

KENDRIYA VIDYALAYA SANGATHAN:CHENNAI REGION
Class XII COMMON FIRST PRE BOARD EXAMINATION2016-17
Subject:Physics

Time Allowed: 3 Hours

Maximum Marks: 70

General Instructions

1. All questions are compulsory. There are 26 questions in all.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
3. Section A contains five questions of one mark each, Section B contains five questions of two marks each, Section C contains twelve questions of three marks each, Section D contains one value based question of four marks and Section E contains three questions of five marks each.
4. 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.
5. You may use the following values of physical constants wherever necessary.

$$c = 3 \times 10^8 \text{ m/s}$$

$$h = 6.63 \times 10^{-34} \text{ Js}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$$

$$\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$$

$$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2 \text{ C}^{-2}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$\text{mass of neutron} = 1.675 \times 10^{-27} \text{ kg}$$

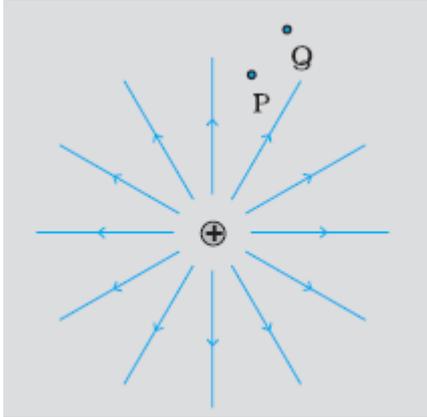
$$\text{mass of proton} = 1.673 \times 10^{-27} \text{ kg}$$

$$\text{Avogadro's number} = 6.023 \times 10^{23} \text{ per gram mole}$$

$$\text{Boltzmann constant} = 1.38 \times 10^{-23} \text{ JK}^{-1}$$

Section A

- 1 Why a plastic comb gets electrified on combing dry hair or on rubbing, but a metal article like spoon does not? (1)
- 2 Give the sign of the potential difference $V_P - V_Q$ with reason. (1)



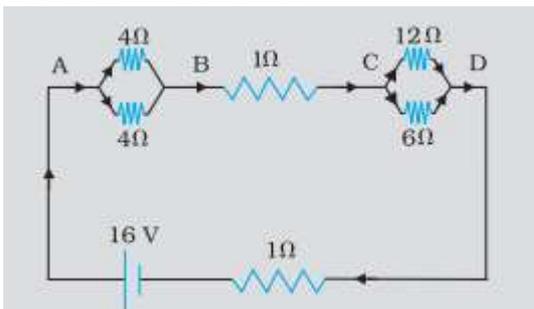
3 What is the value and the unit of the quantity $1/\sqrt{(\mu_0\epsilon_0)}$, where ϵ_0 is the permittivity of free space; μ_0 , the permeability of free space. (1)

4 When light falls on a metal surface, some electrons near the surface absorb enough energy from the incident radiation to overcome the attraction of the positive ions in the material of the surface. After gaining sufficient energy from the incident light, the electrons escape from the surface of the metal into the surrounding space. What is this effect called as per Hertz's observations? (1)

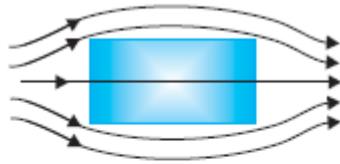
5 What is transducer? Give an example. (1)

Section B

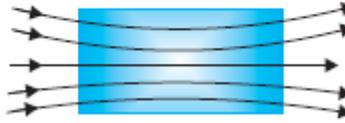
6 A network of resistors is connected to a 16 V battery with internal resistance of 1Ω , as shown in Fig. (a) Compute the equivalent resistance of the network. (b) Obtain the current in each resistor. (2)



7 Identify the following magnetic materials from the Behaviour of magnetic field lines near a substance. Write a property for each case. (2)



(a)



(b)

- 8 Draw a labeled ray diagram for the formation of image by a refracting telescope at normal adjustment position. (2)
- 9 What are coherent sources?, If we use two sodium lamps illuminating two pinholes ,we will not observe any interference fringes. why? (2)
- 10 Draw the energy-band diagram of an intrinsic semi conductor at $T = 0$ K and at higher temperatures ($T > 0$ K), when an intrinsic semiconductor will behave like an insulator at $T = 0$ K or at at higher temperatures ($T > 0$ K) (2)

(Or)

C, Si and Ge have same lattice structure. Why is C insulator while Si and Ge intrinsic semiconductors?

