HILLGROVE SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2019
SECONDARY THREE (NORMAL ACADEMIC)

| CANDIDATE NAME | | ( ) | CLASS | | - | |

| CENTRE NUMBER | S | | | | | INDEX NUMBER | | | | |

SCIENCE **5105**

Physics

Candidates answer on the Question Paper and

Multiple Choice Answer Sheet.

Additional Materials: Multiple Choice Answer Sheet

8 October 2019

09.15 AM to 10.15 AM

1 hr

ANS

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
Write your name and index number on the OTAS in the spaces provided.

There are **fifteen** questions in Section A. 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 separate OTAS sheet.

Answer **all** questions in Section B and Section C.
The use of an approved scientific calculator is expected, where appropriate.
In calculations, you should show all the steps in your working, giving your answer at each stage.
You are advised to spend no longer than 30 minutes on Paper 1.
You may proceed to answer Paper 2 as soon as you have completed Paper 1.

At the end of the examination, hand in your answers to Paper 1 and Paper 2 separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section	**Marks**
A	/15
B	/11
C	/14
TOTAL	/40

Parent's/ Guardian's Signature: _____

Setter: Chow Kar Fai

This document consists of **14** printed pages.

Section A

Answer **all** the questions in the Multiple Choice Answer Sheet provided.
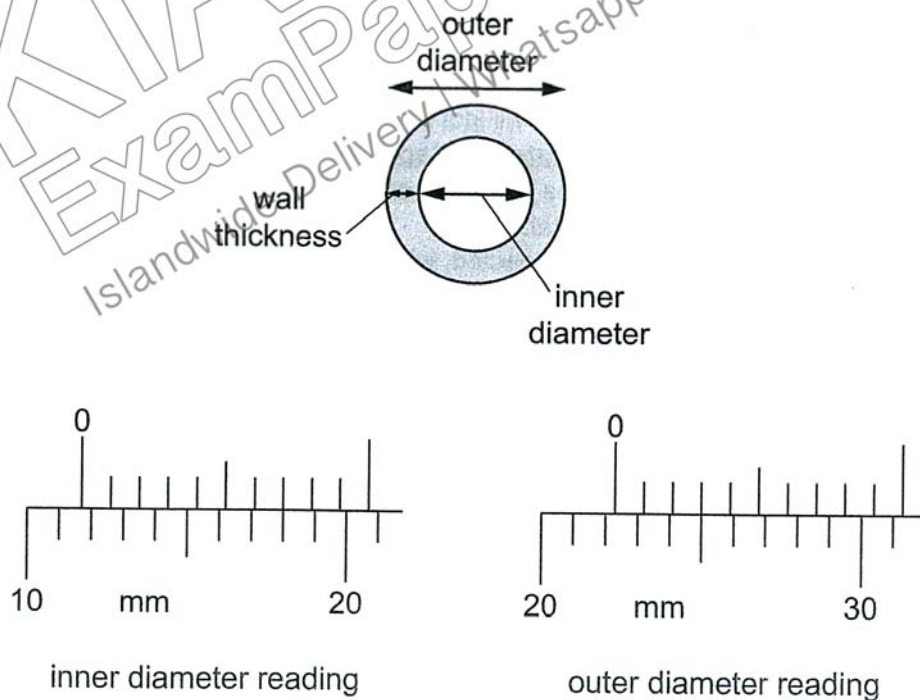
1 The diagram shows a pen next to a ruler.

ans	
1	B
2	A
3	C
4	C
5	B
6	D
7	A
8	B
9	D
10	C
11	A
12	B
13	B
14	A
15	D

What is the length of the pen?

