8 V

MAR THOMA RESIDENTIAL SCHOOL TIRUVALLA

SECOND TERMINAL EXAMINATION DEC 2017

STD XII **Time: 3 h**

Mark:70

PHYSICS

All questions are compulsory.

This question paper is divided in 4 sections A , B , C and D as follows.

SECTION A

Question 1 is of twelve marks .All parts of this question are compulsory.

SECTION B

Question 2 to 12 carry 2 marks each with two questions having internal choice.

SECTION C

Question 13 to 19 carry 3 marks each with two questions having internal choice.

SECTION D

Question 20 to 22 are long answer type questions and carry 5 marks each.

Each question has an internal choice .

SECTION A

Answer all questions.

QUESTION 1

(A) *Choose the correct alternative (a) , (b) , (c) or (d) for each of the questions given below.(5)*

(i)A parallel plate capacitor has a capacitance 8uF . It becomes 32uF when a dielectric medium occupies the space between its two plates . The dielectric constant of the medium is ;

(a) 4 (b) 16 (c) 6 (d) 0.25

(ii)The electrostatic potential energy of two point charges 1uC each , placed 1m apart in air is

(a) $9x10^{3}J$ (b) $9x10^{-3}$ J (c) $9 x 10^{9}$ J (d) $9x10^{-3}eV$

(iii) A convex lens of focal length 'f' is cut into two planocovex lenses. The focal length of each planoconvex lens will be

(a) f (b) 2f (c) f/2 (d) infinity

(iv) The kinetic energy of a moving particle is increased to four times its initial value. The de Broglie wavelength will

(a) remain same (b) become half (c) double (d) four times

(v) A radioactive substance has half life of T years. The time after which its activity is reduced to 6.25% of its initial activity is

(a) 2T years (b) 4T years (c) 6T years (d) 16T years

(7x1=7)

(B)

(i)Two bulbs 400W and 1200W have resistances R1 and R2 respectively . What is the ratio of their resistances , if they operate on the same voltage .

(ii) Define potential gradient .

(iii)What is the impedance of an LCR series circuit at resonance ?

(iv)When is the charge on a body said to be quantized?

(v) How does the polarising angle for a medium change with the wavelength of incident light?

(vi) An equilateral glass prism is kept at the minimum deviation position in water. Find the angle of minimum deviation position. (n_g=3/2 and n_w=4/3)

(vii) Write any one balanced reaction representing nuclear fusion.

SECTION B

Answer all questions.

QUESTION 2

Derive the expression for the energy stored in a capacitor in terms of capacitance C and potential difference V between the plates . (2)

QUESTION 3

What are eddy currents ? Write two methods to minimize it ? (2

QUESTION 4

Explain the meaning of the statement :

Angle of dip at a place is 30^0 If the horizontal component of earth's magnetic field at this place is $3x10^{-5}$T , calculate the earth's total magnetic field at that place . (2)

QUESTION 5

Derive the relation between drift velocity and current flowing in a conductor. (2)

OR

Define emf and terminal voltage of a cell in terms of work done . Hence obtain the relation between them.

QUESTION 6

(i) Name the electromagnetic radiation used in radar systems in aircraft navigation

(ii) Distinguish between conduction current and displacement current. (2)

QUESTION 7

A mark placed on the surface of a glass sphere is viewed along the diameter from opposite surface. If the diameter of the sphere is 10cm and refractive index of the glass is 1.5, find the position of the image. (2)

QUESTION 8

Illustrate spherical aberration in lenses. Suggest one method to minimise it. (2)

QUESTION 9

(a) I f the frequency of the incident radiation is increased from $4x10^{15}$Hz to $8x10^{15}$ Hz, by how much will the stopping potential for a given photosensitive surface go up?

