Measurement, Materials and Motion

1. The dimensions of a cube are measured with vernier calipers.

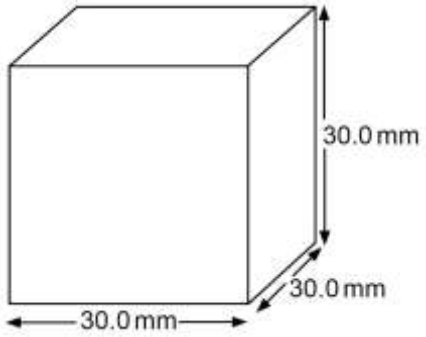
The measured length of each side is 30.0 mm. If the vernier callipers can be read with an uncertainty of +/- 0.1 mm. What is the approximate percentage uncertainty in the value of the volume?

A 4%

B 3%

C 0.3%

D 1%



Your answer

2. To find the resistivity of a semiconductor, a student makes the following measurements of a cylindrical rod of the material :

length = 25 ± 1 mm

diameter = 5.0 ± 0.1 mm

resistance = 68 ± 1 Ω

The resistivity is calculated to be 53 mΩ m. What is the uncertainty in this result?

A ± 1 mΩ m

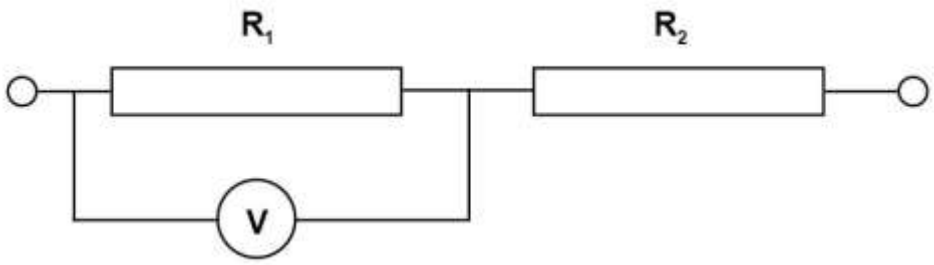
B ± 2 mΩ m

C ± 4 mΩ m

D ± 5 mΩ m

Your answer

3. Two students carry out an experiment to determine the ratio of potential difference across two resistors R_1 and R_2 which are connected in series across a low voltage d.c. supply. The resistors have different values such that $R_2 = 10\ R_1$.



The voltmeter used to take the readings gives a reading of 0.2V before any potential difference is applied.

Amy takes one measurement across each resistor and calculates the ratio as V_1/V_2.

Matthew changes the supply voltage and takes a series of readings for V_1 and V_2. He then plots a graph of V_1 against V_2 and uses the gradient of his graph to determine V_1/V_2.

Which of the following statements is true?

A Amy's value for V_1/V_2 will not be affected by the error.

B Amy's value for V_1/V_2 will be decreased because of the error.

C Matthew's value for V_1/V_2 will not be affected by the error.

D Matthew's value for V_1/V_2 will be decreased because of the error.

Your answer

4. The diameter of a wire being tested is measured as $d = 0.40 \pm 0.005$ mm.

What is the percentage uncertainty in the result of the calculation when d is used to determine cross sectional area of the wire?

A 2.50%

B 1.56%

C 1.25%

D 0.016%

Your answer ☐

5. A student determines a value for a force using the formula $F = k I l$.

k is a constant with units of $\mathrm{N\,A^{-1}\,m^{-1}}$

I is current measured in mA

l is length measured in mm

The student uses the numbers directly from each measurement in their calculation.

What will be the units of the force from that calculation?

A μN

B mN

C N

D MN

Your answer ☐

6. A digital camera records each image as 8 megapixels, with each pixel transferring 14 bits of information.

What is the minimum capacity for a memory card which could hold 120 images?