A 1.5 cm

B 5.5 cm

C 7.0 cm

D 9.5 cm

2 Vernier calipers are used to measure the inner diameter and outer diameter of a tube.

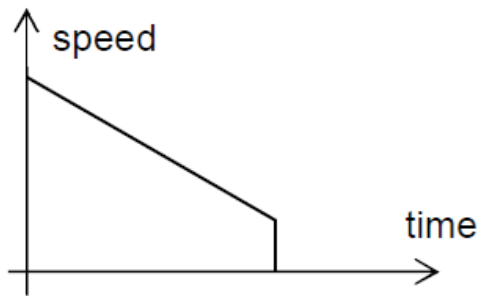A cross section of the tube and the two Vernier caliper readings are shown.

inner diameter reading   outer diameter reading

What is the thickness of the wall of the tube?
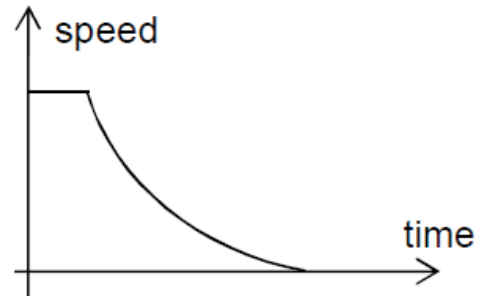
A 5.3 mm   **B** 5.4 mm   **C** 10.6 mm   **D** 10.8 mm

3   When the traffic light turned red, the driver of a car waited for a while before applying
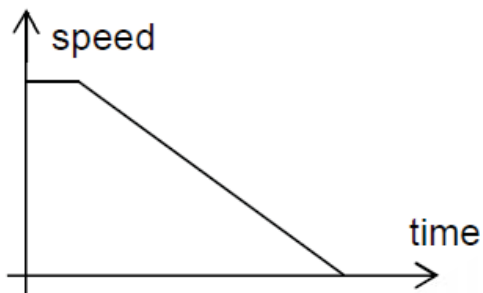the brakes. The car then decelerated uniformly to rest.

Which graph shows how the speed of the car varied with time after the
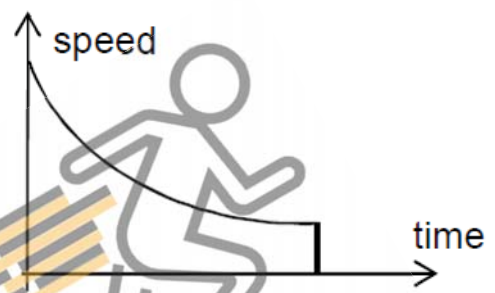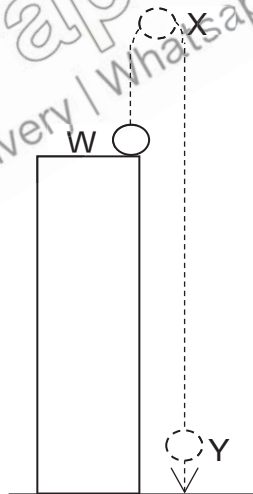traffic light turned red?

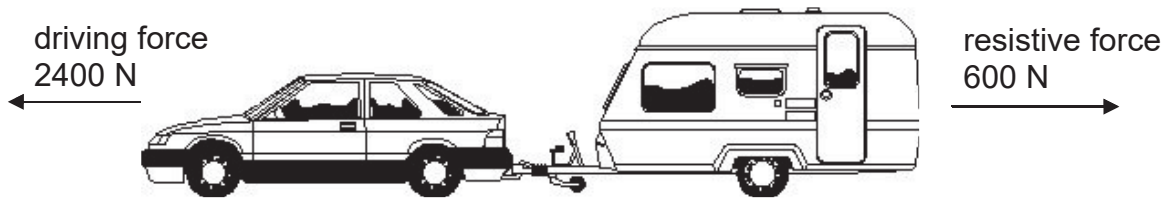**4**   A ball is thrown upwards from a height at position W. It travels upwards and reaches the
highest point at position X. Y is the position just before the ball hits the ground.

What is the acceleration of the ball at position X?

A   less than the acceleration at position Y

B   more than the acceleration at position Y

C   same as the acceleration at position Y

D   zero acceleration

5 A car is used to pull a caravan as shown.

driving force
2400 N

resistive force
600 N

The car produces a driving force of 2400 N to move and pull the caravan with it. If the total resistive force acting on both the car and caravan is 600 N, what is the resultant force acting on both the car and caravan?

A 4 N

B 1800 N

C 3000 N

D 1440000 N

6 The mass and volume of four substances are listed below.

substance	mass / g	volume / cm^3
P	25	4
Q	60	12
R	120	15
S	200	40

Which two substances have the same density?

