Cambridge Assessment International Education

Cambridge IGCSE™

PHYSICS **0625/21**

Paper 2 Multiple Choice (Extended) **May/June 2021**

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

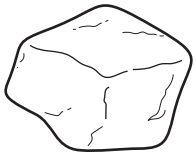
INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

This document has **16** pages.

[Turn over

1 The diagram shows a stone of irregular shape.



Which property of the stone can be found by lowering it into a measuring cylinder half-filled with water?

A length

B mass

C volume

D weight

The correct answer to this question is:

C - Volume

Explanation: When an irregularly shaped stone is lowered into a measuring cylinder containing water, it displaces a certain volume of water. The difference between the initial water level and the new water level after the stone is submerged gives the volume of the stone. This method is based on Archimedes' principle.

Other options are incorrect because:

Length (A) cannot be measured using a measuring cylinder.
Mass (B) requires a balance or scale.
Weight (D) requires a force-measuring device like a spring balance.
Thus, the property that can be determined using this method is volume.

2 Which row describes speed and velocity?

	speed	velocity
A	scalar	scalar
B	scalar	vector
C	vector	scalar
D	vector	vector

Answer

To solve this question, let's understand the concepts of speed and velocity.

Speed is a scalar quantity. This means it only has magnitude and no direction. It tells us how fast an object is moving, regardless of its direction.

Velocity is a vector quantity. This means it has both magnitude and direction. It tells us how fast and in which direction an object is moving.

Now, let's examine each row:

Row A describes both speed and velocity as scalar. This is incorrect because velocity is a vector quantity.

Row B describes speed as scalar and velocity as vector. This is correct because speed is indeed a scalar quantity and velocity is a vector quantity.

Row C describes speed as vector and velocity as scalar. This is incorrect because speed is not a vector quantity, and velocity is not a scalar quantity.

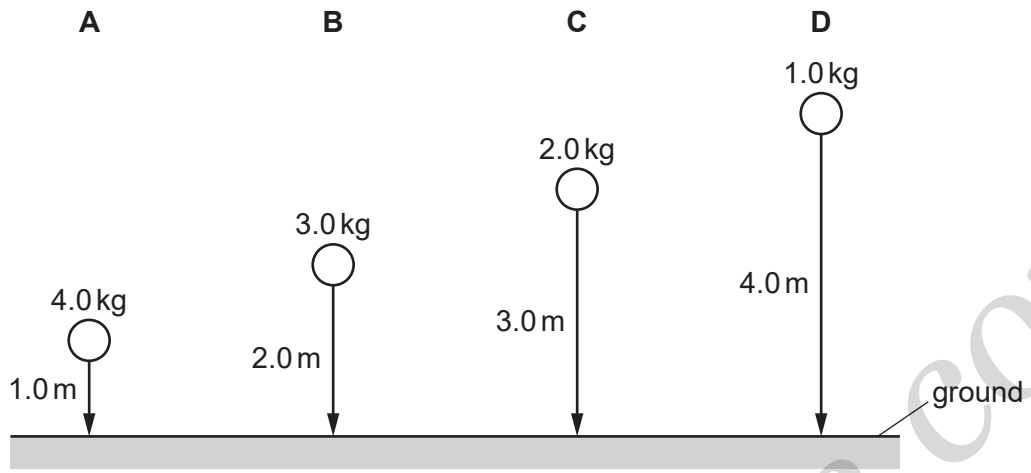
Row D describes both speed and velocity as vector. This is incorrect because speed is not a vector quantity; it is a scalar.

Therefore, the correct answer is Row B, where speed is a scalar and velocity is a vector.

3 Four balls with different masses are dropped from the heights shown.

Air resistance may be ignored.

Which ball has the smallest average speed?



Step 1: Understanding Free Fall and Speed
Since air resistance is ignored, the mass of the ball does not affect its speed. Only the height from which it is dropped determines the speed.

