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1. Fig. 1 shows a burette partly filed with a liquid. The burette was initially full to the mark O. If the quantity of the liquid removed has a mass of 22g, determine the density of the liquid.

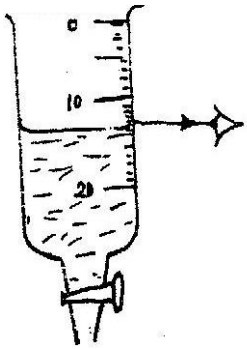


Fig. 1

2. Fig 2 shows a uniform bar in equilibrium.

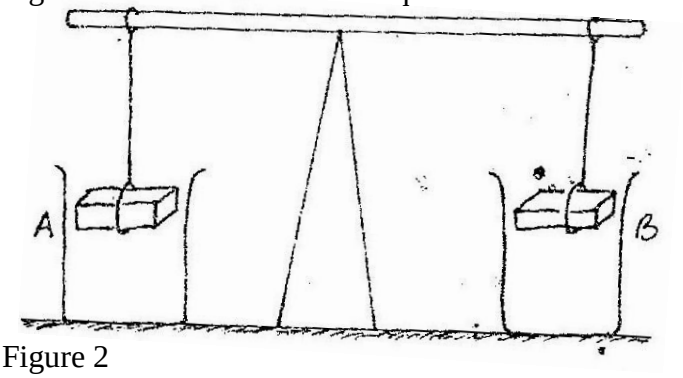


Figure 2

When water is added into the beakers A and B until the weights are submerged, it is observed that the bar tips towards B. Explain this observation.

3. Fig 3 shows two identical hollow spheres. Spheres A is completely filled with the liquid while B is partly filled with identical liquid.

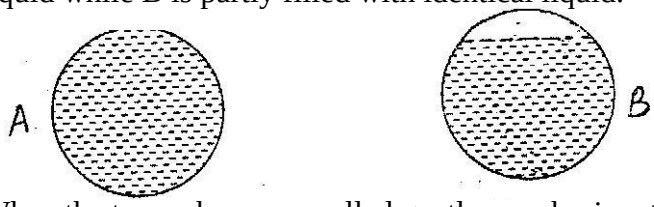


Fig. 3

When the two spheres are rolled gently on a horizontal surface. It is observed that the sphere B stops earlier that the sphere A. Explain this observation.

4. State the reason why it may not be possible to suck liquid into your mouth using drinking straw on the surface of the moon.

5. Fig. 4 (i) shows a beaker filled with water. Some potassium permanganate was gently introduced at the bottom of the beaker at the position shown.

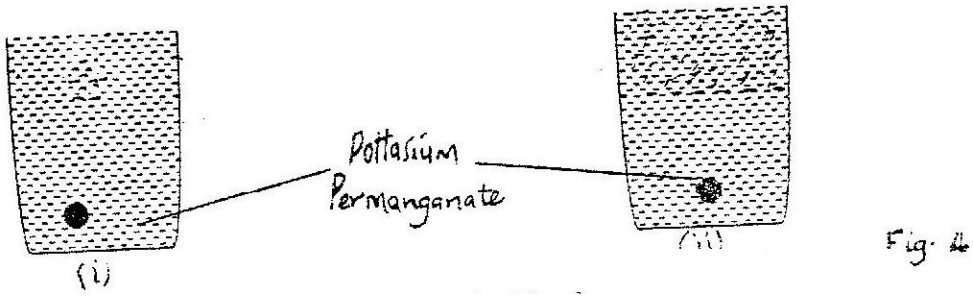
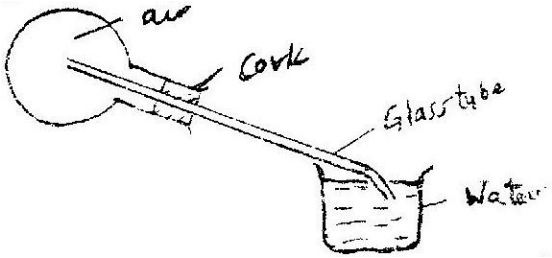


Fig. 4

Fig. 4(ii) shows the appearance of the liquid after about 30 minutes. Explain how this appearance was caused.