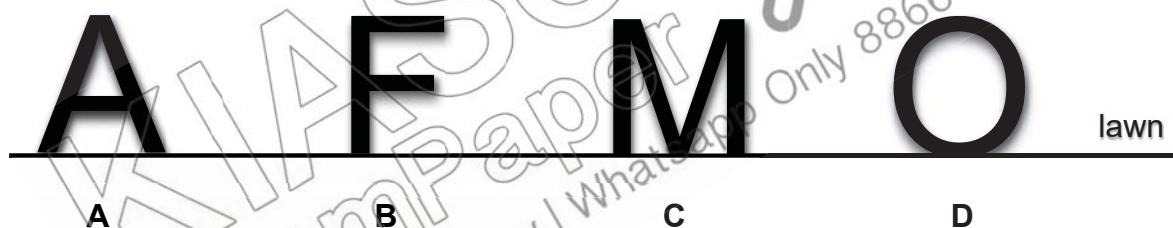**A** P and Q

B Q and R

C P and S

D Q and S

7 A coin is placed on top of a card over a beaker.

If the card is pulled away quickly, the coin does not move sideways but falls into the beaker. What could this possibly be due to?

A mass

B volume

C density

D irregular surface

8 A few giant plastic blocks of alphabets are placed on the lawn outside a museum. Which alphabet blocks is the most unstable?

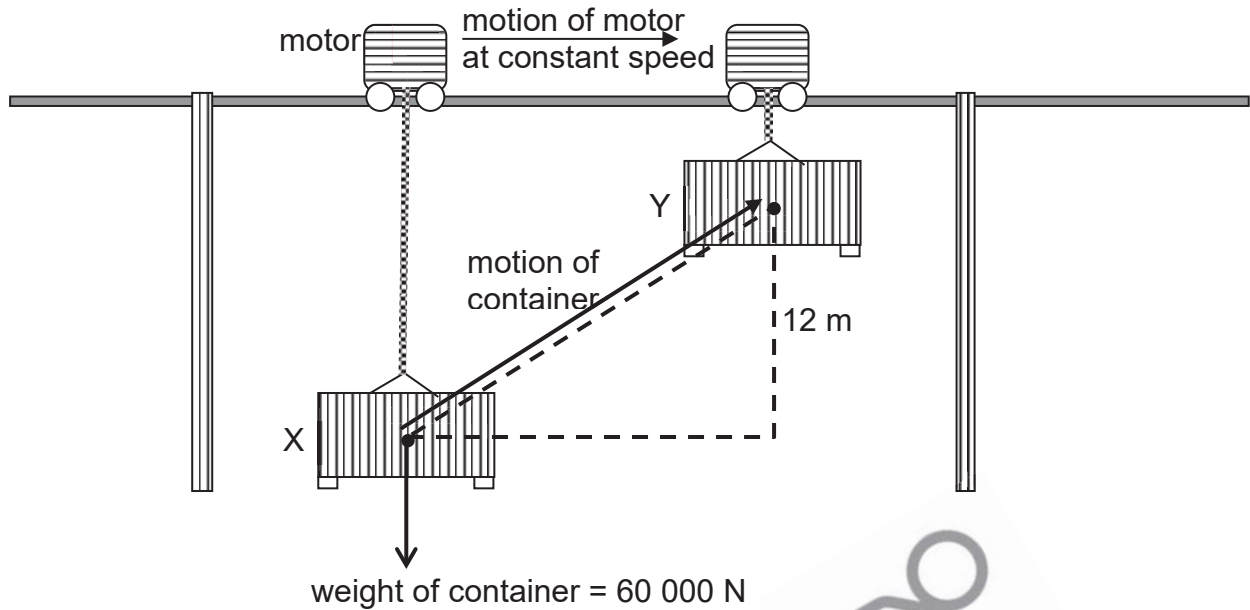**9** A lady with a weight of 500 N wears stiletto shoes.
The area of a stiletto heel is 0.0001 m^2.

What is the pressure exerted by the lady when standing on one stiletto heel?

