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INDIAN SCHOOL SOHAR
PREBOARD EXAM- 2016
PHYSICS – THEORY

CLASS: XII **MARKS:70**
DATE: 7 /1/2016 **TIME:3hrs**

General Instructions:

1. All questions are compulsory.

2. There are 26 questions in all .Questions 1 to 5 carry one mark each, questions 6 to 10 carry two marks each, questions 11 to 22 carry three marks each. Question 23 is a value based question carrying four marks and questions 24 to 26 carry five marks each.

3. There is no overall choice. However, internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each.

4. You have to attempt only one of the given choices in such questions.

5. Use of calculator is not permitted.

6. You may use the following physical constants wherever necessary

$C = 3X\ 10^{8}\ m/s$ $h = 6.626\ X10^{-34}\ Js$ $e = 1.6X\ 10^{-19}\ c$

$\frac{1}{4\pi\varepsilon_o} = 9\ X\ 10^{9}\ Nm^2/c^2$. $\mu o = 4\pi\ X\ 10^{-7}\ T\ m\ A^{-1}$. $N_A = 6.023\ X10^{23}/mol$

$Mass\ of\ proton = 1.676\ X\ 10^{-27}\ kg.$ $Mass\ of\ neutron = 1.675\ X\ 10^{-27}\ kg.$

SECTION-A

1.Write the following radiations in ascending order with respect to their frequencies:
X-rays, microwaves, UV rays and radio waves.

2.You are given following three lenses. Which two lenses will you use as an eyepiece and as an objective to construct an astronomical telescope?

Lens	*Power (P)*	*Aperture (A)*
L1	3D	8 cm
L2	6D	1 cm
L3	10D	1 cm

3. If the angle between the pass axis of polarizer and the analyser is 45º, write the ratio of the intensities of original light and the transmitted light after passing through the analyser.

4. What type of wavefront will emerge from a (i) point source, and (ii) distance light source?

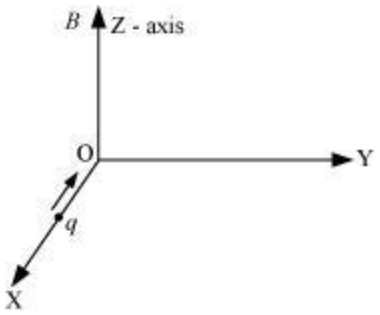
5. Two nuclei have mass numbers in the ratio 1: 2. What is the ratio of their nuclear densities

SECTION – B

6.Derive an expression for drift velocity of free electrons in a conductor in terms of relaxation time.

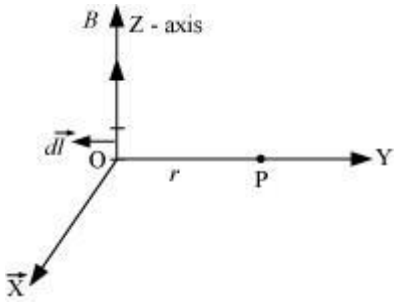
7.How does a charge q oscillating at certain frequency produce electromagnetic waves? Sketch a schematic diagram depicting electric and magnetic fields for an electromagnetic wave propagating along the Z-direction.

8.A charge 'q' moving along the X- axis with a velocity $\vec{v}$ is subjected to a uniform magnetic field B along the Z-axis as it crosses the origin O.



(i) Trace its trajectory.
(ii) Does the charge gain kinetic energy as it enters the magnetic field? Justify your answer.

9.State Biot-Savart law.
A current I flows in a conductor placed perpendicular to the plane of the paper. Indicate the direction of the magnetic field due to a small element $d\vec{l}$ at point P situated at distance $\vec{r}$ from the element as shown in the figure.



10.A radioactive nucleus 'A' undergoes a series of decays according to the following scheme:

$$A \xrightarrow{\alpha} A_1 \xrightarrow{\beta} A_2 \xrightarrow{\alpha} A_3 \xrightarrow{\gamma} A_4$$

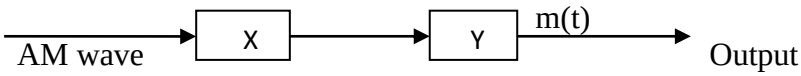
The mass number and atomic number of A are 180 and 72 respectively. What are these numbers for A_4?

OR

10.The half life of a radioactive substance is 30s. Calculate (i) the decay constant (ii) time taken for the sample to decay by $3/4^{th}$ of the initial value.

SECTION-C

11.(a)By what percentage will the transmission ranges of TV tower be affected when the height of the tower is increased by 21%?(b) Figure shows the block diagram of a detector for amplitude modulated signal. Identify the boxes **X** and **Y** and write their functions.



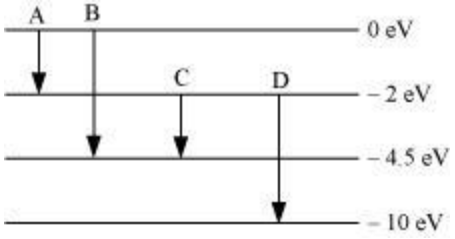
12.(a)Why are high frequency carrier waves used for transmission?
(b) A message signal of 12 kHz and peak voltage 20V is used to modulate a carrier wave of frequency 12MHz and peak voltage 30V. Calculate the (i) modulation index (ii) side band frequencies.

OR

12.Explain the method to locate an GPS device with the help of diagram.

13.A thin conducting spherical shell of radius R has charge Q spread uniformly over its surface. Using Gauss's law, derive an expression for an electric field at a point outside the shell.
Draw a graph of electric field $E(r)$ with distance r from the centre of the shell for $0 \leq r \leq \infty$.

