9/7/2020

KCSE CHECKPOINT PHYSICS PAPER 1

A KCSE PHYSICS TOPICAL ANALYSIS FROM 2006 TO 2019

WITH WELL WORKED OUT ANSWERS

THIS IS A SAMPLE.
FOR THE FULL WORD VERSION,CONTACT 0712258411.

BY VICTOR VC

2020

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY

Table of Contents

PAPER 1 QUESTIONS 2

MEASUREMENT (I) 2
FORCE 5
PRESSURE 7
PARTICULATE NATURE OF MATTER 13
THERMAL EXPANSION 15
HEAT TRANSFER 19
MEASUREMENT (II) 23
TURNING EFFECT OF A FORCE 27
EQUILIBRIUM AND CENTRE OF GRAVITY 30
HOOKE'S LAW 34
FLUID FLOW 40
LINEAR MOTION 44
NEWTON'S LAWS OF MOTION 49
WORK, ENERGY, POWER AND MACHINE 55
QUANTITY OF HEAT 62
GAS LAWS 71
UNIFORM CIRCULAR MOTION 81
FLOATING AND SINKING 87
. 96

SUGGESTED SOLUTIONS PAPER 1 96

MEASUREMENT I 96
FORCE 97
PRESSURE 98
PARTICULATE NATURE OF MATTER 101
THERMAL EXPANSION 102
HEAT TRANSFER 103
MEASUREMENT II 104
TURNING EFFECT OF FORCE 106
EQUILIBRIUM AND CENTRE OF GRAVITY 109
HOOKE'S LAW 111
FLUID FLOW 113
LINEAR MOTION 114
NEWTON'S LAWS OF MOTION 118
WORK, ENERGY, POWER AND MACHINES 121
QUANTITY OF HEAT 126
GAS LAWS 132
UNIFORM CIRCULAR MOTION 136
FLOATING AND SINKING 139

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY

PAPER 1 QUESTIONS

MEASUREMENT (I)

1. 2006 Q1; 2016 Q2

Figure 1 shows the change in volume of water in a measuring cylinder when an irregular solid is immersed in it.

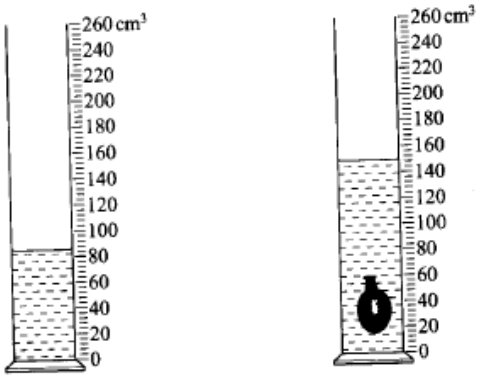


Figure 1

Given that the mass of the solid is 567 g, determine the density of the solid in gcm^{-3}

(Give your answer correct to 2 decimal places) (3 marks)

2. 2008 Q1

A drug manufacturer gives the mass of the active ingredient in a tablet as 5 mg. Express this quantity in kilogramme and in standard form. (1 mark)

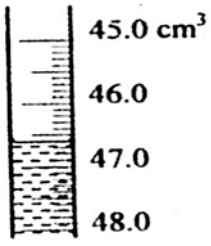
3. 2008 Q2

The masses of equal volumes of a certain liquid and of water were found to be m_l and m_w respectively. Given that the density of water is $1gcm^{-3}$, express the density, ρ, of the liquid in terms of m_l and m_w. (show your working) (2 marks)

4. 2009 Q1

In an experiment to measure the density of a liquid, a student filled a burette with a liquid to the 0 cm^3 mark. **Figure 1** shows a section of the burette showing the level of the liquid after 54.5 g of the liquid had been run out

Figure 1



Determine the density of the liquid. (3 marks)

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

5. 2010 Q2

A stop watch started 0.50 s after the start button was pressed. The time recorded using the stop watch for a ball bearing failing through a liquid was 2.53s. Determine the time of fall.

(1 mark)

6. 2010 Q16

In an experiment to determine the density of sand using a density bottle, the measurements were recorded:

Mass of empty density bottle	=	43.2g
Mass of density bottle full of water	=	66.4g
Mass of density bottle with some sand	=	67.5g
Mass of density bottle with the sand filled up with water	=	82.3g

Use the above data to determine the:

(a) Mass of the water that completely filled the bottle; (2 marks)

(b) Volume of water that completely filled the bottle; (1 mark)

(c) Volume of the density bottle; (1 mark)

(d) Mass of sand; (1 mark)

(e) Mass of water that filled the space above the sand; (1 marks)

(f) Volume of the sand; (3 marks)

(g) Density of the sand. (2 marks)

7. 2012 Q1

Figure 1 shows a measuring cylinder containing some water.

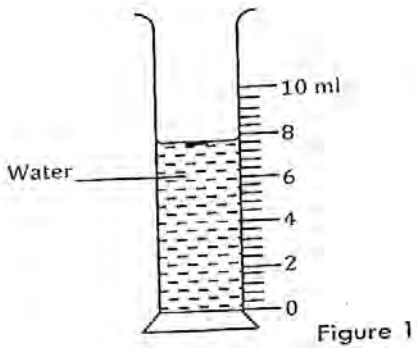


Figure 1

Determine the reading on the measuring cylinder, after three drops of water each of volume $0.6cm^3$ are added. (2 marks)

8. 2014 Q1

A student measured the length of a wire four times using a metre rule and obtained the following readings: 18.6 cm; 18.5 cm and 18:5 cm. Determine the length the student should record.

(2 marks)

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

9. 2015 Q2

Figure 2 (a) shows the initial reading of a burette used to measure the volume of oil. After 50 drops of the oil were run out, the final reading was as shown in **Figure 2** (b)

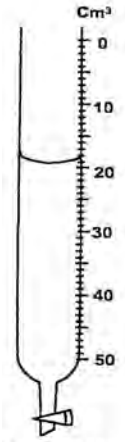


Figure 2 (a)

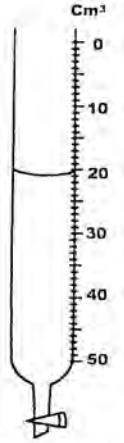


Figure 2 (b)

Determine the volume of one drop of oil (1 mark)

10. 2015 Q13; 2016 Q1

Mechanics is one of the branches of physics. State what it deals with. (1 mark)

11. 2017 Q2

In an experiment to determine the density of Liquid R, a student obtained the followed data:

- Mass of an empty density bottle = 55.0 g
- Mass of the density bottle + water = 80.0 g
- Mass of the density bottle + Liquid R = 70.0 g

Determine the density of Liquid R. *(density of water is 1000 kgm^{-3})* (3 marks)

12. 2018 Q2

Figure 1 shows the position of a student's eye while illustrating the length of a wooden block using a metre rule.

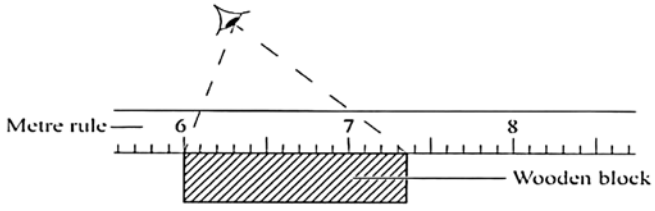


Figure 1

Determine the length of the block as viewed by the student. (1 mark)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

FORCE

1. 2006 Q2

Figure 2 (a) shows body being acted on by two forces, F_1 and F_2.

