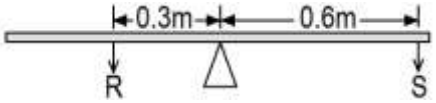
ST JOSEPH'S SEMINARY
S.4 PHYSICS REVISION QUESTIONS SET 2 2022

1. (a) (i) Define moment of a force.
(ii) State the principle of moments.
(b) Describe an experiment to determine the mass of an object using a metre rule and a single known mass.
(c) A uniform beam of weight 2.5 N is pivoted at its midpoint as shown below.



The beam remains in equilibrium when forces R and S act on it. If R is 5N, find
(i) the value of S.
(ii) the reaction at the pivot.
(d) Write down two applications of moments.

2 a) Define the joule.
(i) What is linear momentum?
(ii) State the law of conservation of linear momentum.
b) A bullet of mass 20g is fired into a block of wood of mass 400g lying on a smooth horizontal surface. If the bullet and the wood move together with a speed of 20 ms^{-1} ,calculate (i) the speed with which the bullet hits the wood.
(ii) the kinetic energy lost.
(iii) State the energy changes involved.

3 (a) With the aid of a well labelled diagram briefly explain how a pure spectrum may be produced.
a. (i) What are primary colours? Name them.
(ii) Explain briefly what happens when white light falls on a green body.
b. With the aid of a well labelled diagram describe how a lens camera works.
c. Light traveling in water is incident at a water air surface at 30°. What is the angle of refraction if the refractive index of water is 1.33?

4 (a) (i) Draw a labelled diagram of a lead acid accumulator.

(ii) Write down three precautions necessary to prolong the life of an accumulator.

(iii) State two disadvantages of a nife cell over a lead acid cell.

a. What is meant by the following terms;

i. Electromotive force

ii. Internal resistance of a cell?

b. A cell is connected in series with an ammeter and a variable resistor. The potential difference V across the resistor varies with current I.

Sketch a graph of V against I and show how you can use it to determine the e.m.f and internal resistance of the cell.

5) (a) State three differences between sound and light waves.

(b) i) Explain how stationary waves are formed.

(ii) State three main characteristics of stationary waves.

(c) (i) Define the terms frequency and wavelength as applied in waves

(ii) Describe an experiment to demonstrate resonance in sound.

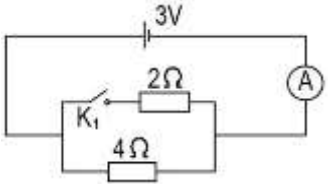
(d). The velocity and frequency of sound in air at a certain time were $320ms^{-1}$ and 200Hz respectively. At a later time, the air temperature changed causing the velocity to change to $340\ ms^{-1}$. Determine the corresponding change in the wave length if the frequency remains unchanged.

6 (a) (i) Electromotive force (emf) and Internal resistance of a cell.

(a) Write down two factors that determine internal resistance.

a. Write down six ways the life of an accumulator can be prolonged.

(b) Define the following terms;



The figure above shows an ammeter A, two resistors 2Ω and 4Ω connected to a source of e.m.f of 3 V and negligible internal resistance. Determine the reading of the ammeter if

(i) K_1 is open.

(ii) K_2 is closed.

(d) An electric fire, a lamp and an electric drill rated at 2000W, 100W and 300W respectively are connected in parallel across a 240V main.

(i) Find the power taken from the mains.

(ii) Find the current supplied by the mains.

7. (a) Describe an experiment to determine the acceleration due to gravity using a simple pendulum.

bWrite down Newton's equations of motion; identifying clearly the symbols used.

c) A car starts from rest and accelerates at 20 ms^{-2} for 30 seconds. It maintains the velocity reached for another 30 seconds before being brought to rest in the next 15 seconds.

(i) Sketch a velocity time graph for the motion.

(ii) Determine the total distance travelled by the car.

d)Two balls, one dropped from rest and another thrown horizontally from the same height reach the ground at the same time. Explain.

e) Three women of average mass 60kg are standing in a lift. Find the reaction force of the floor of the lift when the lift is accelerating upwards at 3 ms^{-1}.