Fig. 5 shows a flask fitted with a glass tube dipped into a beaker containing water at room temperature. The cork fixing the glass tube to the flask is airtight.



Use the information and the figure to answer questions 6 and 7.

6. State what is observed when ice- cold water is poured on the flask.
7. Give a reason for the observation in question 6.
8. Fig. 6 shows an object O being viewed using tow inclined mirrors M_1 and M_2. Complete the diagram by sketching rays to show the position of the image as seen by the eye E.

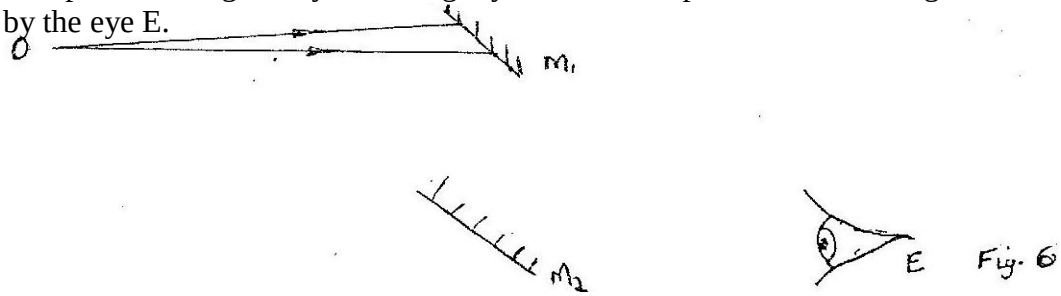


Fig. 6

9 Fig. 7 shows "windmill" which when connected to the dome of a positively charged Van de Graff generator is observed to rotate as indicated. A, B, C and D are sharp points
Figure 7.

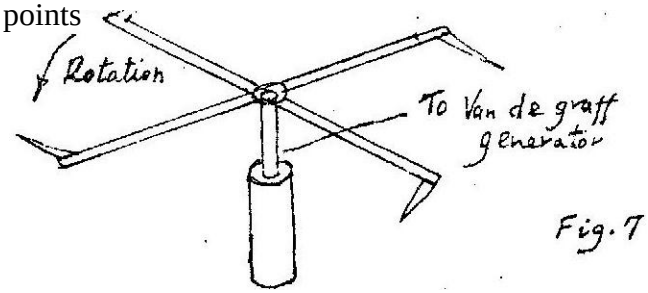


Fig. 7

Explain how this rotation is caused.

10. Explain how polarization reduces current in simple cell.
11. Fig 8 shows a soft-iron ring placed between the poles of a magnet. On the same diagram sketch the magnetic field pattern.

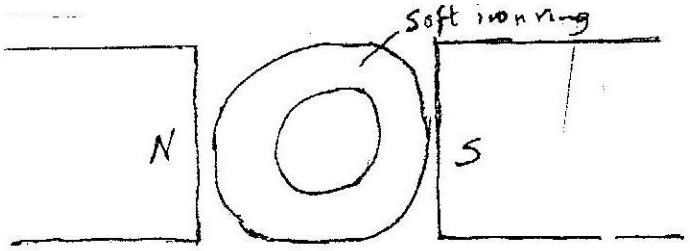


Fig. 8

12. Fig. 9 shows a uniform light bar one meter in length in equilibrium under the action of forces F1 F2 F3 and F4. All the forces are in the same plane. Use the information on the figure to answer questions 12 and 13.