A 1.7 Mbyte

B 13 Mbyte

C 1.7 Gbyte

D 13 Gbyte

Your answer

7. A child (mass *m*) sits on a car seat which is accelerating horizontally at 0.50*g* (where *g* is the acceleration of free fall).

What is the magnitude of the total force F exerted by the car seat on the child?

A 0.50 *mg*

B 1.0 *mg*

C 1.1 *mg*

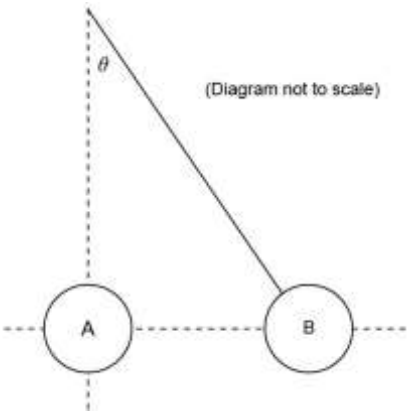
D 1.5 *mg*

Your answer

8. Two metal spheres, A and B, are positively charged. Sphere A is fixed in position. Sphere B is suspended by an insulating thread from a point directly above the centre of sphere A as shown in the diagram:

Sphere B has a weight of 0.50 m N. The size of the electrostatic repulsive force is 0.29 m N.

What angle, θ, does the thread suspending sphere B make to the vertical ?



A 0.66°

B 1.0°

C 30°

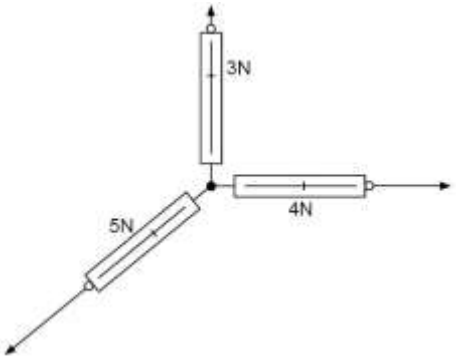
D 60°

Your answer

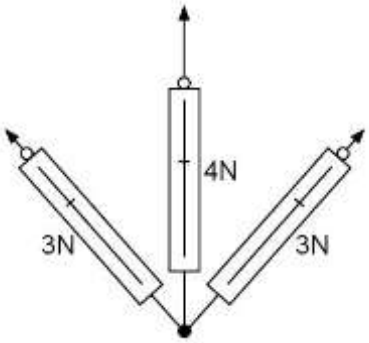
9. Each diagram below shows three newton meters, in a two dimensional arrangement, joined to demonstrate a system of three forces acting at a point. The readings represent the magnitudes of the forces.

Which system of forces could be in equilibrium?