The final speed (v) of a freely falling object is given by:

$v = \sqrt{2 \times g \times h}$

where:

g is the acceleration due to gravity (9.8 m/s^2),
h is the height from which the ball is dropped.
The average speed (V_{avg}) during free fall is calculated using:

$V_{avg} = (\text{initial speed} + \text{final speed}) / 2$

Since the ball starts from rest (initial speed = 0):

$V_{avg} = \sqrt{2 \times g \times h} / 2$

This means the average speed depends only on the height (h).
Greater height = higher average speed
Smaller height = lower average speed

Step 2: Comparing the Heights
The given heights are:

Ball A: 1.0 m
Ball B: 2.0 m
Ball C: 3.0 m
Ball D: 4.0 m
Since ball A is dropped from the smallest height (1.0 m), it will have the smallest average speed.

Step 3: Selecting the Correct Answer
Correct Answer: Option A (Ball dropped from 1.0 m).

4 An object of mass 2.0 kg is taken from the Earth, where the gravitational field strength is 10 N / kg, to the Moon, where the gravitational field strength is 1.6 N / kg.

Which row is correct?

	weight on the Earth / N	weight on the Moon / N
A	0.20	0.80
B	0.20	3.2
C	20	0.80
D	20	3.2

Answer

Let's calculate the weight of the object on both the Earth and the Moon to determine which row is correct.

The weight of an object is calculated using the formula:

Weight (N)=mass (kg)×gravitational field strength (N/kg)

Weight on the Earth:

Mass = 2.0 kg
Gravitational field strength on Earth = 10 N/kg
Weight on Earth = 2.0 kg * 10 N/kg = 20 N
Weight on the Moon:

Mass = 2.0 kg
Gravitational field strength on the Moon = 1.6 N/kg
Weight on Moon = 2.0 kg * 1.6 N/kg = 3.2 N
Now, let's examine each row:

Row A: Weight on Earth = 0.20 N, Weight on Moon = 0.80 N. This is incorrect because the calculated weights are 20 N and 3.2 N, respectively.

Row B: Weight on Earth = 0.20 N, Weight on Moon = 3.2 N. This is incorrect because the weight on Earth should be 20 N.

Row C: Weight on Earth = 20 N, Weight on Moon = 0.80 N. This is incorrect because the weight on the Moon should be 3.2 N.

Row D: Weight on Earth = 20 N, Weight on Moon = 3.2 N. This is correct because both calculated weights match these values.

Therefore, the correct answer is Row D, where the weight on the Earth is 20 N and the weight on the Moon is 3.2 N.

5 The mass of an empty flask is 34 g.

The volume of liquid added to the flask is 20 cm^3.

The total mass of the flask and the liquid is 50 g.

What is the density of the liquid?

A 0.80 g / cm^3 **B** 1.25 g / cm^3 **C** 2.50 g / cm^3 **D** 4.20 g / cm^3

Answer

To find the density of the liquid, we can use the formula for density:

Density = Mass / Volume

First, we need to determine the mass of the liquid alone. This is done by subtracting the mass of the empty flask from the total mass of the flask and the liquid.

Mass of the liquid:

