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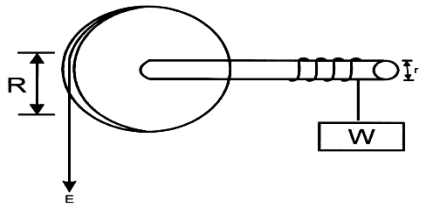
Physics form three assignment 2020

1.A machine is a device that enables work to be done more easily and conveniently. State any two ways in which a machine makes work easier. (2 marks)

b) Figure 7 shows a wheel and axle being used to raise a load W by applying an effort E. The radius of the wheel is R and of the axle is r.

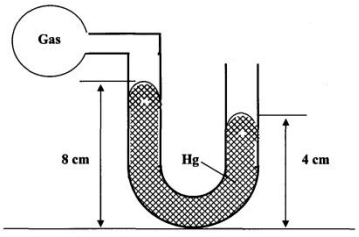


i) Show that the velocity ratio (V.R) of this machine is given by $\frac{R}{r}$

(3 Marks)

ii) Given that r = 5cm and R = 50cm, determine the effort required to raise a load of 200N if the efficiency of the machine is 90%. (3 mks)

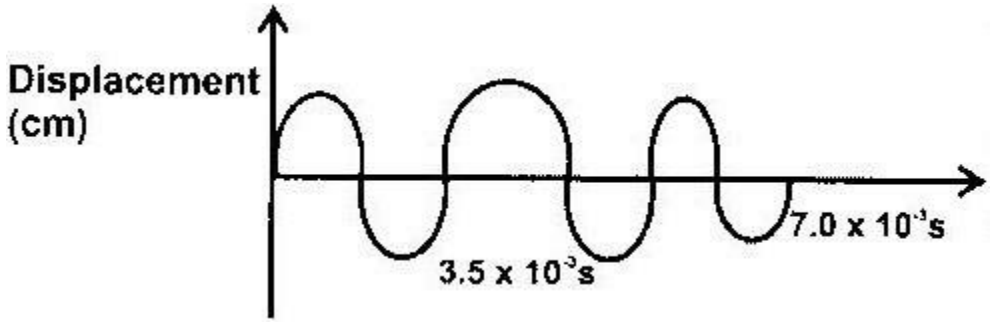
c) An airtight flask containing a gas is connected to a mercury manometer. The levels of mercury in the two limbs of the manometer are as shown in the diagram below.



Calculate the pressure of the gas (Density of mercury = 1.36×10^4 kg/m^3 and atmospheric pressure = 1.0×10^5 N/m^2)

(3mks)

2.Fig 1 shows the displacement – time graph for a certain wave



Determine the frequency of the wave?

3. State one effect that would be observed when water waves pass from deep to shallow water.

4. A source generates 40 waves in a second. If the wavelength is 8.5 cm. Calculate the time taken to reach a wall 102m from the source.

5. Name a property of light that shows it is a transverse wave.

6. State ONE difference between mechanical and electromagnet waves.

7. Explain the following terms and state their S.I units

(i) Wavelength

(ii) Amplitude

(iii) Periodic time

(iv) Frequency

8. State THREE differences between light waves and sound waves.

9. (a) Name two types of progressive wave motion

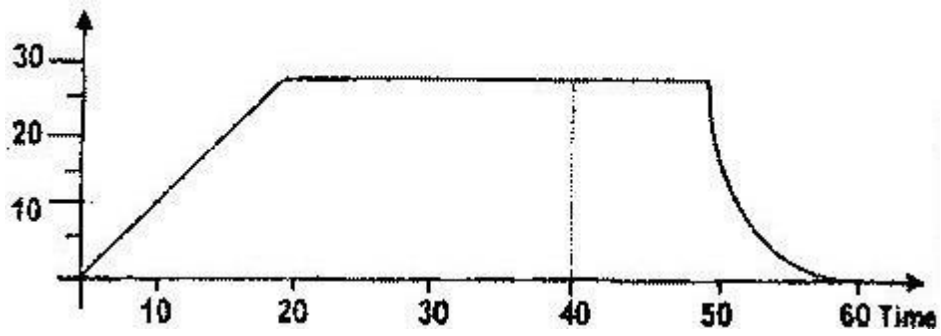
(b) Distinguish between the waves stated in 3 (a) above

