FORM TWO PHYSICS TOPICAL QUESTION

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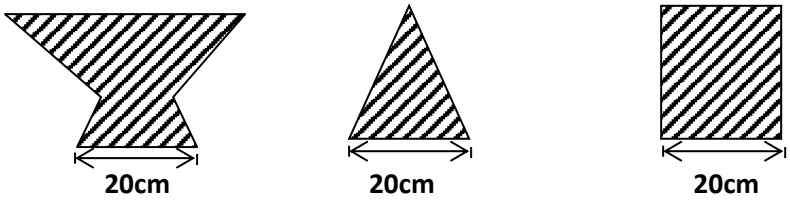
EQUILIBRIUM CENTRE OF GRAVITY QUESTIONS

1. The figure 2 below show three wooden blocks resting on a flat surface. (They are of the same material).

Figure 2



(i) Arrange them starting from the least stable. (1mark)

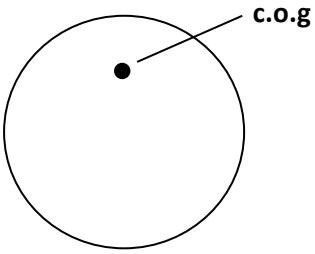
(ii) State the factor that you have considered in 2(i) above. (1mark)

2. The figure below shows a cuboid in two positions. Explain how the stability of the cuboid changes when it is changed from position 'a' to 'b'. (2 marks)

(a) (b)

(b) How does the area of support affect the stability of a body? (1 mark)

3. The figure below shows a solid sphere with its centre of gravity marked with a dot. The sphere is rolled on a horizontal ground and comes to rest after. Some time.



On the space provided below sketch the sphere and mark with a dot the most likely position of the c.o.g after it comes to rest. (1mk)

4. Fig 3 shows a solid cylinder standing on a horizontal surface. The cylinder is in stable equilibrium.

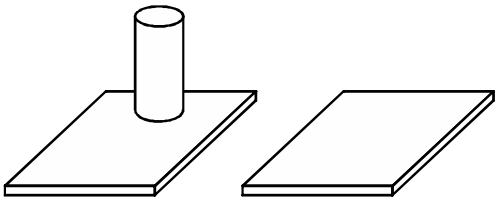


Fig 3

On the horizontal space provided, sketch the cylinder in neutral equilibrium (1 mark)

5. A person carrying a heavy luggage using one hand leans away from the luggage. State the reason for this. (1 mark)

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

7. Figure 2 shows a marble placed on an inverted bowl.

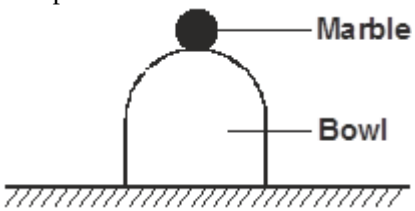


Fig. 2

State and explain the type of equilibrium the marble is. (3 marks)

8. (i)State two conditions necessary for equilibrium of a body acted upon by a number of forces.
ii) Figure 7 shows beaker containing a block of ice.

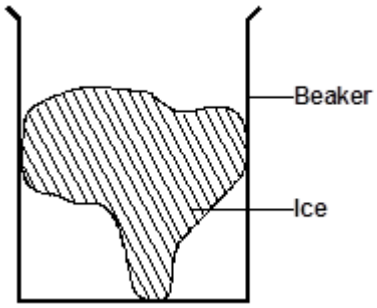


Fig 7

State and explain the change in stability when the ice melts. (3 marks)

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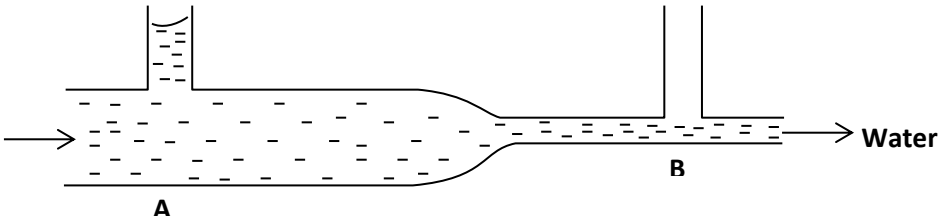
FLUID FLOW QUESTIONS

1. A pipe of radius 3mm is connected to another pipe of radius 9mm. If water flows in the water pipe at a speed of $2ms^{-1}$, what is the speed in the narrower pipe (2 marks)

2. A tube of radius 9 mm has a constriction of diameter 10mm. Water flows in the tube at $3ms^{-1}$. Determine the velocity of water in the constriction. (3 marks)

3. Figure 3 below shows water flowing through two sections A and B of a pipe having different cross-sectional area.

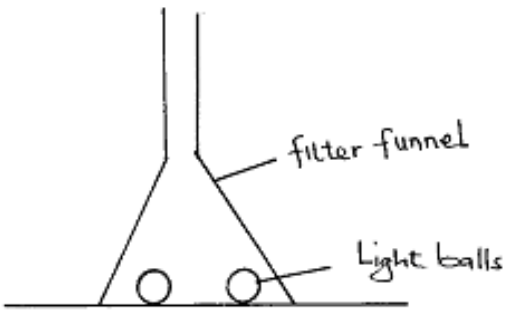
Figure 3



Indicate and explain the water level in manometer B. (2marks)

4. Trees planted along a busy road are observed to lean towards the road as they grow. Explain this observation. (2mks)

5. The figure below shows light balls resting on a flat surface. A filter funnel is then inverted over them. State what is observed when air is blown through the funnel. (1mk)



6. The figure 6 below shows parts A, B and C of a glass tube.

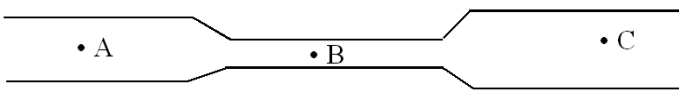


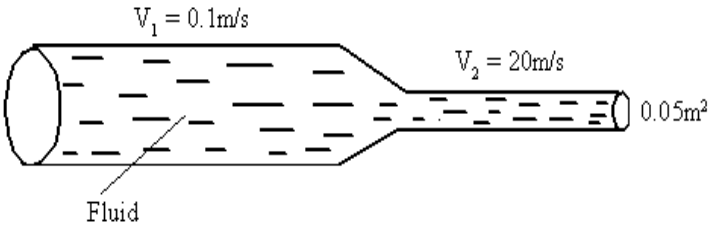
Fig. 6

State with a reason the part of the tube in which the pressure will be lowest when air is blown through the tube from A towards C. (1mk)

7. (a) Distinguish between streamline and turbulent flow. (2mks)
(b) The figure below shows two light sheets of paper arranged as shown.

Explain the observation made when air is blown at the same speed and time at point A and B. (2mks)

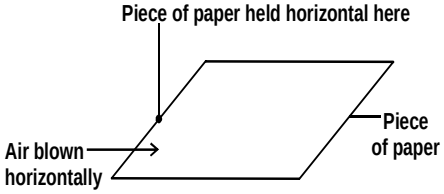
(c) The figure below shows an incompressible fluid moving through a tube of varied cross section area. If the area of the small tube is $0.05m^2$, Calculate the diameter of the large tube in cm. (3mks)



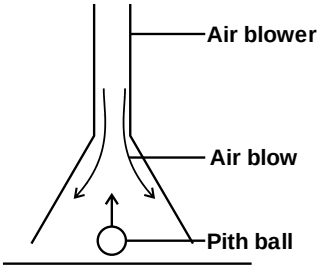
8. A liquid flows along a horizontal pipe of cross-section area of $20cm^2$ at a speed of 3.0m/s. If the speed increases to 9.0m/s when it reaches a narrow section, determine the cross-section area of the narrow section. (2mks)

9. A pipe of radius 2mm is connected to another pipe of radius 6mm. If water flows in the narrow pipe at a speed of 3m/s, determine the speed of water in the wider pipe. (3 marks)

10. Air is blown over a piece of paper as shown below. State what is observed.



11. The figure below shows a pithball being lifted into a funnel end of a blower.



Explain this observation. (2 marks)

12. a) An aero plane is moving horizontally through still air at a uniform speed. It is observed that when the speed of the plane is increased, its height above the ground increases. State the reason for this observation. (1 mark)

b) Figure 4 shows parts A, B and C of a glass tube.

