MECHANICS (ESSAY)

EXERCISE

1 (a) (i) What is meant by the term **pressure**? State its S.I Unit. (2)

(ii) Briefly explain why the tyres of a tractor are large and wide. (2)

(b) In an experiment to determine the density of paraffin by Hare's apparatus, the following results were obtained:

Length of water column = 16cm

Length of paraffin column = 20cm

Calculate the density of paraffin. (3)

(c) (i) What is meant by the term **atmospheric pressure**? (1)

(ii) Describe an experiment to show that the atmosphere exerts pressure. (5)

(d) (i) State four applications of atmospheric pressure. (2)

(ii) Explain why cooking may be impossible at a mountain top. (2)

2. (a) Define the following terms;

(i) Density (1)

(ii) Relative density (1)

(b) Briefly describe an experiment to determine the density of a floating body. (7)

(c) A stone of mass 5g was lowered into a solution of turpentine of relative density 1.6, if the relative density of the stone is 2.0. Calculate the mass in kg of the turpentine displaced by the stone.

(5)

(d) Explain why the mass of an object is the same on the moon and on earth but weight is different. (2)

3. (a) State **Pascal's principle** of transmission of pressure. (2)

(b) Briefly describe the principle and action of a bicycle pump. (7)

(c) Some water was put in an empty tin and boiled for several minutes. The tin was tightly covered and the heating stopped immediately. Cold water was run over the tin.

(i) State what happened to the tin. (1)

(ii) Briefly explain the observation in c (i) above. (3)

(d)

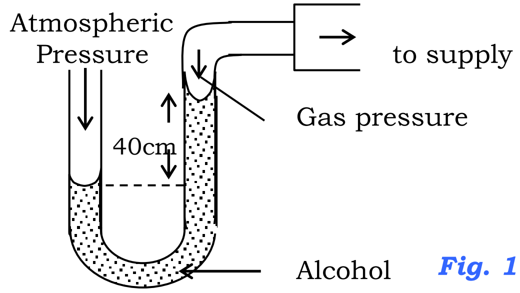


Fig. 18

The diagram in figure 18 above shows a simple manometer used to determine the pressure of a gas supply. If the atmospheric pressure acting on the open end of the tube is 1.0 x $10^5 Nm^{-2}$, and the density of alcohol is $800kgm^{-3}$, calculate the pressure of the gas. (3)

4. (a) State the **work-energy theorem**. (1)

(b) (i) Define the term **mechanical power**. (1)

(ii) A crane of mass 300kg is raised by an electric motor through a height of 60m in 45 seconds. If the efficiency of the motor is 80%, find the useful power put into the motor. (4)

(c) What is meant by the following?

(i) **Mechanical advantage** (1)

(ii) **Velocity ratio**. (1)

(d) (i) Draw a diagram to show a pulley system of velocity ratio 5. (3)

(ii) Describe an experiment to determine the efficiency of the pulley system above. (5)

5. (a) Define **pressure**. State its S.I unit. (2)

(b) State two factors on which the pressure of a liquid depends. (2)

(c) A metallic box of mass 100kg is suspended in water using a rope, so that its upper face is 0.20m below the water surface, see figure 19 below.

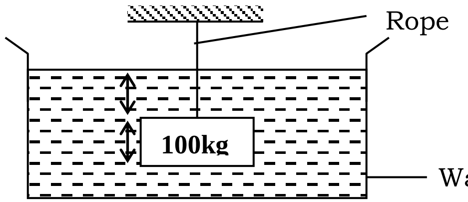


Fig. 19

(i) Calculate the pressure in excess of atmospheric pressure at the top and at the base of the box, given its height is 0.30m. (6)

(ii) If the area of the top and the base of the box is $0.5m^2$, find the corresponding forces acting on each of these faces. (4)

(d) Explain why mercury is used in a barometer rather than water. (2)

6. (a) (i) State the **principle of moments**. (1)

(ii) State the factors on which the moment of a force depends. (2)

(b) Describe an experiment to find the mass of a metre rule. (4)

(c) What is meant by:

(i) The mechanical advantage (1)

(ii) Efficiency of a machine? (1)

(d) A pulley system of velocity ratio 3 and an efficiency of 75% raises a load of 12kg at a constant speed. Find the:

(i) size of the effort needed. (4)

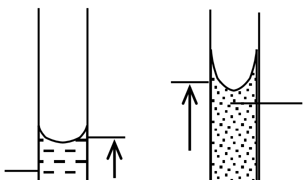
(ii) work done by the effort, if the load is lifted through 0.5m. (3)

7. (a) Define **pressure**. (1)

(b) (i) State two factors on which pressure in liquids depend. (2)

(ii) Explain why an elephant is able to walk on a soft river bank where as a cow sinks on the same bank. (3)

(c)



Alcohol

Water 15cm

12cm

Mercury

The figure 20 above shows a manometer containing alcohol, water and mercury.

(i) Explain why the meniscus of mercury curves upwards and that of alcohol downwards. (2)

(ii) Calculate the density and relative density of alcohol. (3)

(d) Briefly describe the action of a **lift pump**. (5)

8. (a) (i) State the **principle of moments**. (1)

(ii) Describe an experiment to find the **centre of gravity** of an irregular shaped lamina of a cardboard. (5)

(b) A uniform rod of mass 10kg and length 3.2m is placed horizontally across smooth supports A and B.

If A is 20cm from one end and B is 100cm from the other end, find the forces A and B. (5)

(c) A spring is stretched 0.02m by a weight of 4.0N.

Calculate the;

(i) force constant, k. (3)

(ii) weight of an object, which can cause an extension of 0.08m. (2)

9. (a) State what is meant by the following;

(i) Uniform retardation. (1)

(ii) Free-fall. (1)

(b) A body is fired horizontally with a speed of $25ms^{-1}$ from a cliff 180m above the ground.

Calculate;

(i) the time taken before the body hits the ground. (2)

(ii) the horizontal distance traveled. (2)

(c)

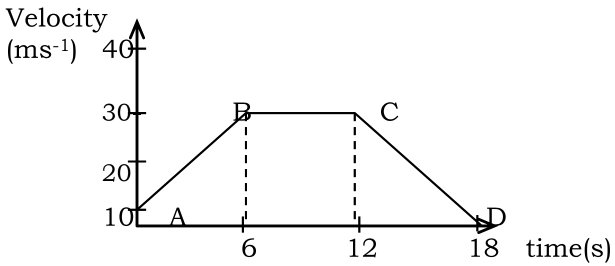


Fig. 21

The diagram in figure 21 above represents a **velocity-time** graph of a body in motion.

(i) Describe the motion of the body. (2)

(ii) Calculate the total distance traveled. (3)

(d) (i) What is meant by the terms **scalar** and vector quantities. Give two examples of each. (2)

(ii) State the condition under which a body is said to be in mechanical equilibrium. (1)

(e)

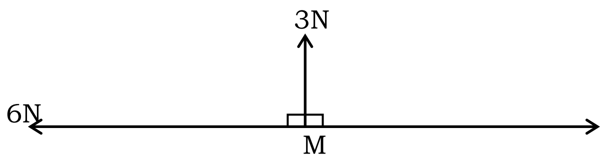


Fig.22

Forces of 3N, 6N and 10N act on a body of mass 2kg, initially at M as shown in figure 22 above. Find the;

(i) magnitude of the acceleration with which the body moves. (2)

(ii) magnitude of the equilibrant force. (1)

10. (a) What is meant by **acceleration due to gravity**? (1)

(b) An object is projected in air and falls to the ground after a certain time (t). Sketch;

(i) Distance-time graph for the motion. (3)

(ii) Velocity-time graph for the motion. (3)

Explain the shape of each graph.

