External assessment 2022

Multiple choice question book

Engineering

General instruction

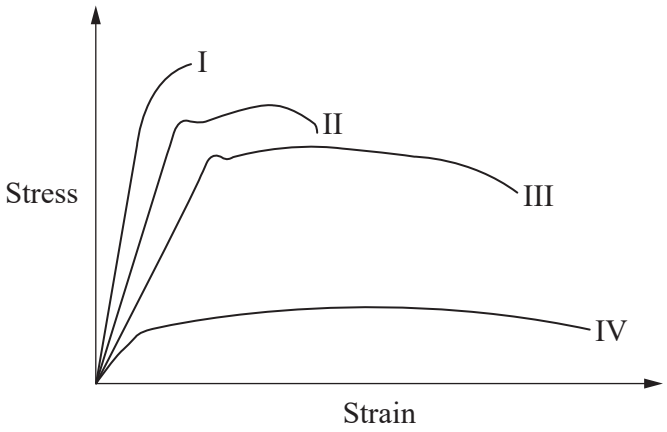
- Work in this book will not be marked.

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

Section 1

QUESTION 1

The graph shows the tensile stress–strain curves of four different materials.



The toughest of the four materials is

(A) I

(B) II

(C) III

(D) IV

QUESTION 2

Waste water drainage pipe is commonly manufactured using

(A) nylon.

(B) polypropylene.

(C) polylactic acid.

(D) polyvinyl chloride.

QUESTION 3

During a race, the rear wheels of a go-kart exert a horizontal force of 100 N on the racetrack surface when the rear axle is rotating at 1000 revolutions per minute (rpm). The wheels have a diameter of 280 mm.

The power being transmitted to the track by the rear wheels is

(A) 88 kW

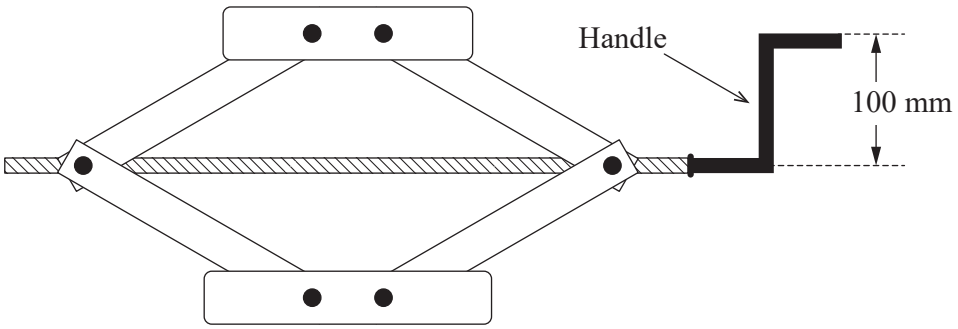
(B) 2.9 kW

(C) 1.5 kW

(D) 0.73 kW

QUESTION 4

A scissor jack is used to lift a 1.5 tonne vehicle.



Not to scale

If the 2.5 mm pitch of the central screw allows the vehicle to be raised 5 mm during one revolution of the handle, the velocity ratio of the jack is

(A) 40:1

(B) 126:1

(C) 251:1

(D) 300:1

QUESTION 5

A pump transfers water vertically up to a cylindrical water tank sitting on a platform 7 m above the ground. The tank is 3 m deep and holds 20 kL when full.

Given that 1 L of water has a mass of 1 kg, the potential energy of the full tank at its vertical midpoint relative to a water outlet 1 m above ground level is

(A) 1.47 MJ

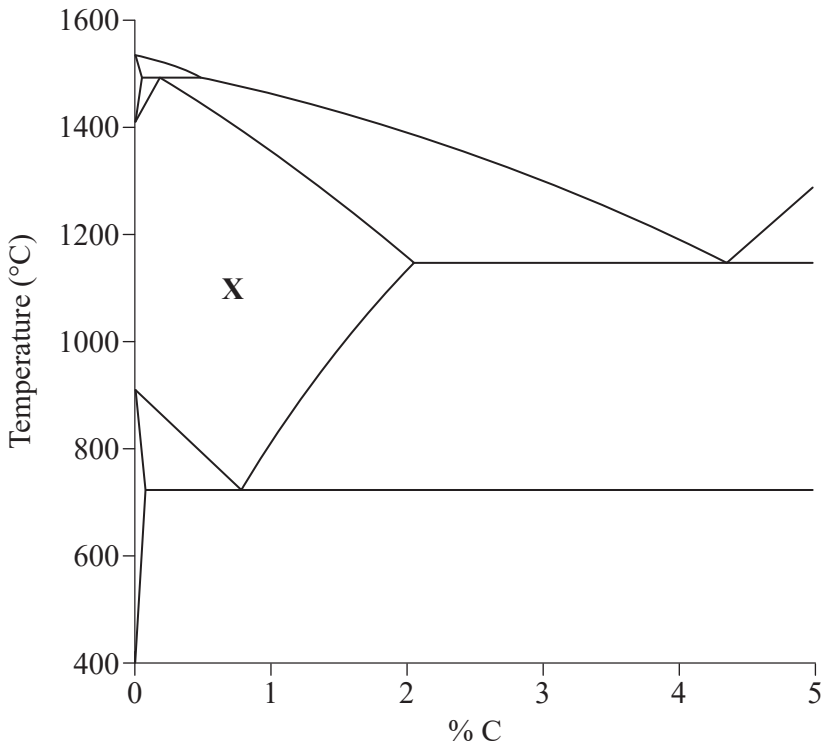
(B) 1.67 MJ

(C) 1.76 MJ

(D) 1.86 MJ

QUESTION 6

A section of an iron–carbon phase diagram is shown.



