CBSE Board
Class XII Physics

Time: Three Hours **Maximum Marks: 70**

General Instructions

(a) All questions are compulsory.

(b) There are 29 questions in total. Questions 1 to 8 carry one mark each, questions 9 to 16 carry two marks each, questions 17 to 25 carry three marks each and questions 27 to 29 carry five marks each.

(c) Question 26 is a value based question carrying four marks.

(d) 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 three questions of five marks each. You have to attempt only one of the given choices in such questions.

(e) Use of calculator is not permitted.

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

$$e = 1.6 \times 10^{-19} \text{ C}$$
$$c = 3 \times 10^{8} \text{ m s}^{-1}$$
$$h = 6.6 \times 10^{-34} \text{ J s}$$
$$\mu_o = 4\pi \times 10^{-7} \text{ T ma}^{-1}$$
$$K_B = 1.38 \times 10^{23} \text{ J K}^{-1}$$
$$N_A = 6.023 \times 10^{23} \text{ /mole}$$
$$m_n = 1.6 \times 10^{-27} \text{ kg}$$

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1. If electric field intensity at a place is zero, will the electric potential be necessarily zero at that point? Justify your answer. (1)

2. How will you identify whether the magnetic field at a given point is due to Earth or due to some current carrying wire? (1)

3. What is inductive reactance X_L in the ac circuit? What is its value in dc circuit? (1)

4. What phase relationship exists between electric & magnetic field in an electromagnetic wave? (1)

5. Is the light coming out from headlight of a car: i) plane polarized ii) highly coherent? (1)

6. When photons of energy 5eV fall on the surface of a metal, the emitted photoelectrons are stopped by a cut off potential of 3.5 volt. What is the work function of the metal? (1)

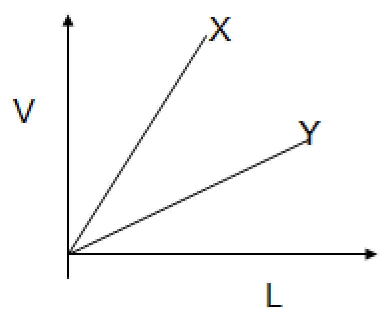
7. A neutron is absorbed by a $_3Li^6$ nucleus with subsequent emission of an α-particle. Write the corresponding nuclear reaction. (1)

8. The output of an OR gate is connected to both the inputs of NOR gate. Draw the logic circuit of the combination. (1)

9. Write an expression for electric field intensity due to a charged spherical shell at a point
(i) inside the shell
(ii) outside the shell.
Represent graphically the variation of electric field vector E as a function of position vector r in the case of charged spherical shell. (2)

10. Two charged conductors A (hollow) & B (solid) carry charges q & q' respectively. Conductor B is inserted inside A such that the surface B is kept insulated from A. What will be the total charge outside the surface of A? (2)

11. The variation of potential difference with length is given in case of two potentiometers X and Y is shown. Which one of these will you prefer to compare emf's of two cells & why? Justify. (2)



12. A current I flows through a wire of length L. Prove that if this wire is bent into a circular coil & suspended in a magnetic field B, then the torque acting on it will be maximum when the coil of single turn is formed. What will this maximum torque be? (2)

13. Two parallel current carrying wires in the same direction attract each other. Give reason. Depict pictorially as well. (2)

14.

(a) The susceptibility of iron is greater than that of aluminium. What do you infer from this?

(b) A certain region of space needs to be shielded from a magnetic field. How can this be done? (2)

15. Derive an expression for the emf induced when the area of rectangular loop placed perpendicular to the uniform magnetic field is changed by moving one of its arms. (2)

16. Represent an analog & a digital signal graphically. (2)

17.

(a) It is often heard "The domestic supply is at a voltage of 220V". What voltage value is this referring to? Express both peak & rms values.