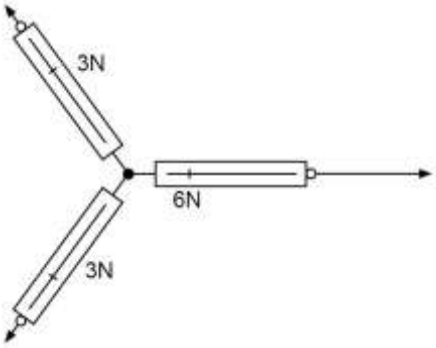
A



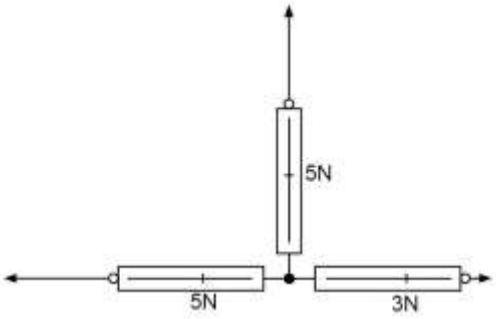
B



C



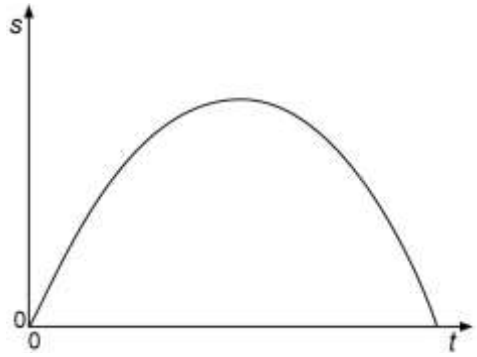
D



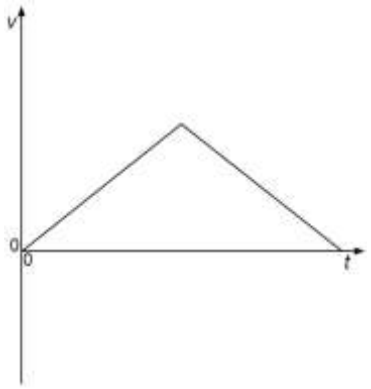
Your answer

10. The diagram shows the graph of displacement *s* against time *t* for an object moving in a straight line.

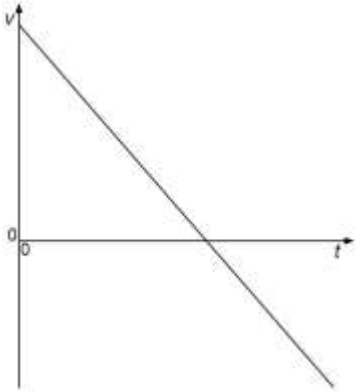
Which of the following graphs of velocity *v* against time *t* represents the motion of the body over this period?



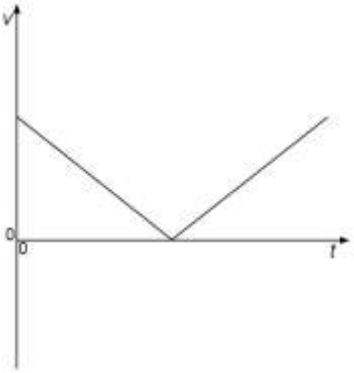
A



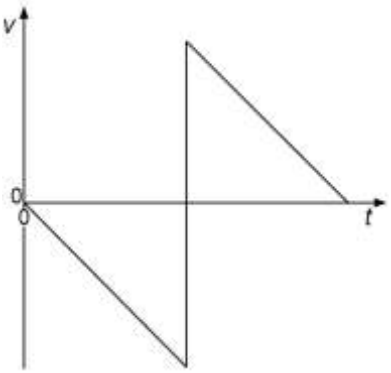
C



B

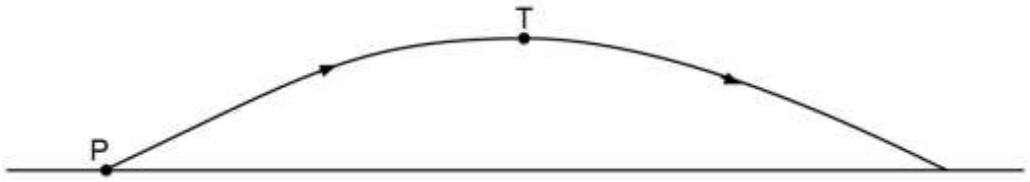


D



Your answer

11. In the absence of air resistance a stone is thrown from **P** and follows a parabolic path, as shown, in which the highest point reached is **T**.



