FLOATING AND SINKING

KCSE QUICK REVISION

Compilation of Possible Questions in Physics Likely to be examined in KCSE.

A Special Analysis of Prediction Questions that may be Tested in KCSE from this Topic in Form 4.

PHYSICS

SERIES 1

For Marking Schemes

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FLOATING AND SINKING

1. (a). State Archimedes's Principle .

b). A during bell of weight 60,000N and volume $2m^3$ is to be raised from the bottom of the sea. If the density of sea water is $1024kg/m^3$, calculate:

(i) the mass of sea-water displaced by the bell.

(ii) The force a crane must first exert to just lift the bell from the sea-bed.

(c). The figure below shows a bock of wood of dimension 16cm x 8cm 2cm floating with ¾ of its size submerged in a liquid.During the experiment with the following set-up above, the following results were obtained.

-Initial reading of the Toppan balance with empty beaker = 22g.

-Final reading of the top pan balance = 176g.

Use the above results to determine:

(i). the density of the block

(ii). The density of the liquid.

2. (a) A piece of sealing wax weighs 3N in air and 0.22N when immersed in water. Calculate:

(i) Its relative density.

(ii) Its apparent weight ,in a liquid of density 800 kgm^{-3}.

(b) The figure below shows a uniform beam one metre long and weighing 2N kept in horizontal position by a body of weight 10N immersed in a liquid.

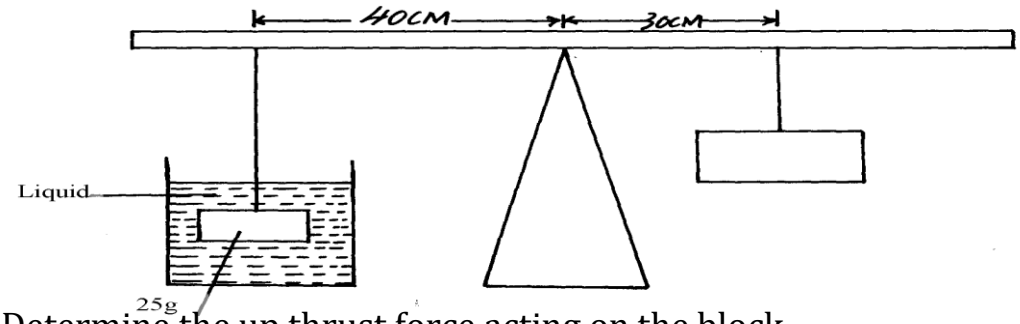
Determine the upthrust on the load.

3. A bubble of air has a diameter of 2.0 mm when it is 0.5m below the water surface of a boiler. Calculate the diameter of the bubble as it reaches the surface, assuming that the temperature remains constant.

(Take g = $10Nkg^{-1}$ density of water = 10^3kgm^{-3} and atmospheric pressure = 10^5Mn^{-2}

4. (a) State the Archimedes principle

(b) The figure below shows a block of mass 25g and density $200kg/m^3$ submerged beam by means of a thread. A mass of 2g if suspended form the beam as shown in the figure below



(i) Determine the up thrust force acting on the block

(ii) Calculate the density of the liquid

(c) A rectangular block of dimensions 4m x 3m x 2m is tethered to the sea bed by a wire. If the density of the material making the block is 0.67g/cm^3 and density of water is 1.1g/cm^3, calculate:

(i) Up thrust force on the block

(ii) Tension on the wire

5. Explain why a needle can be carefully made to float in pure water but sinks if a detergent is added.

6. (i) State the law of floatation.

(ii) The fig. below shows a floating object of volume 40,000 cm^3 and mass 10g. It is held as shown in water of density 1.25g/cm^3 by a light cable at the bottom so that ¾ of the volume of the object is below the water surface. (Assume that up thrust due to air is negligible)

Figure 11

(iii) (I) Calculate the volume of the object under water.

(II) State the volume of water displaced by the object.

(III) Calculate the weight of water displaced.

(iv) Determine the tension in the cable

(v) Calculate the density of the object.

7. (a) A trolley is being pulled horizontally from a ticker-tape timer. The figure below shows part of the ticker-tape.

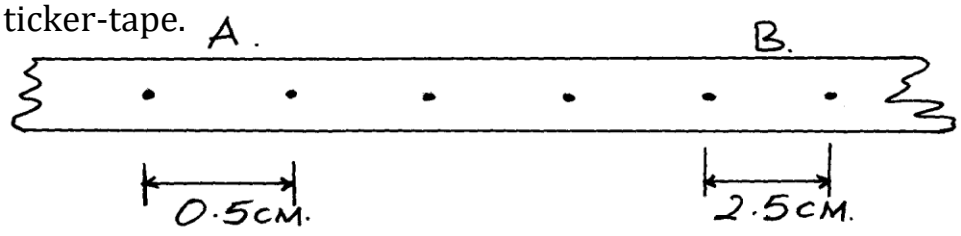


Figure 12

(i) Find the average velocity, **u**, at the section marked **A**.

(ii) Find the average velocity, **V** at the section marked **B**.

(iii) Find the acceleration of the trolley between **A** and **B**.

(b) If the mass of the trolley is 500g, determine the resultant force which acted on the trolley that caused the acceleration.

8. (a) State Archimedes' principle

(b) (i) Draw a clearly labelled diagram of common hydrometer which is suitable for measuring the densities of liquids varying between 1.0 and 1.2 g/cm^3. Show clearly the marks indicating 1.0, 1.1 and 1.2 g/cm^3.

(ii) State the principle upon which the instrument's use depends

(c) A concrete block of volume **V** is totally immersed in sea water of density ρ. Write an expression for the upthrust on the block

9. (a) Define the term relative density

(b) The diagram below shows a wooden log 12m long, density 800kg/m^3 and cross-sectional area 0.06m^2 floating upright in sea water of density 1.03g/cm^3, such that a third of it is covered by water.