(b) What is the instantaneous and average power per cycle supplied to the Capacitor? (3)

18. For refraction through a glass prism, derive the prism formula:

$$n_{21} = \frac{\sin[(A + D_m)/2]}{\sin[A/2]}$$ (3)

19. A convex lens has 20 cm focal length in air. What is the focal length in water? (Refractive index of air-water = 1.33, refractive index for air-glass is 1.5.) (3)

20. The frequency of incident light is doubled keeping the intensity constant. What is the effect on:

(i) KE of the photoelectrons

(ii) Photoelectron current

(iii) Stopping potential? (3)

21. How many alpha & beta particles are given out when ${}_{92}X^{235}$ changes into ${}_{88}Y^{219}$? State & define a unit of decay rate. (3)

22. The base region in a transistor is usually thin. Why?

In the common emitter mode of a transistor, the dc current gain is 20 & emitter current is 7mA. Find (i) the base & (ii) the collector current. (3)

OR

A pure inductive circuit does not consume any power in a complete cycle. Prove it. (3)

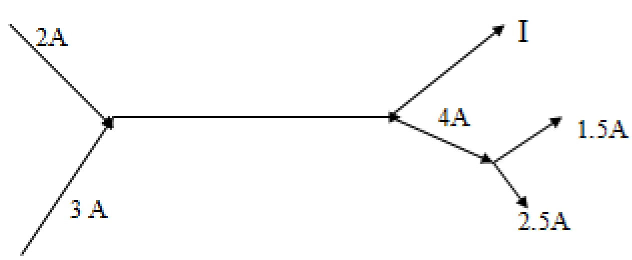
23. Draw input & output characteristics for a transistor in common emitter mode. Draw the corresponding circuit diagram.
Conclude at least one important feature from each of the characteristic curves. (3)

24. Name the device used for data transmission from one computer to another. What does it do?
Draw a simple block diagram depicting the general form of communication systems. (3)

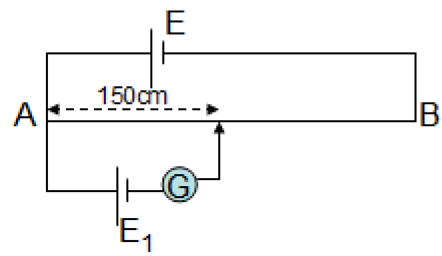
25. Define the term 'resolving power' of an astronomical telescope. How does it get affected by
(i) Increasing the aperture of the objective lens?
(ii) Increasing the wavelength of the light used?
Justify your answer in each case. (3)

26. In a winter night, Sonu was sitting with his grandmother, she told him "when I was of your age, paisa coins were used like one paisa, two paisa etc., and those paisa coins were having great value at that time." Sonu asked his grandmother, "from which metal was the coin made up of?"
Grandmother replied, "I don't know about it, as I am not educated and I even never tried to know about that". But Sonu's elder brother Monu was standing behind and listening to the conversation between them, he told Sonu that those were made up of Aluminium Magnesium alloy. Grandmother felt happy with her grandsons.
(a) Write about Monu's intelligence.
(b) A paisa coin weighs 0.75 g and is square shaped with diagonal 17 mm. Suppose it is electrically neutral. If the coin is only made up of aluminium, find the magnitude of equal number of +ve ad –ve charges. (4)

27.
(a) What is current I in the figure below?



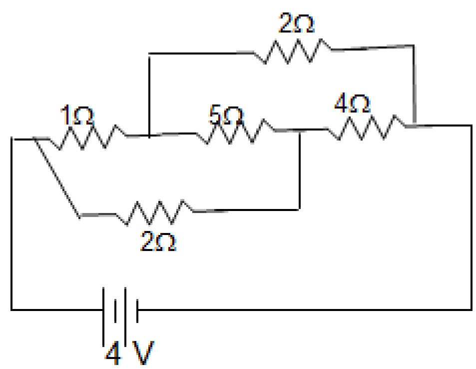
(b) AB is a wire of uniform cross section on which exists a potential gradient of 0.01V/cm.



(i) If the galvanometer shows zero deflection in the position shown, find the emf E_1 of the cell used.