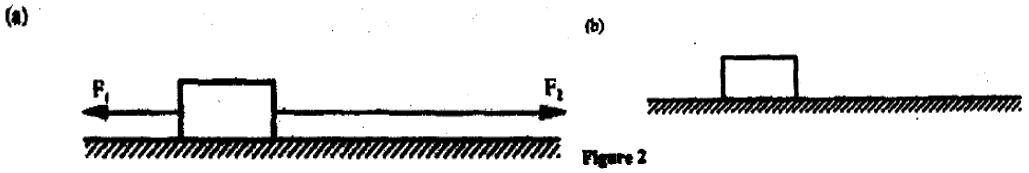


Figure 2

On **figure 2** (b), draw the force F_3 that has same effect on the body as the two forces.

(1 mark)

2. 2008 Q3

Figure 1 shows a brick placed on a plane inclined at an angle θ to the horizontal.
The weight, W, of the brick is shown.

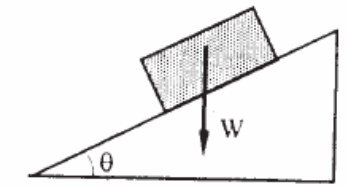


Figure 1

(a) On the same diagram show with arrows the other two forces acting on the brick and name them. (1 mark)

(b) State how each of the two forces named (a) above is affected when the angle θ is reduced. (1 mark)

3. 2009 Q3

A steel needle when placed carefully on water can be made to float. When a detergent is added to the water it sinks. Explain this observation. (2 marks)

4. 2011 Q7

Figure 6 shows a small toy boat floating on water in a basin. X and Y are two points near the toy.

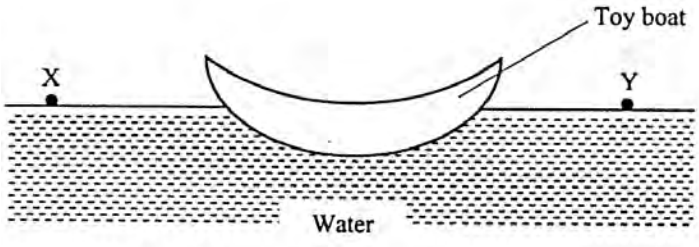


Figure 6

When a hot metal rod is dipped into the water at point X, the toy is observed to move towards Y. Explain this observation. (2 marks)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

5. 2012 Q3

A solid weighs 16.5 N on the surface of the moon. The force of the gravity on the moon is 1.7Nkg^{-1}. Determine the mass of the solid. (3 marks)

6. 2013 Q11; 2016 Q4

Figure 6 (a) and **6 (b)** show capillary tubes inserted in water and mercury respectively.

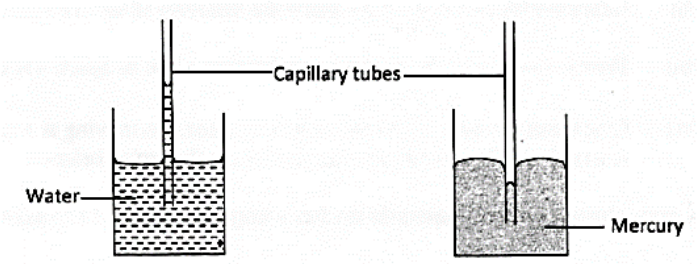


Figure 6(a) **Figure 6(b)**

It is observed that in the water the meniscus in the capillary tube is higher than the meniscus in the beaker, while in mercury the meniscus in the capillary tube is lower than the meniscus in the beaker. Explain these observations. (2 marks)

7. 2014 Q3

State the reason why it is **not correct** to quote the weight of solid objects in kilograms. (1 mark)

8. 2018 Q1

State the reason why an object on earth has a higher weight than on the moon. (1 mark)

9. 2019 Q3

State two ways of reducing the surface tension of a liquid. (2 marks)

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

MEASUREMENT (II)

1. 2006 Q14

(a) Distinguish between solid and liquid states of matter in terms of intermolecular forces. (1 mark)

(b) In an experiment to estimate the diameter of an oil molecule, an oil drop of diameter 0.05 cm spreads over a circular patch whose diameter is 20 cm.

Determine:

(i) The volume of the oil drop. (2 marks)

(ii) The area of the patch covered by the oil (2 marks)

(iii) The diameter of the oil molecule (3 marks)

(c) State

(i) Any assumption made in (b) (iii) above (1 mark)

(ii) Two possible sources of errors in this experiment (2 marks)

2. 2007 Q1,2

Figure 1 shows a metal cube of mass 1.75g placed between the jaws of a micrometer screw gauge. The magnified portion of the scale is also shown. The reading on the gauge when the jaws were fully closed without the cube was 0.012 cm. Use this information and the figure to answer questions (a) and (b).

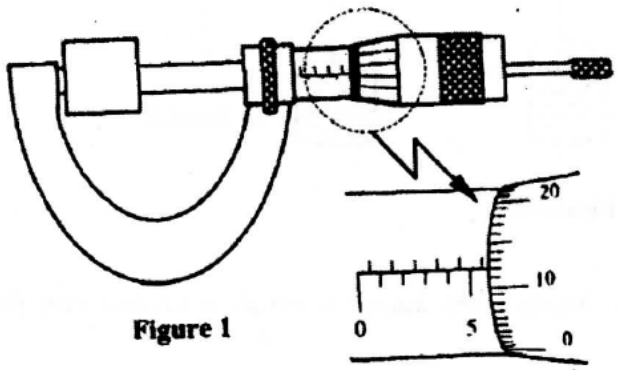


Figure 1

(a) What is the length of the cube? (1 mark)

(b) Determine the density of the metal cube giving your answer correct to three significant figures. (3 marks)

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

TURNING EFFECT OF A FORCE

1. 2008 Q19

(a) State the principle of moments. (1 mark)

(b) A uniform metal strip is 3.0cm wide, 0.6cm thick d 100cm long. The density of the metal is 2.7 g/cm^{3}.

(i) Determine the weight of the strip. (3 marks)

The strip is placed in a pivot and kept in equilibrium by forces as shown in **Figure 13**.

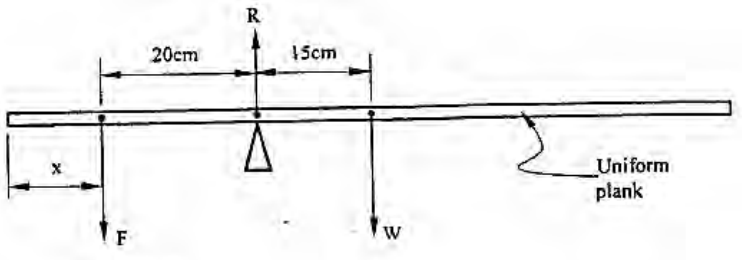
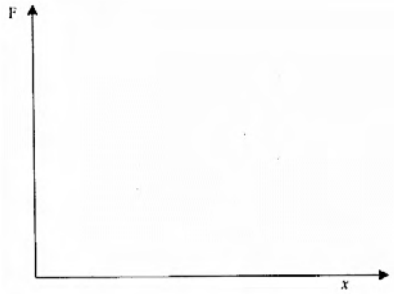


Figure 13

(ii) Determine the value of F and R (3 marks)

(iii) X is the distance from the end of the plank to the point of application of force F. Force F is now applied at various points nearer to the pivot so that x increases. Equilibrium is maintained all the time. On the axes provided sketch the relation between force F and x. (2 marks)



(iv) Give a reason for the answer in (iii) above (1 mark)

2. 2010 Q6

Figure 3 shows a uniform metre rule pivoted at 30cm mark. It is balanced by weight of 2N suspended at the 5cm mark.

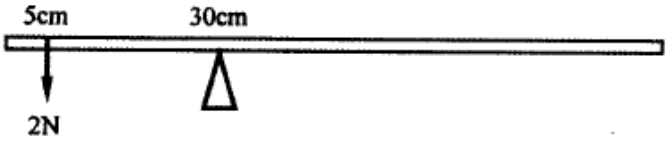


Figure 3

Determine the weight of the metre rule. (2 marks)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

7. 2014 Q8

Figure 5 shows a uniform rod 4 m long and of mass 2 kg. It is pivoted 1 m from one end and balanced horizontally by a string attached near the other end.