Figure 4

State with a reason the part of the tube in which the pressure will be lowest when air is blown through the tube

from A towards C. (2 marks)

13. State how the pressure in a moving fluid changes when the velocity of the fluid increases. (1 mark)

14. A lawn sprinkler has 20 holes each of cross-sectional area 1.25×10^{-3} cm² and is connected to a horse-pipe of cross-section area 2.4cm². If the speed of the water in the horse pipes is 1.5m/s, calculate the speed at which the water emerges from the holes. (3 marks)

15. Water flows through a narrow pipe of radius 6cm connected to another pipe of radius 9cm. If the speed of water in the narrow pipe is 3m/s, determine the speed of water in the wider section. (3 marks)

16. Explain how the propellers on top of a helicopter help in lifting the helicopter above the ground.(2 marks)

17. Water flows along a horizontal pipe of cross-sectional area 30cm². The speed of the water is 4m/s but it reaches 7.5m/s in a constriction in the pipe. Calculate the area of the constriction in m² (3 marks)

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HOOKE'S LAW QUESTIONS

7. The spiral springs shown in the figure 2 below are identical. Each spring has a constant K = 300N/m.

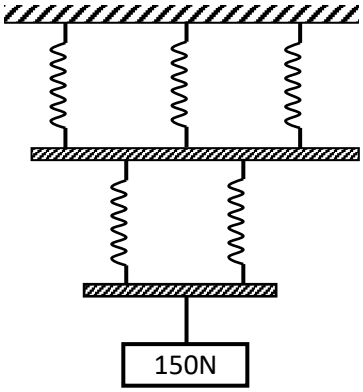
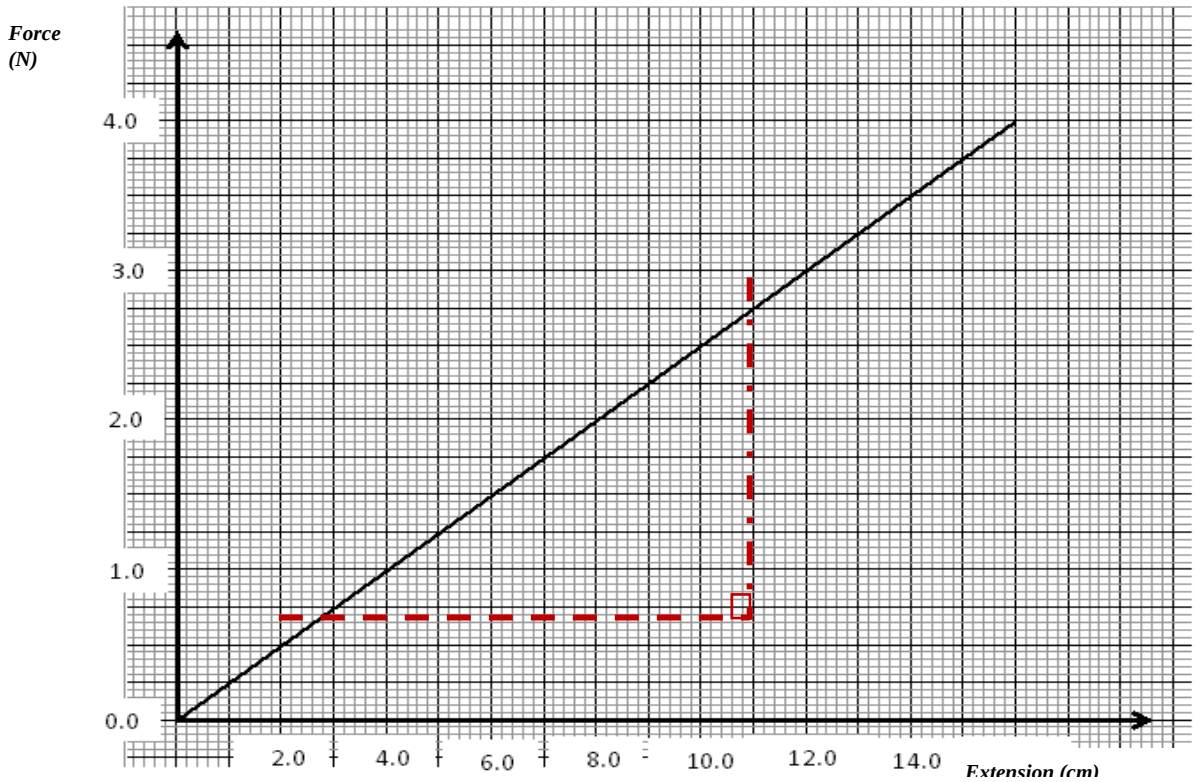


Figure 2

Determine the extension caused by the 150N weight (Ignore weight of springs and connecting rods) (3 marks)

2. (a) State Hooke's Law (1mark)

(b) The diagram below shows a graph of force against extension for a certain spring.

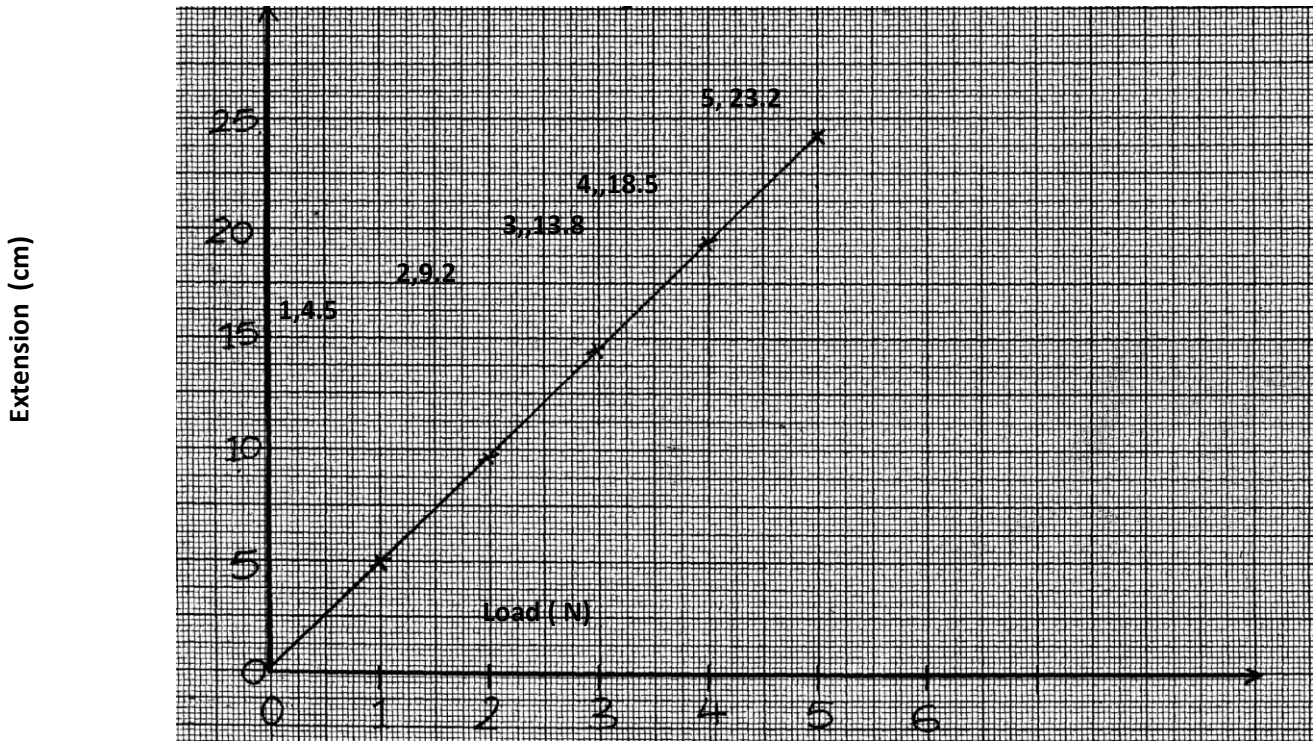


(i) What is the spring constant of the spring? (2 marks)

(ii) What force would cause two such springs placed side by side to stretch by10cm (3 marks)

3. a) State Hooke's law. (2marks)

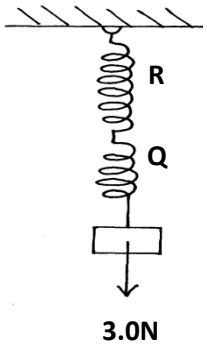
b) The graph shows how extension e of a helical spring varied with load, hanging on it. (cm)



(i) Determine from the graph, the proportionality constant of the spring. (3marks)

c) State three factors that affect the proportionality constant of a helical spring. (3marks)

d) Two spring Q and R have proportionality constants $20Nm^{-1}$ and $25Nm^{-1}$ respectively. Q weighs 0.2 N while the weight of R is negligible. The two springs are arranged to support a load of 3.0N as shown in the diagram that follows.

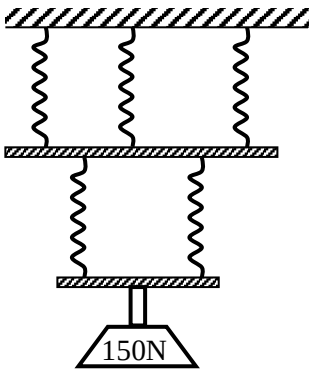


Determine the extension in

i) Q (2marks)

ii) R (2marks)

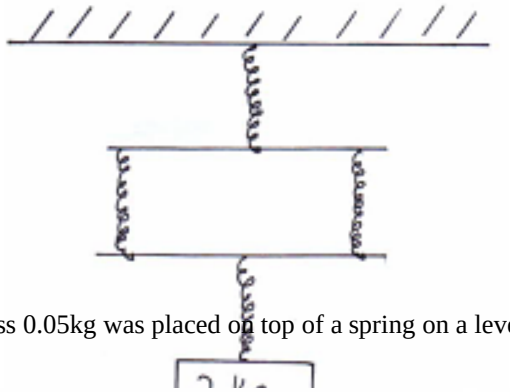
4. (a) The spiral springs shows in the figure below are identical. Each spring has a spring constant K = 200N/m. Each rod weighs 0.1N and each spring weigh 0.1N.