(ii) If the internal resistance of the driver cell E_1 increases somehow, how will it effect the balance point?

(c) Find the current drawn from a battery of 4V in the given network.



(5)

OR

A transistor is used in common emitter mode in an amplifier circuit. When a signal of 20 mV is added to the base-emitter voltage, the base current changes by 20 μA and the collector current changes by 2 mA. The load resistance is 5 $k\Omega$. Calculate (a) the factor β, (b) the input resistance R_{BE}, (c) the transconductance and (d) the voltage gain. (5)

28.

(a) An electron & a proton moving with the same speed enter a uniform magnetic field B perpendicularly. Which particle will have larger radius of its circular path? Find the ratio of their radii. The masses of electron & proton are 9.1 x 10^{-31} kg & 1.67 x 10^{-27} kg.

(b) Show that for a moving charged particle in a uniform magnetic field, the kinetic energy of the particle remains constant.

(c) A coil placed in the plane of the page has a current in the clockwise direction when looking from above. What will be the change in the magnetic field at the center of the coil if

(i) the current through the coil is reduced to half?

(ii) radius of the coil is doubled ?

(iii) what will be the direction of the magnetic field? (5)

OR

(a) Derive an expression for the magnifying power of an astronomical telescope. Draw a ray diagram showing image formation in it.

(b) An astronomical telescope consists of two thin lens set 36cm apart and has a magnifying power 8. Calculate the focal length of the lens.

(c) A giant refracting telescope at an observatory has an objective lens of focal length 15 cm. If an eye-piece of focal length 1.0 cm is used, what is the angular magnification of the telescope? If this telescope is used to view the moon, what is the diameter of the image of the moon formed by the objective lens? The diameter of the moon is 3.48×10^6 m, and the radius of lunar orbit is 3.8×10^8 m. (5)

29.

(a) Double convex lenses need to be manufactured from a glass of refractive index 1.55 with both faces of same radii of curvature. What is the radius of curvature required if the focal length of the lens is to be 20 cm?

(b) In case of a microscope:

(i) Magnifying power of simple microscope in inversely proportional to to the focal length of the lens. What then stops us from using a convex lens of smaller focal length & achieving greater magnifying power?

(ii) Why must both the objective & the eye piece of a compound microscope have short focal length?

(c) An object is first seen in blue light & then in red light through a simple microscope. Compare its magnifying power. (5)

OR

Write the relation for the force $\vec{F}$ acting on a charge carrier *q* moving with a velocity $\vec{v}$ through a magnetic field $\vec{B}$ in vector notation. Using this relation, deduce the conditions under which this force will be (i) maximum (ii) minimum

An electron travelling west to east enters a chamber having a uniform electrostatic field in a north to south direction. Specify the direction in which a uniform magnetic field should be set up to prevent the electron from deflecting from its straight line path. (5)

CBSE Board
Class XII – Physics
Solution

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1. No it may not be zero. If $E = -\frac{dV}{dr} = 0$, it implies that electric potential V at a place is constant.

2. Magnetic field due to earth: Compass needle will always point N-S irrespective of the change in its position.
Magnetic field due to current carrying wire: Compass needle can point in any other direction but for N-S at a given place.

3. In ac circuit, $X_L = L\omega$
In dc circuit: since $\omega = 0$, $X_L = 0$.

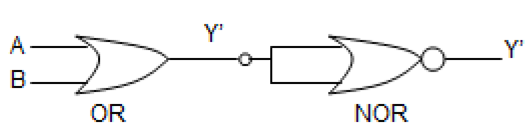
4. They vibrate in the same phase.

5.
(i) Light from headlight of a car is not plane polarized
(ii) Light from headlight of a car is not at all coherent.

6. Using Einstein's photoelectric equation:
Work function of the metal = Incident energy – Energy required to stop the photoelectrons
Work function of the metal = 5 eV - 3.5 eV = 1.5 eV

7. ${}_3Li^6 + {}_0n^1 \rightarrow {}_1H^3 + {}_2He^4$

8.