The vertical component of acceleration of the stone, as it follows this path, is:

A zero at **T**

B greatest at **T**

C greatest at **P**

D The same at **P** as at **T**

Your answer ☐

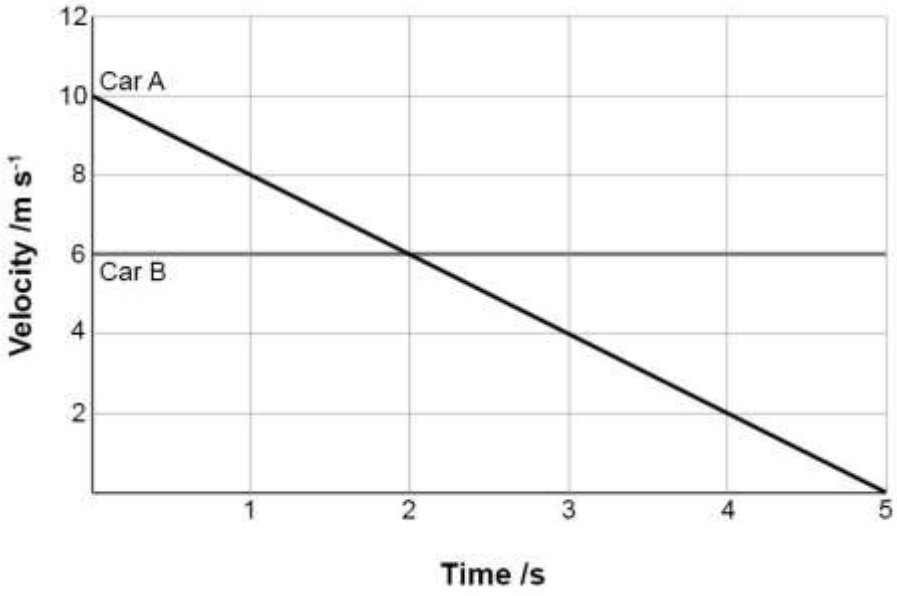
12. A satellite moves at a constant speed in a circular orbit about the Earth.

Which pair of statements about momentum and kinetic energy are correct?

	Momentum	*Kinetic energy*
A	constant	changing
B	constant	constant
C	changing	changing
D	changing	constant

Your answer ☐

13. The graph below shows the velocity – time graphs of two cars.



At what time have both cars travelled the same distance since $t = 0$?

A 1.0 s

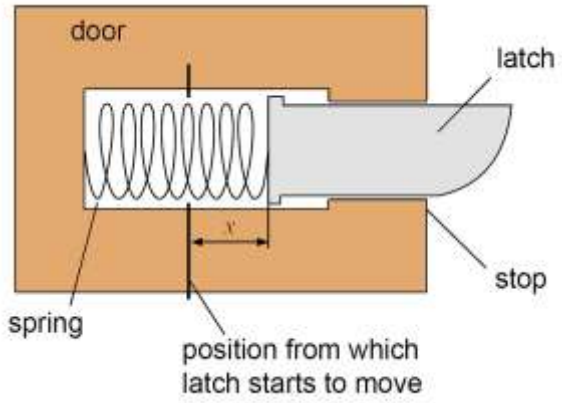
B 2.0 s

C 3.0 s

D 4.0 s

Your answer

14. A door is fitted with a spring operated latch as shown.

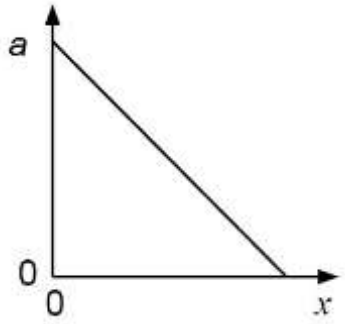


The latch is pushed in, the spring becomes compressed but remains within its elastic limit.

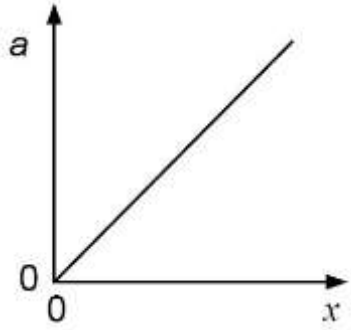
The latch is then suddenly released.

Which graph best shows how the acceleration of the latch varies with the distance *x* it moves before it is stopped?

