KENDRIYA VIDYALAYA SANGATHAN ERNAKULAM REGION

PRE BOARD EXAMINATIONS 2018

CLASS XII   **TIME 3 HR**

PHYSICS THEORY   **MAX .MARKS : 70**

General Instructions:

(i)   All questions are compulsory. There are **27** questions in total.

(ii)   This question paper has **four** sections: Section A, Section B, Section C, Section D .

(iii) Section A contains 5 questions of one mark each, Section B contains 7questions of two marks each; Section C contains 12 questions three marks each, and section D contains 3 questions of five marks each.

(iv)   There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.

(v)   You may use the following physical constants wherever necessary.

$C = 3 \times 10^8$ ms^{-1} $e = 1.602 \times 10^{-19}$ C

$\frac{1}{4\pi\varepsilon_o} = 9 \times 10^9$ N m^2 C^{-2} $h = 6.63 \times 10^{-34}$ Js

$\mu_0 = 4\pi \times 10^{-7}$ TmA^{-1} $m_e = 9.1 \times 10^{-31}$ Kg

$m_p = 1.673 \times 10^{-27}$ Kg $\varepsilon_0 = 8.854 \times 10^{-12}$ C^2 N^{-1} m^{-2}

Avogadro's number $= 6.023 \times 10^{23}$ per gram mole   Boltzmann constant $= 1.38 \times 10^{-23}$ JK^{-1}

SECTION A

1   Name the physical quantity whose SI unit is JC^{-1}. Is it a scalar or vector quantity?   1

2   What is the resistance of a carbon resistor which is marked with yellow, orange, orange and gold rings?   1

3   How does the angle of minimum deviation of a glass prism vary if the incident violet light is replaced by red light?   1

4   Two metals A and B have work function 4 eV and 10 eV respectively. Which metal has higher threshold wavelength?   1

5   Draw a graph showing the variation of decay rate with number of active nuclei?   1
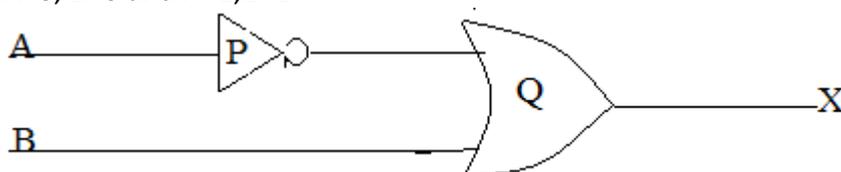
SECTION B

6   Calculate the potential difference and the energy stored in the capacitor C_2 in the circuit shown in the fig. given potential at A is 90 V, C_1=20 µF, C_2=30µF and C_3=15µF   2
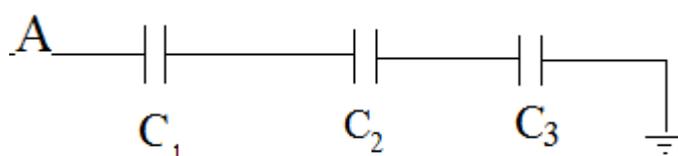
7   Derive a relation between current and drift velocity.   2
8   In an AC circuit, the instantaneous voltage and current are V=200 sin 300t V and I=8 cos 300t A   2
    respectively. Is the nature of circuit capacitive or inductive? Give reason.
9   An unpolarised light is incident on the boundary of two transparent media. State the condition   2
    when the reflected wave is totally plane polarized. Find out the expression for the angle of
    incidence in this case.
    OR
    How can you distinguish between an unpolarised light and a linearly polarized light beam using
    a Polaroid?
10 A proton and a deuteron are accelerated through the same accelerating potential. Which one   2
    of the two has (a) greater value of de-Broglie wavelength associated with it, and (b) less
    momentum?
11 Based on the VI graph shown below answer the following questions.   2
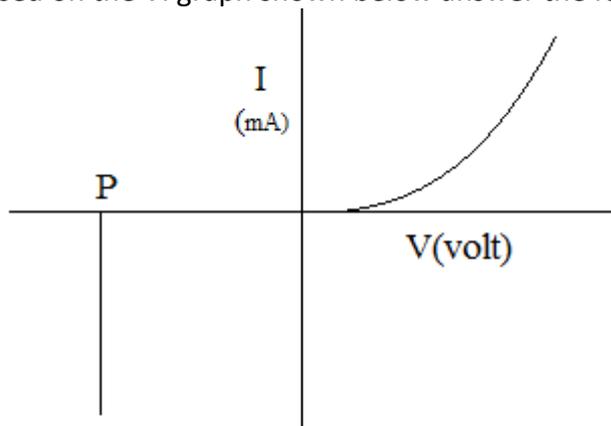
    (i)   Name the type of diode whose characteristics are shown in figure
    (ii)   What does the point P in the fig represent?
12 (i)   Identify the logic gate marked P and Q in the given logic circuit given below   2
    (ii)   Write down the output at X for the inputs
              A=0, B=0 and A=1,B=1

## SECTION C

13 Derive an expression for the electric field intensity due to a uniformly charged spherical shell   3
    at a point (i) outside the shell (ii) inside the shell. Plot the graph of electric field with distance
    from the center of shell.
14 Derive an expression for the electric field intensity at a point on the equatorial line of an   3
    electric dipole of dipole moment p and length 2a. What is the direction of this field?
15 With the help of a circuit diagram, explain how a potentiometer is used to compare the emf's   3
    of two primary cells. Obtain the required expression used for comparing the emfs.