(i) Determine the weight of the block

(ii) The up-thrust on the block

(iii) The minimum weight that can be placed on the block to just make it fully submerged

(c) The following set-up was then used by a student to determine the relative density of a cork

During the experiment, the following measurements were taken:-

- Weight of sinker in water = $\mathbf{w_1}$
- Weight of sinker in water and cork in air = $\mathbf{w_2}$
- Weight of sinker and cork in water = $\mathbf{w_3}$

(i) Write an expression for the up thrust on cork

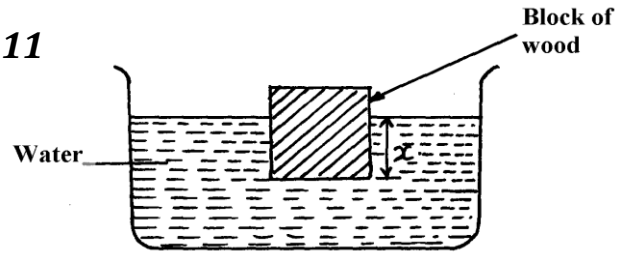
(ii) Write an expression for the relative density of the cork

10. (a) State the law of floatation

(b) The diagram ***figure 11*** below shows a block of wood floating on water in a beaker. The set-up

is at room temperature:-

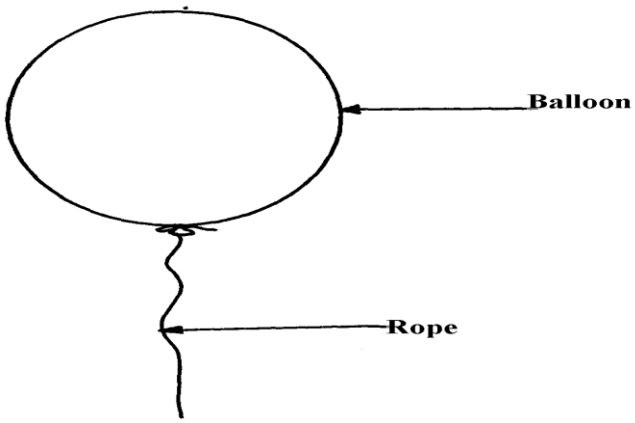
fig. 11



The water in the beaker is warmed with the block still floating on it. State and explain the changes that are likely to occur in depth **x**

(c) The diagram ***figure 12*** below shows a balloon which is filled with hot air to a volume of $200m^3$. The weight of the balloon and its contents is 2200N.

fig. 12



(i) Determine the upthrust on the balloon (density of air $0.0012g/cm^3$)

(ii) The balloon is to be balanced by hanging small rats each of mass 200g on the lower end of the rope. Determine the least number of rats that will just make the lower end of the rope touch the ground.

11. (a) State Archimedes's principle

(b) A rectangular brick of mass 10kg is suspended from the lower end of a spring balance and gradually lowered into water until its upper end is some distance below the surface

(i) State and explain the changes observed in the spring balance during the process

(ii) If the spring reads 80N when the brick is totally immersed, determine the volume of the brick. (Take density of water = $1000kgm^{-3}$)

(c) The figure below shows a hydrometer

Explain:

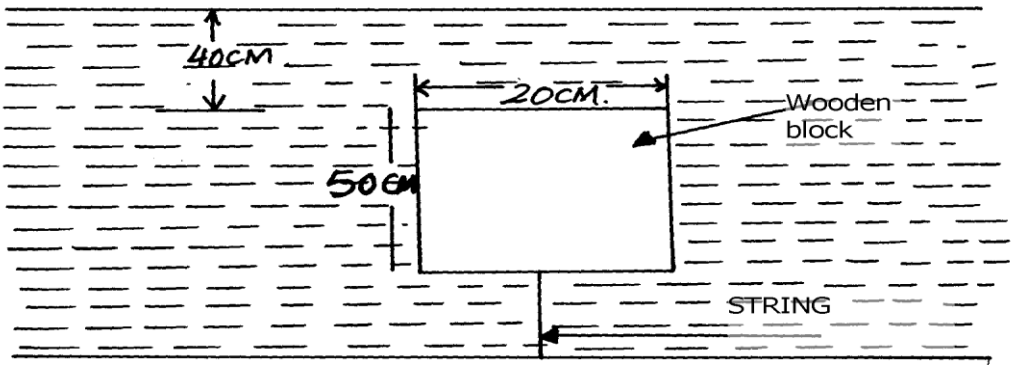
(i) Why the stem is made narrow

(ii) Why the bulb is made wide

(iii) Why the lead-shots are placed at the bottom

12. (a) State the law of floatation

(b) The diagram below shows a wooden block of dimensions 50cm by 40cm by 20 cm held in position by a string attached to the bottom of a swimming pool. The density of the block is 600kgm^{-3}



(i) Calculate the pressure in the bottom surface of the block

(ii) State the **three** forces acting on the block and write an equation linking them when the block is stationary

(iii) Calculate the tension on the string

13. A block of glass of mass 250g floats in mercury. What volume of glass lies under the surface of Mercury? Density of mercury is 13.6 x 10^3 Kg/m^3

14. a) State the law of floatation

b) A balloon of negligible weight and capacity 80m^3 is filled with helium of density 0.18Kgm^{-3}.

Calculate the lifting force of the balloon given that the density of air = 1.2Kgm^{-3}

c) A piece of glass has a mass of 52g in air, 32g when completely immersed in water and 18g when completely immersed in an acid. (Take: density of water = 1g/cm^3)

Calculate:

i) Density of glass

ii) Density of the acid

For Marking Schemes/Answers

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