8. (a) (i) What is a magnetic field?

(ii) Sketch the magnetic field between two North-poles of two bar magnets facing each other and show the neutral point on it.

With the aid of a well-labelled diagram describe the structure and mode of action of a moving coil loud speaker.

State the factors which determine the magnitude of a force exerted on a current carrying conductor in a magnetic field.

A DC motor has an armature resistance of 4Ω. If it draws a current of 10 A when connected to a supply of 200V, calculate the,

(i) power wasted in the windings.

(iii) efficiency of the motor.

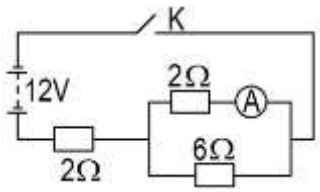
9.(a) Define the following terms

(i) The volt

(ii) Electrical resistance

a. List six ways by which the life of an accumulator can be prolonged.

b. A battery of emf of 12 V and negligible internal resistance is connected to resistances 2Ω, 2 Ω, 6 Ω as shown below.



Find the reading of the ammeter when the switch K is closed.

c. State three advantages of alternating current over direct current in power transmission.

d. Sketch the current versus voltage variation for a semi-conductor diode.

10.(a) (i) What is meant by the strength of a material?

(ii) State the factors which affect the strength of a material.

(b) A spring of natural length 5cm extends by 2mm when a force of 1.8N acts on it. Calculate the extension and strain when a force of 10N is applied to the spring.

(c) Give four reasons why bicycles are made of hollow cylindrical structures.

(d) (i) State the composition of reinforced concrete

(ii) Explain why lower part of a ceiling of a building is made of reinforced concrete while the upper part is not reinforced.

(e) Explain how one can show that a beam on a building is a strut or a tie.

11.(a) State the law of Magnetism

(f) Explain how “keepers” are used to store magnets

(g) With the aid of a labelled diagram describe how a magnet can be made using an electric current, from a bar of magnetic material.

(h) What is meant by;

(i) Magnetic meridian?

(ii) Neutral point in a magnetic field?

(i) Draw the magnetic field pattern.

(i) due to an electric current in a circular coil.

(ii) around two bar magnets placed close to one another with opposite poles facing each other.

12. (a) (i) What is meant by cathode rays?

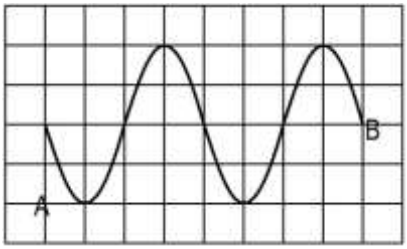
(ii) With the aid of a labelled diagram describe how cathode rays are produced by thermionic effect.

(b) With reference to the cathode ray oscilloscope describe:

(i)The function of the time base.

(iii) How the brightness is regulated.

c) A cathode ray oscilloscope (CRO) with the time base switched on is connected across a power supply, the waveform obtained is as shown in the figure below:



Distance between two lines =1cm

i) Identify the type of voltage generated by the power supply.

ii) Find the amplitude of the voltage generated if the voltage gain is 5Vcm^{-1}.

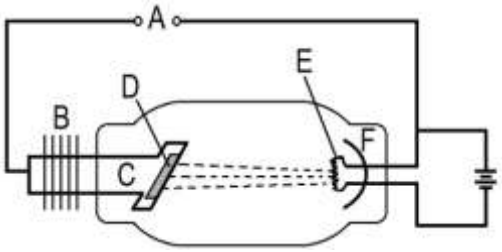
iii) Calculate the frequency of the power source if the time base setting on the CRO is 5.0×10^{-3}scm^{-1}.

13. (a) (i) What is meant by a radio-isotope?