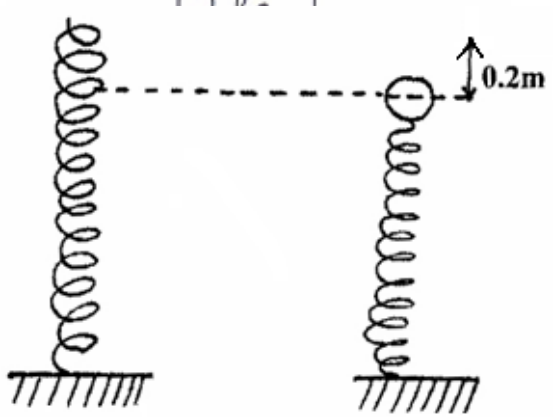
Determine the total extension caused by the 150N weight. (2 marks)

(b) Apart from length of the spring and nature of material, state one other factor affecting the spring constant. (1 mark)

5. When a mass of 2kg is hang from a single spring, the spring extends by a distance χ = 5cm. Determine the total extension in the set up below given that the springs are identical and weightless. (2mks)



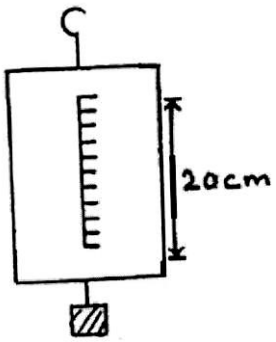
6. A steel ball of mass 0.05kg was placed on top of a spring on a level ground. The spring was then compressed through a distance of 0.2m.



If the spring constant is 15N/m. Calculate the maximum height reached when the spring is released. (3mks)

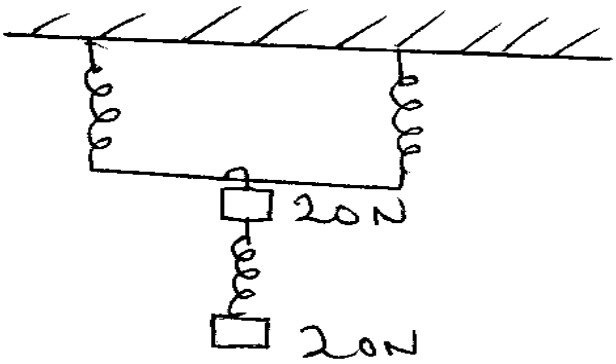
7. A spring has a spring constant 4N/m. Two identical springs are connected end to end. Find their effective spring constant. (2mks)

8. The figure below shows a spring balance, its spring constant is 225N/m. The scale spreads a distance of 20cm.



Determine the maximum weight that can be measured using the spring balance. (2mks)

9. The three springs shown below are identical and have negligible weight. The extension produced on the system of springs is 20cm.



Determine the constant of each spring. (2 Mks)

10. A spring of spring constant 60n/m is extended through 50cm. Calculate the amount of work down in stretching.(2mks)

11. A spring has a spring constant of 40N/m, if the extension on the spring is 6.0cm, determine the tension on the spring. (2mks)

12. A spring extends by 4cm when a load of 10N is suspended from it. Six similar springs are used in the system shown in figure 5. Determine the total extension. (3 marks)

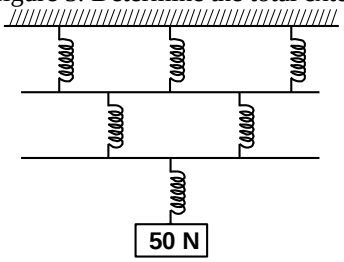
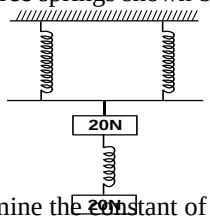


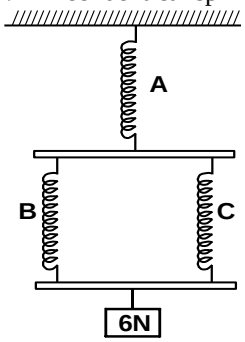
Fig 5

13. The three springs shown below are identical and of negligible weight. The extension on the system of springs is 20cm.



Determine the constant of each spring.

14. Three identical springs each of spring constant $10Nm^{-1}$ and weight 0.5N are used to support a load as shown.



Determine the total extension of the system.

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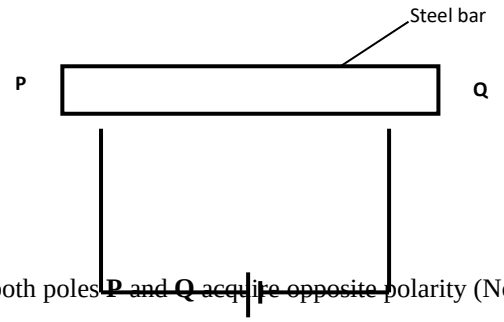
MAGNETISM QUESTIONS

1. State the law of magnetism. (1mark)

2. State and explain the functions of the keeper when storing magnets. (2marks)

3. **Figure 2** shows a steel bar to be magnetized.

Figure 2

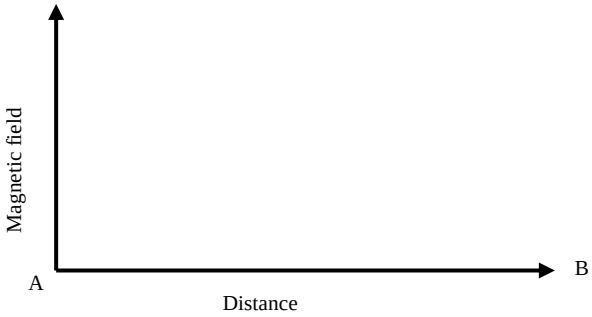


Complete the circuit such that both poles **P** and **Q** acquire opposite polarity (North- south respectively).(1mark)

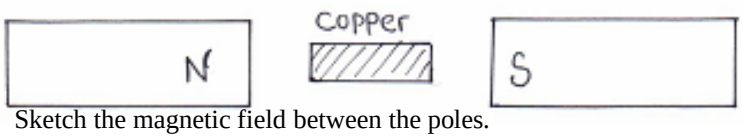
4. The **figure 2** shows a bar magnet. Point **A** and **B** are in front of the magnet.

Fig. 2

On the axis provided, sketch a graph showing how the magnetic field strength changes from A to B.(2marks)

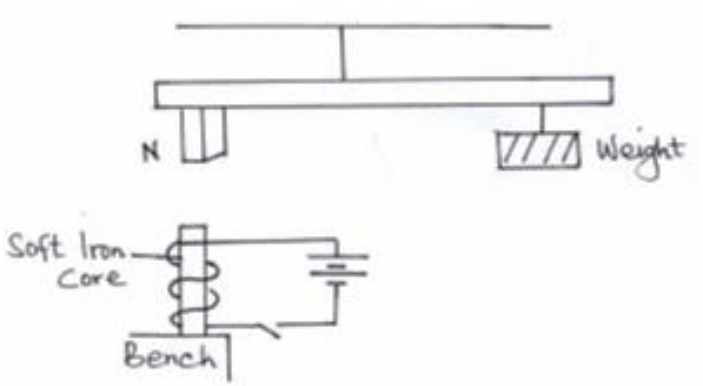


5. Figure 3 below shows a block of copper placed between two poles of a magnet.



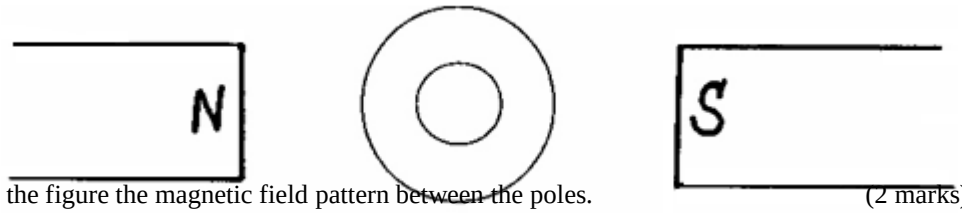
Sketch the magnetic field between the poles. (2mks)

6. Figure 5 below shows a metre rule suspended by a thread such that it is in equilibrium balanced by a permanent magnet attached to the metre rule and some weight.