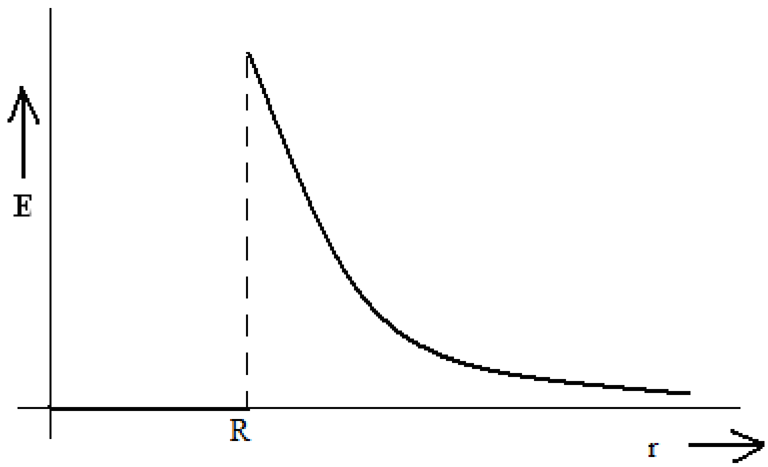


9. Electric field intensity due to a charged spherical shell at a point

(i) inside the shell: $\vec{E} = 0$

(ii) outside the shell: $\vec{E} = \frac{q}{4\pi\varepsilon_0 r^2} n$

The graph for $\vec{E}$ vs r:



Here R is the radius of the spherical shell & r is the position vector measured from the centre of the charged shell.

10. When a conductor B with charge q' is inserted in the cavity, it induces a charge –q' inside the metal surface of conductor A & +q' on the outside of A.
Hence, the total charge outside the surface A will be q + q'.

11. Potentiometer wire Y will be preferred.
Reason: For comparison of emf, we prefer potentiometer with greater sensitivity. For greater sensitivity, potential gradient $K = \frac{V}{L}$ should be small.

Since, Slope of X > Slope of Y
So, potentiometer Y will have greater sensitivity.

12. Radius of coil having 1 turn: $r_1 = L/2\pi$

Radius of coil having 2 turns: $r_2 = L/4\pi$

Radius of coil having 3 turns: $r_3 = L/6\pi$ ... & so on

Torque on current carrying loop placed in magnetic field B will be:

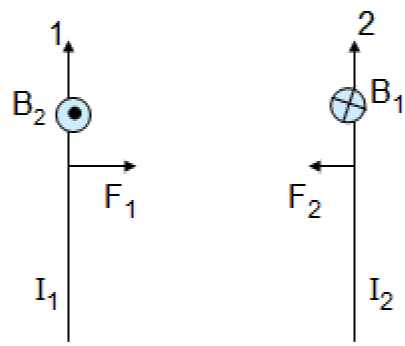
$$\tau = \text{NiAB}\sin\theta$$

i.e., $\tau \propto \text{NA}$

The value of NA is maximum for a coil having 1 turn, thus we have

$$\tau_{\text{max}} = 1 \times i \times \pi (L/2\pi)^2 B = (iL^2B)/4\pi$$

13. Wire 1 is in the magnetic field of '2' & wire 2 is in the magnetic field of '1'.



The direction of magnetic field is given by Right hand thumb rule & that of force is given by Fleming's left hand rule.

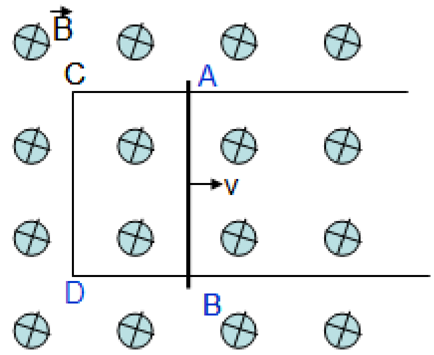
The two wires therefore attract each other.

14.