A 200 Pa

B 5000 Pa

C 500 000 Pa

D 5 000 000 Pa

10 At the Port of Singapore Authority, a motor runs on a horizontal rail at a constant speed while raising up a 60 000 N container from X to Y as shown in the diagram.

motor $\xrightarrow[\text{at constant speed}]{\text{motion of motor}}$

Y

motion of container

12 m

X

weight of container = 60 000 N

The container is raised at a constant speed from X to Y.
What is the work done by the motor against gravity in pulling up the container?

A   5 kJ

B   480 kJ

C   720 kJ

D   1260 kJ

11 Jill weighs half as much as Jack.
Jack climbs 3 m vertically up a hill in 4 seconds.
Jill climbs vertically up the same hill in the same amount of time.
What can you say about the output power of Jack and Jill?

A   Jack has higher output power.

B   Jill has higher output power.

C   They both have the same output power.

D   There is not enough information to make a conclusion.

12 A substance consists of particles that are close together and moving past each other at random. The average speed of the particles is gradually increasing. Which situation is being described?

A A solid being heated

B A liquid being heated

C A solid melting

D A liquid boiling

13 During a hot day, a marble floor feels colder than a carpeted floor. Which statement is the most likely explanation?

A Carpet is a better conductor of heat than marble.

B Marble is a better conductor of heat than carpet.

C Carpet is a better radiator of heat than marble.

D Marble is a better radiator of heat than carpet.

14 When a liquid evaporates, some of its molecules escape from the surface and the temperature of the liquid changes.

Which row describes the escaping molecules and the change in temperature of the liquid?

	escaping molecules	temperature of liquid
A	high energy	decreases
B	low energy	decreases
C	high energy	increases
D	low energy	increases

15 A hot drink at 80 °C is left in a room that is at a temperature of 25 °C.
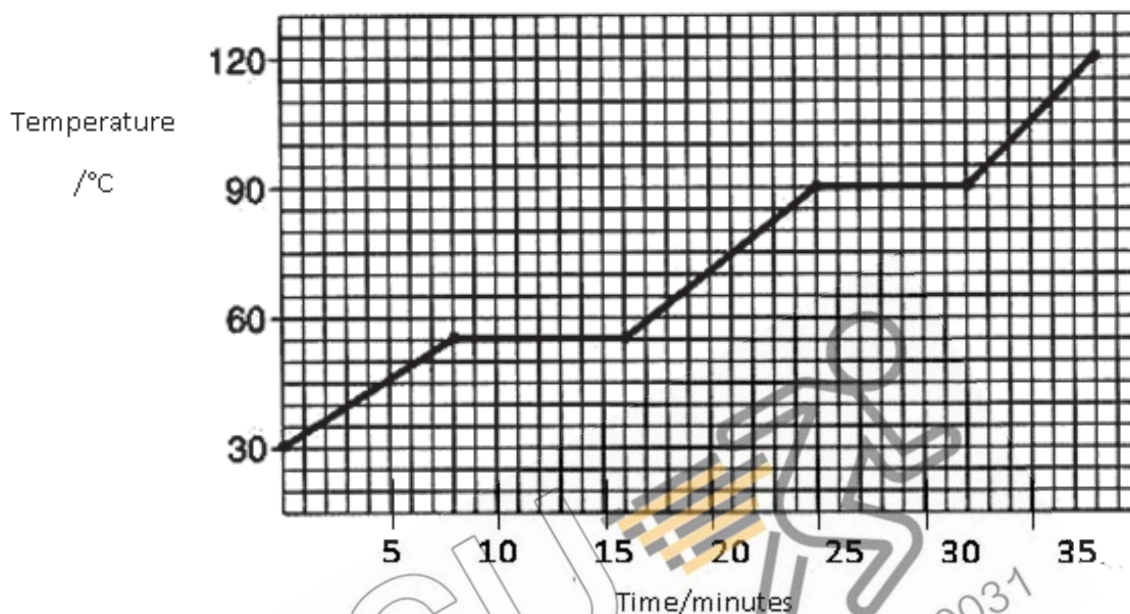
What happens to the drink in ten minutes?

A Its density becomes lower.

B It gets hotter than before.

C Its particles increase.

D Its internal energy becomes lower.

Section B

Answer **all** the questions in the spaces provided.

16 A substance with an initial temperature of 30°C is heated in a laboratory. Its temperature is recorded every minute.

The results are shown in the graph below.

(a) At what temperature does the substance boil?