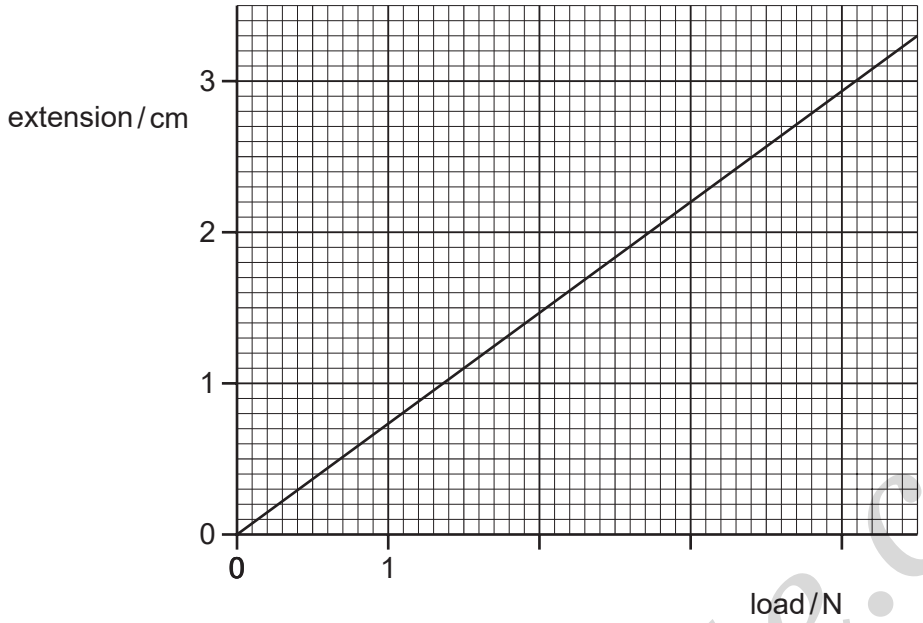
Total mass of the flask and liquid = 50 g
Mass of the empty flask = 34 g
Mass of the liquid = 50 g - 34 g = 16 g
Volume of the liquid:

Volume = 20 cm^3
Density of the liquid:

Density = Mass / Volume = 16 g / 20 cm^3 = 0.80 g/cm^3
Now let's examine each option:

Option A: 0.80 g/cm^3. This matches our calculated density.
Option B: 1.25 g/cm^3. This does not match.
Option C: 2.50 g/cm^3. This does not match.
Option D: 4.20 g/cm^3. This does not match.
Therefore, the correct answer is Option A, with a density of 0.80 g/cm^3.

6 The extension–load graph for a spring is shown. The unstretched length of the spring is 17.0 cm.



When an object is suspended from the spring, the length of the spring is 19.2 cm.

What is the weight of the object?

A 1.4 N **B** 1.6 N **C** 2.6 N **D** 3.0 N

Let's analyze the problem step by step:

Given:
Unstretched length of the spring: 17.0 cm
Stretched length when the object is hanging: 19.2 cm
To calculate the extension of the spring, subtract the unstretched length from the stretched length:

Extension = 19.2 cm - 17.0 cm = 2.2 cm
Now, we need to understand how the extension relates to the load (force applied to the spring). The extension-load graph shows how the spring stretches as different forces are applied.

From the graph:

We find that for 2.2 cm extension, the corresponding load is 6.0 N.
Conclusion:
The weight of the object is 6.0 N, so the correct answer is:

D. 6.0

7 A cart has a mass of 10 kg. A boy pushes on the cart horizontally with a force of 50 N. The cart accelerates at 0.50 m / s^2.

What is the frictional force acting on the cart?

A 5.0 N **B** 20 N **C** 30 N **D** 45 N

Answer
To find the density of the liquid, we can use the formula for density:
Density = Mass / Volume
First, we need to determine the mass of the liquid alone. This is done by subtracting the mass of the empty flask from the total mass of the flask and the liquid.

Mass of the liquid:

Total mass of the flask and liquid = 50 g
Mass of the empty flask = 34 g
Mass of the liquid = 50 g - 34 g = 16 g

Volume of the liquid:

Volume = 20 cm^3

Density of the liquid:

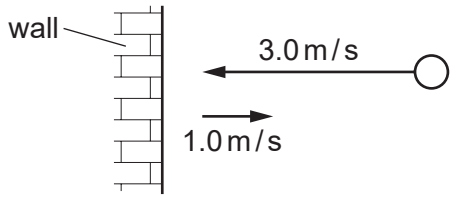
Density = Mass / Volume = 16 g / 20 cm^3 = 0.80 g/cm^3

Now let's examine each option:

Option A: 0.80 g/cm^3. This matches our calculated density.
Option B: 1.25 g/cm^3. This does not match.
Option C: 2.50 g/cm^3. This does not match.
Option D: 4.20 g/cm^3. This does not match.