(a) Greater the value of susceptibility $\chi = (I/H)$, greater is the intensity of the magnetization I, for a given magnetizing field H.
Hence, iron can be easily magnetized in comparison to aluminium.

(b) The region to be shielded can be surrounded by soft iron rings. The lines of force of any external magnetic field will be drawn into the iron rings leaving an enclosed space free from the field.

15. ABCD is a rectangular loop with a movable arm AB. It is placed in the magnetic field B perpendicular to the page directed inwards.



Let AB move with speed v. In time Δt, the change in area $\Delta A = L (v\Delta t)$

We know that

$\phi = BA \cos \theta$, where $\theta = 0$

$\Delta\phi = B\Delta A$

$\Delta\phi = B\, L\, (v\Delta t)$

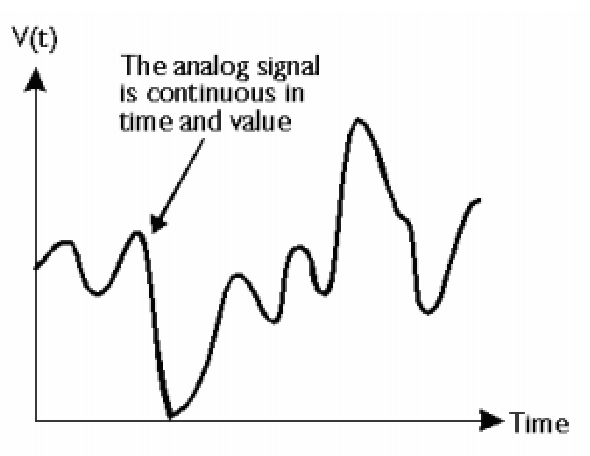
Thus, induced emf is

$$e = \frac{\Delta\phi}{\Delta t} = \frac{BLv\Delta t}{\Delta t}$$

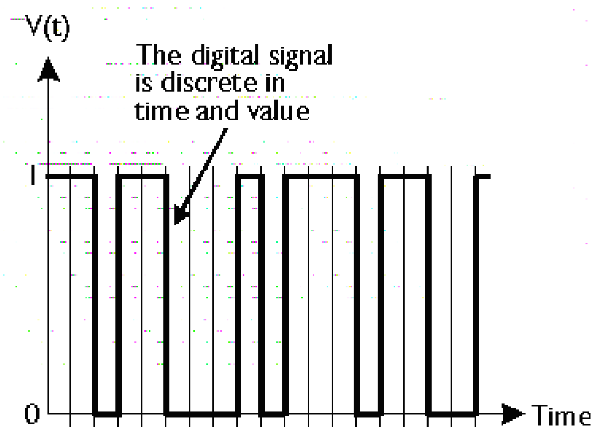
$$e = BLv$$

This is the induced emf across AB due to change in area of rectangular loop in presence of magnetic field.

16.



(1 mark)



17.

(a) It is referring to the rms value. V_{rms} = 220 V.

So, the peak value for voltage is $V_0 = \sqrt{2}V_{rms} = 311$ V.

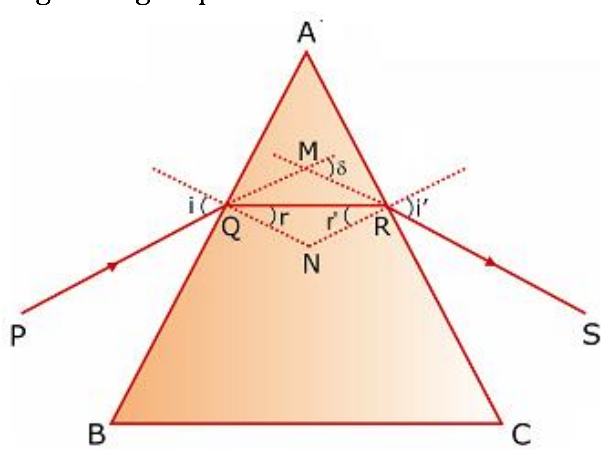
(b) The instantaneous power is always $P(t) = V(t)I(t)$, and in this case, it is

$$P(t) = \frac{V_0^{\ 2}}{X_c}\cos(\omega t + \phi)\cos(\omega t + \phi + \pi/2)$$

Thus, the average power is

$$\overline{P_c} = \frac{V_0^{\ 2}}{2X_c}\cos\left(\frac{\pi}{2}\right) = 0$$

18. Consider light passing through a prism ABC as shown



The angle between the emergent ray RS and incident ray direction PQ is called the angle of deviation δ.