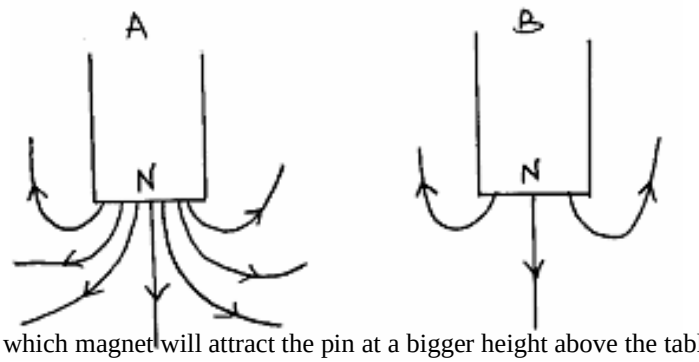
If the soft iron is fixed to the bench, state and explain the effect on the metre when the switch is closed.(2mks)

7. A soft iron ring is placed between two poles of a magnet as shown in the figure below.



(a) Show on the figure the magnetic field pattern between the poles. (2 marks)
(b) State **one** application of soft iron in magnetism. (1 mark)

8. Two magnets **A** and **B** in figure 2 were brought from a point high above a table towards a steel pin.



State with a reason which magnet will attract the pin at a bigger height above the table. (2mks)

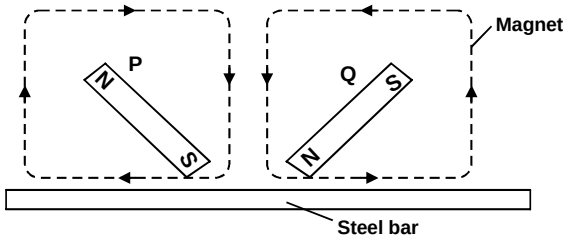
9. Explain In terms of domain theory what happens when a bar magnet is placed in a solenoid in which an alternating current flows. (2 Mks)

10. Figure 4 shows conductor carrying current in magnetic field and moves in direction shown.

Figure 4
Identify polarities X and Y. (2mks)

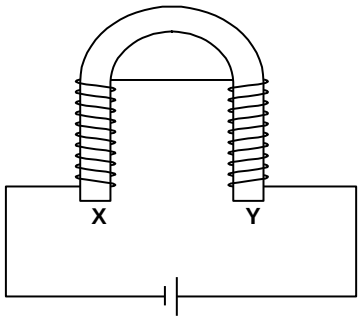
11. An electromagnet is made by winding insulated copper wire on an iron core. State two changes that could be made to increase the strength of the electromagnet. (2 marks)

12. The figure below shows two magnets being used to strike a steel bar.



Identify he method of making magnets represented by the diagram. (1 mark)

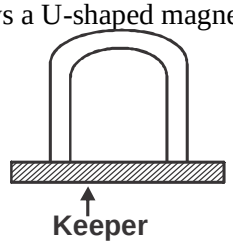
13. The figure shows an electromagnet. State the polarities at X and Y. (2 marks)



14. One method of producing a weak magnet is to hold a steel rod in the North -South direction and then hammer it continuously for some time. Using domain theory of magnetism explain how this method works. (2 marks)
15. Use domain theory to differentiate between magnetic and non-magnetic materials.(1 mark)

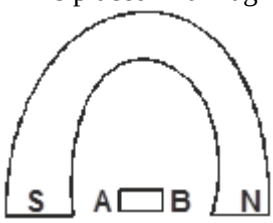
16. An electromagnet is made by winding insulated copper wire on an iron core. State three changes that could be made to increase the strength of the electromagnet. (3 marks)

17. Figure below shows a U-shaped magnet stored with a keeper.



Explain how this method helps to retain magnetism longer. (2 marks)

18. A soft iron bar AB is placed in a magnetic field of a horse shoe magnet as shown below.



What are the polarities of A and B. (1 mark)

19. Give a reason why attraction in magnetism is not regarded as a reliable method of testing for polarity.

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REFLECTION AT CURVED SURFACES QUESTIONS

1. Figure 1 below shows a parabolic surface with focal point F. A small source of light is placed at F.

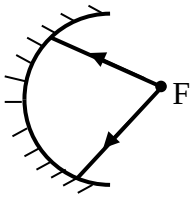


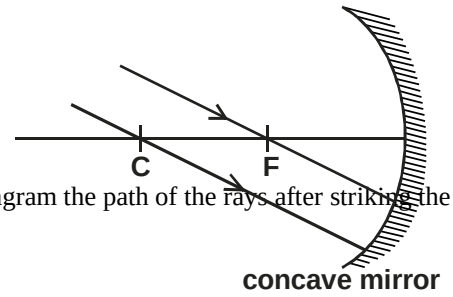
Fig. 1

Complete the ray diagram to show the incident rays are reflected by the surface.

2. An object of height 2 cm is placed 25 cm in front of a concave mirror. A real image is formed 75 cm from the mirror. Calculate the height of the image. (2marks)

3. **Figure 3** below shows two parallel light rays incident on a concave mirror.

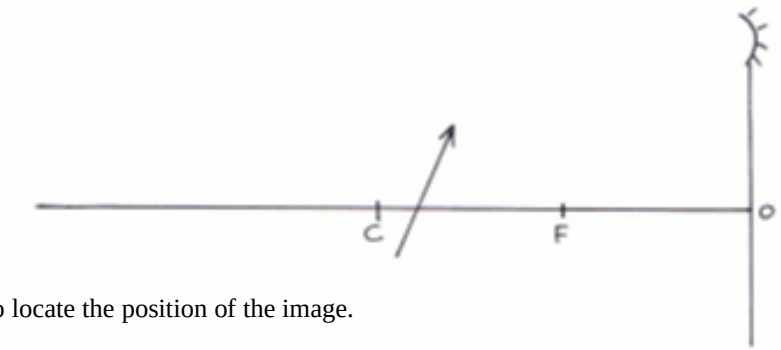
Fig 3



Sketch on the same diagram the path of the rays after striking the mirror and show the image. (2marks)

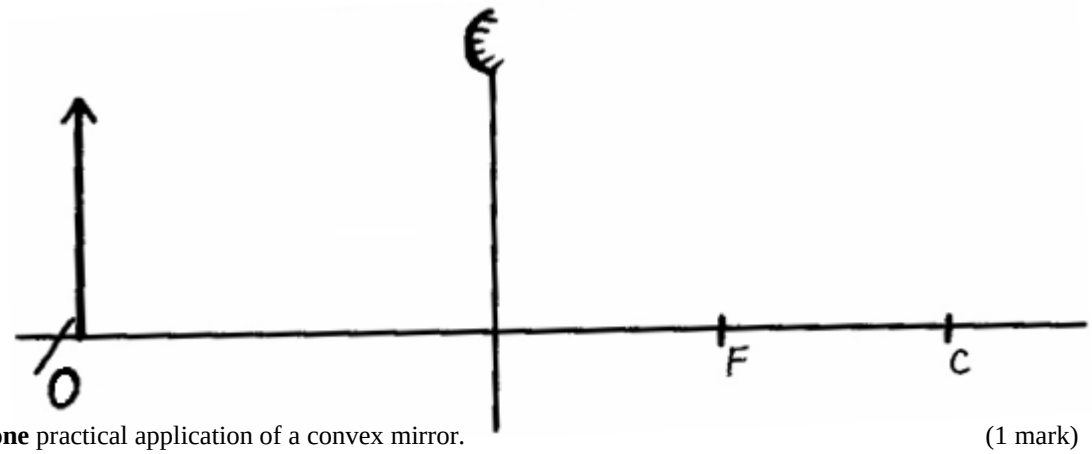
4. State one application of each the following mirrors. (2 marks)
   (i) Convex mirror
   (ii) Parabolic reflector

5. Figure 4 below shows an object placed infront of a concave mirror.



Use rays to locate the position of the image.

6. An object O is placed in front of convex mirror as shown in the diagram below.
   (a) Complete the diagram to locate the position of the image, 1. (3 marks)

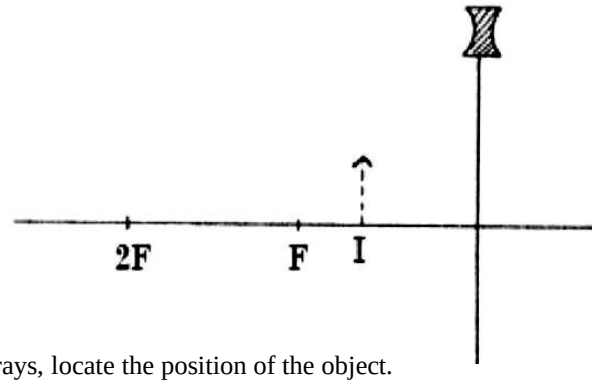


(b) State **one** practical application of a convex mirror. (1 mark)

7. A student holds a large concave mirror of focal length 1M, 80cm from her face. State **two** characteristics of her image in the mirror.