Figure 5

Determine the position where a mass of 5 kg should be placed on the rod so that the rod remains horizontal and the tension in the string is zero. (3 marks)

8. 2015 Q8

Figure 4 shows a uniform metal rod balanced at it's centre by different forces.

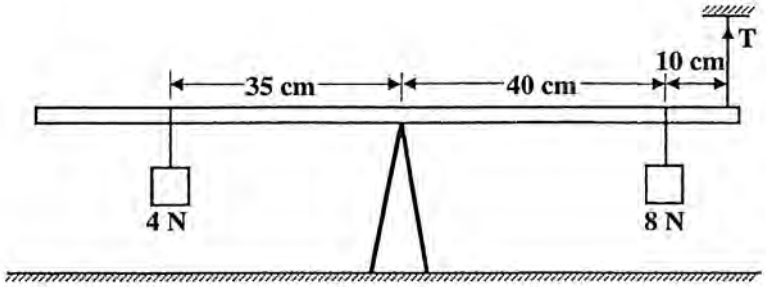


Figure 4

Determine the value of T. (3 marks)

9. 2017 Q12

A uniform metre rule is pivoted at its centre. Two weights of 20 N and 10 N are suspended at the 20 cm and 100 cm marks respectively. Determine the position at which a 10 N weight should be suspended in order to balance the system. (3 marks)

10. 2019 Q8

Figure 4 shows a one meter long uniform rod of negligible weight supporting two weights.

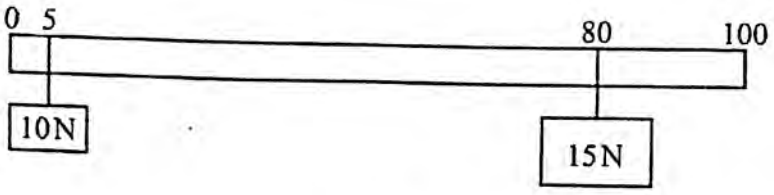


Figure 4

Determine the position of the fulcrum from 0 cm for the rod to remain in equilibrium.

(3 marks)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

EQUILIBRIUM AND CENTRE OF GRAVITY

1. 2007 Q8

Figure 5 shows a uniform bar of length 1.0 m pivoted near one end. The bar is kept in equilibrium by a spring balance as shown.

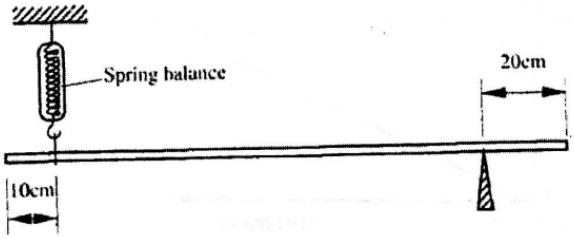


Figure 5

Given that the reading of the spring balance is 0.6 N. Determine the weight of the bar.

(3 marks)

2. 2008 Q10, 11.

Figure 5 shows a toy resting on top of a closed bottle. Use the information on the figure to answer the questions that follow.

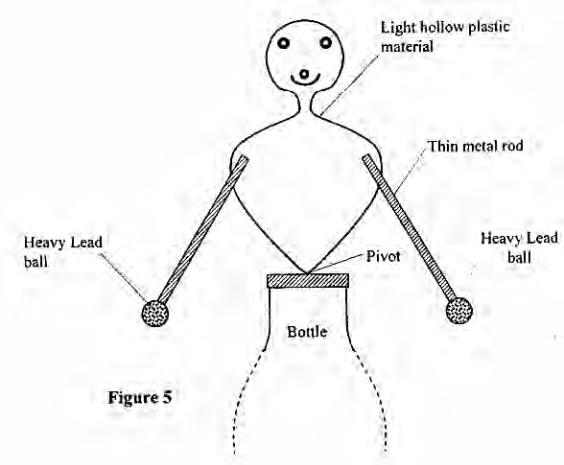


Figure 5

(a) Mark on the diagram, point Q, the approximate centre of gravity of the toy. (1 mark)

(b) Giving a reason, name the state of equilibrium of the toy. (2 marks)

3. 2009 Q9; 2016 Q11

Figure 4 shows a uniform cardboard in the shape of parallelogram

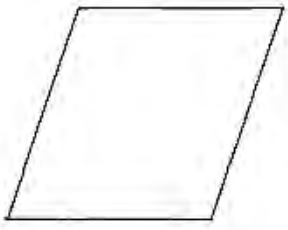


Figure 4

Locate the centre of gravity of the cardboard. (1 mark)

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

4. 2010 Q6

Figure 3 shows a uniform metre rule pivoted at 30cm mark. It is balanced by weight of 2N suspended at the 5cm mark.

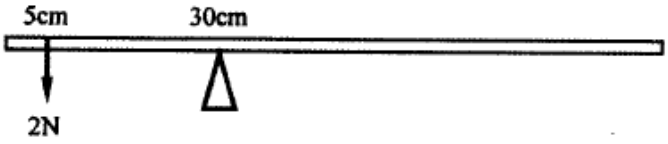


Figure 3

Determine the weight of the metre rule. (2 marks)

5. 2010 Q14

Figure 6 shows an athlete lifting weights while standing with the feet apart.

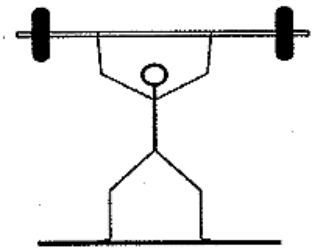


Figure 6

Explain why standing with the feet apart improves an athlete's stability. (1 mark)

6. 2011 Q1

Figure 1 shows a lorry moving on an inclined section of a straight road. At the back is a chain hanging from a point on a horizontal axis through the centre of gravity of the lorry.

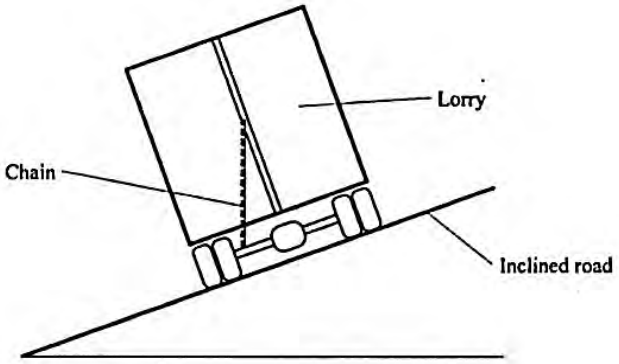


Figure 1

State with a reason whether the lorry is stable or not stable. (2 marks)

7. 2012 Q9

State the reason why a steel sphere resting on a horizontal surface is said to be neutral equilibrium. (1 mark)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

NEWTON'S LAWS OF MOTION

1. 2006 Q13

A footballer kicks a ball of mass 0.6 kg initially at rest using a force of 720N. If the foot was in contact with the ball for 0.1 seconds, what was the take-off speed of the ball?

(3 marks)

2. 2007 Q16; 2016 Q19; 2018 Q15

(a) State Newton's first law of motion. (1 mark)

(b) A wooden block resting on a horizontal bench is given an initial velocity, **u**, so that it slides on the bench surface for a distance **x**, before coming to a stop. The values of **d** were measured and recorded for various values of initial velocity. **Figure 9** shows the graph of $\mathbf{u^2}$ against **x**.