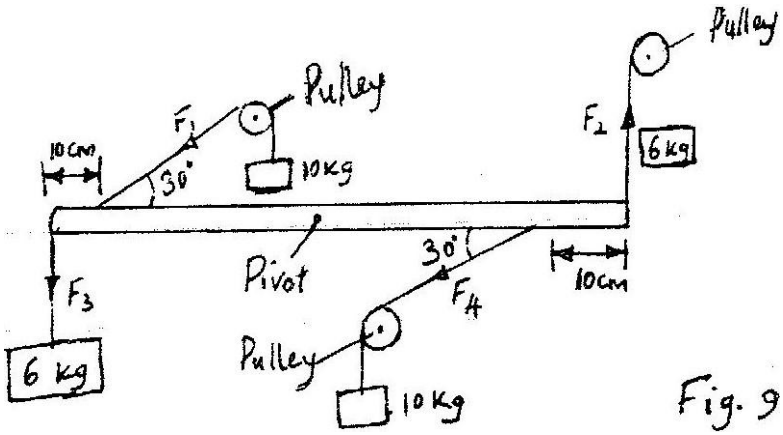


Fig. 9

Name one set of forces on the figure that constitutes a couple.

13. Determine the moment of the couple named in question 12.
14. A bullet moving at a velocity of $300ms^{-1}$ hits a tree trunk of diameter 50cm. It emerges from the opposite side with a velocity of $150ms^{-1}$. Determine the average deceleration of the bullet in the trunk.
15. A certain machine raises 2.0 tonnes of water through 22 metres.It the efficiency of the machine is 80%, how much work is done on the machine.(Acceleration due to gravity $g = 10ms^{-2}$)
16. Fig 10. Shows water waves incident on a shallow region of the shape shown with dotted line.

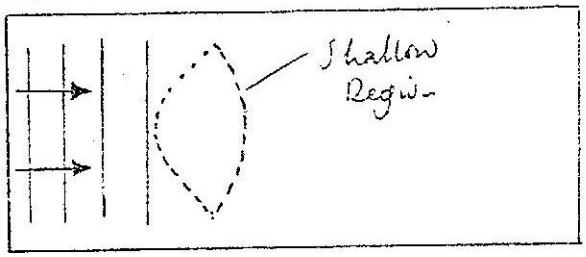


Fig. 10

On the same diagram, sketch the wave pattern in and beyond the shallow region.

17. The ammeter in the circuit in Fig. 11 has negligible resistance.
When the switch S is closed, the ammeter reads 0.01A. Determine the internal resistance of the battery.

18. An electric heater rated 240V ; 300w is to be connected to a 240V mains supply, through a 10A fuse. Determine whether the fuse is suitable or not.

19. Fig 12 shows tow identical containers A and B into which a copper rod is fitted. The containers are well lagged.

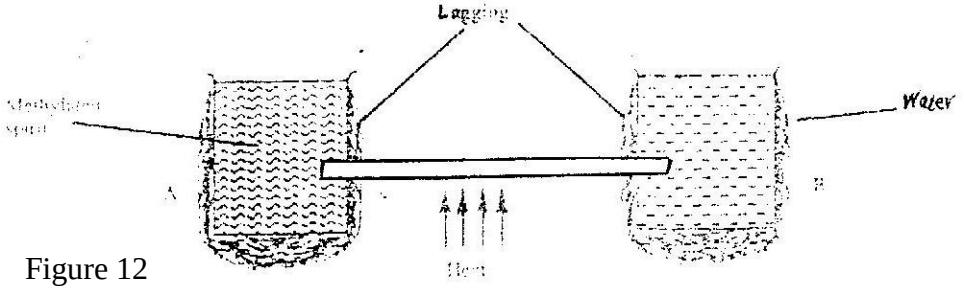


Figure 12 Fig. 12

The liquids in the containers were initially at the same temperature if the heat is a applied continuously at the position shown, state with reason for the container through which the loss of heat is likely to be higher.

20. Fig. 13 shows a point object O placed in front of a concave mirror.
Draw appropriate rays to locate the image of the object.