90   [1] some students obviously do not know how to interpret the graph

......°C [1]

(b) For the first 8 minutes shown in the graph, draw the molecular arrangement of the particles in the box below.

1m no overlap, touching, orderly arrangement.
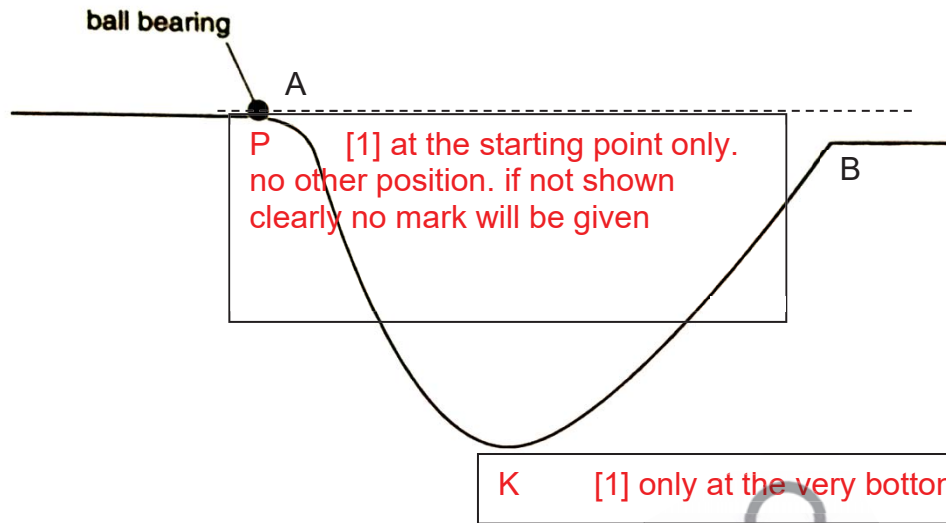many students draw too many small spheres. and the spheres go out of shape.

[1]

(c) State one difference between boiling and evaporation of liquids.

any reason. must compare difference
- boiling is throughout the liquid, evaporation only at the surface
- boiling happens at a fixed temperature, evaporation happens at any temperature
- boiling needs a source of energy, evaporation takes energy from surroundings

.... [1]

17 A small ball bearing is released from position **A** as shown.

The ball bearing moves along the track.

ball bearing

A

P [1] at the starting point only.
no other position. if not shown
clearly no mark will be given

B

K [1] only at the very bottom

(a) Mark on the diagram,

(i) with the letter **K**, where the ball bearing has the greatest kinetic energy.

(ii) with the letter **P**, where the ball bearing has the greatest gravitational potential energy. [2]
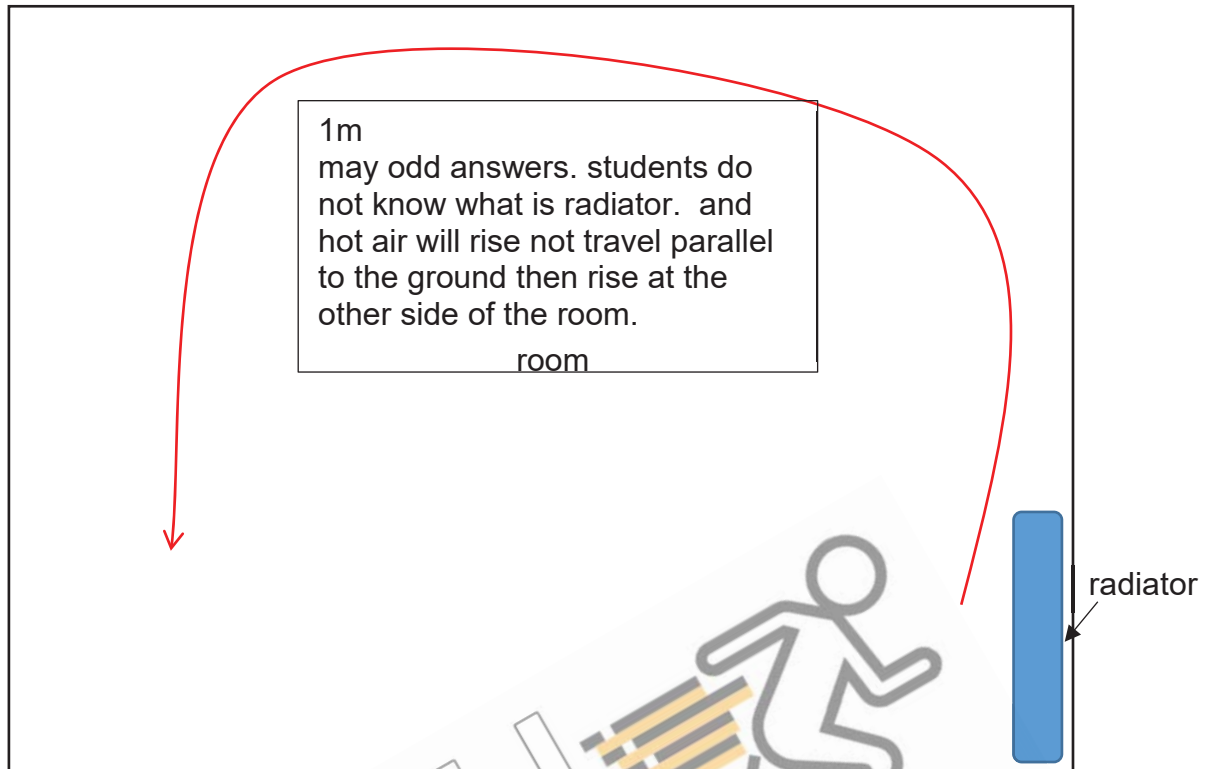
(b) State the Principle of Conservation of Energy.