(c) The motion of a car at different speeds is shown in the table 1.0 below;

Table 1.0

Speed in ms^{-1}	0	3	8	15	24	35	49	65
Time/s	0	1	2	3	4	5	6	7

(i) Plot a graph of speed against time. (6)

(ii) Calculate the distance traveled between 5 and 7 seconds. (3)

11. (a) Describe an experiment to estimate the thickness of an oil molecule. State any assumptions made in this experiment. (6)

(b) Use the kinetic theory to explain the following observations;

(i) Ice melts faster when salt is sprinkled on it. (2)

(ii) The temperature of a fixed mass of a gas at a constant volume increases when the temperature increases. (2)

(iii) Evaporation results in cooling. (2)

(c) $0.5cm^3$ of oil was mixed with $199.5cm^2$ of ethanol. $1cm^3$ of solution when placed on the surface of clean water spreads into a patch of area $100cm^2$. Calculate the thickness of the oil patch. (4)

12. (a) (i) State **Newton's laws of motion**. (3)

(ii) Show how Newton's second law may be used to define a unit of force. (3)

(d) A man of mass 50kg rests on the floor of a lift when standing. Calculate the reaction at the man's feet when;

(i) The lift is stationary. (3)

(ii) The lift accelerates upwards at $2ms^{-2}$. (3)

(e) Explain why the man in (b) above feels weightless when the lift moves downwards. (2)

(f) With the aid of a diagram explain the principle and action of a rocket engine. (3)

(g) State the differences between a petrol engine and a diesel engine. (2)

13. (a) Draw a labeled diagram of a block and tackle pulley system which has two pulley wheels in each block. (2)

(i) How would you measure the effort necessary to lift a load of 60N using this system? (2)

(ii) Explain how far the effort moves if the load moves vertically by 10cm. (2)

(iii) Calculate the effort required to lift this load in (ii) above if the efficiency of the system is 75%. (2)

(b) The readings obtained in such an experiment are as follows: W is the load attached to the lower pulley block.

Table 1.1

Load W (N)	0.2	0.6	1.0	1.5	2.0	2.4	3.0	4.0	5.0
Efficiency (%)	20	48	60	68	73	76	80	82	82

Plot a graph of efficiency against Load (W)

(i) Comment on the shape of the graph. (5)

(ii) Read from the graph, the efficiency for W = 1.2N and hence calculate the effort required to lift this load. (3)

14. (a) (i) Define the centre of gravity of a body. (1)

(ii) Describe an experiment to find the centre of gravity of an irregular card board. (4)

(b) Explain what is meant by;

(i) Stable equilibrium. (2)

(ii) Unstable equilibrium. (2)

(iii) Neutral equilibrium. (2)

(c) A uniform metre rule of weight 0.8N is suspended horizontally with two spring balances **P** and **Q** at marks 5cm and 95cm respectively. An object **X** of weight 0.4N is suspended at mark 27.5cm.

(i) Draw a neat diagram showing the forces on the ruler. (2)

(ii) Calculate the readings on the spring balances **P** and **Q**. (3)

15 (a) Use kinetic theory of matter to explain why liquids expand more than equal volumes of solids when heated through the same temperature. (3)

(b) Give one application of expansion of solids. (1)

(c) Explain why thermal radiation passes more easily into a green house than out of it. (2)

(d) A drop of olive oil of volume $0.1mm^3$ is placed on the surface of clean water. It spreads out completely into a patch of area $100cm^2$.

(i) Calculate the thickness of the oil patch. (4)

(ii) Estimate the number of molecules in $0.1mm^3$ of the oil. State any assumptions made. (6)

16 (a) Define the following terms

(i) Displacement (1)

(ii) Retardation (1)

(iii) **Uniform acceleration**. (1)

(b) A body is projected vertically upwards. Sketch the following graphs to represent the motion

(i) Distance – time graph (2)

(ii) Displacement – time graph (2)

(c) A body of mass m, is acted on by a force F, to give it an acceleration a. Show that the above quantities are related by F = ma. (3)

(d) A bullet of mass 0.01kg is fired into a block of wood of mass 0.39kg lying on a smooth surface. After impact, the wood moves with a speed of $10ms^{-1}$. Find the

(i) velocity of the bullet before collision (2)

(ii) total Kinetic energy before and after collision. Deduce the loss in kinetic energy of the system. (4)

17 (a) (i) State Archimedes principle (1)

(ii) Describe an experiment to verify Archimedes principle. (5)

(b) A metal cube of side 2cm weighs 0.56N in air. Calculate

(i) the apparent weight when the cube is wholly immersed in spirit of density $0.85gcm^{-3}$. (3)

(ii) Density of the metal of which the cube is made. (3)

(c) Describe the construction and working of a hydrometer. (4)

18 (a) State the law of conservation of linear momentum. (1)

(b) A gun of mass 20kg is used in firing at armed robbers. If the bullets used have a mass of 150g and released at a speed of $300ms^{-1}$, calculate the recoil velocity of the gun. (3)

(c) (i) Define a *Joule* (1)

(ii) Define ***work, power*** **and** ***energy*** (3)

(d) A man of mass 57kg climbs a 6.5m high ladder in 5 seconds. Calculate the;

(i) Work done by the man. (2)

(ii) Power developed by the man. (2)

(e) Briefly describe the action of a rocket engine. (4)

19 (a) (i) What is meant by *friction*? (1)

(ii) Name advantages of friction. (2)

(iii) Give two ways of reducing friction. (2)

(b) With aid of a diagram describe an experiment to determine the density of an irregular stone in the laboratory. (4)

(c) A bucket containing $5 \times 10^{-3} m^3$ of oil has a mass of 7.0kg. The mass of the empty bucket is 0.5kg.

(i) Calculate the density of oil. (2)

(ii) If the bucket is made of a metal of density $7800kgm^{-3}$, calculate the volume of material used to make the bucket. (3)

(d) Name two ways by which the stability of a bus can be increased during manufacturing. (2)

HEAT

EXERCISE

1 (a) Define specific latent heat of vaporization. (1)

(b) Describe with the aid of a diagram an experiment to determine specific latent heat of vaporization. What precautions are in this experiment? (5)

(c) Ice, when mixed with water, removes heat from water at a rate of $30Js^{-1}$. How long will it take to convert 1kg of water at 20^0C to ice at 0^0C? (4)

(d) With the aid of a diagram, show how convection currents occur in gases. (4)

(e) Explain why a person feels cold after taking a bath. (2)

2. (a) State three differences between evaporation and boiling (3)

(b) Use the molecular theory of matter to account for the drop in temperature when a volatile liquid evaporates rapidly. (6)

(c) A lump of copper of mass 0.5 kg is placed in an oven for some time and then transferred quickly to a large dry block of ice at 0^0C when the temperature of the lump drops to 0^0C, 0.3 kg of the ice is found to have melted.