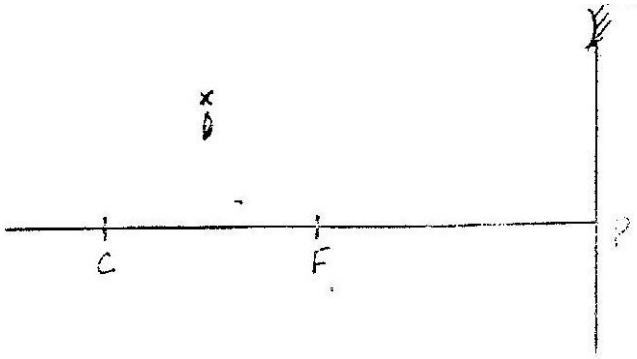


Fig. 13

21. Fig. 15 14 shows a ray of light incident on a glass prism.

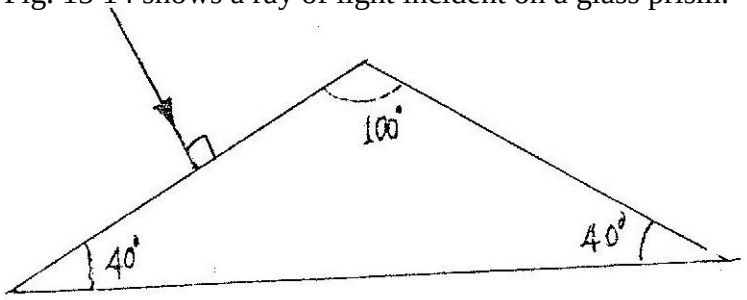


Fig. 14

If the critical angle of the glass is 39o sketch on the same diagram the path of the ray until it emerges from the prism.

22. Fig. 15 shows a tall jar containing two fluids A and B. The viscosity of A is higher than that of B. A solid sphere is released at the top of the jar and falls through the fluids.

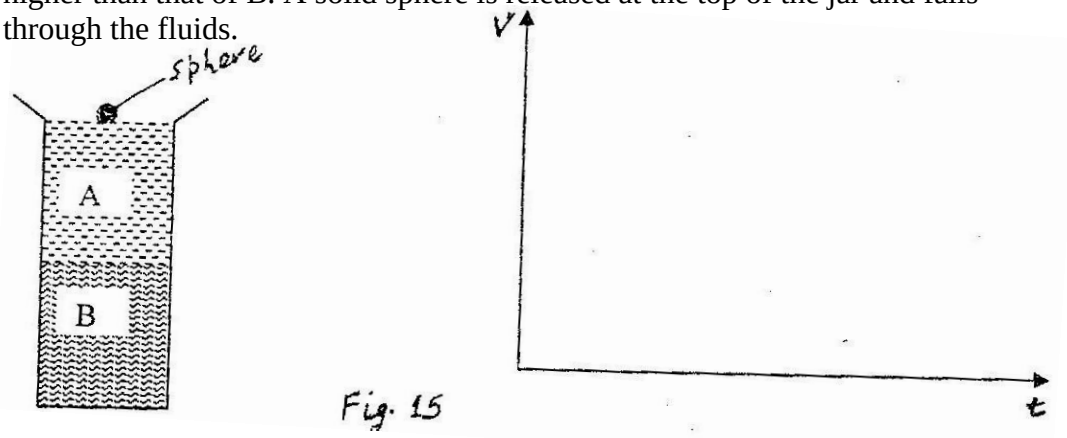


Fig. 15

On the axes provided, sketch the velocity – time graph for the motion of the spheres through the fluids.

23. Fig. 16 shows a non – viscous fluid flowing through a pipe a long which vertical tubes A, B and C have been fitted.

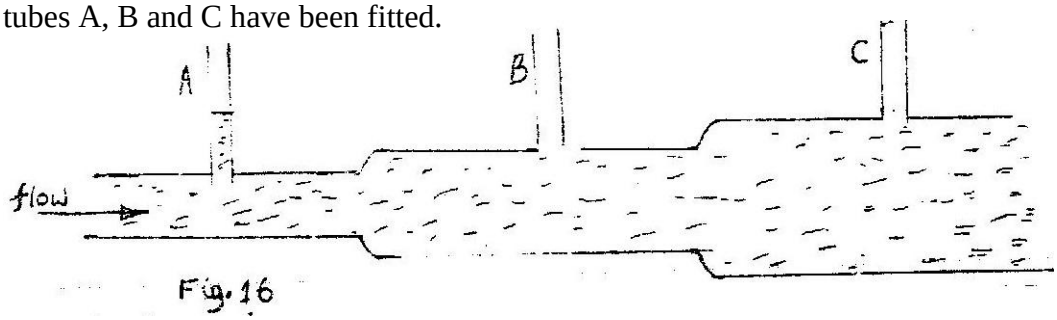


Fig. 16

Complete the diagram by indicating the possible levels of the fluid in tubes B and C.