(ii) State one medical, one biological and one industrial use of radioisotopes.

b) Describe what happens when a beam of radiations consisting of alpha particles, beta particles and gamma rays is incident on a thin sheet of lead.

c) Describe what happens when a beam of radiations consisting of alpha particles, beta particles and gamma rays is incident through an electric field.



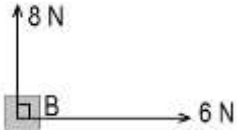
d) The diagram above shows the essential parts of an x-ray tube.
   i) Name the parts labelled A, B, C, D and E
   ii) State the functions of each part.
   iii) Describe how x-rays are produced.

e) What safety precautions must be taken in an x-ray laboratory?

14.(a) (i) Distinguish between scalar and vector quantities. Give two examples of each.

(ii) State the conditions under which a body can be in mechanical equilibrium.

(iii)



A body B is acted on by two forces 8N and 6N at right-angles as shown above. Find the magnitude of the third force needed to keep the body in equilibrium.

(b) What do you understand by the acceleration due to gravity?

(c) A 5 kg mass is dropped from a height above the ground and hits the ground after 4.5 s.
   (i) Find the velocity of the mass as it hits the ground.
   (ii) Calculate the kinetic energy of the mass as it hits the ground.
   (iii) Determine the height from which the mass was dropped.
   (iv) State the energy changes of the mass.

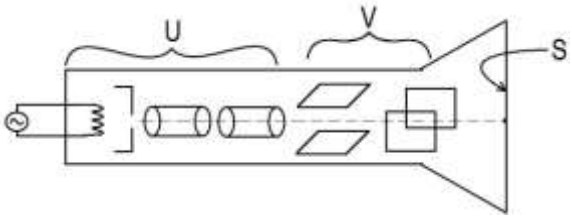
15(a) (i) Distinguish between node and antinode.
   (ii) Explain how a stationary wave is formed.
   (iii) Sketch stationary waves corresponding to fundamental note and first overtone in a closed pipe.

(b) (i) What is meant by resonance?
   (ii) Describe an experiment to demonstrate resonance in air.

(c) A radio station transmits signals at a frequency of 103.7 MHz. Find the wavelength of the signals.

(d) Explain how sound waves travel in air.

16



The figure above shows the main parts of a cathode ray oscilloscope.

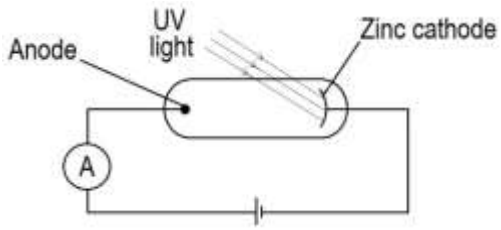
i) Identify the parts labelled U, V and S.

ii) Briefly describe the functions of each of the parts labelled in (i) above

b) i) Name the particles emitted by radioactive materials.

ii) Draw diagrams to show the paths of the particles named in b) i) above in an electric field.

c)



A zinc Cathode was enclosed in an evacuated glass bulb as shown above. The anode and cathode were then connected to an ammeter and source of emf E. When the cathode was irradiated with ultraviolet radiations the ammeter gave a reading.

(i) Explain why the ammeter gave a reading.

(ii) A gas was gradually introduced into the glass tube. Explain what happened.

17 (a) State the

(i) law of conservation of momentum.

(ii) factors on which linear momentum of a body depends.

(b) Explain what happens to a passenger in a bus when the driver brakes suddenly.

(c) (i) State Newton's laws of motion.

(ii) Explain the forces acting on a block of wood resting horizontally on a table.

(d) With the aid of a labelled diagram describe an experiment to measure the uniform velocity of a body using a ticker timer.

18 (a) With the aid of a labelled diagram explain dispersion of white light by a glass prism.

(j) (i) What is a secondary colour?

(ii) Name two secondary colours.

(k) Explain the appearance of a fly with red, yellow and black stripes in white light.

(l) (i) An object of height 0.5 cm is placed 2 cm in front of a convex lens of focal length 3 cm. By graphical method determine the position and height of the image.

(ii) State two applications of convex lenses.