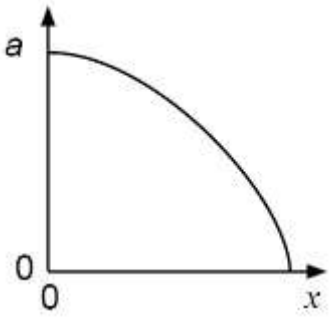
A



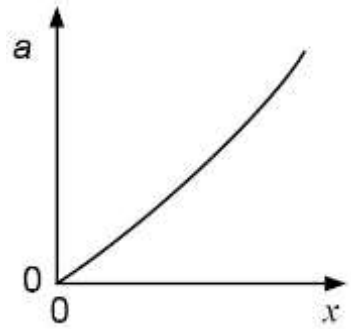
C



B



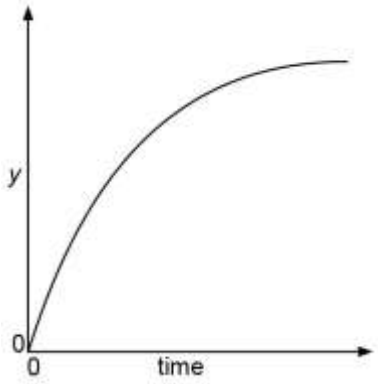
D



Your answer

15. The graph relates to the motion of a falling body.

What could *y* represent on the vertical axis?



A distance when air resistance is negligible

B distance when air resistance is not negligible

C speed when air resistance is negligible

D speed when air resistance is not negligible

Your answer

16. A skydiver falls from the open door of an aircraft in steady level flight.

It is observed that it takes three seconds for the skydiver to reach terminal velocity.

Which statement about the motion of the object is correct?

A The horizontal component of the skydiver's velocity is constant.

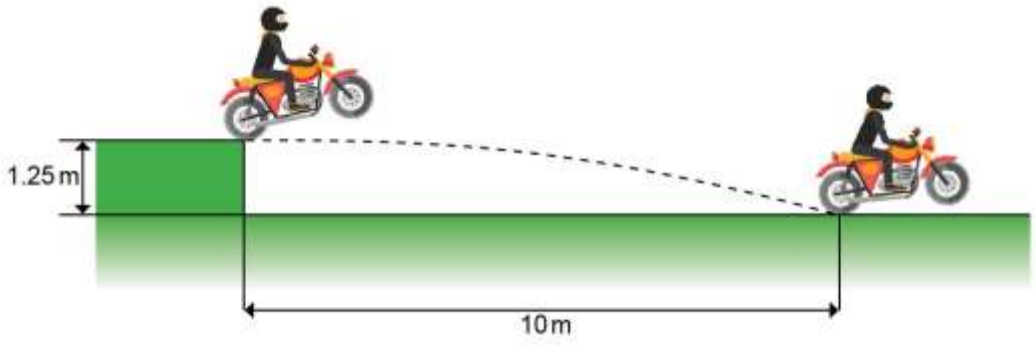
B The horizontal component of the skydiver's acceleration is zero.

C The vertical component of the skydiver's velocity decreases for three seconds.

D The vertical component of the skydiver's acceleration is zero after three seconds.

Your answer

17. A motorcycle stunt-rider moving horizontally, takes off from point 1.25 m above the ground.



She lands 10m away from the take-off point, as shown.

What was the speed at take-off?

A 5 m s^{-1}

B 10 m s^{-1}

C 15 m s^{-1}

D 20 m s^{-1}

Your answer

18. The engine of a high speed train, travelling at 50 ms^{-1}, delivers a power of 2 MW.

What is the force exerted by the engine?

A 4×10^4 N

B 1×10^5 N

C 4×10^7 N

D 1×10^8 N

Your answer ☐

19. A force of 1000 N is needed to lift the hook of a crane at a constant velocity. The crane is then used to lift a load of 10000 N at a velocity of 0.50 ms^{-1}.