(2mks)

8. The figure below shows the image formed when an object is placed in front of a concave lens.



Using suitable rays, locate the position of the object. (3mks)

9. Figure 2 below shows an object infront of concave mirror and it's image.

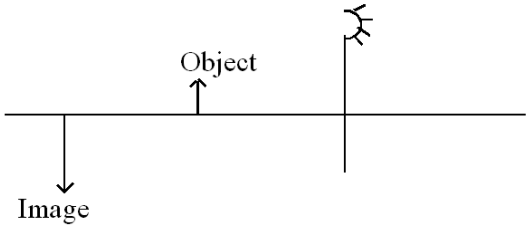
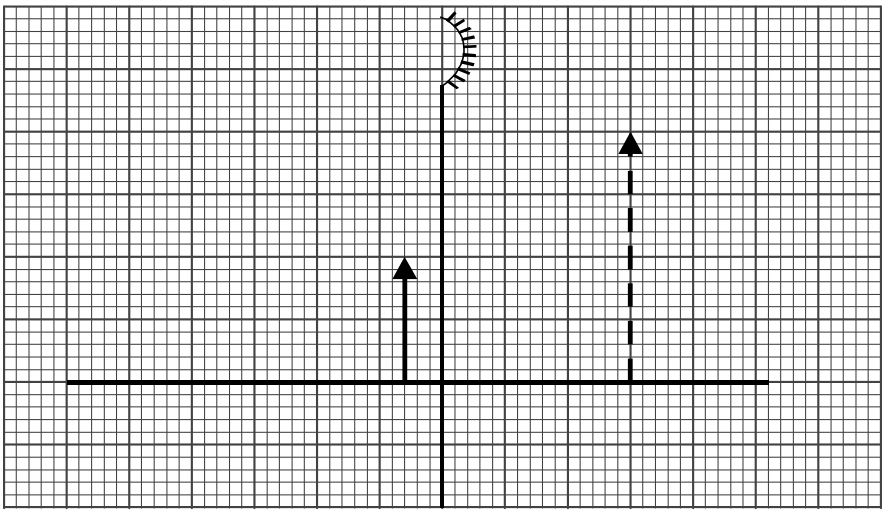


Figure 2

Locate position of its principal focus. (2mks)

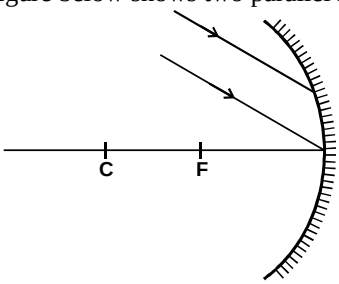
10. A lady holds a large concave mirror of focal length 80cm, 60cm from her face. State two characteristics of her image in the mirror. (2mks)

11. The figure which is drawn to scale 1 : 5, represents an object O and its image I formed by a concave mirror.



(i) By drawing suitable rays, locate the mark on the figure the position of the principal focus F of the mirror. (3 marks)

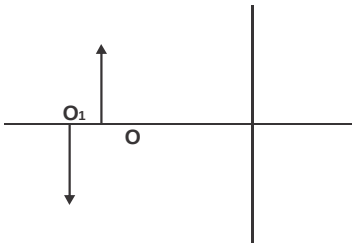
12. The figure below shows two parallel rays incident on a concave mirror. F is the focal point of the mirror.



Sketch on the same diagram the path of the rays after striking the mirror. (2 marks

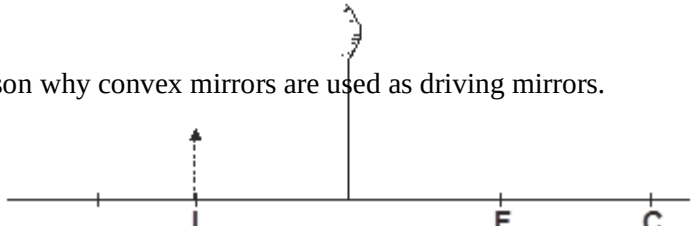
13. A diverging lens of focal length 10cm produces a virtual image half the size of the object. Find the distance between the object from the lens. (3 marks)

14. The figure below shows the object O and its image O_1 formed by a concave mirror. Locate the position of the principle focus. (2 marks)



15. The figure below shows an image I formed by an object placed infront of a convex mirror. C and F are the centre of curvature and principal focus of the mirror respectively. Using appropriate rays locate the object position. (3 marks)

16. State one reason why convex mirrors are used as driving mirrors. (1 mark)



NAME	
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SOUND QUESTIONS

20. The range of audible frequencies varies from 20 Hz to 20 kHz. If the speed of sound is 340 m/s, what is the corresponding range of wavelength? (3marks)

21. Explain how an increase in temperature affects the speed of sound in air. (1 mark)

22. (a) **Figure 13** shows a loudspeaker producing sound waves in air.

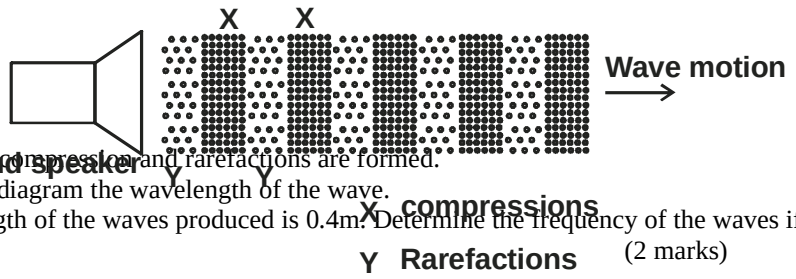


Fig 13

(i) Explain how compressions and rarefactions are formed. (2 marks)
(ii) Show on the diagram the wavelength of the wave. (1 mark)
(iii) The wavelength of the waves produced is 0.4m. Determine the frequency of the waves if the speed of sound in air is 330m/s. (2 marks)

23. A fathometer produces sound in a ship and receives two echo's where there is a raised sea bed. One after 2.5 seconds and the other after 3.0 seconds. Find the height of the raised sea bank if the velocity of sound in water is 1460m/s. (4mks)

24. A hunter standing some distance from a cliff blows a whistle and hears its echo 2 seconds later. How far is the cliff from the hunter? (speed of sound in air=340m/s) (2mks)

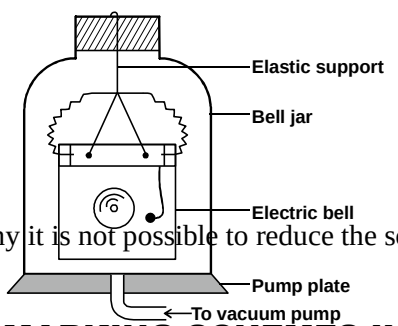
25. State **one** factor that affects the speed of sound in a solid. (1 mark)

26. A policeman standing between two high walls fires a gun. He hears the first echo after 3 seconds and the next 2 seconds later. What is the distance between the wall. (Take velocity of sound = 330m/s). (2mks)

27. A student shouts and hears an echo after 0.6 seconds. If the velocity of sound is 330m/s. Calculate the distance between student and reflecting surface. (3mks)

28. A soldier standing some distance from a wall blows a whistle and hears its echo 3.6 seconds later. How far is the wall from the soldier?(Speed of sound in air is 360m/s) (3mks)

29. The diagram below shows a set up that was used to demonstrate that sound requires a material medium for transmission.



Give two possible reasons why it is not possible to reduce the sound completely when air is pumped out. (2 marks)

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TURNING EFFECT OF FORCE QUESTIONS

Specific Objectives

- Moment of a force, unit of moment of a force
- Principle of moments
- Problems on principle of moments (consider single pivot only)

8. A uniform 120m metal rod is pivoted near one of its ends and kept in equilibrium by a spring balance as shown in figure 3.

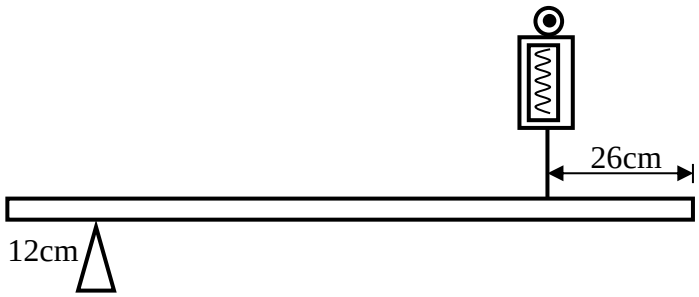
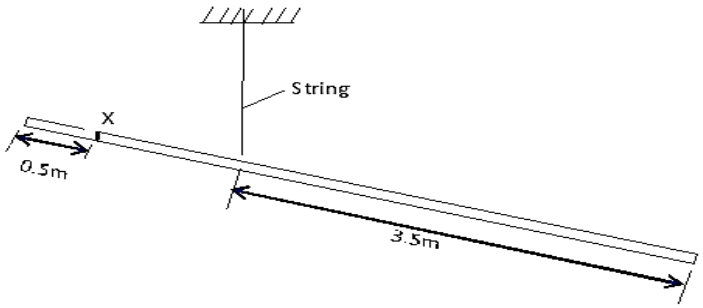


