HOLY CROSS LAKE VIEW S.S.S JINJA

**S.4 2019 PHYSICS RECESS QUESTIONS**

1. (a) Write a statement of the law of flotation. (1mark)

(b) Describe how the law of flotation can be verified in the laboratory. (4marks)

(c) A piece of wax of density 0.95gcm-3 and mass 190g is anchored by a 50m length of cotton to a weight at the bottom of a vessel containing salt water of density 1.05gcm-3. If the wax is completely immersed , Find the

(i) tension in the string

(ii) volume of the water displaced. (4 marks)

(d) State Archimedes principle (1mark)

(e) A block of wood of mass 24kg floats is water.

The volume of the wood is 0.032m3

Find the

1. volume of the block below the surface of the water.
2. density of the wood.(Density of water = 1000kgm-3) (6 marks)

2. (a) Distinguish between apparent weight and up thrust. (2 marks)

(b) (i) State three different types of hydrometers and their uses.

(6 marks)

(ii) Describe the structure and working of a hydrometer.

(5 marks)

(c) A plastic block of volume 200cm3 is suspected of having air bubbles in it. It is tested by floating it in water of density 1000kgm-3 and it is found to float with 90% of its volume immersed.

The density of plastic is 1200kgm-3. Calculate the total volume of the air bubbles. (4 marks)

3. (a) (i) State Hooke’s law (1mark)

(ii) Draw a sketch of a graph of extension against load for an elastic material. (3marks)

(b) Describe a simple experiment to verify hooke’s law. (5marks)

(c) (i) What is a plastic material? (1mark)

(ii) Give three examples of plastic materials. (3 marks)

(d) (i) Distinguish between ties and struts. (2marks)

(ii) Explain why most roof structures are made with triangular sections. (2 marks)

A

B

F

C

D

E

**X Sec. Sch.**

The figure shows the sign post of x secondary school made out of glass rods.

1. Identify the glass rods under tension and those under compression forces. (5 marks)
2. Give a reason why the structure may not last for long time.

(2 marks)

4. (a) Distinguish between momentum and moment of a force. (2 marks)

(b) Describe an experiment to show that momentum is conserved during inelastic collision. (4marks)

(c) A man 70kg stands on a spring balance inside a lift. When the lift ascends with an acceleration of 2.5ms-2, what is the reading of the

weighing scale?

(d) Two boys of masses 45kg and 60kg sit facing each other on light frictionless trolleys holding the ends of a strong inextensible taut cord between them. If the lighter boy tugs the cord between them, he acquires a velocity of 2ms-1. What is the initial velocity of the other boy? (3marks)

5. (a) (i) Define the terms ; mutual induction and self-induction.

(2 marks)

(ii) State the laws of electrometric induction. (2 marks)

(iii) Describe a simple experiment to demonstrate

electromagnetic induction. (4 mark)

(b) (i) Describe with the aid of a labelled diagram how a d.c.

generator works. (5 mark)

(ii) State one modification which can be made on a d.c

generator to change it into a d.c motor. (1mark)

(c) State four factors that limit the efficiency of an a.c transformer.

(2marks)

(d) The figure below shows a transformer connected in a circuit used to allow a 6V, 12W bulb to operate normally.

**3200**

**Turns**

**6V 12W**

**Bulb**

**240V a.c**

1. Explain how the transformer transfers electrical energy from the primary coil to the secondary coil.
2. Calculate the number of turns in the secondary coil.
3. Find the current in the secondary coil.
4. Find the current in the primary coil assuming that the transformer is ideal.

6. (a) (i) State the laws of electrostatics.

(ii) Explain how two insulators rubbed together acquire equal and opposite charges.

(b) (i) Define the term electrostatic induction.

(ii) Explain how a charged body attracts an uncharged conductor when placed close to each other.

(c) (i) Define the term corona discharge.

(ii) Describe how a lightening arrestor works.

1. The surface of a positively charged conductor is connected to the metal cap of a neutral gold leaf electroscope. Explain what is observed if a pin is placed on top of the conductor with its blunt end in contest with the conductor and the sharp end in air.

(d) (i) Explain how gold leaf electroscope can be used to detect the

sign of charge on a charged body.

(ii) Why are metal chains attached to the trucks carrying petrol or other inflammable materials and dangling at the rare end of the trucks?