(i) Estimate the temperature of the oven (3)

(ii) Give two sources of errors in the above estimate (2)

(d) (i) What is a bimetallic strip? (2)

(ii) Name three practical applications of bimetallic strips (3)

3. (a) Define *temperature* in terms of kinetic theory. (1)

(b) Give four reasons why water is never used in thermometers. (4)

(c) The fundamental interval of a thermometer is 30cm long, on a mercury column; find the temperature that corresponds to the length of 12cm from the lower fixed point. (3)

(d) (i) Define *specific latent heat of fusion.* (1)

(ii) Calculate the amount of heat absorbed by 200g ice at -4^{0}C to 123^{0}C. (5)

(e) State one instance that shows that evaporation causes cooling. (5)

4. (a) Differentiate between *convection* and *radiation.* (4)

(b) Describe an experiment which can be performed to show convection in a liquid. (5)

(c) (i) Draw a well labeled diagram of a vacuum flask (2)

(ii) Explain how a vacuum flask minimizes heat losses. (5)

(d) Explain why a car radiator is made of metal fins and painted black. (4)

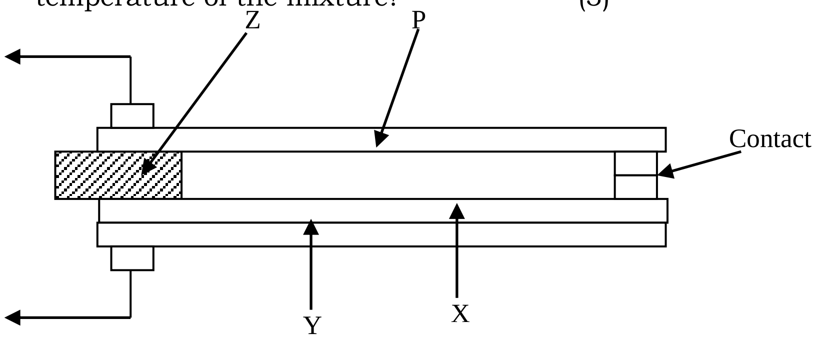
5 (a) Explain how evaporation of a liquid causes cooling of the liquid. (3)

(b) (i) Define specific heat capacity. (1)

(ii) With the aid of a labeled diagram, describe how specific heat capacity of water can be determined. State the precautions required. (5)

(c) 0.1kg of steam at 100^{0}C was bubbled through 5kg of water in a lagged aluminium can of mass 0.5kg both at 0^{0}C. What is the temperature of the mixture? (3)

(d)



The diagram shows a thermostat which switches off when the temperature of a flat iron reaches a desired value.

(i) What materials are P, X, Y and Z made of? (2)

(ii) Explain why the contact opens when a certain temperature is exceeded. (2)

(iii) What changes should be made if the thermostat is to used in refrigeration? (2)

6. (a) Define the following;

(i) Heat capacity (1)

(ii) Specific latent heat (1)

(b) 0.6kg of water at 70^{0}C is contained in a well insulated container made of a poor conductor of heat. 0.2kg of ice is added to the water. When all the ice has melted the temperature of water is 40^{0}C. Calculate the specific latent heat of fusion of ice. (4)

(c) (i) Describe an experiment for the determination of the upper fixed point. (4)

(ii) The length of the mercury column when in melting ice and boiling water is 5cm and 30cm respectively. What is the temperature reading if the length is 25cm? (4)

(d) State two qualities of a good thermometric liquid. (2)

OPTICS

EXERCISE

1. (a) State one property of light that a pinhole camera illustrates. (1)

(b) State two ways in which the image in a pinhole camera is different from the object. (2)

(c) State the effect on the image, of making the pinhole larger. (1)

Turn Over

(b) What is the effect of moving the pinhole camera closer to the object? (1)

(c) Although a pinhole camera can produce a good photograph, a lens camera is widely used in daily life, state and explain two reasons why this is so. (4)

(d) State two advantages of a pinhole camera over the lens camera.(2)

(e) An object is at a fixed distance from the hole of a pinhole camera, does a change in the distance of the film from the hole make any difference on the size of the image? Explain your answer. (2)

(f) Peter stands at a distance of 5.0m from the hole of a pinhole camera. If the distance of the film from the hole is 20cm and an image 5.0cm long is formed on the film, find the height of Peter. (3)

2 (a) (i) Define *focal length* and *radius of curvature* as applied to a concave mirror. (2)

(ii) An object 2cm high is placed 15cm from the pole of a concave mirror perpendicular to the principal axis. The radius of curvature of the mirror is 10cm. By construction (use a graph paper) determine the position, nature and size of the image formed. (4)

(iii) State two applications of concave mirrors. (2)

(b) Explain the following observations;

(i) A stick appears to be bent when placed in water. (2)

(ii) The light from the star is following a curved path in the earth's atmosphere. (2)

(c) (i) Draw a ray diagram to show the formation of an image by a diverging mirror. (3)

(ii) State one application of such a mirror in d (i) above. (1)

3. (a) Distinguish between a virtual and a real image. (1)

(h) Draw a ray diagram to show how a concave mirror forms a magnified virtual image of an object. (3)

(i) Describe with the aid of a diagram the structure and operation of a lens camera. (4)

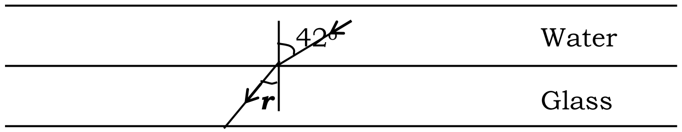
(j) (i) An object 3cm tall is placed perpendicular 45cm in front of a concave mirror of focal length 15cm. By graphical construction determine the position and size of the image formed. (5)

(ii) With the aid of a ray diagram explain why a convex mirror is used as a driving mirror. (3)

4. (a) (i) What is meant by the critical angle.

(ii) With the aid of a diagram explain how total internal reflection occurs.

(b)



The diagram above shows a ray of light incident on the water-glass boundary at an angle of 42°. Calculate the angle of refraction, ***r***, if the refractive index of water and glass are 1.33 and 1.52 respectively.

(c) By scale drawing, determine the position, size and nature of the image formed by a convex lens of focal length 10cm when an object 2.5cm high is placed at a distance of 15cm from the lens.

(d) State one application of a converging lens.