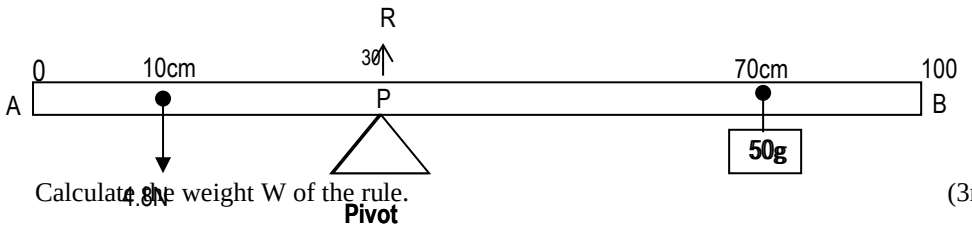
Figure 3

The reading indicated by the spring balance is 2.0N. Work out the mass of the metal rod. (g = 10N/kg)(3 marks)

9. The diagram below shows a uniform 5m long metal rod of mass 800g. It is suspended by a string tied at a point 3.5m from one end. Determine the load which should be hung at point X to keep the plank horizontal. (3 marks)

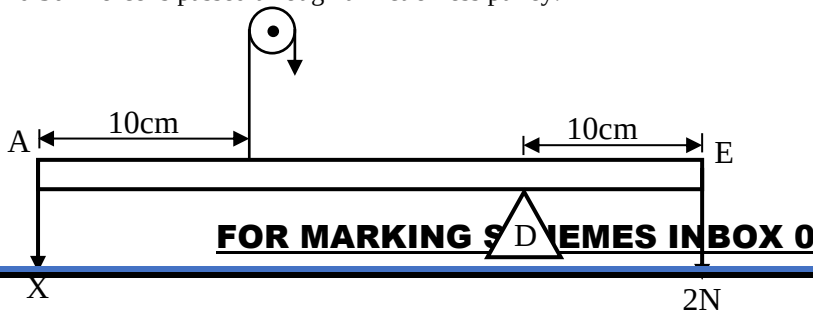


10. The figure below show a uniform metre rule balanced when pivoted at the 30cm mark under the conditions of forces as shown below.



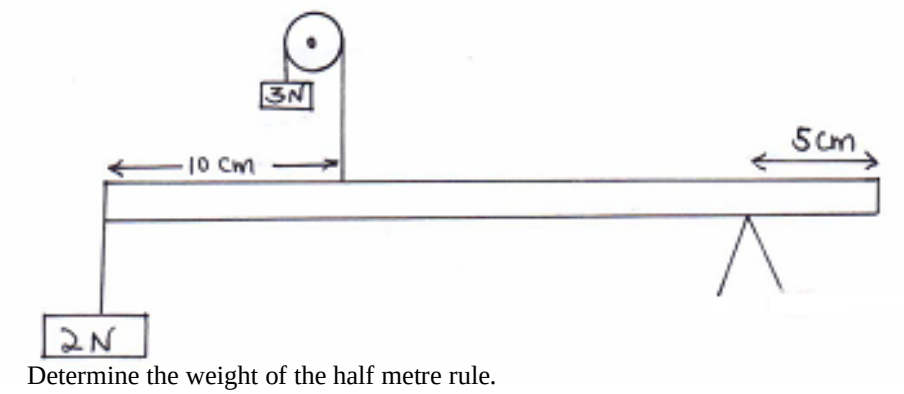
Calculate the weight W of the rule. (3marks)

11. The figure below shows a uniform rod **AE** which is 40cm long. It has a mass of 2kg and pivoted at **D**. If 2N is acting at point **E**, and 30N force is passed through a frictionless pulley.



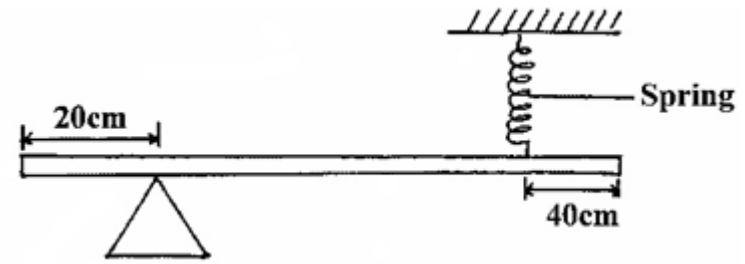
Find the force X acting at end **A**. (3 marks)

12. A uniform metre rule is supported by force of 3N and 2N as shown in figure 3 below.



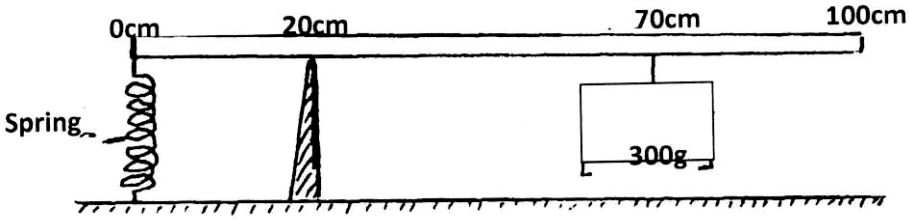
Determine the weight of the half metre rule. (3mks)

13. The figure below is a uniform bar of length 2.0m pivoted near one end. The bar is balanced horizontal by a spring.



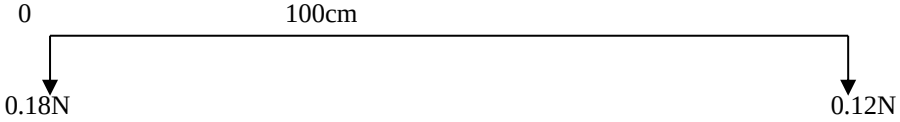
Given that the tension on the spring is 1.2N, determine the weight of the bar. (3mks)

14. The figure below shows a uniform metal rod of mass 100g balanced over a pivot using a spring balance and a mass of 300g.



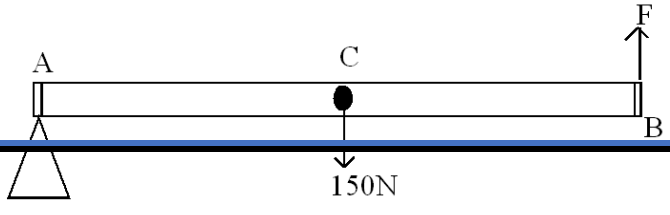
Calculate the tension in the spring. (3mks)

15. The figure below shows a uniform metre rule of weight 1N with two weights 0.18N and 0.12N suspended from its ends.

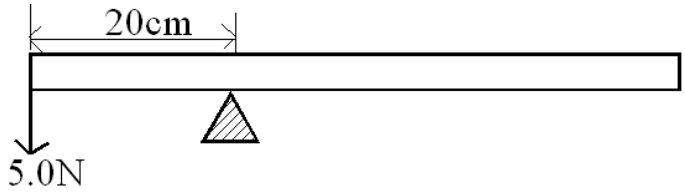


Determine how far from the 0.18N weight a pivot should be placed in order to balance the metre rule. (3 Mks)

8. In the figure 5 below distance AC = kB, calculate the force F that will keep the system in equilibrium. (2mks)

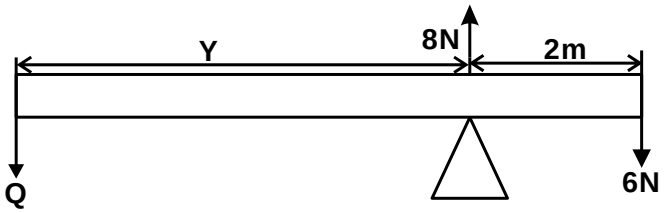


9. A uniform metre rule is balanced as shown below.



Find the weight of the metre rule. (2mks)

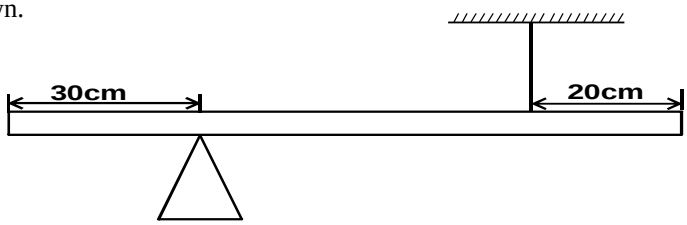
10. A Planck of negligible weight is kept in a horizontal position by the forces shown in the diagram below.



(i) Calculate the magnitude of force Q. (1 mark)

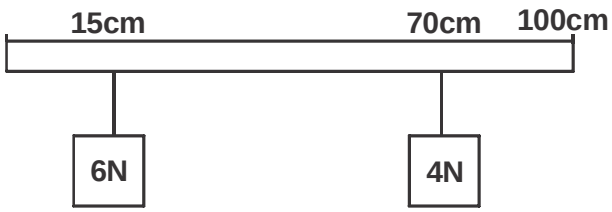
(ii) Calculate the value of Y. (2 marks)

11. The figure below shows a uniform bar of length 1.4m pivoted near one end. The bar is kept in equilibrium by a string as shown.