7. (a) (i) Define the terms E.m.f and internal resistance of a cell.

(ii) State Ohm’s law and state its limitations.

(b) (i) Describe an experiment to measure the internal resistance of

a cell.

(ii) Explain the differences in the design, connection and the

working of ammeters and voltmeters.

(c) Explain briefly, how the following sources of electricity work.

(i) Thermocouple

(ii) Piezo electricity

(d) Two indentical cells each of e.m.f 1.5V and internal resistance 1.0Ω are connected to 3Ω, 4Ω and 6Ω are shown in the circuit diagram below. K1 and K2 are switches.

K**1**

K**2**

1.5V, 1Ω

1.5V, 1Ω

3Ω

6Ω

4Ω

If both switches are closed, determine

1. the ammeter reading
2. the power dissipated in the 3Ω resistor
3. what would be the ammeter reading if only K1 is closed?

(e) (i) State the advantage of a.c over d.c in power transmission.

(ii) A moving coil meter has a resistance of 5.0Ω and full scale deflection is produced by a current of 1.0mA. How can this meter be adapted for use as voltmeter reading up to 10V?

1. An immersion heater rated 3000W is used continuously for 45 minutes 4 times a day. Calculate the cost of using the heater for one month of July if electricity costs Uganda shillings 100 per unit.

8. (a) (i) State **charles’ law**.

(ii) Describe an experiment to verify Boyle’s law.

(iii) What do you understand by the equation of state of an ideal gas?

(b) (i) Define the term absolute zero.

(ii) A bicycle pump contains 60cm3 of air at 17oC and at 1.0

atmospheric pressure. Find the pressure when the air is compressed to 10cm3 and its temperature rises to 27oC.

(c) (i) Distinguish between specific heat capacity and specific latent

heat of a substance.

(ii) Describe an experiment to determine the specific heat capacity of a solid by the method of mixtures.

(d) (i) An aluminium can of mass 102g contains 201g of water.

Both, initially at 17oC, are placed in a freezer at -6oC, calculate the quantity of heat that has to be removed from the water and the can for their temperature to fall to -6oC.

specific heat capacity of aluminium = 900Jkg-1K-1,

specific latent heat of fusion of ice = 340,000Jkg-1

specific heat capacity of ice = 2000Jkg-1K-1

(ii) Explain why the temperature remains constant during a change of state of a substance.

9. (a) State two factors that determine how far x-rays penetrate a certain

material. (02 marks)

(b) The diagram below shows an x-ray tube in operation.

1. Briefly explain how the x-rays are produced.
2. State and explain the adjustment that should be made in order to increase the intensity of the x-rays produced.

(2marks)

1. The x-rays from the tube were soft x-rays . Explain what should be done so that the tube produces hard x-rays. (02 marks)
2. What property of copper makes it suitable as the anode material. (01 marks)

(c) State two industrial applications of x-rays (02 marks)

(d) State the energy changes leading to the production of x-rays in the x-ray tube. (02 marks)

10. (a) What are photoelectrons? (01 marks)

(b) State two factors that determine whether photoelectric effect will occur when a radiation strikes a metal surface. (02 marks)

(c) The diagram below shows a set up used to observe photoelectric

effect.

A

B

S

U.V light

(i) State two ways in which the reading of the galvanometer can

be increased. (02 marks)

(ii) The galvanometer continues to show a reading even when the p.d across the cell is reduced to a small negative value. Explain this observation. (02 mark)

(d) (i) What is a beta particle . (01 marks)

(ii) A beta particle arises from a neutron. Write an equation to this effect. (02 marks)

(e) The half life of uranium is 24 days

(i) What is the meaning of the above statement? (01 mark)

(ii) Determine the count rate of the sample of uranium remaining after 120 days if the original count rate was 64 count per second. (03 marks)

(f) Give **two** differences between a **beta particle** and an **alpha particle**.

(02 marks)

11. (a) Distinguish between a stationary wave and a progressive wave .

(02 marks)

(b) Give three differences between sound and radio waves. (03 marks)

(c) A fishing boat uses ultra sound of frequency to detect fish directly below. Two echoes of the ultra sound are received, one after 0.09s coming from the shoal of fish and the other after 0.12s coming from the seabed. If the sea bed is 84m below the ultra sound transceiver, calculate

(i) The speed of the ultra sound waves in water. (02 marks)

(ii) The wave length of the ultra sound waves in water. (02 marks)

(iii) The depth of the shoal of fish below the boat. (02 marks)

The figure below shows a point vibrator,V, of frequency 30Hz used to produce water ripples of speed 60cms-1 in a ripple tank.