energy cannot be created or destroyed, it can only be converted from
one form to another. [1] Total energy remains the same(optional)
if only half the statement, no half marks [1]

(c) The ball rolls down from position A and then up towards position B. However it is unable to reach point B before it starts falling back to the bottom again.

Explain why the ball is not able to roll up to position B.

some of the energy is used to work against friction. [1]
lost in the form of heat energy (mention work against friction) [1]

18 The diagram shows a room with a radiator. The radiator heats up the room.

1m
may odd answers. students do
not know what is radiator. and
hot air will rise not travel parallel
to the ground then rise at the
other side of the room.

room

radiator

(a) Draw an arrow to show the movement of air in the room.   [1]

(b) (i) Name the process involved in **(a)**. .... **convection [1]** .... [1]

.

   (ii) Explain how this process works.

hotter air **expands** and is l**ess dense** and r**ises up** the vents[1]
cooler denser air flows in from the side of the hall/ doors to replace the hot
air   [1]
mark is given for mentioning hot air is less dense
"expansion" MUST be mentioned next time. this time mark not deducted.
simply saying that hot air rises and cold air sinks is not accepted!!
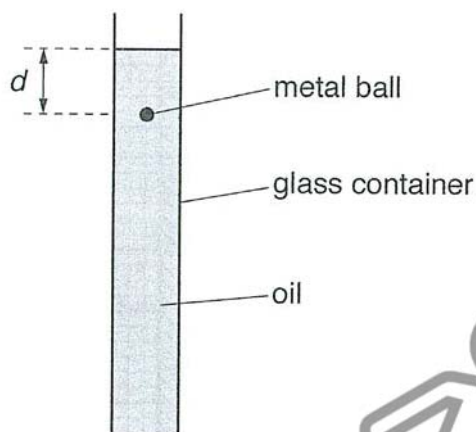also radiator is not a hot air blower.

[2]