10.a) A body accelerates uniformly from initial velocity, U to the final velocity V, in time t, the distance traveled during this time interval is S. If the acceleration is shown by the letter a, show that;

i) $V = U + at$ ii) $s = ut + \frac{1}{2} at^2$ iii) $V^2 = U^2 + 2as$

b) A body initially moving at 50m/s decelerates uniformly at 2m/s until it come to rest. What distance does it cover from the time it started to decelerate?
11. An object dropped from a height h attains a velocity of 6m/s just before

hitting the ground, find the value of h.
12.: a) A stone is thrown vertically upwards from the edge of a platform
eventually the stone lands without bouncing on the ground below the platform. Taking the upward velocity to be positive, sketch the velocitytime graph of the motion of the stone.
b) A car can be brought to rest from a speed of 200m/s in a time of 2s.
i) Calculate the average deceleration ii) If the driver reaction time is 0.2s, Determine the shortest stopping
distance.
13.: The figure shows a speed-time graph for part of the journey of a motorcar.
Determine the distance the car travels in the first 40 seconds



14.A ray of light is directed at an angle of 50^0 on to a liquid-air boundary.
The refractive index of the liquid is 1.4.
Show on a diagram the patch taken by the ray on striking the liquid-air boundary. Show how you arrive at your answer.
15. Figure 13 shows a coin placed in a large empty container. An observer
looking into the container from the position shown is unable to see the coin.

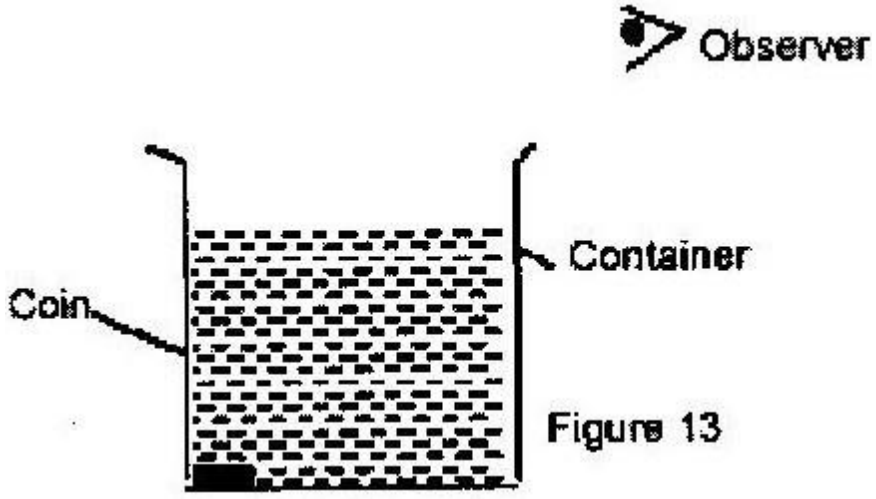


Figure 13

Sketch two rays from a point on the coin to show how the observer is able to see the image of the coin after the container is filled with water.

16.

Figure 6 show a ray of light incident on the face of a water prism.