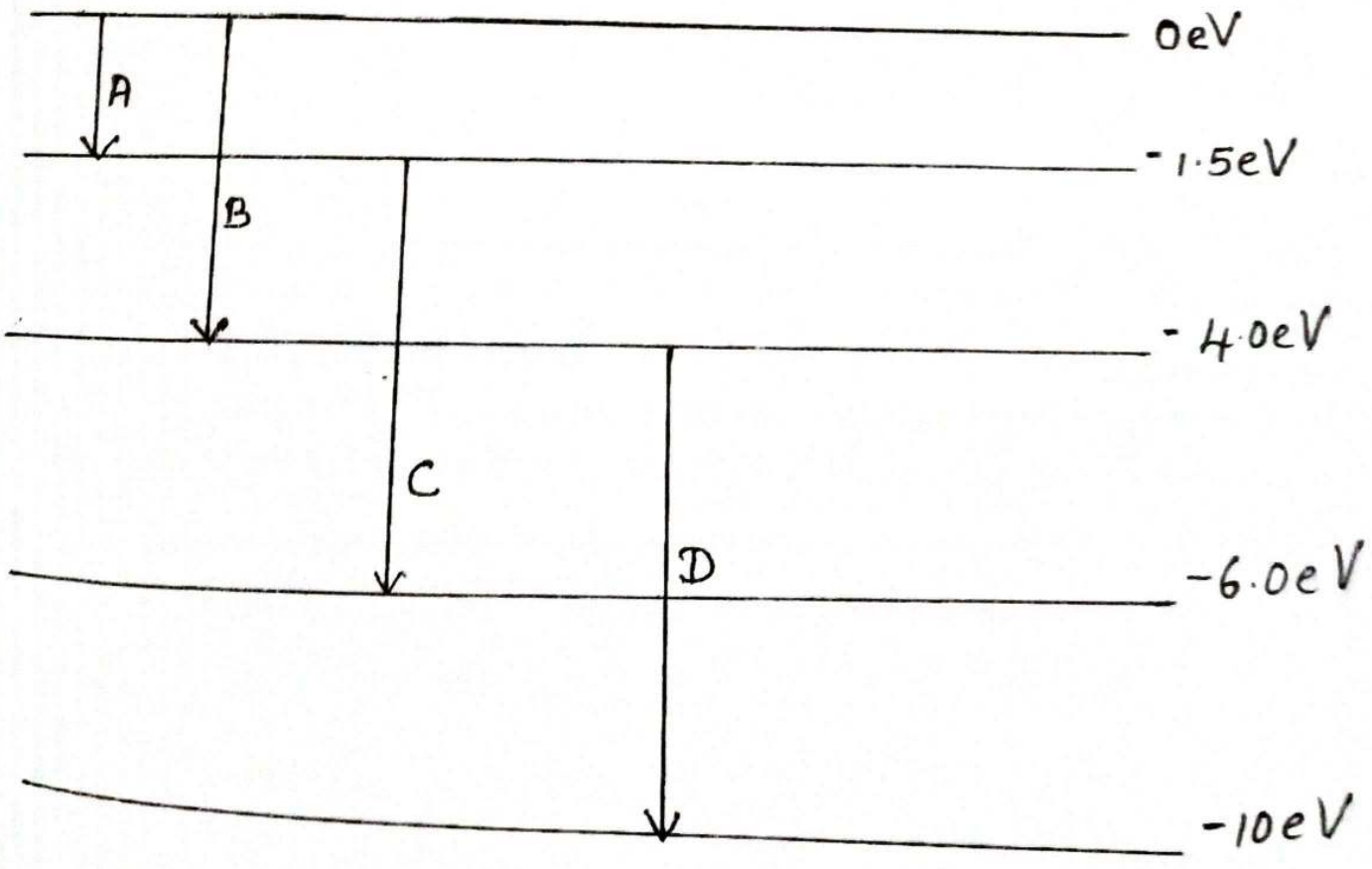
How does this affect photoelectric current?

OR

(b) What are matter waves? Draw a graph showing the variation of de Broglie wavelength with momentum of the particle. (2)

QUESTION 10

The energy levels of an atom of a certain element are as shown in the fig. Which one of the transitions A, B,C or D will result in the emission of photons of electromagnetic radiation of wavelength 275nm? Support your answer with mathematical calculations. (2)



QUESTION 11

Radon is a radioactive substance. Table given below gives the counts at every half minute as it decays.