Therefore, the correct answer is Option A, with a density of 0.80 g/cm^3.

8 A ball has a mass of 2.0 kg. The ball approaches a wall at a speed of 3.0 m/s and rebounds at a speed of 1.0 m/s.



What is the impulse on the wall?

A 4.0 N **B** 4.0 Ns **C** 8.0 N **D** 8.0 Ns

Step 1: Understanding Impulse
Impulse is the change in momentum of an object.

It is given by the formula:

Impulse = Final Momentum - Initial Momentum

Mathematically:

Impulse = m × v_final - m × v_initial

where:

m = 2.0 kg (mass of the ball),
v_initial = -3.0 m/s (velocity before hitting the wall, taking left as negative),
v_final = 1.0 m/s (velocity after rebounding, taking right as positive).
Step 2: Calculating the Change in Momentum
Using the impulse formula:

Impulse = (2.0 × 1.0) - (2.0 × -3.0)
Impulse = (2.0) - (-6.0)
Impulse = 2.0 + 6.0
Impulse = 8.0 Ns

Step 3: Choosing the Correct Answer
A: 4.0 N Incorrect (Impulse is in Newton-seconds, not Newtons).
B: 4.0 Ns Incorrect (wrong calculation).
C: 8.0 N Incorrect (Impulse is in Newton-seconds, not Newtons).
D: 8.0 Ns Correct.

Final Answer: D (8.0 Ns)

9 Which situation involves no work being done and no energy being transferred?

A a car skidding to a stop on a road

B a crane lifting a load

C a heavy load hanging from a strong bar

D a student dragging a big box over a rough floor

Answer

To determine which situation involves no work being done and no energy being transferred, we need to understand the concept of work and energy transfer. Work is done when a force causes an object to move in the direction of the force. If there is no movement, no work is done, and consequently, no energy is transferred.

Let's evaluate each option:

Option A: A car skidding to a stop on a road.
In this situation, the car is moving, and friction is doing work to stop the car. Energy is transferred from the car's kinetic energy to thermal energy due to the friction. So, work is being done.

Option B: A crane lifting a load.
Here, the crane is doing work to lift the load against the force of gravity. Energy is transferred from the crane to the load, increasing its gravitational potential energy. So, work is being done.

Option C: A heavy load hanging from a strong bar.
In this scenario, the load is stationary and not moving. No work is being done because there is no displacement in the direction of the force (gravity is acting downwards, but the load is not moving). Thus, no energy is being transferred. This situation involves no work being done.

Option D: A student dragging a big box over a rough floor.
In this situation, the student is doing work to overcome the friction between the box and the floor. Energy is transferred from the student to the box and the floor through friction. So, work is being done.

Therefore, the correct answer is Option C, where a heavy load hanging from a strong bar involves no work being done and no energy being transferred.

10 A student suggests that there are several ways of transferring energy to a small, stationary block of iron on a smooth table. He makes the following suggestions.

1 Heat it.

2 Shine light on it.

3 Pass a current through it.

Which suggestions are correct?

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

Answer

To determine which suggestions involve transferring energy to the block of iron, we need to consider how energy can be transferred:

Heating it: This transfers energy to the block by increasing its thermal energy. This is a correct method of energy transfer.

Shining light on it: Light carries energy in the form of electromagnetic radiation, which can be absorbed by the block, increasing its energy. This is also a correct method of energy transfer.

Passing a current through it: When an electric current flows through the block, electrical energy is transferred to the block, often increasing its thermal energy due to resistance. This is a correct method of energy transfer as well.

All three suggestions involve transferring energy to the block of iron. Therefore, the correct answer is D: 1, 2, and 3.