STD XII

MAR THOMA RESIDENTIAL SCHOOL TIRUVALLA
FIRST TERMINAL EXAMINATION AUG- SEP 2019
PHYSICS

TIME: 3h
Mark:70

Section A

Answer all questions

Question 1

(A) *Choose the correct alternative (a), (b), (c) or (d) for each of the questions given below:* [5×1]

(i) The order of coloured rings in a carbon resistor is Red-Yellow-Blue and Silver. The resistance of the carbon resistor is

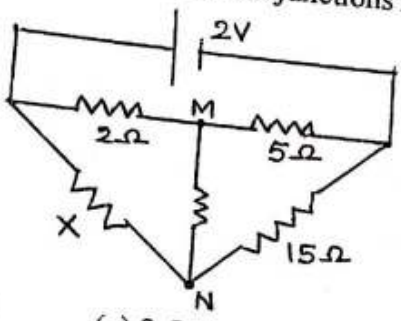
(a) $24\times10^{6}\Omega \pm 5\%$ (b) $24\times10^{6}\Omega \pm 10\%$

(c) $34\times10^{4}\Omega \pm 10\%$ (d) $26\times10^{4}\Omega \pm 5\%$

(ii) In current electricity, ohm's law is obeyed by all

(a) solids (b) metals (c) liquids (d) gases

(iii) Find the value of X in the circuit so that the junctions M and N are at the same potential.



(a) 4 Ω (b) 6 Ω (c) 2 Ω (d) 8 Ω

(iv) The ratio of kinetic energy to the total energy of an electron in an orbit of hydrogen atom is

(a) 1:1 (b) 1:-2 (c) 2:-1 (d) 1:-1

(v) The average life of a radioactive substance is

(a) $T = 1/T_{1/2}$ (b) $T=\ln 2/T_{1/2}$ (c) $T=\ln 2/\lambda$ (d) $T=\lambda/\ln 2$

(B) *Answer the following questions briefly and to the point.* [7×1]

(i) What conclusion was drawn by Rutherford based on α- particle scattering experiment?

(ii) Sun glasses have curved surfaces, yet their power is zero. Why?

(iii) Write a balanced equation of nuclear fission.

(iv) A parallel plate air capacitor has a capacitance of 5μF. It becomes 50 μF when a dielectric medium occupies the entire space between them. What is the dielectric constant of the medium?

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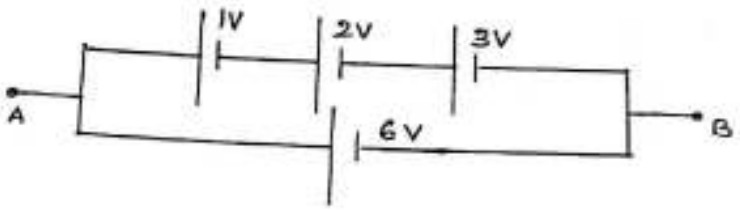
*This question paper consists of **5** printed pages and a blank page.*

(v)



Find the emf of the battery shown.

(vi) A current I flows through a metallic wire of radius 'r' and the free electrons in it drift with a velocity V_d. Calculate the drift velocity of the free electrons through the wire of the same material, having double the radius, when the same current flows through it.

(vii) What is meant by drift speed of electrons?

Section B

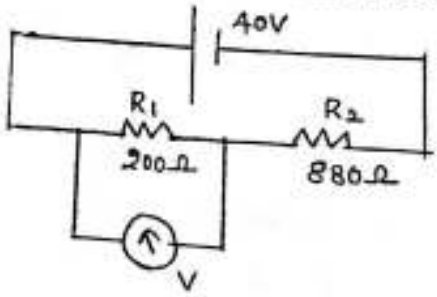
*Answer **all** questions*

Question 2

State kirchaff's laws. What are the conservation principles related to it. [2]

Question 3

Figure shows two resistors connected to a battery having an emf 40V. A voltmeter having a resistance of 300 Ω is used to measure potential difference across R1. Find voltmeter reading. [2]



OR

With the help of a neat diagram, derive the expression for internal resistance of a cell using a potentiometer.

Question 4

Derive an expression for intensity of electric field at a point in broad side on position. [2]

Question 5

Draw labelled graphs to show how electrical resistance varies with temperature for

a) metallic wire b) a piece of carbon [2]

Question 6

With the help of a labelled diagram show that the balancing condition of a wheat stone bridge in $\frac{R1}{R2} = \frac{R3}{R4}$ where terms having usual meaning. [2]

Question 7

(i) Define wave front.

(ii) Sketch the wave front emitted by (a) point source (b) linear source. [2]

Question 8

(i) What do you mean by pair production?

(ii) How much energy is required for pair production? [2]

Question 9

(a) An α- particle of energy 6 4 MeV is making head on collision with a gold nucleus(Z=79). Calculate the distance of closest approach.

(b) (i) Define half life of a radio active substance.