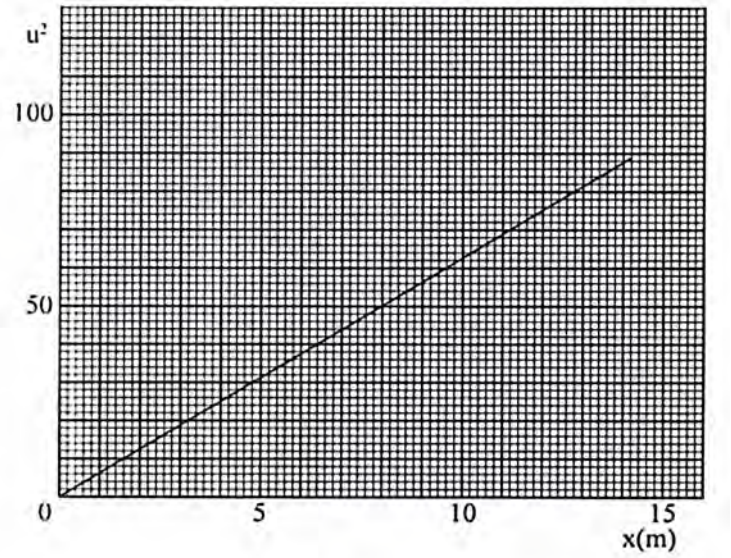


Figure 9

(i) Determine the slope, **S,** of the graph (3 marks)

(ii) Given that $\mathbf{u^2} = 20\ \mathbf{kd}$, where **k** is a frictional constant for the bench surface, determine the value of **k** from the graph (2 marks)

(iii) State with a reason how the value of **k** would be affected by a change in the roughness of the bench surface (2 marks)

(c) A car of mass 800 kg starts from rest and accelerates at 1.2 ms^{-2}. Determine its momentum after it has moved 400 m from the starting point (4 marks)

3. 2008 Q15

(a) State Newton's second law of motion. (1 mark)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

(b) A *matatu* starts from rest and accelerates to cover a distance of 49 m in 7 seconds.
Determine
(ii) Its acceleration; (3 marks)
(ii) Its velocity, after 7 seconds (2 marks)

(c) A trolley moving on a horizontal bench of height 1.2m, strikes a barrier at the edge of the bench. The brass mass on the top of the trolley flies off on impact and lands on the ground 2.5m from the edge of the bench.
Determine:
(i) The time taken by the brass mass to reach the ground; (2 marks)
(ii) The speed at which the trolley struck the barrier. (2 marks)

4. 2010 Q8
A cart of mass 30kg is pushed along a horizontal path by a horizontal force of 8N and moves with a constant velocity. The force is then increased to 14N.
Determine:
(i) The resistance to the motion of the cart; (1 mark)
(ii) The acceleration of the cart. (2 marks)

5. 2011 Q2
State the constant force that opposes the motion of a stone initially at rest, as it falls through air from a tall building. (1 mark)

6. 2011 Q6
Figure 5 is a graph of net force on a body against its velocity as it falls through a liquid.

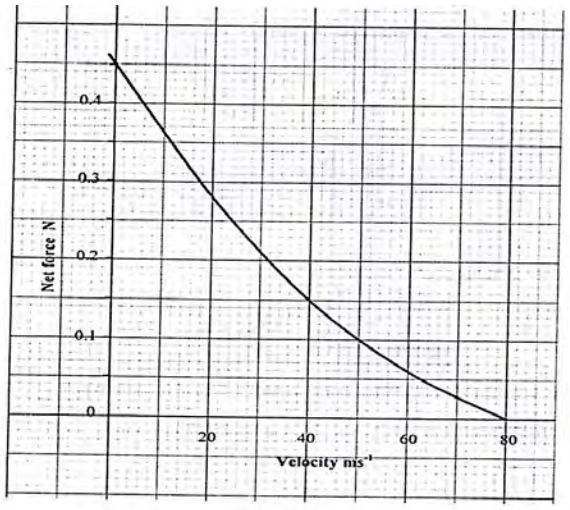


Figure 5

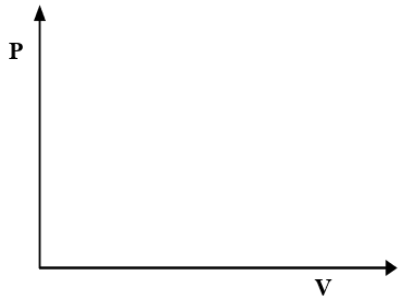
Determine the terminal velocity of the body. (1 mark)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

GAS LAWS

1. 2006 Q9

On the axes provided sketch the graph of pressure P against volume V for a fixed mass of an ideal gas. (1 mark)



2. 2006 Q12

The uniform bar in **figure 7** is provided at its midpoint. It is in equilibrium under the action of two identical balloons filled with equal volumes of different light gases at the same temperature.

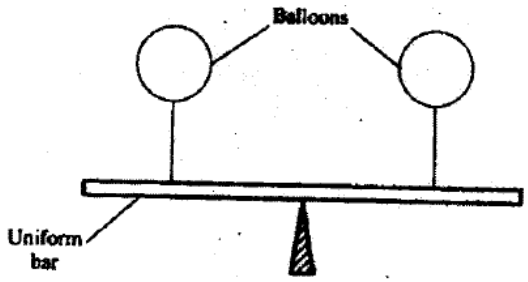


Figure 7

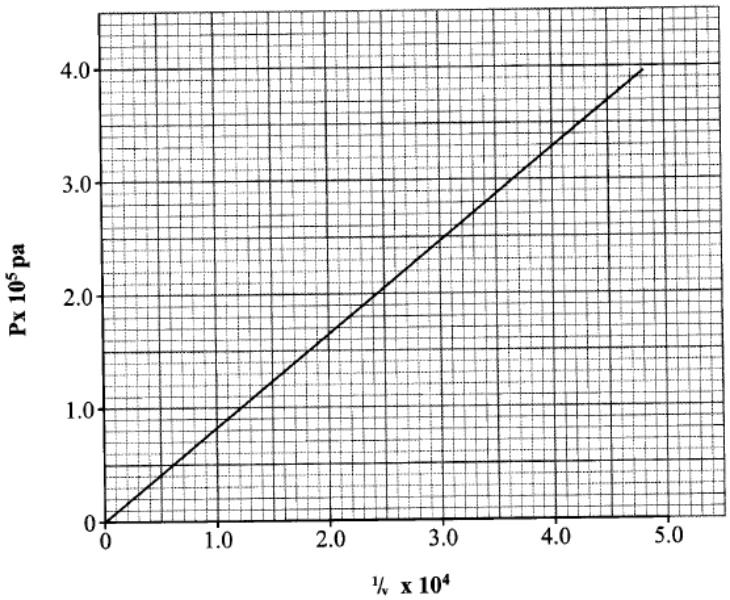
Explain why the bar may not remain in equilibrium if the temperature of the surrounding changes. (2 marks)

3. 2006 Q16; 2016 Q15

(a) State what is meant by an ideal gas? (1 mark)

(b) The pressure acting on a gas in a container was changed steadily while the temperature of the gas maintained constant. The value of volume V of the gas was measured for various values of pressure. The graph in **figure 9** shows the relation between the pressure, p and the reciprocal of volume $\frac{1}{V}$

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020



(i) Suggest how the temperature of the gas could be kept constant. (1 mark)

(ii) Given that the relation between the pressure P_1 and the volume, V_1 of the gas is given by **PV = k** where **k** is a constant, use the graph to determine the value of k. (4 marks)

(iii) What physical quantity does k represent? (1 mark)

(iv) State one precautions you would take when performing such an experiment (1 mark)

(c) A gas occupies a volume of 4000 litres at a temperature of 37 ^{0}C and normal atmospheric pressure. Determine the new volume of the gas if it is heated at constant pressure to a temperature of 67 ^{0}C.
(normal atmospheric pressure P=1.01 × 10^5 pa) (4 marks)

4. 2007 Q12, 13

The graph in **figure 7** shows the relationship between the pressure and temperature for an ideal gas. Use the information in the figure to answer questions 12 and 13

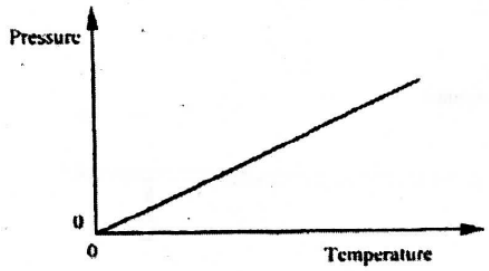


Figure 7

(a) State the unit of the horizontally axis. (1 mark)

(b) Write a statement of the gas law represented by the relationship. (1 mark)

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

5. 2008 Q17

(a) What is meant by absolute zero temperature? (1 mark)

Figure 10 shows a set up to investigate the relationship between temperature and volume for a certain gas.