5. (a) Define the following terms as applied to optics

(i) critical angle (1)

(ii) total internal reflection (1)

(b) With the aid of a diagram, describe an experimental determination of both the critical angle and refractive index of the material of a prism. (6)

(c) When a ray of white light is incident on one side of a glass prism at an angle of incidence greater than zero, a spectrum of white light is observed on the screen. Draw two conclusions from the above statement. (4)

(d) List four applications of what total internal reflection. (4)

6. (a) Define the following terms

(i) Principal focus of a converging lens. (1)

(ii) A virtual image (1)

(iii) Total internal reflection (1)

(b) An object 3cm high is placed at right angles to the principle axis of a concave mirror of focal length 15cm. The object is 10cm from the pole of the mirror. Construct an accurate ray diagram to show the image formed. (3)

(c) Use the diagram in (b) above to determine:

(i) The nature of the image (1)

(ii) The image position (1)

(iii) The magnification. (2)

(d) State two applications of a concave mirror. (2)

(e) With aid of a well labeled diagram describe how a lens projector works. (4)

7. (a) State the laws of reflection of light. (2)

(b) (i) An object of height 10cm is placed 5cm from a concave mirror. If a virtual image produced is three times as long as the object, determine by graphical means, the focal length of the mirror. (3)

(ii) Explain why convex mirrors are used as driving mirrors. (2)

(c) (i) Define the terms *critical angle* and *total internal reflection.* (4)

(ii) Explain why the sun appears red at sun set and sun rise. (2)

(iii) Calculate the critical angle for air-glass interface if refractive index of glass is 1.5. (2)

(d) Briefly explain how a mirage is formed. (3)

WAVES

EXERCISE

1. (a) Waves can be classified as longitudinal and transverse. Give two differences between the two types and examples (two for each). (2)

(b) (i) Name the properties common to all electromagnetic waves. (2)

(ii) State, putting them in the order of increasing wavelength, five regions of the electromagnetic spectrum. (3)

(c) Moving across the electromagnetic spectrum from left to right, what property of radiation is;

(i) Decreasing? (1)

(ii) Increasing? (1)

(iii) Constant? (1)

(d) Give two types of electromagnetic waves with wavelength less than 1.0m. (2)

(e) Name the type of electromagnetic radiation which;

(i) Causes a sun-burn. (1)

(ii) Is used to detect aircraft. (1)

(iii) Is used in the treatment of deep-rooted cancer. (1)

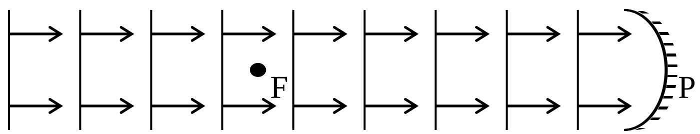
(iv) Is used to detect flows and defects in steel plates. (1)

(v) Is absorbed by glass. (1)

(vi) Is used in security systems. (1)

2. (a) Differentiate between longitudinal and transverse waves and one example of each. (4)

(e)



The figure above shows plane waves incident on a concave reflector with F as the focal point of the curved surface. Sketch the pattern of the reflected waves after reflection by the curved surface up to point P. (3)

(f) A boy standing 100m from the foot of a high wall claps his hands and the echo reaches him 0.5seconds later. Calculate the velocity of sound in air. (4)

(g) Describe an experiment to determine the speed of sound in air by echo method. (5)

3. (a) Distinguish between longitudinal and transverse waves. (3)

(b) Describe an experiment to show interference of water waves. (3)

(c) (i) What are the conditions for the formation of standing waves. (1)

(ii) Name two instruments where standing waves are applied. (1)

(d) Describe the echo method of determining speed of sound in air. (3)

(e) (i) A man stands at a distance of 495m away from a vertical cliff and makes a loud sound. Calculate the time after which he hears the echo. (3)

(ii) In the resonance method of determining the speed of sound in air, a tuning fork of frequency 250Hz was used. Calculate the wavelength of the sound note produced by the fork. (3)

4. (a) What is meant by the following terms as applied to sound?

(i) pitch (1)

(ii) overtones (1)

(iii) timbre (1)

(b) Two stretched strings A and B, of the same material, thickness and length, are fixed side by side on a sounding box. When plucked in turn, A emits a louder note and B emits a higher pitched note. State how the;

(i) tensions in A and B differ (2)

(ii) vibrations of A and B differ with reference to amplitude and frequency (4)

(c) Explain why sound is heard at longer distances from the source in the evening than at mid-day on a hot day. (5)

(d) State two differences between sound waves and light waves. (2)

5. (a) Distinguish between a transverse and a longitudinal wave. Give one example of each. (4)

(b) Define the term *wavelength*. (1)

(c) (i) Name two factors that affect the frequency of a vibrating string. (2)

(ii) Describe how the factors you have named affect frequency. (2)

(d) Describe an experiment to show that sound needs a material medium for transmission. (4)

(e) When a vibrating tuning fork is placed at the mouth of an open tube, the shortest length of a tube for resonance to take place in the tube is 0.12m. The next resonant length is 0.37m. The speed of sound in air is $340ms^{-1}$. Calculate the frequency of the sound produced by the tuning fork. (4)

6. (a) Explain the differences between transverse and longitudinal waves. Give one example of each. (3)

(b) List three differences and three similarities between sound waves and light waves. (3)

(c) Describe the resonance method of determining the speed of sound in air. (4)

(d) A tiny fork is held over a tube containing water. If the frequency of the tuning fork is 320Hz and the speed of sound in air is $330ms^{-1}$, find

(i) the wavelength of the sound produced. (2)

(ii) the smallest length, *l*, for which resonance occurs. (2)

(e) How is the fundamental frequency of a vibrating string affected by increasing?

(i) Length (ii) Tension (iii) Thickness

7. (a) Define a *longitudinal wave*. Give two examples of such a wave. (2)

(b) Distinguish between *compressions* and *rare factions* in a sound wave. (2)

(c) A sound source produces 160 compressions in 10s. The distance between successive compressions is 20m. Calculate the;

(i) Frequency of sound (2)

(ii) Wave speed (2)

(d) Give two properties of sound waves. (2)

(e) Briefly describe an experiment to demonstrate interference of waves. (6)

8. (a) State any two differences between sound waves and light waves. (2)

(b) (i) Describe a simple experiment to determine the velocity of sound in air.

(ii) Explain why the speed of sound is higher in solids than in air. (3)

(c) Two people X and Y stand in a straight line at distances of 330m and 660m respectively from a high wall. Find the time interval taken for X to hear the first and second sounds when Y makes a loud sound. (Speed of sound in air = $330ms^{-1}$) (3)

(d) (i) What is meant by a *stationary wave*? (1)

(ii) Give any two conditions for a stationary wave to occur. (2)

(iii) Name one musical instrument which produces stationary waves. (1)

ELECTROSTATICS

EXERCISE

1. (a) Draw a labeled diagram of a gold-leaf electroscope charged positively. (4)

(b) Describe an experiment to charge a metallic sphere negatively. (4)

(c) What is meant by an *electric field*? (1)

(d) Draw the electric field pattern for;

(i) a positively charged hollow sphere. (1)

(ii) two parallel plates with opposite charges at a distance apart. (1)

(iii) two negatively charged point objects. (1)

(e) Briefly explain how lightning is formed. (4)

2. (a) State the law of electrostatics. (1)

(b) Describe an experiment to charge a gold-leaf electroscope negatively. (4)

(c) (i) Explain what happens when a positively charged rod is brought near the cap of an uncharged electroscope and slowly taken away. (3)

(ii) How can an electroscope be used to test whether a material is a conductor or an insulator. (4)

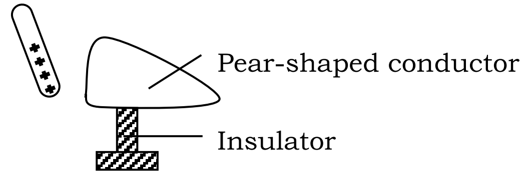
(d) Explain how a lightning conductor safeguards a house against lightning.