If AB and CD are straight and convex reflectors respectively

1. Sketch the wave forms showing the incident and reflected wave forms at the barriers. (02 marks)
2. Find the distance between two successive creats of the wave produced by the vibrator. (02 marks)

**D**

**S**

**C**

**P**

**Q**

**R**

**B**

**A**

**V**

(e) State one application of ultra-violet radiation. (01 mark)

12. (a) Define the following terms:

(i) refraction of light

(ii) refractive index of a medium

(iii) critical angle.

(iv) total internal reflection. (4mks)

(b) State the laws of refraction of light. (2mks)

**A**

**B**

**C**

**θ**

**300**

**θ**

(c)

The figure shows alight ray AB incident on a semi-circular glass block of centre C, with critical angle 42o.

1. Calculate the value of angle (3mks)
2. Give a reason why the ray is not deviated at B. (1mk)

A

P

C

B

450

450

(d)

The figure shows a light ray incident on face AC at P of a right angled isosceles prism of refractive index 1.5.

If the ray is incident on face CB at an angle of 60o;

1. Trace the ray through the prism and find the
2. angle of emergence e.
3. angle of incidence on face AC. (5mks)

Give two reasons why reflecting prisms are preferred to plane mirrors in periscopes. (1mks)

13. (a) Distinguish between;

(i) Heat and temperature

(ii) Heat capacity and specific heat capacity

(iii) Specific latent heat and specific latent heat of vapouration.

(b) (i) Describe an experiment to determine the specific heat

capacity of a piece of metal rod in the laboratory by method

of mixtures. (5mks)

(ii) Calculate the quantity of heat required to evaporate completely 0.2kg of ice at -10oC . (04mks)

(SHC of ice = 3100 Jkg-1K-1, SHC of water = 4200Jkg-1K-1, Lf = 340, Jk-1,Lv = 2.600,000Jk-1

(c) What is meant by the term thermometric properties? (1mk)

(d) (i) Describe an experiment you can use to determine the lower

fixed point of a Celsius thermometer . (3mks)

1. The mercury thread of a Celsius thermometer reads 5cm at the lower fixed point, 25cm for the upper fixed point and 7cm below the upper fixed point when the thermometer is placed in hot porridge. Find the temperature of the porridge. (2mks)

14. (a) (i) Define the term **crest**. (01 mark)

(ii) Derive the expression **T =**  (03 marks)

(b) The fundamental frequency of a stretched wire of a sonometer is 480Hz and the length of the single segment (loop) formed is 18cm. Calculate the

(i) wave length of the wave formed if 3 loops are produced in the same length of the wire. (03 marks)

(ii) frequency of the vibrating wire . (02 marks)

Displacement (m)

2

Time (s)

2

1.2

2

0.9

0.6

0.3

0

-0.4

-0.2

0.2

0.4

(c)

The above figure show how the displacement of a point varies with time as a wave passes it. On the same figure draw a wave which passes the point with half amplitude and twice the frequency of the one shown. (01 mark)

(d) (i) Explain how beats are formed. (02 marks)

(ii) Distinguish between **harmonics** and **overtones**. (02 marks)

(iii) Explain why open pipes are preferred to closed pipes.

(02 marks)

15. (a) (i) Distinguish between **e.m.f** and terminal **p.d.** of a cell.

(02 mark)

(ii) Give **two** differences between **Nife cells** and **lead-acid**

**accumulators**. (02 marks)

(b) (i) What is meant by an **electrolyte**? (01 mark)

(ii) Explain how electrolytes conduct electricity. (02 marks)

(iii) State **one** application of electrolysis. (01 mark)

(c) (i) Define **internal resistance** of a cell. (01 mark)

(ii) Describe an experiment to determine the internal resistance of a cell. (04 marks)

2Ω

Switch

3.0V

2Ω

1Ω

2Ω

Determine the lost p.d in the above circuit when the switch is closed given that the internal resistance of each cell is 0.5Ω. (03 marks)

16 .a) (i) Define the term energy (1 mark)

(ii) What is a primary source of energy and give two examples of primary

Source (3 marks)

b) State the principle of moments (1 mark)

c) A uniform metre rule of weight 1.2N is pivoted at 30cm mark.