Time in min	0	½	1	1½	2	2½	3	3½
Count in Tens	200	138	100	69	50	35	25	18

Plot a graph with number of atoms N versus time t. Find the half life of radon . (2)

QUESTION 12

What do you mean by Modulation in communication systems?

State any one need of modulation. (2)

SECTION C

Answer all questions

QUESTION 13

Draw a circuit diagram for the determination of the internal resistance of a cell using a potentiometer .

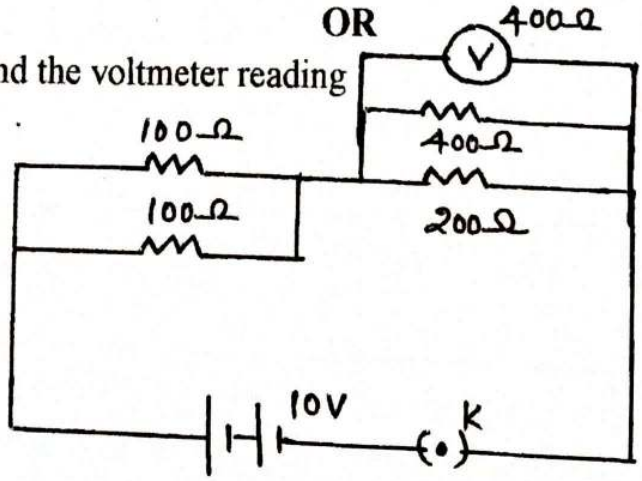
Derive the expression for calculating internal resistance . (3)

QUESTION 14

Using Gauss's theorem , derive the expression for intensity of electric field E at a point , which is at a distance 'r' (r >R) from the centre of a thin spherical shell of radius R carrying charge Q (3)

OR

Using the given circuit , find the voltmeter reading



QUESTION 15

Using Ampere Circuital law , derive the expression for magnetic intensity inside a long solenoid .

What is the strength of the magnetic field at one end of the solenoid ?. On a graph , show how magnetic field intensity varies with distance . (from one end of the solenoid to the other end)

(3)

QUESTION 16

(a) Derive the mirror formula for spherical mirrors.

OR

(b) Using the equation $n_2/v-n_1/u=(n_2-n1)/R$ for a single spherical surface, derive Lens maker's formula. (3)

QUESTION 17

Using Huygen's wave theory, verify snell's law of refraction, (3)

QUESTION 18

Calculate the energy released during the α decay of $_{92}U^{238}$.

(mass of U=238.05079u mass of TH= 234.04363u mass of α=4.00260u 1u= 931MeV) (3)

QUESTION 19

Draw the circuit diagram of a full wave rectifier. Show the variation of input and output voltages with time graphically. (3)

SECTION D

Answer all questions

QUESTION 20

What is the fundamental difference between resistance and reactance in a circuit ?

Derive the expression for resonant frequency in LCR series circuit . On a graph show how impedance varies with frequency at resonance . Draw the phasor diagram for LCR series resonant circuit.

OR

Derive the expression for the emf induced in an ac generator . Draw the output wave form and mark the peak emf and time period . (5)

QUESTION 21

(a) Draw a labelled diagram of an astronomical telescope forming final image at the least distance of distinct vision. Derive an expression for its magnifying power.

OR

(b) Draw a neat and labelled diagram of an experimental setup of Young's double slit experiment to study the interference of light and show that $\beta=\lambda D/d$ .where the terms have their usual meaning.Show the variation of intensity of interference pattern graphically. (5)

QUESTION 22

(a) 1. With reference to pn junction explain forward and reverse biasing.

Draw the voltage-current characteristic curve in each case.

2. With the help of a circuit diagram explain the working of a zener diode as a voltage regulator.

OR

(b) 1. Show how will you obtain OR gate using only NAND gate. Draw the truth table for the arrangement of gates.

2. Draw the circuit diagram of a common emiter transistor amplifier.

3. A transistor has current gain β=50. In a CE amplifier ,the collector resistance is 5kΩ and the input resistance is 1kΩ. Calculate the output voltage if the input voltage is 0.01V. (5)