How much power does the motor of the crane need to develop to lift the hook and load?

A 5.0 kW

B 5.5 kW

C 20 kW

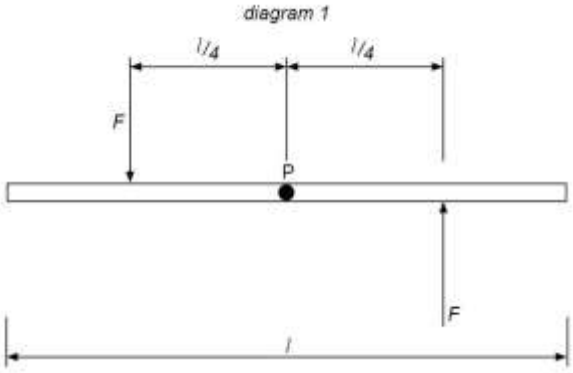
D 22 kW

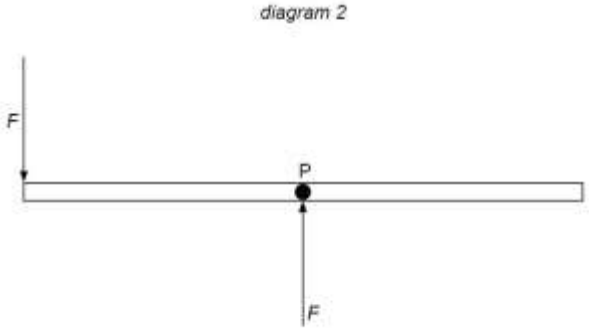
Your answer ☐

Multiple Choice Questions (MCQ) topic quiz – Moments Q20 and Q21 are (Physics A only) – Not Advancing Physics

20. Diagram 1 shows two parallel forces *F* acting on a bar of length *l* pivoted at **P**. The forces create a couple of torque *M*.

In diagram 2, the two parallel forces have each moved $l/4$ to the left.





What is the torque of the couple in diagram 2?

A 0

B $M/2$

C M

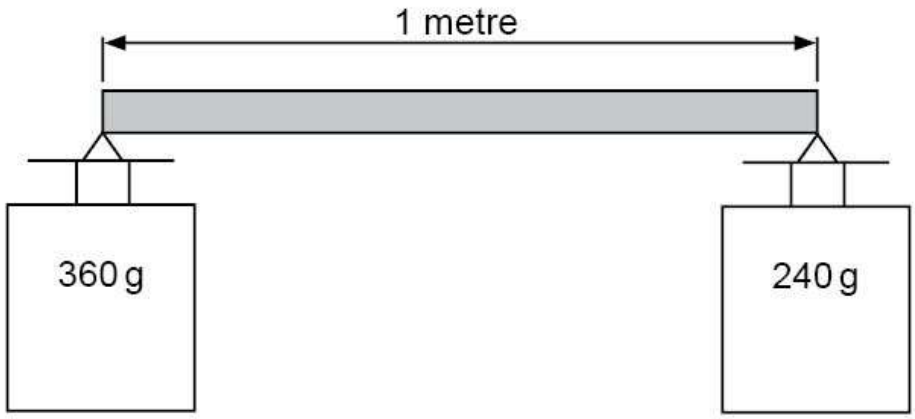
D $2M$

Your answer

21. A rod of length 1 metre has a non-uniform composition, so that its centre of gravity is not at the geometrical centre of the rod, which would be half way along its length.

The rod is laid on supports across two electronic balances, as shown in the diagram.

The balances, which have been previously set to zero, give readings of 360 g and 240 g.



Where is the centre of gravity of the rod relative to its geometric centre?

A $\frac{1}{10}$ m to the left

B $\frac{1}{10}$ m to the right

C $\frac{1}{6}$ m to the left

D $\frac{1}{6}$ m to the right

Your answer

22. An iron wire and a brass wire, of equal lengths and cross sectional area, are joined at one end. A tensile force *F* is applied to the free ends as shown.