Section C

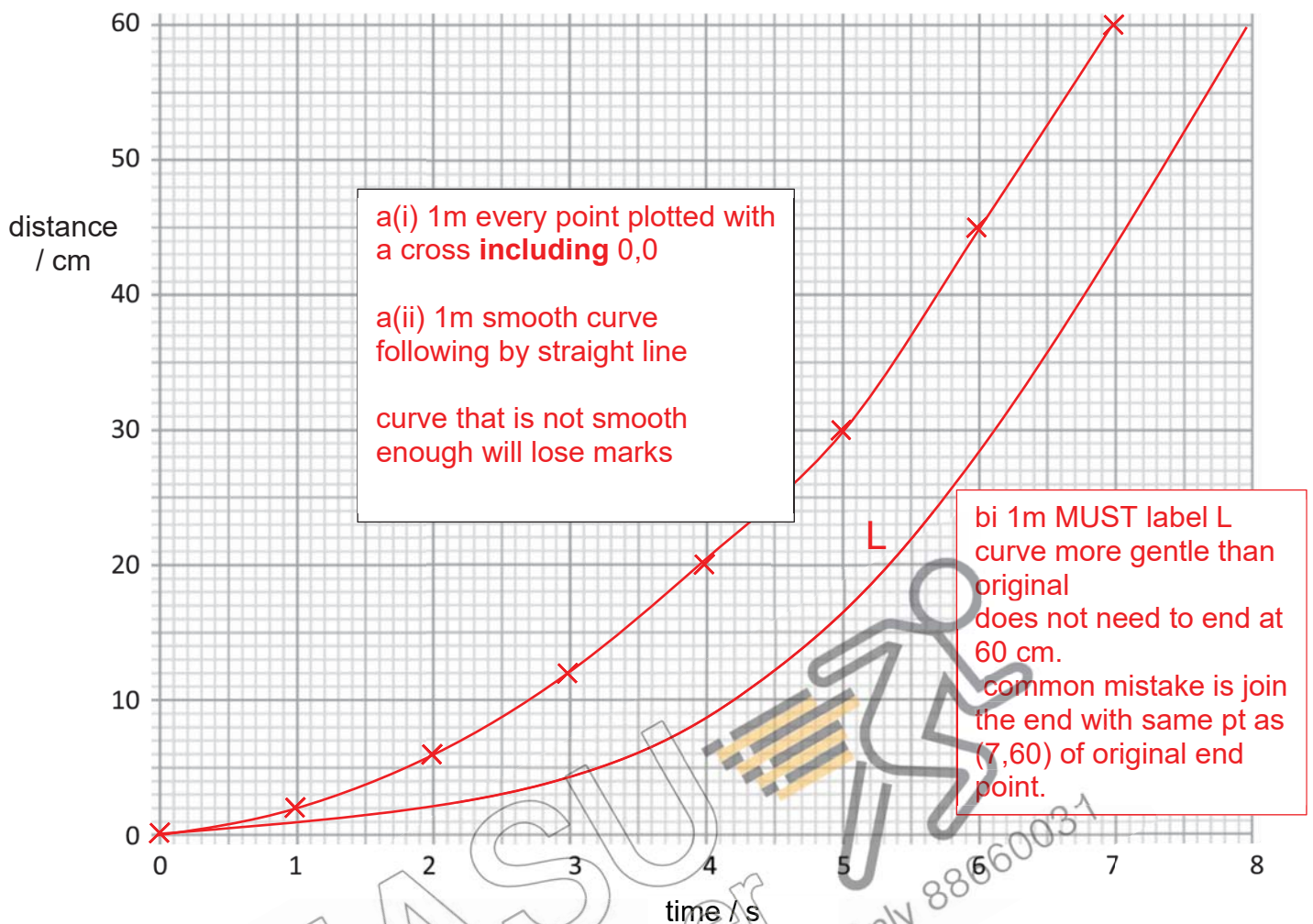Answer **all** questions from this section in the spaces provided.

19 A scientist performs an experiment to investigate the motion of a ball falling through a column of oil as shown in the diagram. The metal ball is released. The distance, d, that the metal ball travels from the surface of the oil is measured and recorded every second as it falls through the oil.

(a) The results for this experiment are recorded in the table.

time / s	distance d / cm
0.0	0.0
1.0	2.0
2.0	6.0
3.0	12.0
4.0	20.0
5.0	30.0
6.0	45.0
7.0	60.0

(i) Plot a graph of these results, marking each point with a cross (x). [1]

(ii) Draw a best-fit line taking into account all the plotted points. [1]

Graph annotations (marking scheme):

a(i) 1m every point plotted with a cross **including** 0,0

a(ii) 1m smooth curve following by straight line

curve that is not smooth enough will lose marks

bi 1m MUST label L curve more gentle than original
does not need to end at 60 cm.
common mistake is join the end with same pt as (7,60) of original end point.

distance / cm (y-axis: 0 to 60)
time / s (x-axis: 0 to 8)

L

(iii) From your graph determine the time when the speed of the metal ball **first** becomes uniform. Give your answer to one decimal place.

time = ……… 5 ……. s [1]

(iv) Find the average speed of the falling metal ball in the first 7 seconds.

avg spd = TD/TT
= 60/7
=8.6 or 8.57 cm/s
2/3 sf [1m]

average speed = ……….………. cm/s [1]

(b) In a second experiment, the scientist uses the same metal ball but replaces the oil with a thicker oil.

