2

(D) 1.8 m/s^2

QUESTION 5



Not to scale

This crane vertically lifts a load a distance of 20 m using a pulley system. What distance must the main winch cable move during the vertical lift?

(A) 100 m

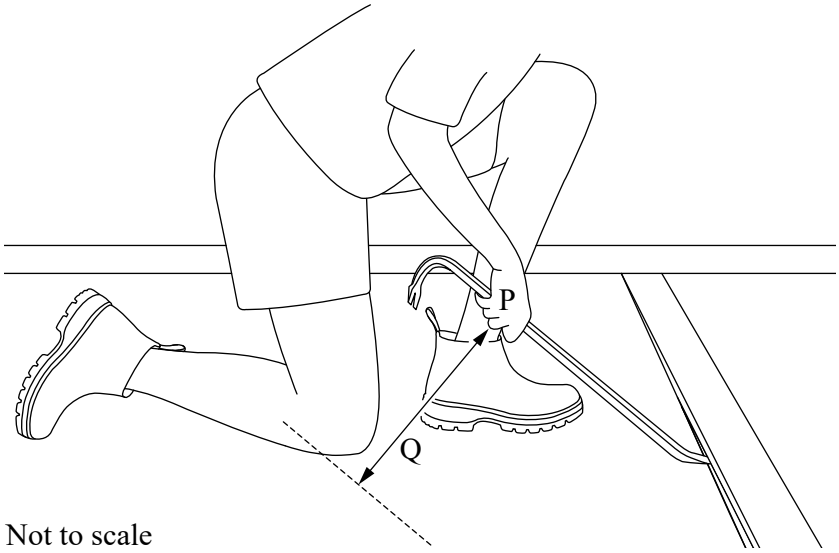
(B) 80 m

(C) 20 m

(D) 5 m

QUESTION 6

A crowbar is used to lever a floorboard as shown. An effort of 55 N is applied to the crowbar at position P, generating a force of 550 N that raises the floorboard by 20 mm. If the crowbar displacement Q is 700 mm, what is the efficiency of the crowbar?



Not to scale

(A) 79%

(B) 36%

(C) 29%

(D) 10%

QUESTION 7

A pulley system with an efficiency of 75% is used to vertically raise a 120 kg load a distance of 3 m. If the length of pulley rope pulled to raise the load is 8 m, the effort required is

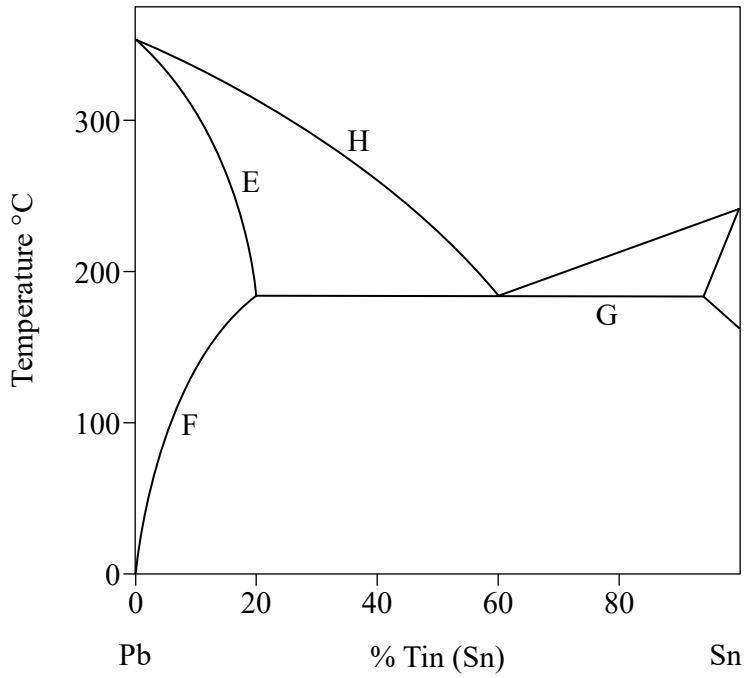
(A) 330 N.

(B) 392 N.

(C) 440 N.

(D) 588 N.

QUESTION 8



In the lead–tin thermal equilibrium phase diagram, a liquidus line is represented by the letter

(A) E.

(B) F.

(C) G.

(D) H.

QUESTION 9

The work done by a jack to vertically raise a 1500 kg vehicle a distance of 180 cm is

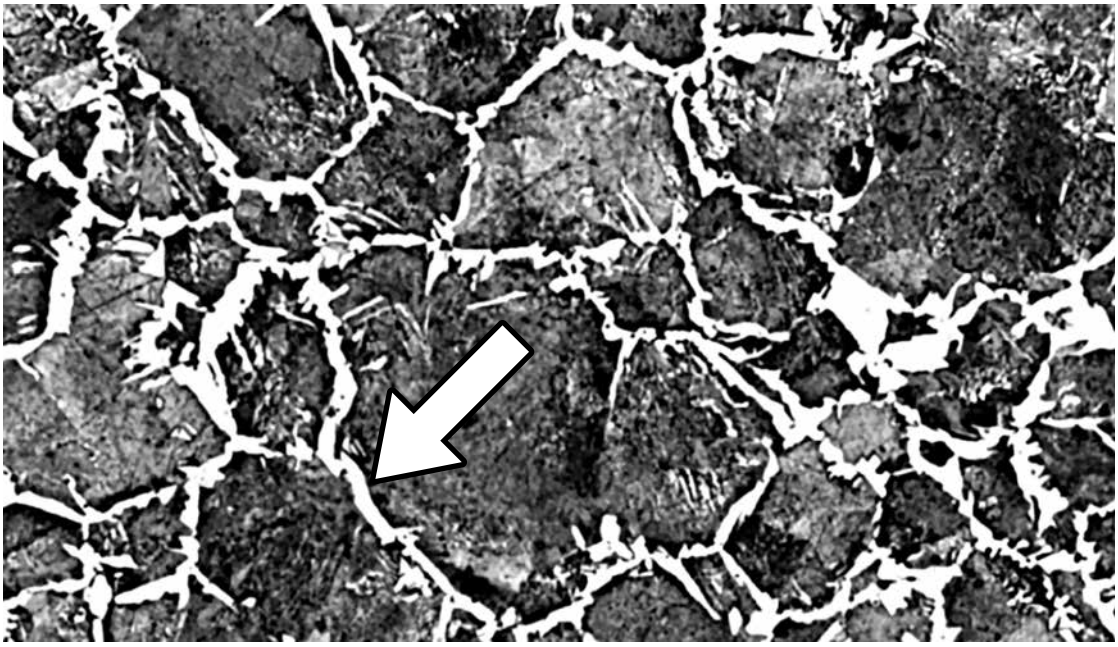
(A) 2700 J.

(B) 8167 J.

(C) 26 460 J.

(D) 81 667 J.

QUESTION 10



What is the hypereutectoid formation indicated by the arrow in the carbon steel microstructure?

(A) cementite

(B) austenite

(C) pearlite

(D) ferrite

References

Question 10

Dr R F Cochrane, University of Leeds, Structure of hypereutectoid steel Source *7.2.1 Hypo and Hyper* 2021, *Uni-kiel.d*e, https://www.tf.uni-kiel.de/matwis/amat/iss/kap_7/backbone/r7_2_1.html
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