Given that the weight of the bar is 1.5N, determine the tension in the string. (3 marks)

12. Figure 5 below shows a uniform metre rule of weight 3N supporting two weights. The metre rule is pivoted somewhere such that it is horizontally balanced. (pivot not shown)



The 6N weight is at 15cm mark while the 4N weight is at 70cm mark. Determine the position of the pivot from zero cm mark. (3 marks)

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WAVES QUESTIONS

6. A vibrator is sending out 8 ripples per second across a ripple water tank. The ripples are observed to be 4cm apart. Calculate the velocity of the ripples (2 marks)

7. The range of audible frequencies varies from 20 Hz to 20 kHz. If the speed of sound is 340 m/s, what is the corresponding range of wavelength? (3marks)

8. Distinguish between transverse waves and longitudinal waves. (1mark)

9. Plane water waves produced in a ripple tank are passed from a region of deep water into a region of shallow water. **Figure 5** shows the top view of the tank.

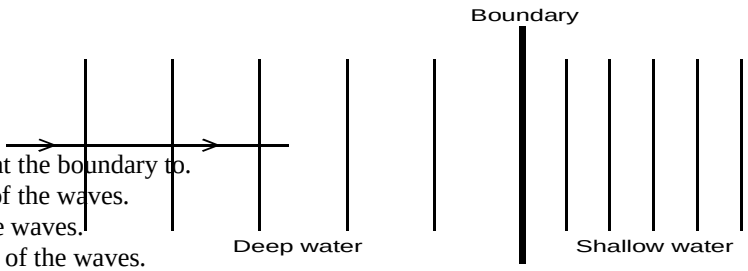
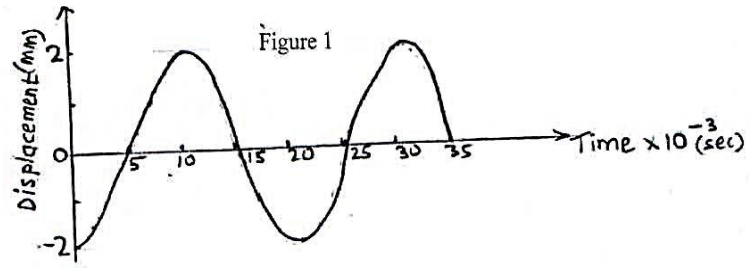


Fig 5

State what happens at the boundary to.
(a) The frequency of the waves. (1 mark)
(b) The speed of the waves. (1 mark)
(c) The wavelength of the waves. (1 mark)

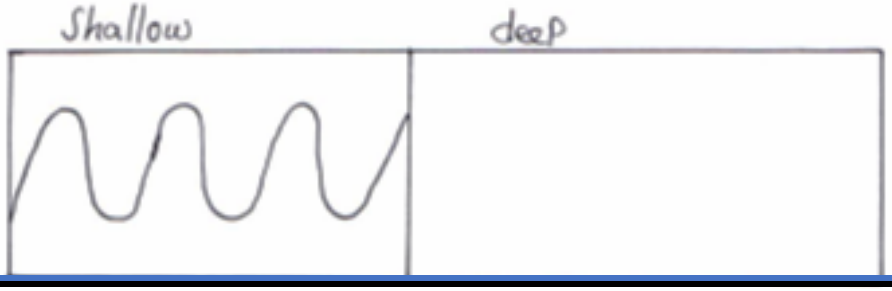
10. Distinguish between longitudinal and transverse waves giving one example of each. (3 marks)

11. Figure 1 represents a displacement – time graph for a wave.



Determine the frequency of the wave. (3 marks)

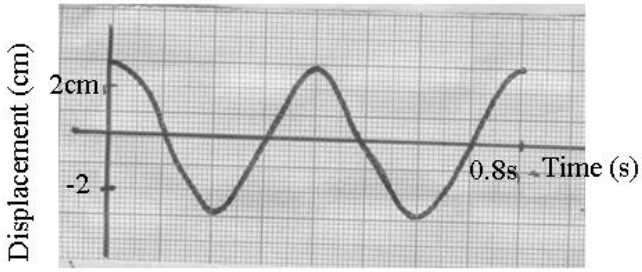
12. Figure 6 below shows a progressive wave incident from a shallow end to a deep end.



(a) Sketch the appearance of the wave in the deep region. (1mk)

(b) State the property of waves demonstrated in the figure above. (1mk)

13. (a) The figure below show the displacement time graph of a wave traveling at 400cm/s.

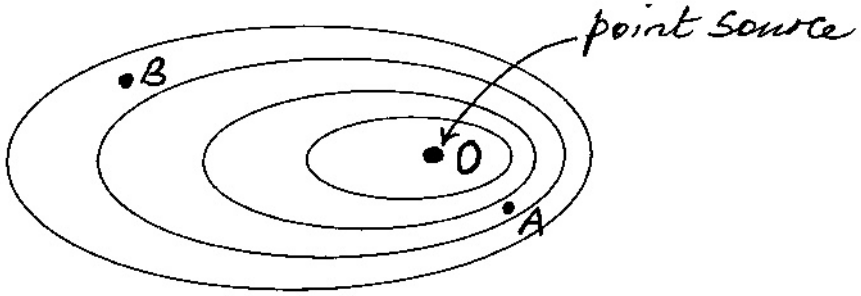


Determine for the wave the:

(i) Amplitude (1mk)
(ii) Period (1mk)
(iii) Frequency (2mks)
(iv) Wavelength (3mks)

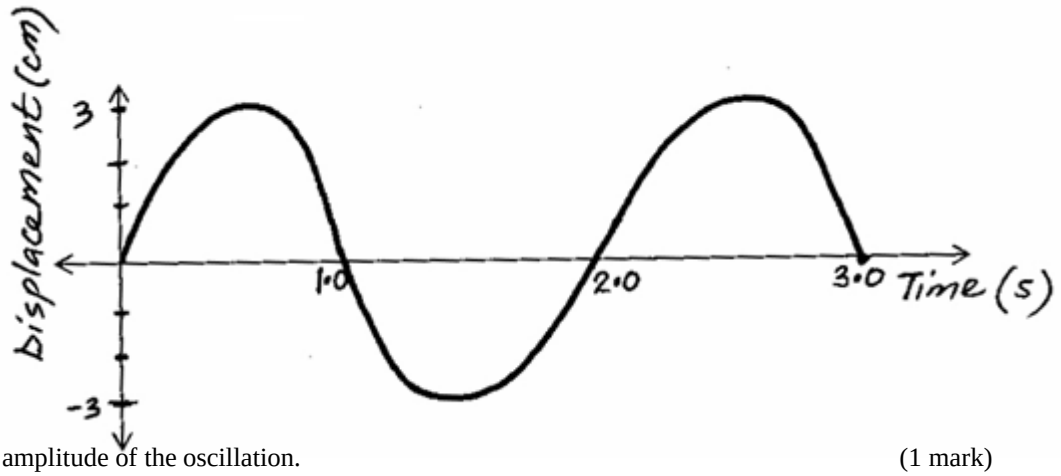
14. State **one** example of a transverse-progressive wave. (1 mark)

15. The figure shown below illustrates crests of circular water wave-fronts radiating from a point source O in a pond.



State how the depth of the pond at **A** compares with that at **B**. (1 mark)

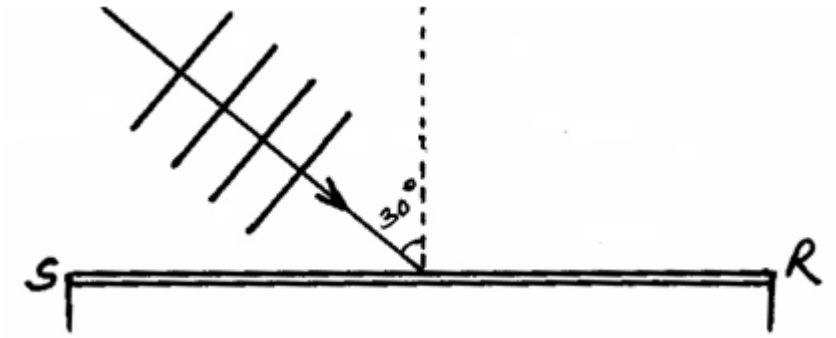
16. The graph in the figure below shows the displacement of a pendulum bob from its rest position as it varies with time.