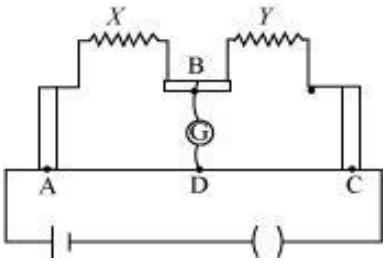
14. (a) The energy levels of an atom are as shown below. Which of them will result in the transition of a photon of wavelength 275 nm?



(b) Which transition corresponds to emission of radiation of maximum wavelength?

15.A proton and an alpha particle are accelerated through the same potential. Which one of the two has (i) greater value of de Broglie wavelength associated with it, and (ii) less kinetic energy? Justify your answers.

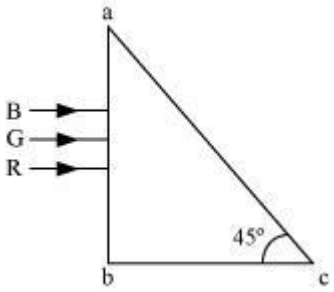
16. (a) Define self inductance. Write its S.I. units.
(b) Derive an expression for self inductance of a long solenoid of length *l*, cross-sectional area A having N number of turns.



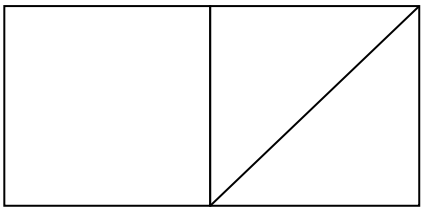
17. The figure above shows experimental set up of a meter bridge. Mention and state the principle of a meter bridge. When the two unknown resistances X and Y are inserted, the null point D is obtained 40 cm from the end A. When a resistance of 10 Ω is connected in series with X, the null point shifts by 10 cm. Find the position of the null point when the 10 Ω resistance is instead connected in series with resistance 'Y'. Determine the values of the resistances X and Y.

18. (i) What happens when a diamagnetic substance is placed in varying magnetic field?
(ii) Name the properties of a magnetic material that make it suitable for making (a) a permanent magnet and (b) a core of an electromagnet.

19. Three light rays red (R), green (G) and blue (B) are incident on a right angled prism 'abc' at face 'ab'. The refractive indices of the material of the prism for red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively. Out of the three which colour ray will emerge out of face 'ac'? Justify your answer. Trace the path of these rays after passing through face 'ab'.



20. Calculate the value of resistance R in the circuit shown in the figure so that the current in the circuit is 0.2A. What would be the potential difference between points A and D?



21. Using Bohr's second postulate of quantization of orbital angular momentum show that the circumference of the electrons in the n^{th} orbital state in hydrogen atom is n times the wavelength associated with it.
(b) The electron in hydrogen atom is initially in the third excited state. What is the maximum number of spectral lines which can be emitted when it finally moves to the ground state?

22. (a) For a ray of light from a denser medium of refractive index n_2 to a rarer medium of refractive index n_1, prove that $n_1/n_2 = \sin i_c$.
(b) Explain with the help of a diagram, how the above principle is used to transmit video signals using optical fibres.

SECTION-D

23. One evening, Pankaj outside his house fixed two meter high insulating slab and attached a large aluminium sheet of area $1m^2$ over its top. To his surprise, next morning when he incidently touched the aluminium sheet, he received an electric shock. He narrate the incident to his Physics teacher in the school who explained him the reason behind it.
(a) What are the values being displayed in Pankaj?
(b) What may be the reason behind the electric shock received by Pankaj?

SECTION-E

24. (a) Derive an expression for the average power consumed in a series LCR circuit connected to a.c. source in which the phase difference between the voltage and the current in the circuit is Φ.

(b) Define the quality factor in an a.c. circuit. Why should the quality factor have high value in receiving circuits? Name the factors on which it depends.

OR

24.(a) Derive the relationship between the peak and the rms value of current in an a.c. circuit.
(b) Describe briefly, with the help of labelled diagram, working of a step-up transformer.
A step-up transformer converts a low voltage into high voltage. Does it not violate the principle of conservation of energy? Explain.

25. (i) Draw a circuit diagram to study the input and output characteristics of an n-p-n transistor in its common emitter configuration. Draw the typical input and output characteristics.
(ii) Explain, with the help of a circuit diagram, the working of n-p-n transistor as a common emitter amplifier.

OR

25.How is a zener diode fabricated so as to make it a special purpose diode? Draw I-V characteristics of zener diode and explain the significance of breakdown voltage.
Explain briefly, with the help of a circuit diagram, how a p-n junction diode works as a half wave rectifier.

26.Trace the rays of light showing the formation of an image due to a point object placed on the axis of a spherical surface separating the two media of refractive indices n_1 and n_2. Establish the relation between the distances of the object, the image and the radius of curvature from the central point of the spherical surface.
Hence derive the expression of the lens maker's formula.

OR

26.(a) What is the effect on the interference fringes in Young's double slit experiment when (i) the separation between the slits is increased? (ii) the width of the source slit is increased? (iii) the monochromatic source is replaced by a source of white light?
Justify your answer in each case.
(b) Explain with the help of diagram how sunlight is polarized by scattering through atmospheric particles.
(c) A partially plane polarized beam of light is passed through a polaroid. Show graphically the variation of the transmitted light intensity with angle of rotation of the Polaroid.