(i) On the same grid that you used for **(a)(i)** sketch a second line to show the results you would expect when using thicker oil.
Label this line with the letter **L**. [1]

(ii) Explain the effect on the motion of the metal ball when using thicker oil.

> the ball will fall **slower/take longer time** to reach the bottom [1]
> as there is **more resistance**   [1]
> from the thicker oil
> many fail to mention the effect itself(slow down) or **explain** the
> effect(more resistance).

....

....

… [2]

(c) In a third experiment, the scientist repeated the first experiment using a metal ball of the same mass but with a larger diameter.

(i) Name an instrument that can be used to measure the diameter of the ball.

….
> Vernier caliper or micrometer screw gauge   1m **correct** spelling

. [1]

(ii) The larger metal ball takes longer to fall a certain distance through the oil. Suggest why.
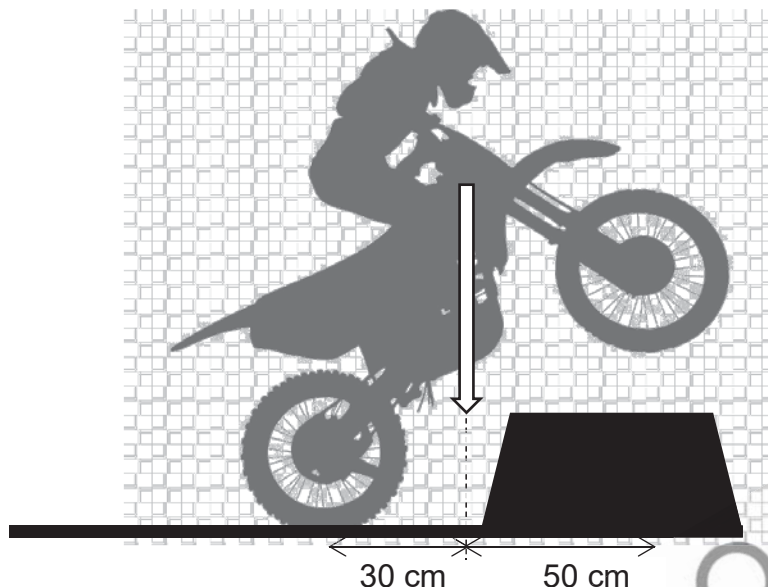
> there is more resistance/friction as the ball has a larger cross sectional area
>   [1] (both parts mentioned for the 1 complete mark)
> for the liquid particles to push against.
>
> alt ans
> the ball has a lower density as it has a bigger volume but same mass
> so there is more buoyancy in the ball.

….

….

….

[1]

20 The motorcyclist shown makes the bike stand on the rear wheel, doing a wheelie while getting over an obstacle.

30 cm   50 cm

(a) The total weight of the motorcyclist and the bike is 1700 N.

What is the total mass of the motorcyclist and the bike?

170 kg

total mass = ……………….. kg [1]

(b) The area of each wheel in contact with the ground is 220 cm². What is the pressure acting on the ground due to both the rider and the bike when balancing on one wheel on the ground.

pressure = F/A   [1]
= 1700 / 220
= 7.7 or 7.73 N/cm² [1] 2/3 sf
many SF rounding errors!!! instead of 7.73 written as 7.72

pressure = …………...……. N/cm² [2]

(c) The direction that the weight of the rider and bike is shown in the diagram. Calculate the moment due to this weight about the rear wheel.
State the direction of the moment at this instant.

moment = F x ⊥d
= 1700 x 30
= 51 000 Ncm   [1]
direction = clockwise   [1]
need to understand how the calculation of moment is done. this question is poorly done.

moment = ……………………… Ncm

direction of moment = ………………….[2]

- End of Paper -