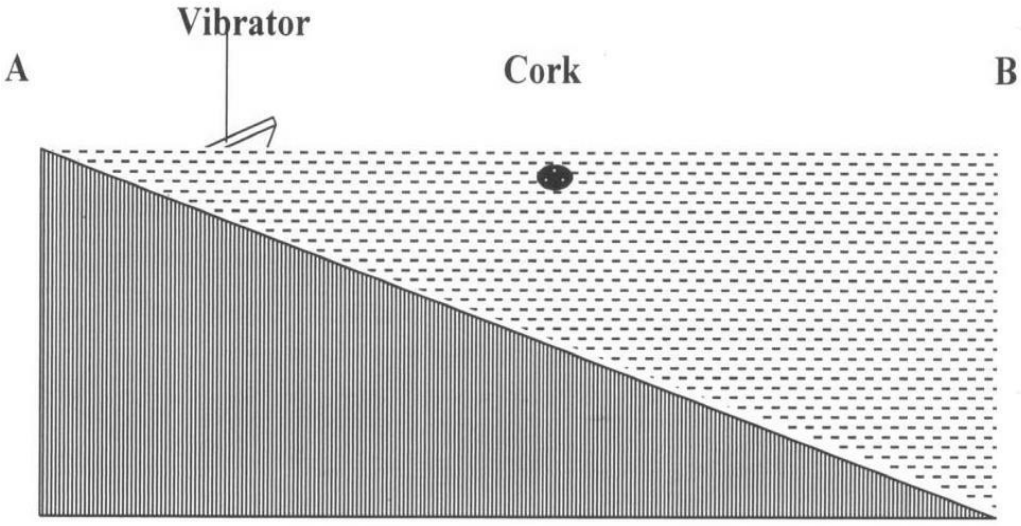
(i) Determine the amplitude of the oscillation. (1 mark)
(ii) What is the time for one complete oscillation? (1 mark)

(iii) On the same graph, draw a sketch graph which represents a pendulum swinging with half the amplitude and twice the frequency. (2 marks)

(iv) Plane water wave fronts are incident onto reflector **SR** as shown in the figure below. Show on the diagram the nature and direction of the reflected wave fronts. (1 mark)



17. (a) The figure below shows the cross-section of a ripple tank full of water. a piece of cork floats on the surface of water and a straight edge vibrator placed at shallow end A to generate waves that travel to deep end B.



Name the type of wave generated on the water surface. (1mk)

The cork is observed to stay put despite passing water waves. Explain this observation. (2mks)

It was estimated that successive waves pass the cork every 0.25 seconds. If the speed of the waves is 0.28m/s, determine the frequency and wave length of the waves at that point. (4mks)

In the space provided, sketch the wavelength as viewed from a point above the ripple tank. (1mk)

A

(a) A ship sends out an ultrasound whose echo is received after 10 seconds. If the wavelength of the ultrasound in water is 0.05m and the frequency of the transmitter is 50KHz, determine the depth of the ocean.

18. Use figure 5 to answer following question.

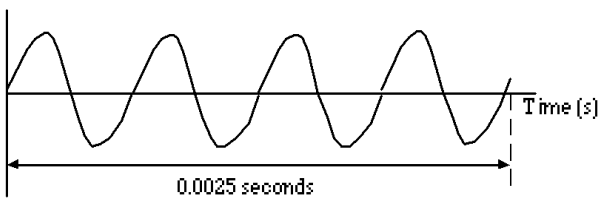


Figure 5

Determine the frequency of wave. (3mks)

19. Figure 6 shows water waves moving towards barrier.

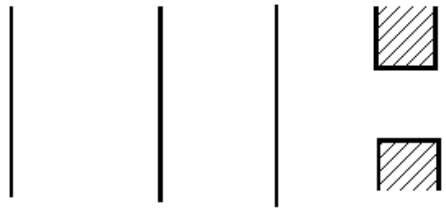


Figure 6

20. Figure 4 shows water waves incident on a shallow region of the shape shown with dotted line

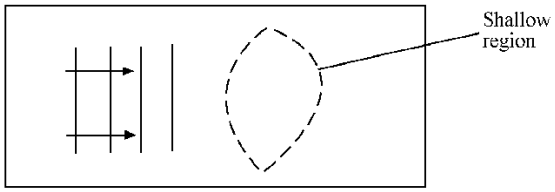


Figure 4

On the same diagram, sketch the wave pattern in and beyond the shallow region. (1mk)

21. Figure 4 shows how the displacement varies with time for a certain wave.

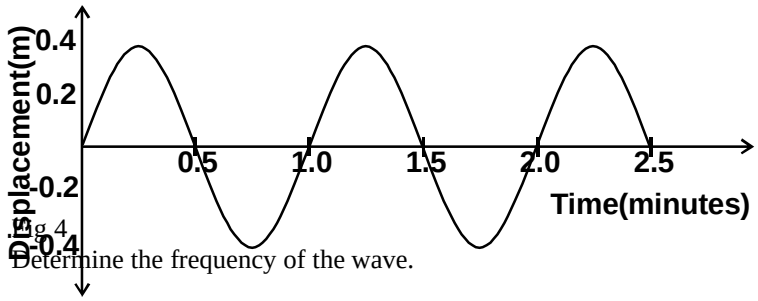
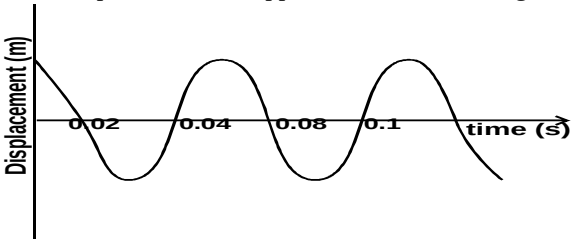


Fig 4

Determine the frequency of the wave. (2 marks)

22. The receiving part of a TV aerial should have a length equal to half the wavelength of the incoming waves. What is the ideal aerial length for reception of TV transmission of frequency 400MHz. (Speed of radio waves = 3×10^8m/s) (3 marks)

23. Water waves are produced in a ripple tank. The following is an example of the wave from that was observed.



(a) (i) From the graph determine the frequency of the wave. (2 marks)

(ii) Derive an equation relating velocity of a wave, frequency and wavelength. (2 marks)

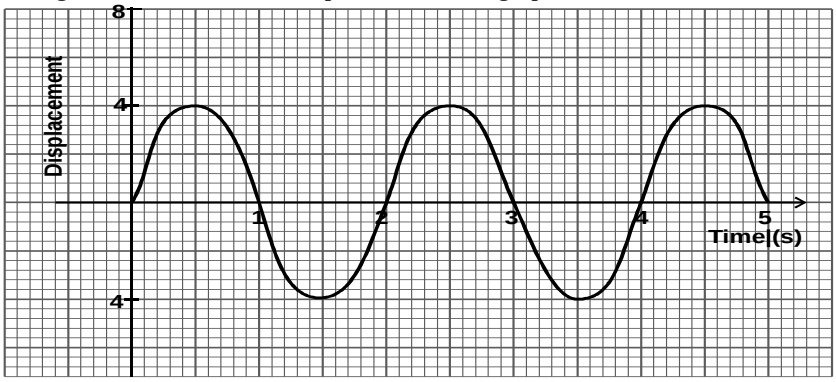
(b)Ultrasound scanning can be used by doctors to obtain information about internal structure of human body without the need of surgery. Pulses of ultrasound are sent into the body from the transmitter placed on the skin.

(i) The ultrasound used has a frequency of 4.5MHz. State why waves of this frequency are called ultrasound.(1 mark)

(ii) A pulse of ultrasound enters the body and its reflection returns to the transmitter after a total time of 1.6×10^{-4}S. Calculate how far the reflecting surface is given that the average speed of ultrasound in a body = $1500ms^{-1}$(3 marks)

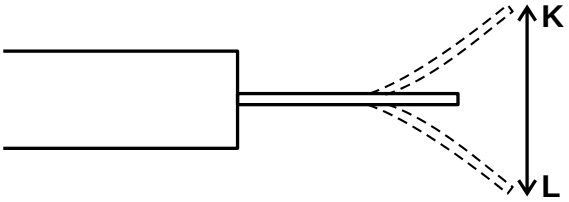
(iii) State why the ultrasound sources are transmitted in pulses. (1 mark)

24. The figure below shows the displacement-time graph for a certain wave.



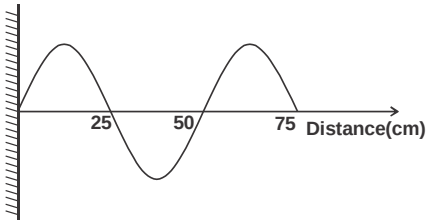
Determine the frequency of the wave. (2 marks)

25. Figure 1 below shows a vibrating hack saw blade.



The time interval for the blade to move from K to L is 0.008 seconds. Determine the frequency of vibration. (3 marks)

26. Figure 8 is an illustration of a wave pattern.



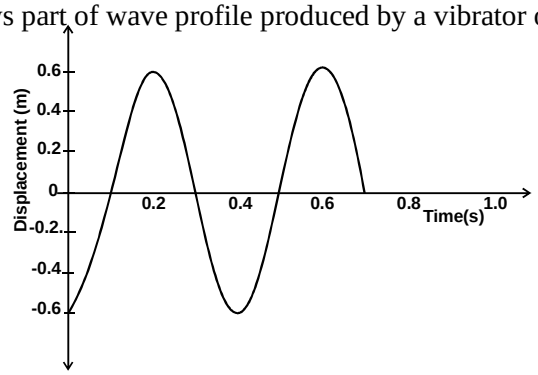
i) State with reason the type of wave shown. (2 marks)

ii) Determine the wavelength of the wave. (1 mark)

iii) Calculate the frequency of the wave given that the speed of the wave is 9m/s. (3 marks)

22. (a)Distinguish between transverse and longitudinal waves. (2 marks)

b) Figure below shows part of wave profile produced by a vibrator on the surface of water.



Calculate the

i) Period (1 mark)

ii) Frequency (1 mark)

iii) Wavelength if velocity of the wave is 330m/s (3 marks)