The microstructure of the phase represented by **X** is solid

(A) cementite.

(B) austenite.

(C) pearlite.

(D) ferrite.

QUESTION 7

A 10 kg wheelbarrow sits stationary but just on the point of sliding on an inclined ramp. When the ramp is raised by 5° to make an angle of 20° to the horizontal, the wheelbarrow slowly starts to slide.

The minimum amount of additional force required to stop the wheelbarrow from sliding is

(A) 59 N

(B) 34 N

(C) 25 N

(D) 8 N

QUESTION 8

High carbon steel is used in the manufacture of

(A) boiler plates.

(B) railway tracks.

(C) punching tools.

(D) engine crankshafts.

QUESTION 9

A mechanism extends an initially stationary rod 15 mm at a final velocity of 2.5 m/s.

The acceleration of the rod is

(A) 417 m/s^2

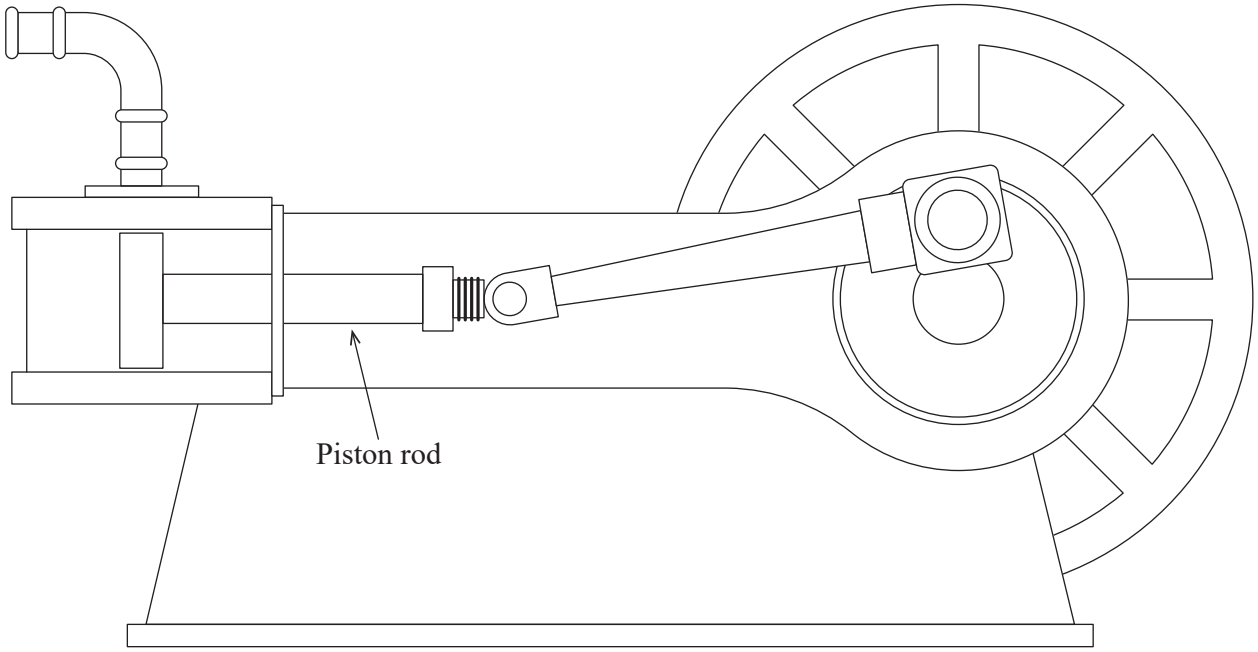
(B) 208 m/s^2

(C) 38 m/s^2

(D) 21 m/s^2

QUESTION 10

A diagram of a steam-driven engine is shown.



Not to scale

When the steam engine is in motion, the movement of the piston rod is

(A) oscillating.

(B) reciprocal.

(C) rotary.

(D) linear.

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References

Question 1

Based on Webber 2007, 'Material ductility', *Wikimedia Commons*, https://commons.wikimedia.org/wiki/File:Material_Ductility.jpg. Public domain.

Question 4

Based on 'Car lift jack', *PxFuel*, https://www.pxfuel.com/en/free-photo-jscvj

Question 10

Adapted from Hawkins, N 1904, 'Buffalo horizontal steam engine', *New catechism of the steam engine*, https://commons.wikimedia.org/wiki/File:Buffalo_horizontal_steam_engine_(New_Catechism_of_the_Steam_Engine,_1904).jpg. Public domain.