24. Two identical containers A and B are placed on a bench. Container A is filled with oxygen gas and container B with hydrogen gas such that the two gases have equal masses. If the containers are maintained at the same temperature state with reason the container in which the pressure is higher.

25. Fig. 17(i) shows a stretched string AB vibrating in its fundamental mode.
Figure 17(I)

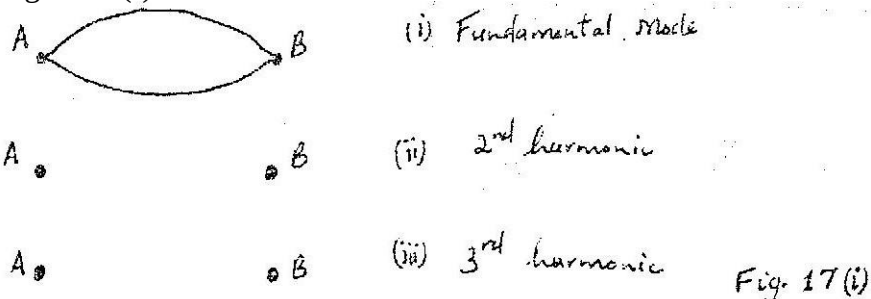


Fig. 17(i)

Sketch in fig 17. (ii) and (ii) the 2nd and 3rd harmonic of the string respectively.

26. Fig. 18 shows the wave patterns produced in one second when two tuning forks were sounded together.

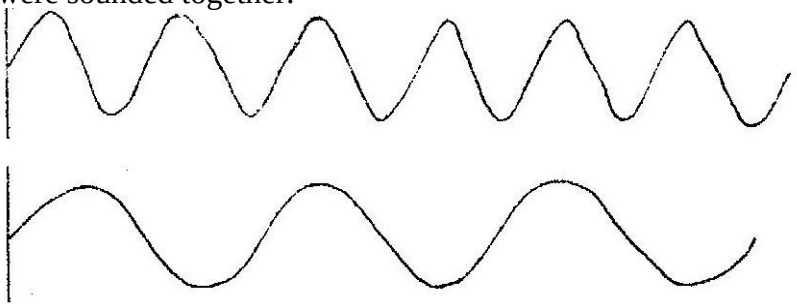


Fig. 18

Determine the beat frequency.

27. State the reason why radio waves signals are easier to receive than TV (television) signals in a place surrounded by hills.

28. Fig. 19 shows two spheres made of wax each of mass 0.10kg held in a liquid by strings A and B.

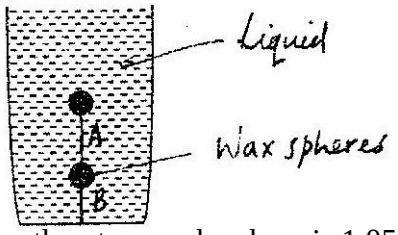


Fig. 19

If the upthrust on each sphere is 1.05N, determine the tension in each string.(acceleration due to gravity g = 10ms^{-2})

29. Fig. 20 shows a ball being whirled in a vertical plane.

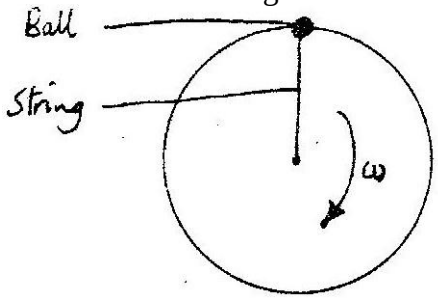


Fig. 20

Sketch on the same figure the path followed by the ball if the string cuts when the ball is at the position shown in the figure.