3. (a) (i) Which of the following substances are conductors and which ones are insulators; Water, Copper sulphate, wood, human body, glass, ebonite

(ii) Distinguish between an insulator and a conductor. (2)

(b) A glass rod rubbed against a woolen cloth is said to be positively charged and the woolen cloth positively charged. Explain how they acquire these charges. (3)

(c) In the diagram below, a positively charged glass rod is brought close to a pear-shaped conductor.



(i) Explain how the pear-shaped conductor may be charged using the positively charged glass rod, and state the type of charge it will acquire. (3)

(ii) Show the distribution of charge on this conductor. (2)

(iii) The pear-shaped conductor loses charge faster when a needle is attached at point P. Explain how this happens. (3)

4. (a) State the laws of electrostatics. (1)

(b) With the aid of a diagram briefly describe how two bodies acquire similar charges by induction. (4)

(c) A charged conductor was brought near the cap of an uncharged gold-leaf electroscope and slowly taken away. State what was observed.

(d) Give two uses of a gold-leaf electroscope. (2)

(e) Sketch field patterns between;

(i) An isolated positive charge. (1)

(ii) A positive plate and a negative point charge. (2)

(f) Explain briefly how leakage of charge occurs at sharp points. (3)

5. (a) Describe how you would use a gold leaf electroscope to determine the sign of the charge on a given body. (5)

(b) Explain how an insulator gets charged by rubbing. (3)

(c) Sketch the electric field pattern between a charged point and a metal plate. (2)

(d) Describe how a lightning conductor safeguards a tall building from being struck by lightning. (6)

MAGNETISM, ELECTROMAGNETIC INDUCTION

EXERCISE

1. (a) Define the following as applied to magnetism;

(i) Magnetic field. (1)

(ii) Neutral point. (1)

(b) Draw a diagram of the magnetic field pattern for a bar magnet with its pole facing north, in the earth's magnetic field. (2)

(c) Describe how you can plot the magnetic field around a wire carrying a current perpendicular to the plane of the paper. (3)

(d) Explain briefly what is meant by mutual induction. (1)

(e) (i) Mention the causes of energy losses in a transformer and how they can be minimized. (4)

(ii) A transformer is designed to produce an output of 220V when connected to a 25V supply. If the transformer is 80% efficient, calculate the current when the output is connected to a 220V, 75W lamp. (4)

2. (a) State the laws of electromagnetic induction. (2)

(b) (i) With aid of a diagram describe how an a.c generator works. (7)

(ii) Draw a graph showing the variation of current with time for an a.c generator. (1)

(c) State the causes of the energy losses in a transformer and how they can be minimized. (4)

(d) A transformer has primary voltage of 240V, 5oHz with the number of turns in the primary greater than the number of turns in the secondary.

(i) Explain the effect of increasing the primary frequency to 100Hz on the secondary voltage when the primary voltage is kept at 240V. (1)

(ii) Explain the effect on the secondary if the primary a.c supply is replaced by a 240V d.c supply. (1)

3. (a) State three factors which affect the resistance of a conductor. (3)

(b) Describe the structure and action of an a.c generator. (6)

(c) (i) Explain the difference between the step up and step down transformers. (3)

(ii) A step up transformer is designed to operate from a 20V supply and deliver energy at 250V. If the transformer is 90% efficient determine the current in its primary winding when the out put terminals are connected to a 250V, 100W lamp. (4)

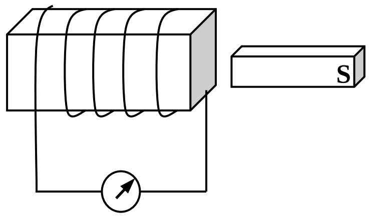
4. (a) Draw a well labeled diagram of a moving coil galvanometer and describe how it works. (6)

(b) A galvanometer has a coil of resistance 20Ω and it gives a full scale deflection when a current of 50mA passes through it. Calculate the

Turn Over

value of the resistance that must be used so that the galvanometer may measure a current up to 2A. (4)

(c) The diagram below shows a coil connected to a galvanometer.



(i) State what will be observed when the magnet is pushed into the coil.

(ii) State what will be observed when the magnet is pulled out of the coil. (1)

(iii) Explain the observations above. (4)

ELECTRICITY AND ELECTROSTATICS

EXERCISE

1. (a) State the law of electrostatics.

(b) (i) Explain why two bodies charged by friction gain equal and opposite charges.

(ii) State two effects of charging by friction.

(c) What is meant by the term electric field?

(d) Draw the electric field pattern for;

(i) Two like charges close to each other.

(ii) Two oppositely charged parallel metal plates at a small distance apart.

(e) Describe how a lightning conductor works to safeguard a building.

(f) Give three differences between charging by electrostatic induction and conduction.

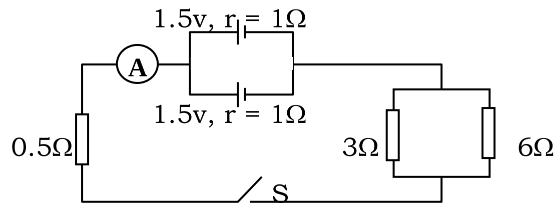
2. (a) State the use of the following in power supply systems;

(i) Fuse (1)

(ii) Earth connection. (1)

(b) Describe with the aid of a circuit diagram, how you would verify Ohm's law. (4)

(c)



The diagram above shows two cells each of *e.m.f* 1.5V and internal resistance of 1.0Ω connected to a circuit which includes switch S. Calculate;

(i) The reading of the ammeter A. (3)

(ii) The voltage across the 0.5Ω resistor when S is closed. (2)

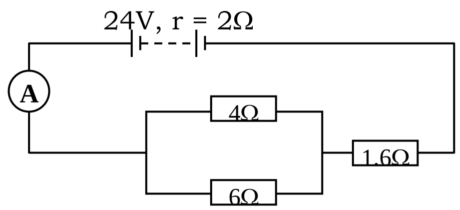
(d) Describe the mode of operation of a simple d.c generator. (5)

3. (a) What is meant by electromotive force of a cell? (1)

(b) With the aid of a diagram, describe how a dynamo generates *e.m.f.* (4)

(c) The resistance of a galvanometer is 5Ω and its full scale deflection is 10mA. Calculate the value of the resistance that should be connected to it so that it reads 1.5V. (3)

(d)



A battery of *e.m.f.* 24.0V and internal resistance 2Ω is connected to three resistors as shown in the diagram above. Find;

(i) Reading of the ammeter. (3)

(ii) Current through the 6Ω resistor. (3)

(iii) Power dissipated in the 6Ω resistor. (2)

4. (a) (i) What is a fuse? (1)

(ii) A vacuum cleaner has a rating of 720W, 240V.