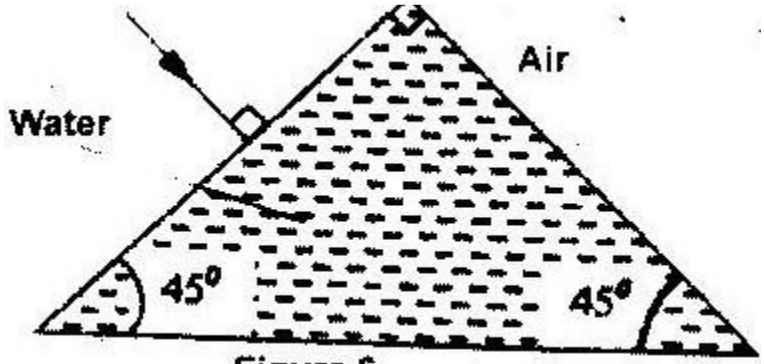


Figure 6

Sketch the path of the rays as it passes through the prism. Critical angle for water is 49^0 (1mk)

17. Calculate the refractive index of glass given that the velocity of light in air is $3x\ 10^8\ ms^{-1}$ and velocity of light in glass is $2.4 \times 10^8 ms^{-1}$.

18. The real thickness of crown glass block of refractive index 1.58 is 10cm is 10cm.

Calculate the apparent thickness of the glass. 9. You are provided with the following;

-A 50cm beaker full of water.
-Stand and clangs
-A half metre rule
-2 optical pins
-Cork

a) Explain briefly how you would determine the refraction index of water using the materials provided.

b) The data below shows the results obtained when such an experiment was performed by form three students using various values of real depths, Y of a liquid.

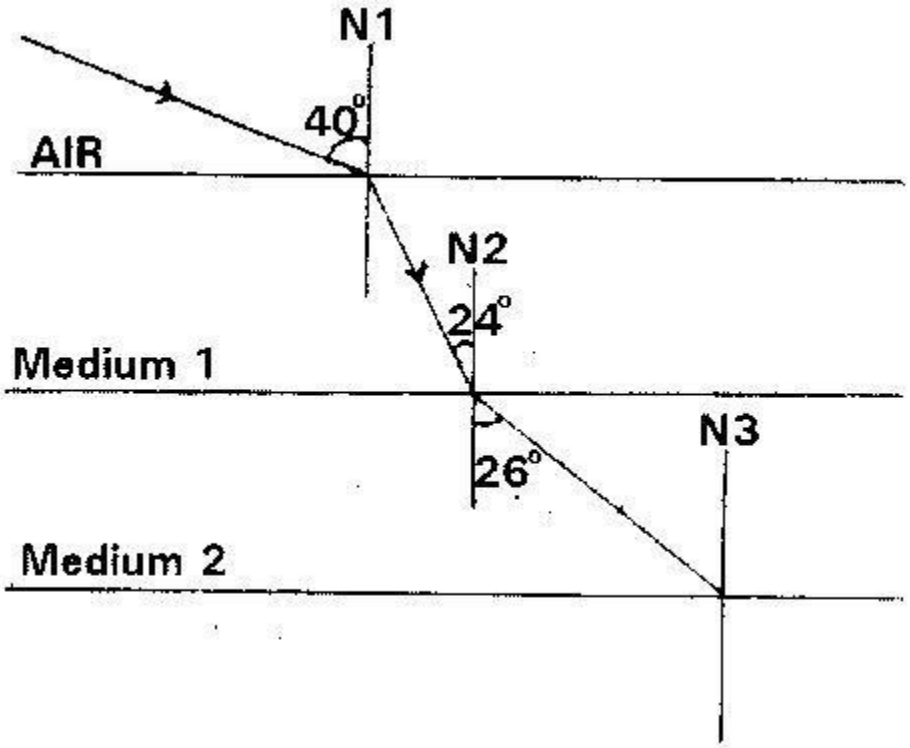
REAL DEPTH (CM)	30	50	70	90	110	130
APPARENT DEPTH(CM)	22	37	52	66	81	96

i) Plot a graph of the real depth (y-axis) against apparent depth. ii) From the graph, determine the refractive index of the liquid.

19. Paraffin has a greater refractive index than that of water. Comment about the relative velocity of light in paraffin and in water.