1. What is meant by a uniform metre rule (1 mark)
2. Explain what is observed when a weight of 0.5N is suspended at 10cm mark (4 marks)

d) (i) The efficiency of a machine is 60%. Find the work done by a man using

this machine to raise a load of 150kg through a vertical distance of 2.5m (4 marks)

(ii) Why is the efficiency of this machine 60%. (2 marks)

17 .a) What is a fundamental interval with reference to thermometers (1 mark)

b) Why is water not commonly used as a thermometric liquid. (3 marks)

c) (i) Describe an experiment to determine the specific latent heat of

vaporization (5 marks)

(ii) Calculate the amount of heat required to convert 0.5kg of water originally at 600C to steam at 1000C. (5 marks)

d) Use the kinetic theory to explain why evaporation causes cooling.(2marks)

18 .a) Distinguish between real and virtual images (2 marks)

b) Give reasons for the following observations:

1. Concave mirror is used as a dentist mirror. (2 marks)
2. Convex mirror is used as a security mirror (2 marks)

c) Describe an experiment to show that angle of incident is equal to angle of

reflection (4 marks)

d) (i) What is refractive index (1 mark)

(ii) In an experiment to determine the refractive index of water, an iron ball

was placed at the bottom of a tall glass container. By varying the depth

of the water in the container, the following readings were obtained.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Real depth (cm) | 8.1 | 12.0 | 16.0 | 20.0 |
| Apparent depth (cm) | 9.5 | 9.0 | 12.0 | 15.1 |

Plot a suitable graph and use it to determine the refractive index of water

(5marks)

19. a) (i) Define resonance with reference to waves. (1 mark)

(ii) Air column in a closed tube produces the first loud sound when the length is 33.2cm, when a turning fork of frequency of 256Hz is placed near the mouth of the tube. What would be the length of the air column if a fork frequency 320Hz was used?? (5 marks)

b) Describe an experiment to demonstrate resonance. (4 marks)

c) (i) Distinguish between harmonics and overtones (2 marks)

(ii) State one difference and one similarity between water waves and sound

waves (2 marks)

(iii) The figure shows plane waves approaching a straight barrier at angle of

450.

Straight barrier

Copy and compete the diagram to show how the waves are reflected from

the barrier. (2 marks)

20 .a) Define the terms

1. Cathode rays (1 mark)
2. Photo electric emission (1 mark)

b) Give two reasons why a cathode ray oscilloscope is considered to be an

ideal voltmeter (2 marks)

c) (i) Carbon -12 and carbon -14 are isotopes of carbon. State one similarity

and one difference between the nuclides. (2 marks)

(ii) A radiation substance decayed to of its original activity after 64

days. Calculate its half-life. (3 marks)

d) Explain two factors that bring a difference in the defection of alpha and

beta radiations in a uniform magnetic field. (4 marks)

e) (i) Define nuclear fusion (1 mark)

(ii) State two cases where radioactivity is a nonsense. (2 marks)

21. a) (i) State Ohm’s law (1 mark)

(ii) Describe an experiment to verify Ohm’s law. (4 marks)

b) In the figure, the emf of each cell is 2.0v and the internal resistance of

each cell is 0.5Ω

**4Ω**

**10Ω**

1. Name the instruments labeled X and Y (1 mark)
2. Calculate the readings of X and Y (4 marks)

c) Explain the following observations.

1. Electric lamps are connected in parallel. (2 marks)
2. Switches and fuses are inserted in the live wire (2 marks)

d) State two advantages of energy saver lamps over filament lamps(2 marks)

22. a) (i) What is meant by uniform deceleration? (I mark)

(ii) The graph represent a velocity time graph for a body

**Velocity**

**0**  **Time**

Describe the motion of the body time (2 marks)

b) Describe an experiment to determine acceleration using a ticker time of

frequency 50Hz. (5 marks)

c) (i) State Hooke’s law (1 mark)

(ii) A spring is 20cm long when a load of 10N is hang on it and 30cm long

when a load of 20N is hang on it. Find its natural length. (4 marks)

d) (i) What is meant by dynamic friction (1 mark)

(ii) State two ways of increasing friction (2 marks)

23. a) (i) What is meant by a permanent magnetic material. (1 mark)

(ii) Use the domain theory to explain how a magnet attracts a ferromagnetic

material. (3 marks)

b) (i) What is a magnetic field (1 mark)

(ii) Draw a magnetic field pattern due to the earth (2 marks)

c) Describe a simple experiment to demonstrate the existence of a magnetic

field around a current carrying conductor. (3 marks)

d) With aid of a diagram, describe the structure and mode of action of an a.c

generator. (6 marks)

24. (a) Define the following terms and state the S1 unit in each case.