What fuse should be fitted in the plug for the appliance to work normally? (3)

(b) An electric kettle containing 2kg of water is connected to a 240v mains supply and it draws a current of 10A. Calculate the

(i) power of the Kettle (2)

(ii) energy produced in 20 seconds (2)

(iii) rise in temperature assuming energy lost is negligible (3)

(c) A meter has resistance of 20Ω and gives a full scale deflection when a current of 50mA passes through it. Calculate the value of the resistance which must be used so that the meter may measure.

(i) Current up to 2A (2)

(ii) Potential difference up to 100V. (3)

5. (a) Define the following terms

(i) Potential difference. (1)

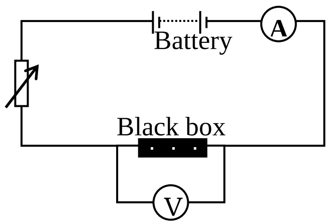
(ii) A volt (1)

(b) An electric kettle is rated “2kW, 240V”.

(i) State what is meant by the markings on the kettle. (2)

(ii) Find the resistance of the element of the kettle when it is working. (3)

(c)



The circuit above was used by a student in a physics practical to investigate the variation of V and I of a black box.

The results obtained were as follows:

Current readings / I	0.0	1.0	2.0	3.0	4.0	5.0
Voltage readings / V	0.0	0.2	0.6	1.5	3.0	6.0

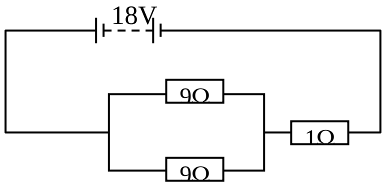
(i) Plot a graph of V and I. (4)

(ii) State with a reason the sort of device connected in the circuit in the black box. (3)

(iii) Use your graph to find the resistance of the device when the operating voltage is 4.0V. (2)

6. (a) Describe a simple experiment to show the variation of current through a conductor and potential difference across its ends. (6)

(b) A battery of e.m.f 18V and internal resistance of 0.5Ω is connected to two 9Ω resistors and a 1Ω resistor as shown below.



(i) Calculate the effective resistance of the circuit. (3)

(ii) Find the rate at which electrical energy is converted into heat energy in the 1Ω resistor. (4)

(c) Four bulbs each rated at 75W operate for 120 hours.

If the cost of electricity is shs.100 per unit, find the total cost in shillings. (3)

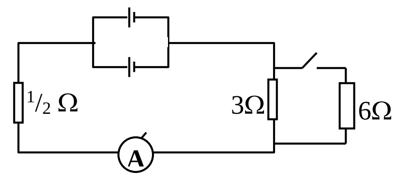
7. (a) What is meant by a *battery*? (1)

(b) (i) With aid of a well labeled diagram, describe briefly how a simple cell works. (4)

(ii) Explain the defects of a simple cell and give the preventive measures.

(d) The diagram below shows two cells each of e.m.f 1.5V and internal resistance of 1.0Ω connected a series of resistances and an ammeter.

(e)



Calculate the current flowing when the switch is;

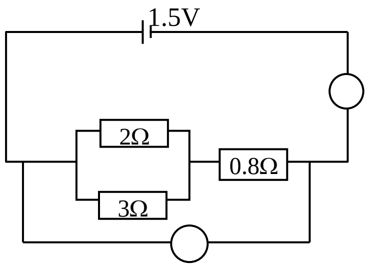
(i) Open (2)

(ii) Closed (3)

(iii) Power dissipated in the 6Ω resistor when the switch is closed.

8. (a) Define *electrical resistance* and state its SI units.

(b) In the circuit below, a dry cell of e.m.f 1.5V is connected across a system of resistors as shown.



If the voltmeter reads 1.0V, find

(i) The ammeter reading (2)

(ii) The internal resistance of the cell (2)

(c) A moving coil galvanometer has full scale deflection current of 1.0mA and coil resistance of 100Ω. How can it be converted into?

(i) An ammeter to read up to 1.0A (3)

(ii) A voltmeter to read up to 10V (3)

(d) Mr. Opetto paid an electricity bill of shs.180 after using two identical bulbs for 2 hours everyday for ten days at a cost of shs.60 per unit.

(i) Determine the power consumption by each of the bulbs. (3)

(ii) State the energy changes that occur in the bulb. (1)

9 (a) (i) State Ohm's law. (1)

(ii) Describe an experiment to determine the resistance of a conductor.

(b) Distinguish between electromotive force and potential difference.

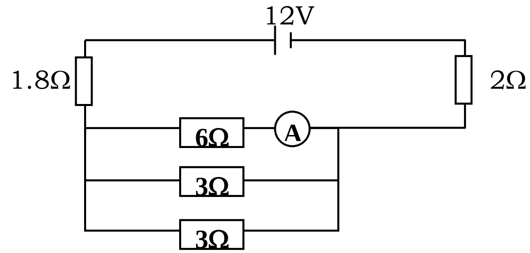
(c) Sketch I – V characteristics for the following;

(i) a filament lamp. (1)

(ii) a semiconductor diode. (1)

(f) The diagram below shows resistances of 1.8 ohms, 2 ohms and 6 ohms connected across a battery of 12V and internal resistance of 1 ohm.

(g)



(i) Calculate the power dissipated in the 2 ohm resistance. (4)

(ii) Find the reading of the ammeter A. (2)

MODERN PHYSICS

EXERCISE

1. (a) What is a radioactive nuclide? (1)

(h) The count rate from a radioactive source was measured at one minute intervals and the following readings were obtained:

Time in min	0	1	2	3	4	5	6	7	8
Counts/ (min)$^{-1}$.	750	610	495	410	330	270	220	180	145

(i) Plot a graph of counts per minute against time. (5)

(ii) From the graph, determine the half-life of the radioactive material. (1)

(iii) Determine the count rate after 5½ minutes. (1)

(i) Briefly describe how cathode rays are produced by thermionic effect. (3)

(j) (i) State two properties of cathode rays. (2)

(ii) Give two uses of x-rays in the field of medicine and any precaution taken by people who operate x-ray machines. (2)

2. (a) What is meant by a radioactive nuclide? (1)

(b) A radioactive nuclide $^{226}_{88}Ra$ decays by emission of two alpha particles and two beta particles to nuclide Y.