19 (a) Define the following:

(i) A volt

(ii) A kilowatt hour

(b) Explain how a fuse inserted in an electric circuit protects the rest of the circuit against excess current.

(c) An electric lamp is marked 1000W, 250V

(i) What does this statement mean?

(iii) If the lamp is connected to a 250V mains, calculate the current taken.

(iv) What is the cost of running this lamp for one day at shs.50 per KWh.

(d) (i) State ohm's law.

(iii) Describe an experiment to verify ohm's law.

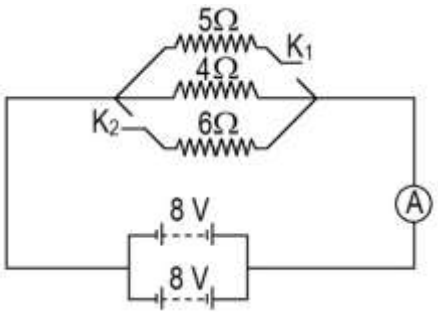
(e) Explain why the ammeter is made of low resistance.

20 (a) (i) State two advantages which lead-acid accumulator has over a dry cell.

i. What is polarization and how it be prevented.

ii. Explain the purpose of a hydrometer when recharging an accumulator.

(b) in an experiment to verify ohm's law it was necessary to maintain the temperature constant, why way the temperature maintained constant?



c) Study the figure above and answer the questions that follow: Determine the;

(i) Current indicated by ammeter, A, when K_1 is open and K_2 is closed.

(ii) Current shown by A when both K_1 and K_2 are closed

(iii) Current shown by A when the three resistors are connected in series.

21 (a) Describe an experiment to determine the acceleration due to gravity using a simple pendulum.

b) Distinguish between Scalar and vector quantities. and give two examples of each.

c) A car starts rest and accelerates at 20 ms^{-2} for 30 seconds. It maintains the velocity reached, for another 30 seconds before being brought to rest in the next 15 seconds.

iii. Sketch a velocity-time graph for the car.

iv. Determine the average velocity of the car.

d) Two balls, one dropped from rest and another thrown horizontally from the same height reach

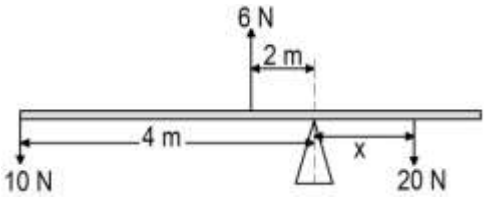
the ground at the same time. Explain

22 (a) Define weight and state its unit.

(b) A person stands on a weighing scale placed on the floor of a lift and the lift is made to move downwards. Explain what happens to the reading of the weighing balance as the lift descends.

(c) Describe an experiment to determine the weight of a uniform meter rule using a known mass and a knife edge only.

d) The diagram below shows a uniform beam



Calculate the value of x when equilibrium is established.

e) State the principle used in (d) above and state one application of the principle.

23 (a) (i) State two factors which affect the frequency of the note produced by a string.

(iii) Why does the quality (timbre) of the sound produced by a violin differ from that produced by a piano?

a. Describe an experiment to show that sound waves do not travel through a vacuum.

b. A pipe is closed at one end has a length of 10cm. if the velocity of sound in the air of the pipe is 340ms^{-1}. Calculate;

i. the fundamental frequency

ii. the first overtone frequency

c. State four differences between sound waves and electromagnetic waves.

24

(a) A radioactive nuclide $^{236}_{92}U$ decays by emission of two alpha particles and two beta particles to form a nuclide

(i) What is meant by a radioactive nuclide?

(ii) Give four differences between alpha and beta particles

b) four precautions that would have to be taken when handling radioactive materials.

c) A certain mass of radioactive materials contains 2.4x10^{12} radioactive atoms. How many atoms will have decayed after 3200 years if the half- life of the material is 800 years.

d) Explain briefly one industrial application of radioactivity

e) Briefly describe full wave rectification.

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