30. Fig 21 shows a converging lens whose local point F is marked.

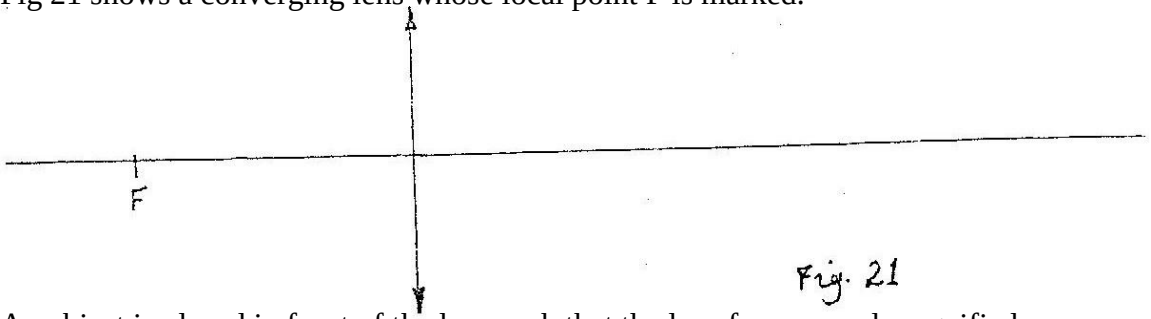
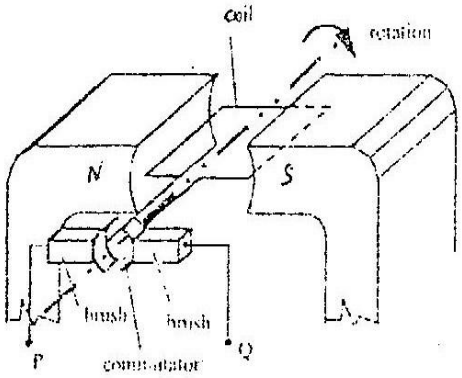


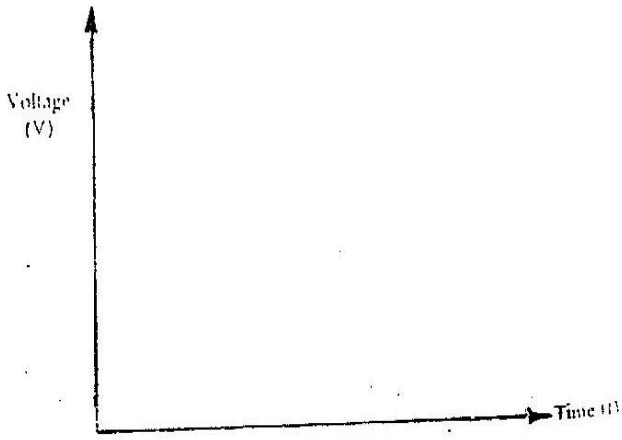
Fig. 21

An object is placed in front of the lens such that the lens forms a real magnified image.

Sketch on the same diagram array diagram to represent this.

31. Fig. 22 shows an electric generator. The points P and Q are connected to a cathode ray oscilloscope (CRO).





Sketch on the axes provided the graph of the voltage output as seen on the CRO Given that when t = 0 the coil is at the position shown in the figure.

32. A 60W bulb is used continuously for 36 hours. Determine the energy consumed. Give your answer in kilowatt hour (kWh).

33. State the factor that determines the hardness of the X – rays produced in an X – ray tube.

34. The following reaction is part of a radioactive series:

$$\begin{matrix} 120 \\ 83 \end{matrix}\!\!\times\!\!\begin{matrix} Y \\ \end{matrix} \longrightarrow \begin{matrix} 210 \\ 4 \end{matrix} \longrightarrow \begin{matrix} c \\ b \end{matrix}$$

Identify the radiation r and determine the values of b and c.