(i) Write a balanced equation for the decay process. (3)

(ii) What is the effect on the parent nuclide if it decays by emission of beta and alpha particles? (2)

(c) A certain mass of radioactive material contains 2.4×10^{24} atoms. How many atoms would have decayed after 3200 years if the half-life of the material is 800 years? (4)

(d) Explain two industrial applications of radioactivity. (4)

(e) What precautions are taken when handling radioactive materials? (2)

3. (a) Uranium has <u>a half-life of 5.67×10^3 years</u>. What does the underlined statement mean? (1)

(b) Radioactive substances can emit either alpha –particles, Beta-particles or gamma-rays. Which one:

(i) Travels at the greatest speed? (1)

(ii) Carries a negative charge? (1)

(iii) Forms dense straight tracks in a cloud chamber? (1)

(c) (i) Distinguish between soft and hard x-rays (1)

(ii) How can the penetrating effect of x- rays and intensity of x-rays be increased in an x-ray tube? (4)

(d) How can the knowledge of radioactive elements be used to determine the age of a fossil. (4)

(e) Briefly describe how alternating current can be fully rectified. (3)

4. (a) Define

(i) Isotope (1)

(ii) Half life (1)

(b) 4g of a radioactive sample reduced to 0.25g in 20 weeks. Calculate the half life of the sample. (3)

(c) Briefly describe the structure and action of a thermionic diode. (4)

(d) State the necessary precautions taken by a lab-technician in an X-ray laboratory. (3)

(e) A radioactive material of $^{238}_{92}U$ decays by emission of an alpha particle and two beta particles. What is the composition of the resultant nucleus after the decay? (4)

5. (a) Explain the difference between hard and soft X-rays. (3)

(b) (i) With a labeled diagram describe how X-rays are produced. (7)

(ii) State one industrial use of X-rays. (1)

(iii) State two ways in which X-rays differ from gamma rays. (2)

(c) (i) What is meant by isotopes? (1)

(ii) Naturally occurring chlorine is a mixture of two isotopes. One isotope has 17 protons and 18 neutrons. Find the total mass of each atom. (2)

6 (a) (i) What is meant by the terms *atomic number* and *atomic mass*? (2)

(ii) What would be the composition of the resulting nucleus if $^{234}_{92}U$ decayed by emitting an alpha particle? (2)

(b) Using a Geiger- Muller tube the count rate from a radioactive element is measured daily. The results are shown below.

Turn Over

Time/ day	0	1	2	3	4	5	6
Count rate/ $(min)^{-1}$	12000	7650	5000	3300	2150	1400	900

(i) What is meant by the term *half life*? (1)

(ii) Plot a suitable graph and determine the half life of the element.

(iii) Find from the graph the count rate after 2.5 days. (1)

(c) Give two medical applications of radioactivity. (2)

7 (a) (i) Distinguish between *thermionic emission* and *photoelectric emission.*

(ii) State the conditions for each of the above to occur. (2)

(iii) Mention two applications of each of the effects in (i) above. (2)

(b) With the aid of a well labeled diagram describe how a vacuum diode works.(4)

(c) Describe a simple experiment to show how cathode rays are produced at low pressures. (3)

(d) The X-rays produced in an X-ray tube have frequency of 10^7Hz. Calculate the wavelength of the X-rays. (3)

8. (a) Define the following;

(i) Atomic number (1)

(ii) Mass number (1)

(iii) Isotopes (1)

(b) A radioactive nuclide $^{226}_{88}X$ decays by emission of an alpha particle and two beta particles to nuclide Y. Write an equation for the decay.

(c) State two differences between alpha and beta particles. (2)

(d) With aid of a diagram, explain how a cathode ray oscilloscope works.

(e) State three uses of a cathode ray oscilloscope. (3)

Laws and principles

Newton's laws of motion

- Every body continues in its state of rest or motion in a straight line unless acted upon by an external force. Also called the *inertial law*
- The rate of change in momentum is directly proportional to the applied force and the momentum change takes place in the direction of the force. Also called the *force law*
- For every action there is an equal but opposite reaction force

Conservation of energy: Provided no external acts, the total energy of a system remains constant.

Conservation of momentum: Provided no external force acts on a system of colliding bodies, the total momentum remains constant.

Hooke's law: The deformation of an elastic body is directly proportional to the force producing it provided that the limit of proportionality is not exceeded.

Archimedes' principle: The apparent loss in weight of a submerged body is equal to the weight of the fluid displaced.

Floatation law: A floating body displaces its own weight of the fluid in which it floats.

Principle of moments: For a body in equilibrium, the sum of the clockwise moments is equal to the sum of the anticlockwise moments about a point.

Pascal's principle: When a fluid is enclosed in a vessel and a force applied at any point, the pressure is transmitted equally throughout the whole fluid.

Boyle's law: The volume of a fixed mass of a gas is inversely proportional to the pressure at constant temperature.

Charles's law: The volume of a fixed mass of a gas at constant pressure is proportional to its thermodynamic temperature.

Turn Over

Pressure law: The pressure of a fixed mass of a gas at constant volume is proportional to its thermodynamic temperature.

Laws of reflection

- The incident ray, the reflected ray, and the normal at the point of incidence all lie in the same plane.
- The angle of reflection is equal to the angle of incidence.

Laws of refraction

- The incident and refracted rays are on opposite sides of the normal at the point of incidence, and all three are in the same plane.
- The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant. Also called *Snell's law*

Laws of magnetism

Like *poles* repel and unlike *poles* attract.

Laws of electrostatics

Like *charges* repel and unlike *charges* attract.

Ohm's law: The potential difference across the ends of a metallic conductor at constant temperature is proportional to the current flowing through it.

Laws of electromagnetic induction

- The induced e.m.f is proportional to the rate of change of flux linkage. (Faraday's law)
- The induced current tends to opposite the changes of flux which caused it. (Lenz's law)

Useful formulae

(*letters used in the formulae carry usual meanings*)

Density $\rho = \frac{m}{v}$

Force $F = ma = \frac{m(v-u)}{t}$

Weight $W = mg$

Pressure $P = \frac{F}{A}$

$P = h\rho g$ (For liquids)

Hare's apparatus $\frac{h_w}{h_l} = \frac{\rho_l}{\rho_w}$

Relative density by Archimedes'

$$R.D = \frac{W_a}{W_a - W_w} \quad \text{(For solids)}$$

$$R.D = \frac{W_a - W_l}{W_a - W_w} \quad \text{(For liquids)}$$

Power $P = \frac{w}{t} = \frac{F \times s}{t} = Fv$

Mechanical advantage $M.A = \frac{load}{effort} = \frac{L}{E}$

Velocity ratio $V.R = \frac{\text{effort distance}}{\text{Load distance}}$

Efficiency $\eta = \frac{output}{input} = \frac{M.A}{V.R} \times 100\%$

Wheel and axle $V.R = \frac{2\pi R}{2\pi r} = \frac{R}{r}$

Equations of motion

$$v = u + at \ldots\ldots\ldots\ldots\ldots\ldots(i)$$

$$s = ut + \frac{1}{2}at^2 \ldots\ldots\ldots\ldots(ii)$$

$$v^2 = u^2 + 2as \ldots\ldots\ldots\ldots(iii)$$

Kinetic energy $E_k = \frac{1}{2}mv^2$

Turn Over

Potential energy $E_p = mgh$

Hooke's law; $F = ke$ $\Rightarrow \frac{F_1}{F_2} = \frac{e_1}{e_2}$

Momentum $= mass \times velocity = mv$

Conservation of momentum

$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$ (Elastic collision)

$m_1u_1 + m_2u_2 = \left(m_1 + m_2 \right) v$ (Inelastic collision)

Boyle's law $P_1V_1 = P_2V_2$

Gas equation $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

Heat gained or lost $q = mc\theta$

$q = ml$

Celsius scale $\theta = \left(\frac{l_\theta - l_0}{l_{100} - l_0} \times 100 \right) {}^0\mathrm{C}$

Coefficient of linear expansion $\alpha = \frac{l_\theta - l_0}{l_0\theta}$

Velocity $v = f\lambda = \frac{\lambda}{T}$ (wave motion)