In the quadrilateral AQNR,

$$\angle A + \angle QNR = \angle 180^0$$

From triangle QNR,

$$r + r' + \angle QNR = 180^0$$

Comparing, we get

$$r + r' = A$$

The total deviation is the sum of deviations at the two faces:

$$\delta = (i - r) + (i' - r')$$
$$\Rightarrow \delta = i + i' - A$$

At the minimum deviation $\delta = D_m, i = i'$ which implies that r=r'.

Then, we get from $r + r' = A$

$$2r = A$$
$$\Rightarrow r = \frac{A}{2}$$

Similarly, equation $\delta = i + i' - A$ gives

$$D_m = 2i - A$$
$$\Rightarrow i = \frac{A + D_m}{2}$$

The refractive index of the prism with respect to the medium outside is

$$n_{21} = \frac{n_2}{n_1} = \frac{\sin[(A + D_m)/2]}{\sin[A/2]}$$

This is the prism formula.

19. We have the lens formula

$$\frac{1}{f} = \left(\frac{n_2}{n_1} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

For a glass lens in air, n_2 = 1.5, n_1 = 1, f = +20 cm.

$$\frac{1}{20} = 0.5\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$$

For the same glass lens in water, n_2 = 1.5, n_1 = 1.33. Therefore

$$\frac{1.33}{f} = 0.17\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$$

Combining these two equations, we get

$$\frac{1.33}{0.17f} = \frac{1}{20 \times 0.5}$$
$$f = \frac{1.33 \times 20 \times 0.5}{0.17}$$
$$f = 78.2 \text{ m}$$

20. Einstein's equation is

$$\frac{1}{2}mv_{max}^2 = h(\nu - \nu_o)$$

Where, ν is the frequency of incident light, ν_o is the threshold frequency.

(i) On doubling the frequency of incident light, KE of the photoelectrons is increased.

(ii) There is no effect on photoelectron current as the intensity of the incident light is kept constant.

(iii) We know that, $eV_o = \frac{1}{2} mv^2_{max}$, as frequency is increased this will increase maximum KE of emitted electrons, and hence the stopping potential.

21. Given reaction:

$${}_{92}X^{235} \rightarrow {}_{88}Y^{219}$$

The change in mass number:

235 - 219 = 16

Change in atomic number:

92 - 88 = 4

Since each alpha particle emission corresponds to a decrease of mass number by 4 & decrease in atomic number by 2, we can conclude that in this reaction, 4 alpha particles & 4 beta particles are emitted.

Hence the reaction can be written as:

$${}_{92}X^{235} \xrightarrow{-4\alpha} {}_{84}Z^{219} \xrightarrow{-4\beta} {}_{88}Y^{219}$$

Unit of decay rate: Curie

1 curie is defined as the decay rate of 3.7×10^{10} disintegrations per second.

22. Base is usually made thin so that large numbers of majority carriers go from the emitter into the collector and both their currents are in the same order.