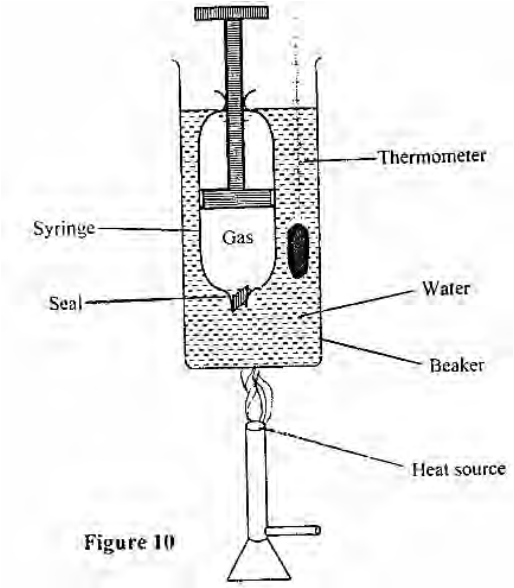


Figure 10

(b) State two factors that are kept constant, in order to determine the relationship. (2 marks)

(c) The graph in **Figure 11** shows the relationship between volume and temperature for the experiment.

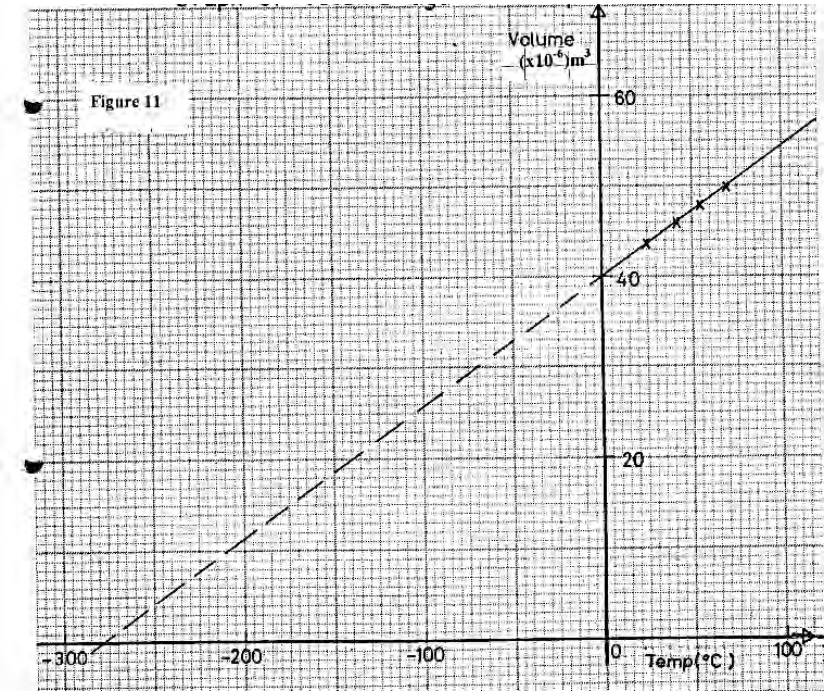


Figure 11

(i) What was the volume of the gas at 0 °C? (1 mark)

(ii) At what temperature would the volume of the gas be zero? (1 mark)

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

19. 2018 Q10

Figure 6 shows the relationship between volume and pressure for a certain gas.

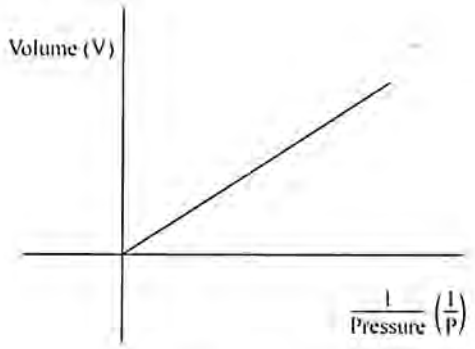


Figure 6

Name the law that the gas obeys. (1 mark)

20. 2018 Q18

(a) State two quantities that must be kept constant in order to verify Boyle's law. (2 marks)

(b) An air bubble at the bottom of a beaker full of water becomes larger as it rises to the surface. State the reason why:

(i) the bubble rises to the surface; (1 mark)

(ii) it becomes larger as it rises. (1 mark)

(c) State two assumptions made in explaining the gas laws using the kinetic theory of gases. (2 marks)

(d) **Figure 11** shows an incomplete experimental set up that was prepared by a student to verily one of the gas laws.

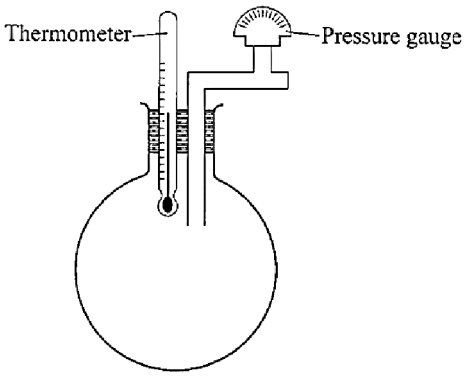


Figure 11

(i) State with a reason which one of the laws may be verified using the set up. (2 marks)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

FLOATING AND SINKING

1. 2006 Q17

(a) State Archimedes principle. (1 mark)

(b) In an experiment to determine the relative density of methylated spirit applying Archimedes Principal, the following were provided, a spring balance, somemasses, a piece of thread, water in a beaker and methylated spirit in a beaker. The table below shows the results obtained.

Mass (g)	100	150	200
Weight in air (N)	1.00	1.50	2.00
Weight in water (N)	0.88	1.32	1.76
Weight in spirit (N)	0.91	1.36	1.82

(i) Draw labelled sketch diagrams to show how the readings in the table were obtained. (1 mark)

(ii) For each mass, determine the upthrust in water and the upthrust in the spirit. (2 marks)

(iii) Determine the average relative density of the spirit. (3 marks)

(c) A weather balloon of volume 1.2 m^3 is tied to a rigid support while being filled with helium gas. The mass of the fabric making the balloon is 0.30kg.
Determine the maximum tension on the string trying the balloon to the rigid support.
(Density of air is 1.25 kgm^{-3} and density of helium is 0.18 kgm^{-3})
(4 marks)

2. 2007 Q19

(a) State the law of floatation. (1 mark)

(b) **Figure 13** shows a simple hydrometer

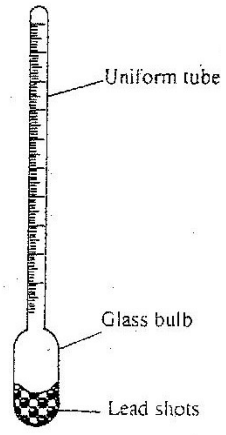


Figure 13

(i) State the purpose of the lead shots in the glass bulb. (1 mark)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

(ii) How would the hydrometer be made more sensitive? (1 mark)

(iii) Describe how the hydrometer is calibrated to measure relative density. (2 marks)

(c) **Figure 14** shows a cork floating on water and held to the bottom of the beaker by a thin thread.