16 Two identical bar magnets P and Q are placed in two identical uniform magnetic field as shown   3
    in figure. Justify that both the magnets are in equilibrium. Which of these are in stable
    equilibrium?
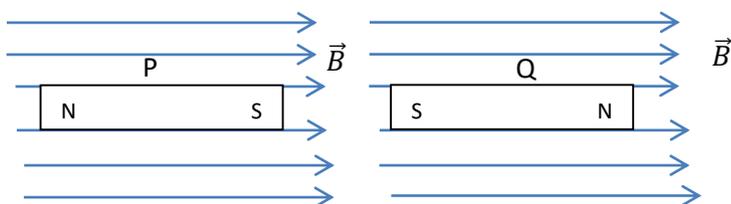
17 (a) Define self-induction and write its SI unit   3
    (b) Obtain an expression for mutual inductance of two long co axial solenoids S_1 and S_2 wound one over the other, each of length L and radii r_1 and r_2 and n_1 and n_2 number of turns per unit length, when a current I is set up in the outer solenoid S_2

18 A series LCR circuit is connected to an ac source. Using the phasor diagram, derive the expression for the impedance of the circuit.   3

19 E M waves with wavelength   3
    (i) λ_1 is used in RADAR communication
    (ii) λ_2 is used to kill germs in water purifier
    (iii) λ_3 is used to improve visibility in run ways, during fog and mist condition.

    (a) Identify and name the part of electromagnetic spectrum to which these wavelengths belong.
    (b) Arrange these wavelengths in ascending order of their wavelengths.
    (c) What is the source of (ii) and (iii)?

20 Draw a labelled ray diagram for the formation of image by a compound microscope. Derive an expression for its total magnification (or magnifying power), when the final image is formed at least distance of distinct vision.   3
    OR
    A compound microscope uses an objective lens of focal length 4 cm and eye piece lens of focal length 10 cm. An object is placed at 6 cm from the objective lens. Calculate the magnifying power of the compound microscope. Also calculate the length of the microscope

21 Light of wavelength 550 nm is incident as parallel beam on a slit of width 0.1 mm. find the angular width and linear with of the principal maxima in the resulting diffraction pattern on a screen kept at a distance of 1.1 m from the slit, which of these width would not change if the screen were moved to a distance of 2.2 m from the slit?   3

22 (i) State two important features of Einstein's photoelectric equation?   3
    (ii) Radiation of frequency 10^{15} Hz is incident on two photo sensitive surfaces P and Q. there is no photo emission from surface P. photo emission occurs from surface Q but phot electrons have zero kinetic energy. Explain these observations and find the value of work function for surface Q

23 (a) A radioactive nucleus A under goes a series of decays as given below: 3

A $\xrightarrow{\ \alpha\ }$ A_1 $\xrightarrow{\ \beta\ }$ A_2 $\xrightarrow{\ \alpha\ }$ A_3 $\xrightarrow{\ \gamma\ }$ A_4
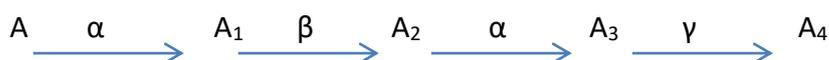
    The mass number and atomic number of A2 are 176 and 71 respectively. Determine the mass and atomic number of A4 and A.
    (b) Write the basic nuclear processes underlying β^+ and β^- decays.

24   (a) What is space wave propagation?   3
           (b) State the factors which limit its range of propagation
           (c) Derive an expression for the maximum line of sight distance between two antennas for the space wave propagation?

SECTION D

25 Explain with the help of a labelled diagram, construction, principle and working of a cyclotron stating clearly the functions of electric and magnetic fields on a charged particle. Derive an expression for the time period of revolution and cyclotron frequency. Show that it is independent of speed of the charged particle and radius of circular path   5

OR

Draw a labelled diagram of moving coil galvanometer. State the principle on which it works. Explain its working, using necessary expressions. Why is it necessary to use (i) radial magnetic field (ii) a cylindrical soft iron core in a galvanometer?

26 A spherical surface of radius of curvature R, separated a rarer and denser medium as shown in the fig   5
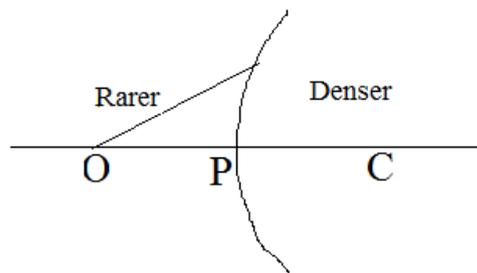
(i)   Complete the path of the ray of light, showing the formation of real image. Hence derive the relation connecting objective distance u, image distance v, radius of curvature R and the refractive indices n_1 and n_2 of two media.
(ii)   Briefly explain how the focal length of a convex lens changes with increased in wave length of incident light.

OR

(a)   What are coherent sources of light? State two conditions for light sources to be coherent?
(b) Derive a mathematical expression for the width of interference fringes obtained in young's double slit experiment with the help of a suitable diagram.

27 Draw a circuit diagram of full wave rectifier. Explain its working. Draw input/out put, wave forms indicating clearly the function of two diodes   5

OR

Draw a simple diagram of CE amplifier. Explain its working. Show that the voltage gain A_v of the amplifier is given by

$$A_v = -\frac{\beta_{ac} R_L}{r_i}$$

Where β_{ac} is current gain, R_L is load resistance r_i is input resistance of the transistor. What is the significance of the negative sign in the expression for voltage gain?