20. a) State SNELL'S LAW

b) A ray of light travels from air into medium 1 and 2 as shown.



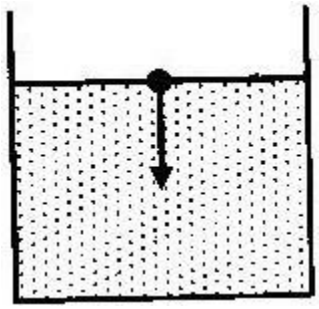
Calculate;
i) The refractive index of medium 1.

ii) Critical angle of medium 1 iii) The refractive index of medium 2 relative to medium ($_1n_2$)

21.Two masses of 3kg and 7kg are connected by a light string. The 3 kg mass rests on a smooth incline plane 30^0 to the horizontal. The 7 kg mass hangs freely from the frictionless pulley attached to the top of plane.
i) Draw a diagram showing the bodies and identify the forces acting on the 3 kg mass.

ii) Calculate the acceleration of the masses.
22. A rocket propelled upward with a constant thrust. Assuming friction due

to air is negligible and the burning of the fuel is steady. Explain its motion.
23. A 2 kg body slides down a smooth slope from a height of 5m. As it reaches the horizontal, it strikes another body of mass 3 kg which is at rest. Both bodies stick together. Calculate the velocity of the bodies after collision.
24. A girl of mass 40 kg stands on a scale balance in a lift. The lift is accelerating upwards. At one instant the acceleration of the lift is 2m/s. Calculate the reading on the scale at that instant.
25. The diagram shows a tall measuring cylinder containing a viscous liquid. A very small steel ball is released from rest at the surface of the liquid as shown. Sketch the velocity- time graph for the motion of the ball from the time it is released to the time just before it reaches the bottom of the cylinder.

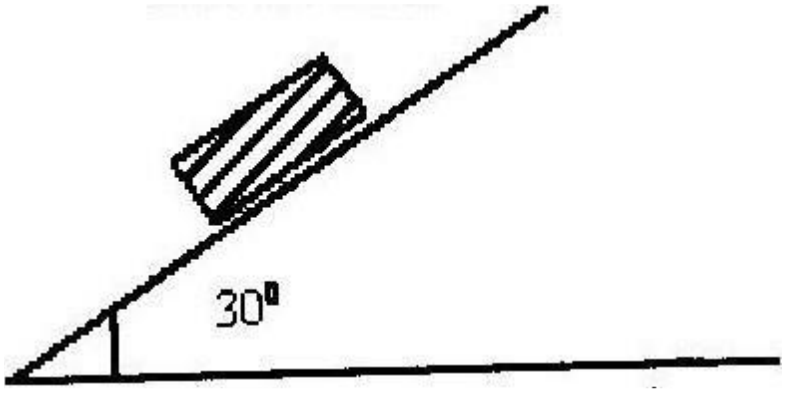


26. A body of mass 5 kg is ejected vertically from the ground when a force of 600N acts on it for 0.1s. Calculate the velocity with which the body leaves the ground.

27. a) i) A body is initially in motion. If no external force acts on the body, describe the subsequent motion.
ii) A car of mass 800 kg is initially moving at 25 m/s. Calculate the

force needed to bring the car to the rest over a distance of 20 m.
b) Two trolleys of masses 2 kg and 1.5 kg are traveling towards each other at 0.25m/s and 0.40 m/s respectively. Two trolleys combine on collision.
i) Calculate the velocity of the combined trolleys.

ii) In what direction do the trolleys move after collision?
28. a) The diagram shows a block of mass 5 kg sliding down from rest on
a plane incline at an angle of 30^0 to the horizontal. A frictional force of 6N acts between the block and the plane.



i) Copy the diagram and show
the forces acting on the block.
II)Calculate the resultant force
on the block.
III) Calculate the time taken by the block to cover the distance of 25cm.