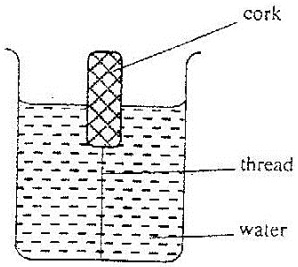


Figure 14

(i) Name the forces acting on the cork. (3 marks)

(ii) Describe how each of the forces mentioned in (i) above changes when water is added into the beaker until it fills up. (3 marks)

3. 2008 Q14

The system in **Figure 8** is in equilibrium.

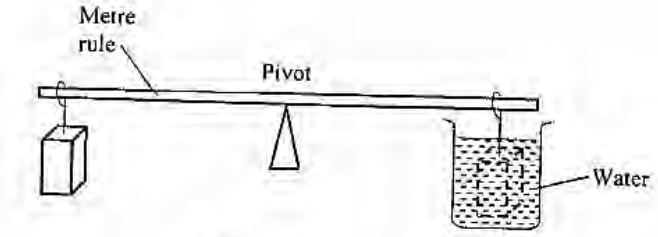


Figure 8

When the temperature of the water is raised the system is observed to tilt to the right, state the reason for this observation. (2 marks)

4. 2009 Q17

(a) State the law of floatation. (1 mark)

(b) **Figure 10** shows a rectangular metal block of density 10500 kgm^{-3} and dimensions 30 cm × 20 cm × 20 cm suspended inside a liquid of density 1200 kgm^{-3} by a string attached to a point above the liquid. The three forces acting on the block are the tension **T**, On the string, the weight **W**, of the block and the upthrust, **U** due to the liquid.

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

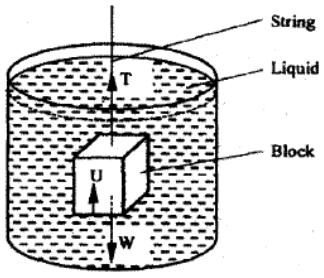


Figure 10

(i) Write the expression relating T, W and U when the block is in equilibrium inside the liquid. (1 mark)

(ii) Determine the weight, W of the block. (3 marks)

(iii) Determine the weight of the liquid displaced by the fully submerged block. (2 marks)

(iv) Hence determine the tension, **T** in the string. (1 mark)

(c) A certain solid of volume 50 cm^3 displaces 10 cm^3 of kerosene (density 800 kgm^3) when floating. Determine the density of the solid. (4 marks)

5. 2010 Q10

The weight of a solid in air is 5.0N. when it is fully immersed in a liquid of density 800kgm^{-3}, its weight is 4.04N. determine:

(a) The upthrust in the liquid (1 mark)

(b) The volume of the solid. (2 marks)

6. 2010 Q18

Figure 8 shows a stone of mass 4.0 kg immersed in water and suspended from a spring balanced with a string. The beaker was placed on a compression balance whose reading was 85N. The density of the stone was 3000 kgm^{-3} while the density of the liquid was 800 kgm^{-3}.

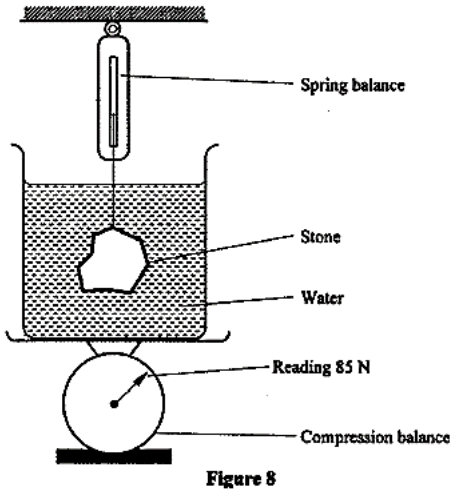


Figure 8

Determine the:

(a) Volume of the liquid displaced; (2 marks)

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

(b) Upthrust on the stone; (4 marks)

(c) Reading of the spring balance; (2 marks)

(d) Reading of the compression balance when the stone was removed from the water. (2 marks)

7. 2011 Q19

(a) State the condition necessary for a body to float in a fluid. (1 mark)

(b) A ship made of steel is observed to float on water yet the density of steel is approximately eight times that of water. Explain this observation. (2 marks)

(c) **Figure 17** shows three stages of an experiment to determine relative density of cork which normally floats on water. To make it sink, a sinker is hung below the cork.

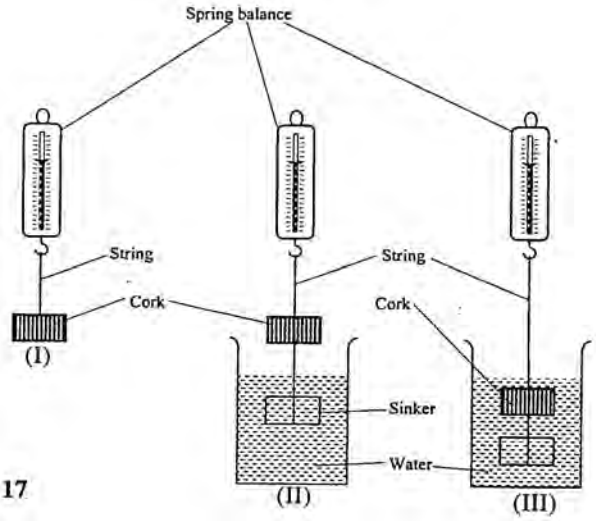


Figure 17

In (I) a spring balance is used to measure the weight W of the cork in air.
In (II) the spring balance is used to measure the apparent weight W_1, when only the sinker is submerged in water.
In (III) the spring balance is used to measure the apparent weight W_2 when both the cork and the sinker are submerged.

The following observations were made.

$W = 0.08$ N
$W_1 = 0.60$ N
$W_2 = 0.28$ N

Use this information to determine the:

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

SUGGESTED SOLUTIONS PAPER 1

MEASUREMENT I

1. Volume = 68cm^3
Mass = 567g
Density = $\frac{mass}{volume}$ = $\frac{567}{68}$
= 8.34 gcm^{-3} (3 marks)

2. 5×10^{-6} kg (if working shown it must be correct) (1 mark)

3. Water V=$\frac{M_W}{1}$ or W =$\frac{M_L}{P}$ RD = $\frac{m_L}{m_L}$ = P
For liquid V= $\frac{M_L}{P}$ P = $\frac{M_L}{M_W}$ (2 marks

4. Volume run out = 46.6 cm^3
Density = $\frac{mass}{volume}$ = $\frac{54.5}{46.6}$ g/cm^3 = 1.16953
= 1.17g/ cm^3 (3 marks)

5. Time = (2.53 + 0.50) s = 3.03s (1 mark)

6. (a) Mass of water completely filling the bottle = (66.4-43.2) g
= 23.3 g (2 marks)

(b) Volume of water completely filling the bottle = 23.3 cm^3 (1 mark)

(c) Volume of density bottle = 23.2 cm^3 (1 mark)

(d) Mass of sand = (67.5-43.2)g = 24g (1 mark)

(e) Mass of water filling space above sand = 82.3 - 67.5 = 14.8g (1 mark)

(f) Volume of sand = (23.2 - 14.8) cm^3 = 8.4 cm^3 (3 marks)

(g) Density of sand = $\frac{m}{v}$ = $\frac{24g}{8{\cdot}4\ cm^3}$
= 2.807 gem'^{3} (2 marks)

7. Total volume = 0.6 × 3 = 1.8cm^3 Working for 1.8 must be shown.
Reading = 7.6+ 1.8
= 9.4cm^3 (2 marks)

8. $L = \frac{18.6 + 18.5 + 18.6 + 18.5}{4}$ ✓(1)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