Section C

- 11 Two point charges $q_A = 3 \mu\text{C}$ and $q_B = -3 \mu\text{C}$ are located 20 cm apart in vacuum.
 (a) What is the electric field at the midpoint O of the line AB joining the two charges? (3)
 (b) If a negative test charge of magnitude 1.5×10^{-9} C is placed at this point, what is the force experienced by the test charge?
- 12 Show that energy stored per unit volume of space, i.e. Energy density of electric field is $u = (1/2)\epsilon_0 E^2$ for the case of a parallel plate capacitor. (3)
- 13 What is the radius of the path of an electron (mass 9×10^{-31} kg and charge 1.6×10^{-19} C) moving at a speed of 3×10^7 m/s in a magnetic field of 6×10^{-4} T perpendicular to (3)

it? What is its frequency? Calculate its energy in keV.

- 14 Give an efficient way to make a permanent magnet. How to select suitable materials for making permanent magnets. Give two materials used to make permanent magnets. (3)
- 15 A square loop of side 10 cm and resistance 0.5Ω is placed vertically in the east-west plane. A uniform magnetic field of 0.10 T is set up across the plane in the north-east direction. The magnetic field is decreased to zero in 0.70 s at a steady rate. Determine the magnitudes of induced emf and current during this time-interval. (3)
- 16 i) Neither stationary charges nor charges in uniform motion (steady currents) can be sources of electromagnetic waves. Why? (3)
ii) Give any two properties of electromagnetic waves.
iii) Arrange the following parts of electromagnetic waves in increasing order of frequency
visible light waves, X-rays, gamma rays, radio waves, microwaves, ultraviolet and infrared waves.
- 17 Calculate the ratio of the accelerating potential required to accelerate i) proton and ii) an alpha particle to have the same De Broglie wavelength associated with them. (3)
- 18 State Bohr's three postulates on atom model and prove that Angular momentum of electron is quantized. (3)
- 19 Obtain the binding energy (in MeV) of a nitrogen nucleus ${}^{14}_7\text{N}$, given $m({}^{14}_7\text{N}) = 14.00307 \text{ u}$ (3)

(Or)

Write nuclear reaction equations for

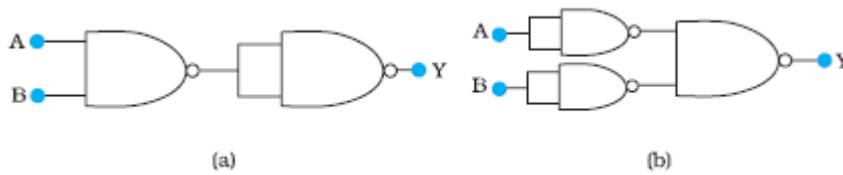
(i) α -decay of ${}^{226}_{88}\text{Ra}$ (ii) α -decay of ${}^{242}_{94}\text{Pu}$

(iii) β^- -decay of ${}^{32}_{15}\text{P}$ (iv) β^- -decay of ${}^{210}_{83}\text{Bi}$

(v) β^+ -decay of ${}^{11}_6\text{C}$ (vi) β^+ -decay of ${}^{97}_{43}\text{Tc}$

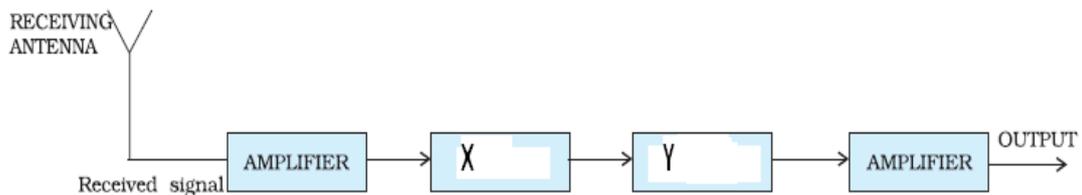
- 20 Give the logic symbols and truth tables of AND and NOR GATES. You are given two (3)

circuits as shown in Fig., which consist of NAND gates. Identify the logic operation carried out by the two circuits.