(i) Work (2mks)

(ii) Power (2mks)

(iii) Energy (2mks)

(b) A body of mass 5.0kg is initially at rest on a horizontal frictionless surface. A force of 15N acts on it and accelerates it to a final velocity of 12ms-1. Calculate the

(i) distance traveled. (2mks)

(ii) work done by the force (2mks)

(iii) final Kinetic energy of the body. (2mks)

(c) A stone of mass of 500g is thrown vertically upwards with a velocity of 15ms-1, Find the

(i) maximum height reached (2mks)

(ii) kinetic energy on reaching the ground (2mks)

25. (a) Define the following terms as applied to waves and state the S1 in each case.

(i) Period (2mks)

(ii) Amplitude (2mks)

(iii) Frequency (2mks)

(b) (i) State three differences between light and sound waves. (3mks)

(ii) A turning fork of frequency 525HZ causes an air column in a closed pipe to resonate with its fundamental frequency. Calculate the length of the tube. (3mks)

(c) Describe a simple experiment to determine the speed of sound in air using echo method (4mks)

26. (a) Distinguish between the weight and mass of a body. (3mks)

(b) The force of gravity on the moon is 2ms-2. Determine the weight of a 12kg mass on the moon. (2mks)

(c) (i) What is meant by centre of gravity? (1mk)

(ii) Describe an experiment to determine the centre of gravity of an irregular Lamina. (5 mks)

(d) (i) Sketch the distance-time gravity for a body falling freely from rest. (2mks)

(ii) An object is released from rest at a height of 0.5km. How does it take to reach the ground. (3mks)

27. (a) What is meant by uniform acceleration. (1mk)

(b) A body of mass 60kg starts moving with an initial velocity of 15ms-1 and accelerates uniformly to 35ms-1 after 5 seconds. Then maintains a constant velocity for another 5 seconds and comes to rest after 7 seconds.

1. Draw a velocity-time graph for the motion. (4 mks)
2. Calculate the momentum of the body during the eighth second. (2mks)
3. Find the total distance traveled using your graph in (i) above. (4 mks)

(c) (i) State Newton’s second law of motion. (1mk)

(ii)

Two forces of 18N and 6N act in apposite directions on an object, A, of mass 3 kg as shown in the diagram. Calculate its acceleration. (4mks)

28. (a) State the laws of reflection. (2mks)

(b) Mention three properties of images formed in plane mirrors. (3mks)

(c) (i) Define the terms focal length and principal focus. (2mks)

(ii) Describe an experiment to determine the focal length of a converging mirror. (5 mks)

(d) By scale drawing, determine the position of the image of an object 10cm high placed 15cm in front of a converging mirror of focal length 20cm. (4 mks)

29. (a) Distinguish between heat and temperature (2mks)

(b) Convert the following temperatures to the thermodynamic scale.

(i) 27oc (2mks)

(ii) -73oc (2mks)

(iii) 107oc (2mks)

(c) (i) State two reasons why alcohol may be preferred to mercury as a

thermometric liquid. (2mks)

(ii) The length of the alcohol thread is 3cm at 0oc, 18cm at 60oc. What is its length at the boiling point of pure water. (3mks)

(d) State three physical quantities of matter that change with change in temperature.

(3mks)

30. (a) State three properties of magnets. (3mks)

(b) Describe the single touch method of magnetizing a steel bar. Mention how its polarity can be determined. (5 mks)

(c) (i) What is a magnetic field. (1mk)

(ii) Sketch the magnetic field pattern around

two bar magnets whose north poles face each other. (3 mks)

(d) (i) State three applications of magnets (3mks)

(ii) Give one example of a natural magnet (1mk)

**END.**