$L = \frac{74.2}{4}$ $= 18.55$

students should record 18.6 cm ✓(1)

9. Volume = 21-19 $= 2\ cm^3$ ✓ (1)

Volume of 1 drop $= \frac{2}{50} = 0.04\ cm^3$ ✓ (1)

10. - Study of motion of bodies under the influence of forces. ✓ (1)

11. Relative density $= \frac{70-55}{80-55}$ ✓

$= 0.6$ ✓

Density $= 0.6 \times 1000$

$= 600\ kgm^{-3}$ ✓

OR Volume of water $= \frac{25}{1} = 25cm^3$ = Volume of R. $= 25\ cm^3$ ✓

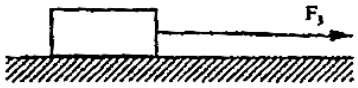
Mass of R = 70 - 55 = 15g ✓

$\rho = \frac{m}{V} = \frac{15}{25} = 0.6gcm^{-3}$ ✓ (3 marks)

12. 7.3-6.0 = 1.3cm (1 mark)

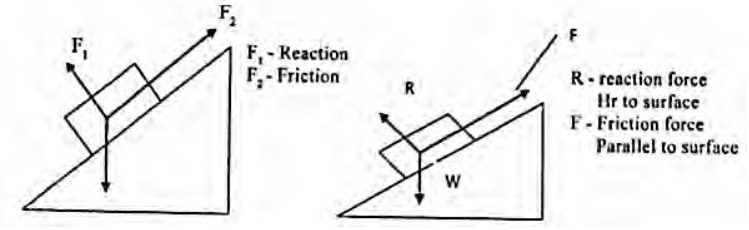
FORCE

1.



(1 mark)

2. (a)



(1 mark)

(b) R – Increases OR R – Approaches W

F – Reduces F – Reduces (1 mark)

3. Needle floats due to the surface tension force

Detergents reduces surface tension, so the needle sinks. (2 marks)

4. Surface tension at X is reduced; ✓1

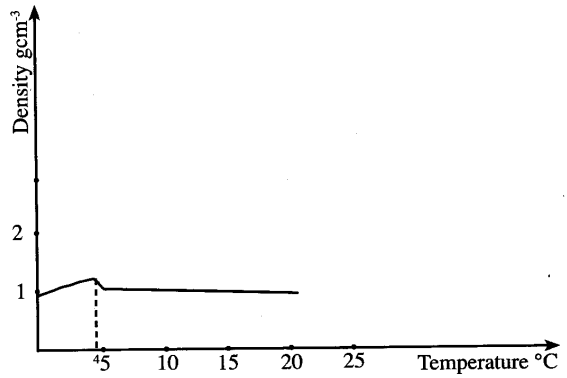
WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

6. (a) - Fire heats air around region C which expands and becomes less dense
- The less dense air/smoke rises up the vent and emerges at A.
- Cool (denser) air moves down the vent at B introducing fresh air into the room.

(3 marks)

(b) The flask has double walls which are silvery / shining surface) on both sides
The shiny surface is a good reflector of heat; (1 mark)

(c)



(1 mark)

7. Wood is a poor conductor of heat; hence heat is used to bum paper, while most heat is conducted away by copper; hence paper takes long to bum. (2 marks)

8. Flask painted black absorbs more heat;
causing more expansion of air above S than above T; ✓(1)
hence S is pushed downwards and T upwards; ✓(1)

9. **B** ✓ (1)
As the heating continues the hot water rises conventionally, due to the reduced density the hot water remains at the top. ✓ (1)

MEASUREMENT I I

1. (a) In solids the molecules are held in position by intermolecular forces that are very large.
In liquids the molecules are able to roll over one another since the forces are smaller
(1 mark)

(b) (i) Volume $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi \times 0.025^3 = 6.54 \times 10^{-5}\ cm^3$ (2 marks)

(ii) Area $= \pi r^2$

$= \pi \times 10^2 \quad = 314\ cm^2$ (2 marks)

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

(iii) A × diameter of molecule = volume;
$314 \times d = 6.54 \times 10^{-5}$
$d = 2.1 \times 10^{-7}$ cm (3 marks)

(c) (i) The oil is assumed to have spread to thickness of one molecule (1 mark)

(ii) **Sources of errors:**
- Getting the right oil
- Measuring drop diameter
- Measuring diameter of patch
- Getting drop of a right size (any 2 × 1 = 2 marks)

2. (a) 0.562 - 0.012 = 0.550 cm; 5.62 - 0.12 = 0.55 cm; 5.5 mm (1 mark)

(b) Density ρ $= \frac{Mass}{Volume}$; $= \frac{1.75\ g}{(0.550)^3\ cm^3}$
$= 10.5 g/cm^3$ answer
$= 10500\ kg/m^3$ - accept g/mm^3
allow transfer of error (3 marks)

3. 1.62cm (1 mark)

4. Drop spreads out until the patch is one molecule thick/monolayer. (1 mark)

5. - Oil film spreads over a large surface of the sea reducing inflow of oxygen needed by the aquatic life.
- Causes death of aquatic animals and plants/ suffocation.
- Beaches become dirty/causes pollution (of water)
- Poisons marine animals when taken in
- Contaminates sea water.

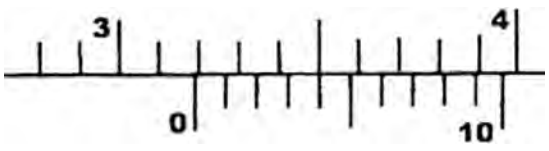
(any 2 correct) (2 marks)

6. 5.32 cm (1 mark)

7. 3.46 mm read from photograph. ✓(1)

8. Volume of drop = Volume of patch ✓(1)
$Ad = V$ ✓(1)
$d = \frac{V}{A}$

9.



Correct reading ✓ (1)

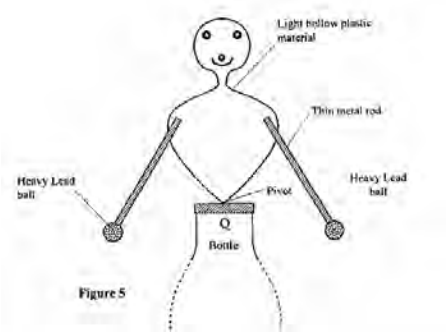
10. - The patch was monolayer. ✓

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

EQUILIBRIUM AND CENTRE OF GRAVITY

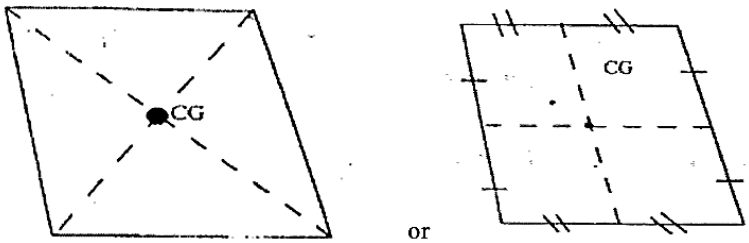
1. Taking moments and equating clockwise moments = anti-clockwise movements
0.6 N × 7cm = mg N × 30cm;
W = mg = 1.4 N: (3 marks)

2. (a) (In the diagram) (1 mark)



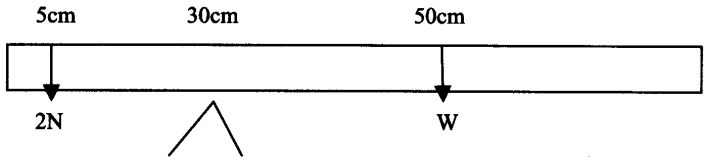
(b) Stable equilibrium
When it is tilted slightly Q rises/ c.o.g is raised when released it turns to its original position (2 marks)

3. Centre of gravity located at the intersection of diagonals or at intersection of lines joining centres of the sides.



(1 mark)

4.