- 21 i) Draw the Circuit diagram for studying the input and output characteristics of n-p-n transistor in CE configuration and (3)
 ii) Draw (a) Typical input characteristics, and (b) Typical output characteristics.

- 22 Explain Why modulation is necessary? (3)
 In the block diagram of a typical receiver, identify X and Y



Block diagram of a receiver.

Section D

- 23 Mr. Dinesh Gupta , a retired Physics teacher, was working in his field along with his grandson. There was a big high tension tower supporting HT cables located in their field .The grandson argues that the tower should be removed from their field so that more space could be created for crops. Mr. Dinesh Gupta explained the necessity of such towers for transmission of electric energy form one place to another. (4)
 Answer the following based on above information
 a) why electrical energy is transferred over long distance at very high voltage?
 b) Which device is used at production place to convert low voltage to high voltage?
 c) which device is used at distributing sub-stations and at utility poles before a power supply of 240 V .
 d) which values are reflected in the approach of Mr.Dinesh Gupta.(minimum three values)

Section E

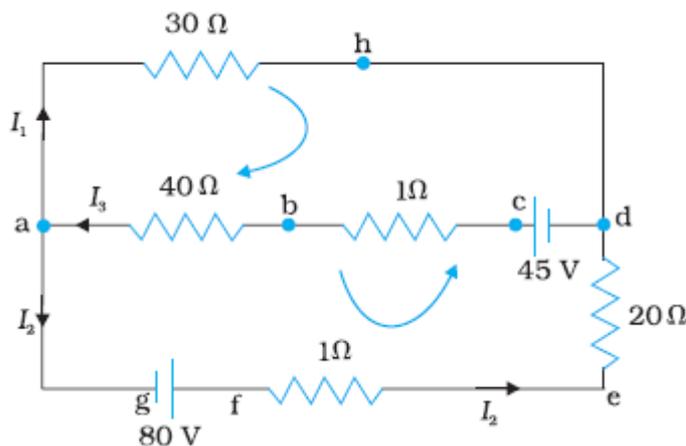
- 24 Give the principle of a potentiometer. With the help of a circuit, explain how potentiometer is used for determining internal resistance of a cell. What is the advantage of potentiometer in measuring emf? (5)

In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 35.0 cm length of the wire. If the cell is replaced by another cell and the balance point shifts to 63.0 cm, what is the emf of the second cell?

(or)

a) State Kirchhoff's rules; prove the balanced condition for *Wheatstone bridge*.

b) Find equations for the loops 'ahdcba' and 'ahdefga', using Kirchhoff's rules



- 25 a) Show that for refraction at a spherical surface a relation between object and image distance in terms of refractive index of the medium and the radius of curvature of the curved spherical surface is (5)

$$\frac{n_2}{v} - \frac{n_1}{u} = \frac{n_2 - n_1}{R}$$

Where the symbols have their usual meaning.

b) Light from a point source in air falls on a spherical glass surface ($n = 1.5$ and radius of curvature = 20 cm). The distance of the light source from the glass surface is 100 cm. At what position the image is formed?

(or)

a) Draw a ray diagram to show the refraction of light through a glass prism. Hence obtain the relation for the angle of deviation in terms of angle of incidence, angle of emergence and angle of prism.

b) A right angled isosceles glass prism is made from glass of refractive index 1.5. Show that a ray of light incident normally on i) one of the equal sides of this prism is