Refraction ${}_an_b = \frac{\sin i}{\sin r}$

$${}_an_b = \frac{realdepth}{apparentdepth}$$

${}_an_b = \frac{1}{\sin c}$ (Critical angle)

Magnification of lens or mirror $M = \frac{v}{u} = \frac{h_i}{h_o}$

Mirror or lens formula $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

(*Real is positive and virtual is negative*)

Power of a lens $p = \frac{1}{f\,(m)}$ (reciprocal of focal length in metres)

Fundamental note of a string $l_1 = \frac{\lambda}{2}$

Speed of wave in a string $v = 2\,fl_1$

Fundamental note in an air column $l_1 = \frac{\lambda}{4}$

Speed of wave in air column $v = 4\,fl_1$

Ohm's law $V = IR$

Resistances in series $R = R_1 + R_2 + R_3 + \ldots\ldots$

Resistances in parallel $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots\ldots$

For two resistances in parallel $R = \frac{product}{sum} = \frac{R_1R_2}{R_1 + R_2}$

Circuit equation $E = I\,(r + R)$

Internal resistance $r = \frac{E - V}{I}$

Electrical power $P_{delivered} = IV$

$$P_{lost} = I^2R = \frac{V^2}{R}$$

Electrical energy $E_{delivered} = Pt = IVt$

$$E_{dissipated} = I^2Rt = \frac{V^2}{R}t$$

Transformer equation $\frac{V_s}{V_p} = \frac{N_s}{N_p}$

Cost of electrical energy = total power (kW) x time (hours) x cost per unit

Radioactive decay: $M_t = \frac{M_o}{2^n}$

$$T_{\frac{1}{2}} = \frac{t}{n}$$

Glossary

Acceleration – rate of change of velocity with time

Acceleration due to gravity – rate of change in velocity with time of a body falling under gravity.

Accommodation - ability of the eye to distinguish two distinct points on a body.

Amplitude – the maximum displacement of a particle from rest position.

Angle of dip – is the angle between the earth's magnetic field and the horizontal. Also called *angle of inclination.*

Antinodes – these are points of maximum displacement on a wave.

Atomic mass – number of protons and neutrons in the nucleus of an atom.

Atomic number – number of protons in the nucleus of an atom.

Centripetal force – force that keeps a body move in a circular path.

Cathode rays – these are fast moving electrons.

Centre of curvature – the radius of the sphere from which the mirror or lens was forming part.

Centre of gravity – the point of application of the resultant force due to the earth's pull.

Couple – these are two equal but opposite forces.

Critical angle – angle of incidence in the dense medium for which the angle of refraction in the less dense medium is 90^0.

Demagnetization – process by which a magnetic material is made to loose its magnetism.

Density – is the mass per unit volume of a substance.

Diamagnetic – materials that are readily repelled by magnets.

Diffraction – bending of a wave motion round an obstacle.

Diffusion – is the spreading of molecules from a region of high concentration to a region of low concentration.

Diode – device that allows current flow in only one direction.

Dispersion – is the splitting of white light into its component colours.

Displacement – distance moved in specified direction.

Domains – these are atomic magnets in a ferromagnetic material.

Echo – this is reflected sound.

Eclipses – these occur when the sun, moon and earth are in a straight line.

Electromagnet – is a solenoid with a core of ferromagnetic material like soft iron.

Electromotive force – is the work done to move a charge of 1 coulomb round a complete circuit including the battery.

Electrophorus – is an induction machine for producing electric charge continuously.

Electrostatic induction – creating charge on a conductor when a charged body is brought close to it.

Ferromagnetic – materials that are strongly attracted by magnets like soft iron, nickel.

Filter – slide that allows light of a single frequency to pass through.

Focal length – is the distance between the optical centre and the principal focus.

Turn Over

Free fall – is the motion of a body under the influence of gravity as the only force acting.

Frequency – is the number of vibrations or oscillations per second.

Fundamental frequency – is the minimum possible frequency a body can vibrate with.

Fuse – a devise that breaks the circuit in case of huge currents.

Half life – time taken for the initial mass of radioactive material to decay by a half.

Heat capacity – quantity of heat required to raise the temperature of a given mass of a body by 1^0C or 1K.

Impulse – is the product of force and time of action of the force or it is the change in momentum of a body.

Inertia – is the body's reluctance to start or stop moving.

Internal resistance – is the opposition to the flow of current by the source itself.

Isotopes – atoms of the same element with the same atomic number but different mass numbers.

Joule – work done when a force of 1N moves through a distance of 1m.

Kilowatt hour – is the energy supplied by a rate of working of 1000 watts for one hour.

Lagging - process of using a material of low thermal conductivity to prevent heat loss.

Latent heat – hidden heat required to change the state of a substance without change in temperature.

Local action – formation of hydrogen bubbles on the cathode due to impurities in the metal cathode.

Longitudinal wave – one whose propagation is parallel to the direction of travel of the wave.

Magnetic field – region around a magnet where a magnetic force is felt.

Magnification – ratio of image distance to object distance or ratio of image height to object height.

Moment of a force – product of force and its perpendicular distance from the turning point.

Noise – this is disorganized sound

Parallax – apparent movement of an object due to motion of another body.

Period – time taken to complete one cycle or oscillation.

Photoelectric effect – process by which electrons are given off from a heated metal surface.

Polarization – formation of hydrogen bubbles on the anode due to discharge of hydrogen on the anode.

Power – rate at which work is done.

Pressure – force acting normally per unit area.

Principal focus – point on the principal axis through which rays parallel and close to the principal axis converge after reflection or refraction from the lens or mirror.

Radioactivity – spontaneous decay of unstable materials accompanied by emission of radiations.

Radioisotopes – unstable materials that continuously decay releasing radiations.

Real image – one formed by actual intersection of light rays.

Rectification – conversion of alternating current to direct current.

Reflection – bouncing back of light rays off a highly polished surface.

Refraction – bending of light rays as light moves from one optical medium to another.

Refractive index – ratio of sine of angle of incidence to sine of angle of refraction for a given pair of media.

Relative density – ratio of density of a substance to density of water.

Resistance – opposition to the flow of current by a device.

Turn Over

Resonance – when a body oscillates at its own natural frequency as a result of impulses received from another system vibrating with the same frequency.

Solenoid – is a coil of insulated wire of many turns.

Specific heat capacity – amount of heat required to raise the temperature of 1kg of a substance by 1K.

Specific latent heat – quantity of heat required to change the state of 1kg of substance at constant temperature.

Surface tension – tangential force acting perpendicularly to any line drawn on the surface of a liquid.

Thermionic emission – process by which electrons are given off from a metal surface when light of high energy falls on it.

Total internal reflection – occurs when the angle of incidence in the dense medium is slightly greater than the critical angle.

Transverse wave – one whose propagation is perpendicular to the direction of travel of the wave.

Uniform acceleration – when the velocity changes equally during equal time intervals.

Up thrust – upward force on a body due to the fluid in which it is placed.

Velocity – rate of change of displacement.

Virtual image – one formed by apparent intersection of light rays.

Watt – rate of doing work of 1J every second.

X- Rays – electromagnetic waves of short wavelength produced when fast moving electrons strike matter.

Turn Over