$W \times 0.2 = 2 \times 0.25$

$\therefore \quad W = \frac{2 \times 0.25}{0.2} = 2.5N$

(2 marks)

5. Increase the base area or lower the centre of gravity. (1 mark)

6. Stable ✓1
Line through the centre of gravity is within the base the base of the lorry; ✓1 (2 marks)

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

NEWTON'S LAWS OF MOTION

1. $Ft = \Delta mv$;

$720 \times 0.1 = 0.6 \times v$;

$= 120 ms^{-1}$ (3 marks)

2. (a) A body at rest or motion at uniform velocity tends to stay in that state unless acted on by an unbalanced force/ compelled by some external force to act otherwise. (1 mark)

(b) (i) Slope, s $= \frac{\Delta U^2}{\Delta d}$

$= \frac{98.75 - 0}{16 - 0}$

$= 6.17 ms^{-2}$ (3 marks)

(ii) $20k = s = 6.17$ (depend on (i))

$K = \frac{6.09}{20}$

$= 0.304$ (2 marks)

(iii) Increase in roughness increases k and vice versa

Uniform speed in a straight line - uniform velocity (1 mark)

(c) Applying the equation $v^2 - u^2 = 2as$

$v^2 - 0 = 2 \times 1.2 \times 400$

$v = \sqrt{960} = 30.98$ m/s

Momentum $p = mv$

$= 800 \times 30.98$

$= 24787.09 \cong 24790 kgms^{-1}$ (4 marks)

3. (a) Rate of change of momentum of a body is proportional to the applied force and takes in the direction of force. (1 mark)

(b) (i) $S = ut + \frac{1}{2} at^2$

$49 = 0 + \frac{1}{2} \times a \times 7^2$

$a = 2M/S^2$ (3 marks)

(ii) $V = u + at$ or $v^2 = u^2 + 2as$

$= 0 + 2 \times 7 = 14 m/s$ $v^2 = 02 + 2 + 2 \times 2 \times 49$

$V2 = 14 m/s$ (2 marks)

(c) (i) $S = ut + \frac{1}{2} gt^2$ either $V^2 = u^2 + 2gs$

$1.2 = 0 + \frac{1}{2} \times 10 \times t2$ $v = u + gt$

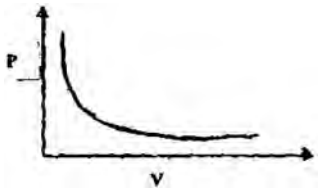
$V^2 = 0^2 + 2 \times 10 \times 1.2$

$T = \sqrt{1.2} =$ $v = \sqrt{24} = 4.899$

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020

GAS LAWS

1.



2. As the temperature changes the volumes of the gases in the balloons change differently. The change in volume and hence the change in upthrust will differ. (2 marks)

3. (a) A gas that obeys the gas laws perfectly (1 mark)

(b) (i) By changing pressure very slowly or by allowing gas to go to original temperature after each change (1 mark)

(ii) k is slope of graph

$$k = \frac{(2.9-0)\times 10^5}{(3.5-0)\times 10^6}$$

$k = 0.083$ Nm (4 marks)

(iii) Work done on the gas (1 mark)

(iv) Use dry gas

Make very small changes in pressure (any 1 × 1 = marks)

(c) Since pressure is constant; $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$T_1 = 273 + 37 = 310$ K

$T_2 = 273 + 67 = 340$ K

$\frac{400}{310} = \frac{V_2}{340}$

$V_2 = 4387$ litres (4 marks)

4. (a) Kelvin (K) (in words; one triangle used follow) (1 mark)

(b) The pressure of a fixed mass of a gas is directly proportional to its absolute (Kelvin) temperature provided the volume is kept constant/ P & T volume constant (1 mark)

5. (a) Lowest temperature theoretically possible or temperature at which/ volume of a gas/ pressure of gas/K.E (velocity) of a gas is assumed to be zero (1 mark)

(b) Mass/ mass of a gas

Pressure / pressure of a gas/ pressure of surrounding (2 marks)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY

(II) $T + mg = mr\omega^2$ ✓(1)

$T = mr\omega^2 - mg$

$= 0.2 \times 0.4 (16\pi^2) - 0.2 \times 10$ ✓ (1)

$= 10.63 \cong 10.6N$ ✓(1)

10. (i) - Tension (T) ✓ (1)

- Weight (Mg) ✓ (1)

(ii) Tension - increases ✓ (1)

Weight - remains constant ✓ (1)

(iii) - Centrifuges ✓ (1)

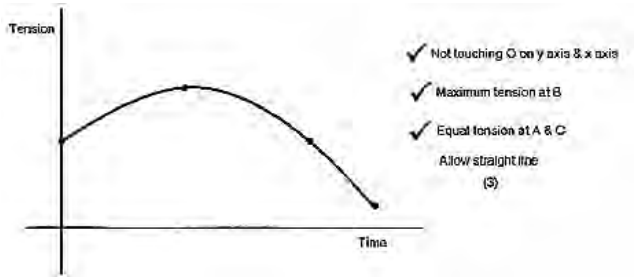
- Speed governor ✓ (1)
- Merry-go-rounds

(any other relevant 2 correct = 2 marks)

11. - Higher friction (wider tyres, rougher road) ✓

- Lower radius ✓
- Higher mass ✓ (3 marks)

12.



(3 marks)

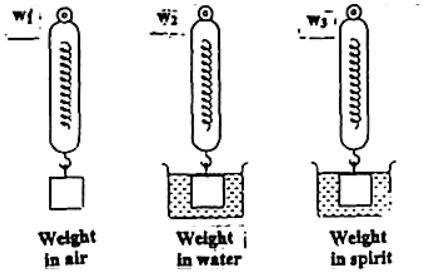
13. A radian is an angle subtended at the centre of a circle by an arc length equal to the radius of the circle. (1 mark)

FLOATING AND SINKING

1. (a) A body fully or partially immersed in a fluid experiences an upthrust equal to the weight of the fluid displaced. (1 mark)

(b) (i)

WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020



(1 mark)

(ii) 100g: $U_w = 0.12N$; $U_s = 0.09N$
150g: $U_w = 0.18N$; $U_s = 0.14N$
200g: $U_w = 0.24N$ $U_s = 0.18N$ (2 marks)

(ii) Relative density $= \frac{\text{upthrust in spirit}}{\text{Upthrust in water}}$

$= \text{average}\left(\frac{\frac{0.09}{0.13} + \frac{0.14}{0.18} + \frac{0.18}{0.24}}{3}\right)$

$= 0.76$ (3 marks)

(c) Weight of air displaced $= \rho Vg$
$= 1.25 \times 1.2 \times 10N \quad = 15N;$
$=$ upthrust
Weight of helium $= \rho Vg$
$= 0.18 \times 1.2 \times 10N = 2.18N;$
Weight of fabric $= 3N$
Forces downwards $= 2.16 + 3 = 5.16N;$
Tension $= 15 - 5.16$
$= 9.84\ N$ (4 marks)

2. (a) A floating body displaces its own weight of the fluid on which it floats (1 mark)

(b) (i) To enable the hydrometer float upright / vertically (1 mark)
(ii) Making the stem thinner/ narrower (reject bulb) (1 mark)
(iii) Float hydrometer on water and on liquid of known density in turn and mark levels; divide proportionally and extend on either side/ equal parts (2 marks)

(c) (i) Tension; upthrust; weight (3 marks)
(ii) As water is added, upthrust and tension increase; reaching maximum when cork is covered and staying constant then after; weight remains unchanged as water is added. (3 marks)

3. Heated water has lower density, hence lower up thrust (2 marks)

KCSE CHECKPOINT PHYSICS PAPER 1 WHATSAPP 0712258411 FOR THE FULL VERSION @SH.100 ONLY VICTOR VC 2020