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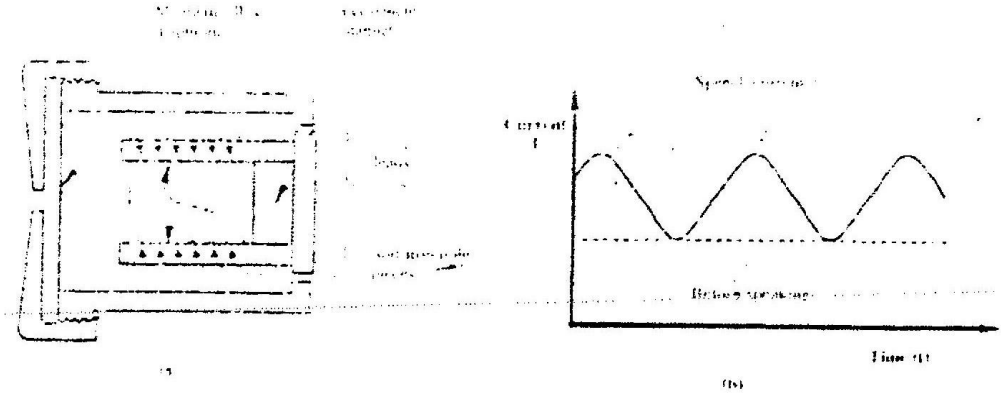
1. A block of ice of mass 40g at 0oC is placed in a calorimeter containing 400g of water at 20oC .Ignoring the heat absorbed by the calorimeter, determine the final temperature of the mixture after all the ices has melted. (Specific latent heat capacity of fusion of ice= 340,00J/kg, specific heat capacity of water = 4,200j/kg).

2. a) Fig 1 (a) shows the circuit of a simple telephone receiver. When the telephone is lifted, a steady current flows through the solenoids. When a person speaks into the microphone on the other side, a varying current flows. These two currents are shown in fig. 1(b).



i) State the reason why solenoids are wounds in opposite directions around the soft-iron core pieces as shown.

ii) Explain how the speech current from the microphone is converted into sound in the receiver.

iii) State and explain the effect of replacing the soft iron core pieces with steel core pieces.

b) A step down transformer has 400 turns in the primary coil and 20 turns in the secondary coil A 50Ωresister is connected to the secondary output. If the r.m.s (root-mean-square) value of the primary voltage is 240; determine the peak value of the current in the in the secondary circuit.

c) a hole of area 2.0 cm^2 at the bottom of a tank 2.0m deep is closed with a cork. Determine the force on the cork when the tank is filled with water. (Density of water is 1000kg/m^3 and acceleration due to gravity is 10m/s^2).

4. Fig 3 shows the main features of a cathode ray tube (CRT) of a cathode ray oscilloscope (CRO)

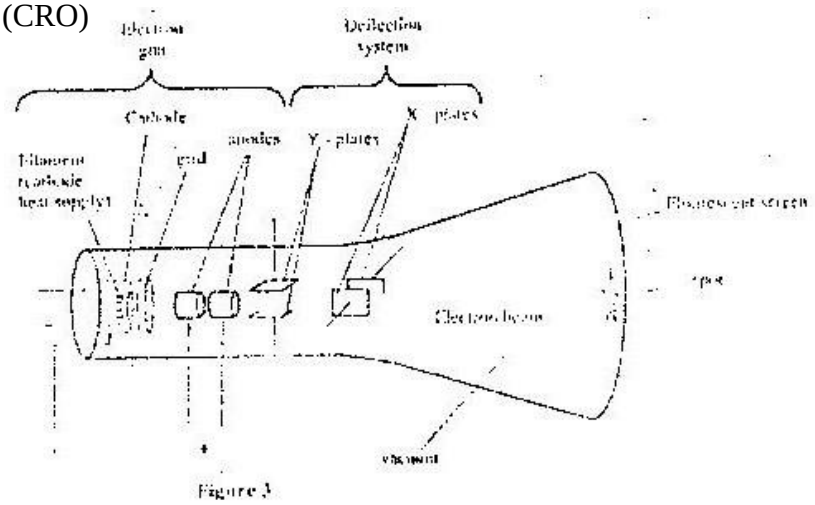


Figure 3

i) Describe how the electrons are produced in the tube.

ii) State and explain the function of the grid.

iii) State what would be observed on the screen if an a.c voltage is connected across the y-plates.

iv) State how the deflection system of a television differs fro that of a CRO.