(ii) The half life of radon is 3.8 days. Calculate the amount of radon will be left out of 1024mg after 38 days. [2]

Question 10

The ground state energy of hydrogen atom is -13.6eV Draw an energy level diagram and show the (i) Lyman absorption lines (ii) Balmer emission lines. [2]

Question 11

(i) Define mass defect and binding energy of a nucleus.

(ii) What is the significance of binding energy per nucleons? [2]

Question 12

(i) Define resolving power of an optical instrument.

(ii) Suggest one method to increase the resolving power of a telescope. [2]

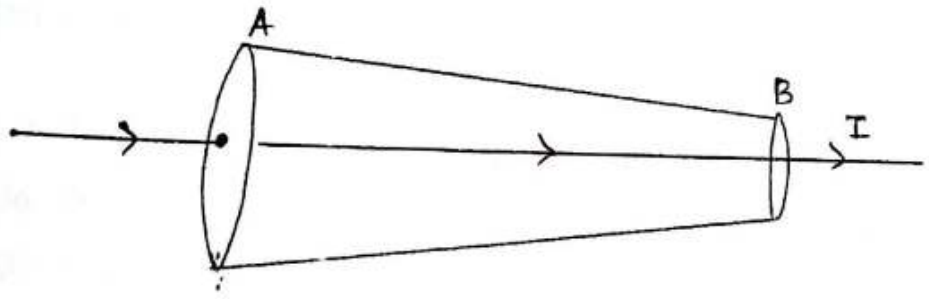
Section C

*Answer **all** questions*

Question 13

a) Derive the relation connecting current (I) and drift velocity (V_d). [3]

b) A metallic plug AB in carrying a current I. State how the drift velocity of free electrons varies , if at all, from end A to end B.



Question 14

What is meant by temperature coefficient of resistance? Write down the expression for it. Derive ohms law in vector form.

[3]

Question 15

Derive the equation for energy stored in a capacitor. Write down the alternate equations. [3]

Question 16

(i) With the help of a ray diagram derive Lens maker's formula.

(ii) Two thin lenses have focal lengths in the ratio 2:3. When they are kept in contact, the equivalent focal length is 12cm. Calculate their focal lengths.

Question 17

(i) State Hugen's principle of light.

(ii) Using this principle verify the laws of reflection.

Question 18

(i) Differentiate between nuclear fission and fusion

(ii) State the function of the following in a nuclear reactor

(a) heavy water (b) cadmium rods

[3

OR

(b)(i) Draw a graph showing the variation of binding energy per nucleon with mass number of nuclei.

(ii) The atomic mass of uranium $_{92}U^{238}$ is 238.0508u, while that of thorium is $_{907h}{}^{234}$ is 234.0436u and that of $_{2}He^{4}$ is 4.002606u. Alpha decay converts $_{92}U^{238}$ INTO $_{90}Th^{234}$. Calculate the energy released during α-decay.

Question 19

(i) Name the spectral series of hydrogen atom in the visible region of the electromagnetic spectrum.

(ii) Calculate the longest and shortest wavelength of this series.

(Rydberg constant = $1.097 \times 10^{7}\ m^{-1}$).

[3

Section D

Answer all questions.

Question 20 [5]

(a)(i) You are provided with (1) low resistance R_L (2) high resistance R_H and two galvanometers. One galvanometer is converted to an ammeter and the other to a voltmeter. Show how you will do this with the help of simple labelled diagrams.

(ii) Using Gauss's theorem, derive the expression for electric field intensity at a point distant 'r' from a line charge.

OR

(b) 'n' cells each of emf ϵ and internal resistance 'r' are joined in series to form a row. 'r n' such rows are connected in parallel to form a battery of N=mn cells. This battery is connected to an external resistance 'R'. Draw a neat labelled diagram

a) What is the emf of this battery? b) How much is its internal resistance?

c) Show that, total current $I=\frac{N\epsilon}{mR+nr}$

Question 21 [5]

(i) State radioactive decay law.

(ii) Obtain the relation $N = N_0e^{-\lambda t}$, where the symbols have usual meaning.

(ii) Draw a graph showing the variation of activity of a radioactive substance with time.

OR

(i) With the help of a neat labelled diagram , derive the expression for the magnifying power of a compound microscope in normal adjustment method.

(ii) What are the advantages of reflecting telescope over refracting telescope?

Question 22 [5]

(i) State the postulates of Bohr atom model.

(ii) Derive s expressions for the orbital radius and total energy of an electron in hydrogen atom.

(iii) The energy of electron in the n^{th} state of hydrogen atom is $E_n = -13.6/n^2$ ev

Calculate the energy of a photon radiated when the electron de-excites from the first excited state to the ground state. To which spectral series does this photon belongs?

OR

(b) (i) Two thin lenses are kept in coaxial contact, Obtain an expression for the equivalent focal length of the combination.

(ii) A double convex lens has radii of curvature 20cm and 30cm respectively. Calculate its focal length in (a) air (b) liquid (n_g= 1.5, n_l= 1.6)

(iii) A convex lens of power P is cut into two halves. What will be the power of each part?

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