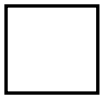
If the Young modulus of iron is twice that of brass, which statement is true?

A The extension of the brass wire is twice that of the iron wire.

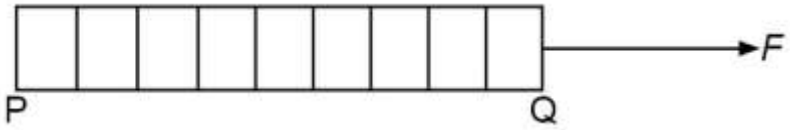
B The extension of the iron wire is twice that of the brass wire.

C The stress of the brass wire is twice that of the iron wire.

D The stress of the iron wire is twice that of the brass wire.

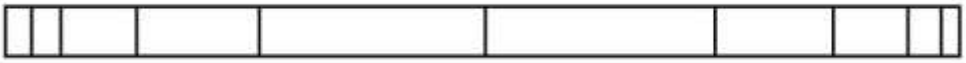


23. A uniform strip of rubber, marked with equal divisions, is fixed at end **P** and pulled by force *F* applied at end **Q**, as shown in the diagram.



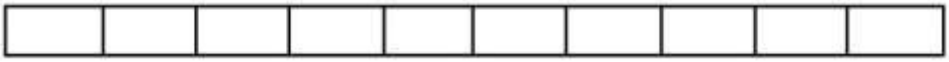
Which diagram shows the separation of the divisions when the elastic is extended to twice its original length?

A



B

C



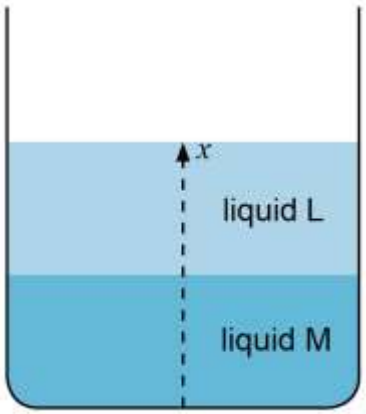
D

Your answer

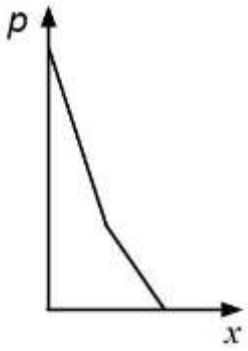
Multiple Choice Questions (MCQ) topic quiz – Pressure (Physics A) Not Advancing Physics

24. A tall container which is open to the atmosphere contains a layer of liquid **L**, floating on liquid **M**, which has a density which is twice that of liquid **L**.

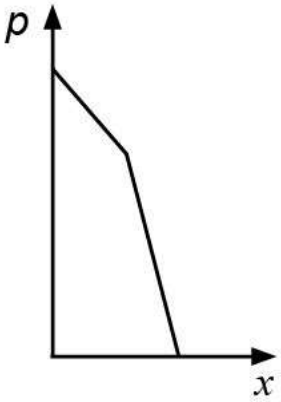
Which graph shows how the pressure in the liquid, *p*, at a point varies with its height, *x*, above the base of the container?



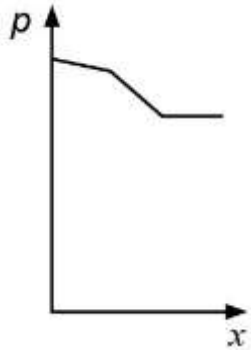
A



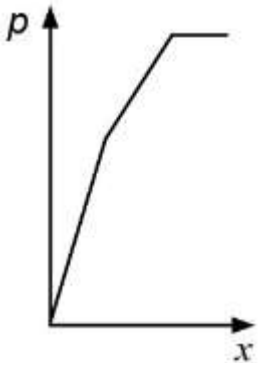
B



C



D



Your answer