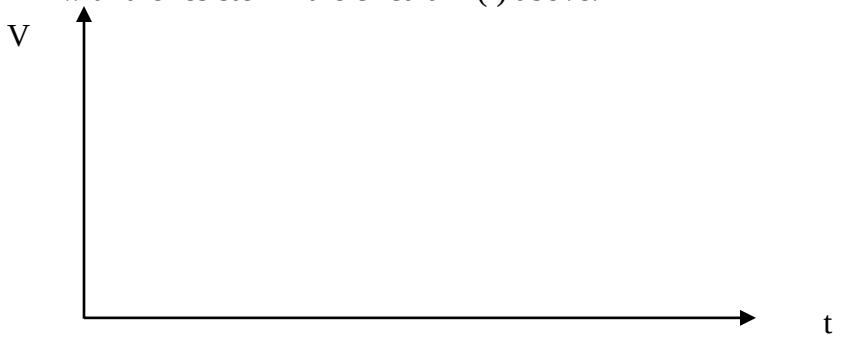
v) Give the reason why it is possible to have a wider screen in the television set than on the C.R.O.

b) In an excited hydrogen atom. An electron moves from an energy level of -1.36 x 10^{-19}J. Determine the wavelength of the radiation emitted. (Planks constant h= 6.63 x 10^{-34} Js and speed of light c= 3.0 x 10^{8} ms^{-1}).

5 a) You are provided with 12V a.c source, four diodes and resistor.

i) Draw a circuit diagram for a full wave rectifier and show the points at which the output is taken.
AC source shown-symbols; arrangement of diode (one for each pair); correct position of R; correct position of output.

ii) Sketch the graph of the output when a capacitor is put in parallel with the resistor in the circuit in (i) above.



b) A certain transistor is connected in common-emitter-mode. The base current I_B is 0.50 ma. Determine the values of the:

(i) Emitter current $I_{E.}$

(ii) Base-collector current gain β

(iii) Current gain α

SECTION II

6 a i) State one of the Newton's law of motion

ii) A body resting on a horizontal surface is given an initial velocity V so that it slides on the surface for some distance before coming to a stop. Table I shows the distances d moved by the body of various values of μ.

Velocity (ms_{-}^{-1})μ	0.20	0.40	0.60	0.80	1.20	1.20
Distance, d (m)	0.007	0.027	0.027	0.110	0.170	0.200

Given that v^2 is 20μd where μ is a constant for the surface, plot a appropriate graph and use it to determine μ. Determine values of μ on table.

b) A train of mass 200 tonnes starts from rest and accelerates uniformly at $0.5ms^{-2}$ determine its momentum after moving 100m.

7 ai) State the pressure law of an ideal gas.

ii) The pressure p, of a fixed mass of a gas at constant temperature T= 300K is varied continuously. The corresponding values of P and the volume V of the gas are shown in table 2.

Pressure, p(x 10^5Pa)	2.00	2.50	3.00	3.50	4.00	4.50
Volume, V (m^3)	0.025	020	0.017	0.014	0.012	0.011

Given that $P^V = 2RT$ where R is a constant, plot an appropriate graph and use it to determine r.

I/V (M^3)	40.0	5	58.8	71.4	83.3	90.0

b) A tin closed with an airtight lid contains air at a pressure of $1.0 \times 10^{5+}$ Pa and temperature of 12 ^{0}C. The tin is heated in a water bath until the lid opens. If the temperature at which the lid opens is 88^0C, determine the pressure attained by the gas. (Ignore expansion of the tin).

I/P x 10^5 (pa -1)	0.5	0.40	0.33	0.29	0.25	0.22