Given, $\beta = 20$, $I_e = 7$ mA

$I_e = I_b + I_c$ and $\beta = \frac{I_c}{I_b} = 20$

i.e., $I_c = 20\ I_b$

Therefore, we get

$I_b = 1/3$ mA

$I_c = 20/3$ mA

OR

In a pure inductive circuit

$I = I_0 \sin \omega t$

$V = V_0 \sin (\omega t + 90^0)$

$V = V_0 \cos \omega t$

V leads by $\pi/2$, hence

$$\text{Power}, P = \frac{1}{T}\int_0^T VI dt$$

$$P = \frac{1}{T}\int_0^T V_0 I_0 \sin \omega t \cos \omega t \, dt$$

$$P = \frac{V_0 I_0}{2T}\int_0^T \sin 2\omega t \; dt$$

$$P = 0 \qquad \because \int_0^T \sin 2\omega t \; dt = 0$$

23. Circuit diagram of transistor in common emitter configuration to study its characteristics is shown below:

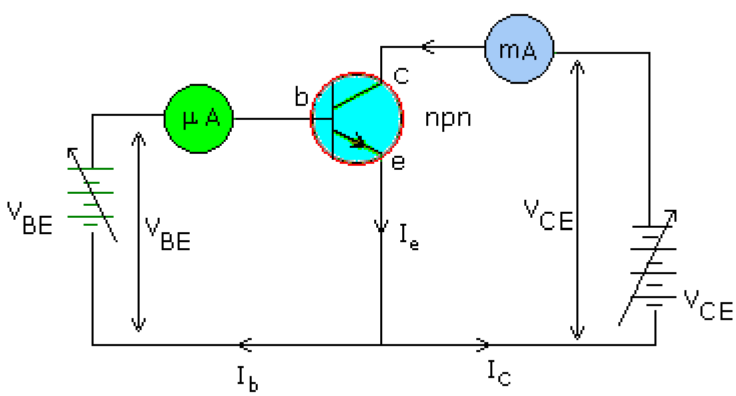
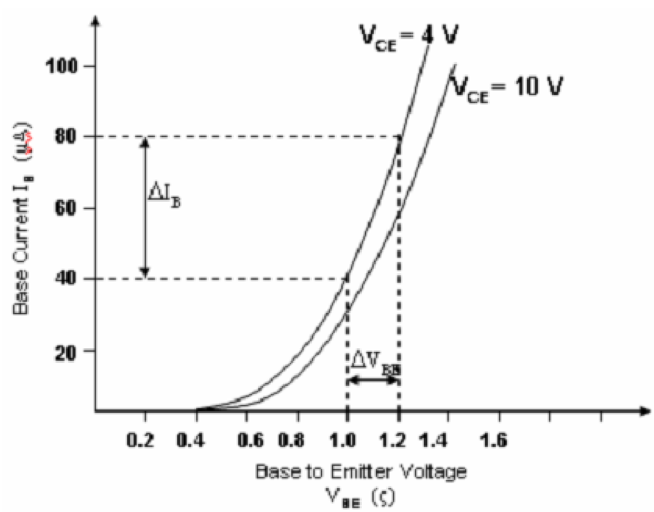


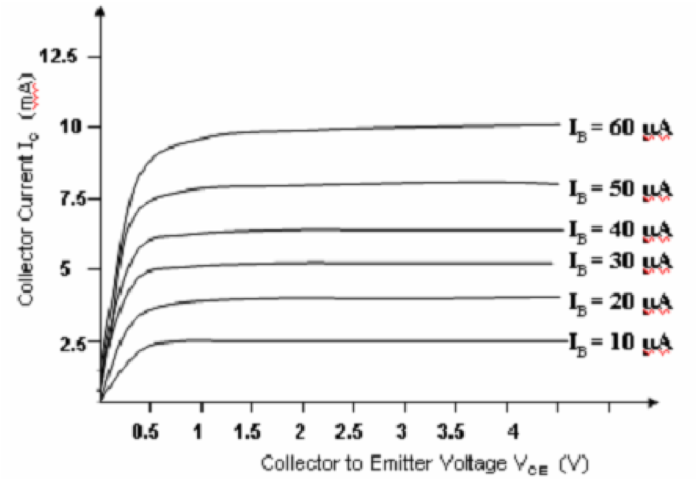
Fig. Common Emitter Configuration

Input characteristics: The variation of current on the input side with input voltage (I_B vs V_{BE}) is known as 'input characteristics'.



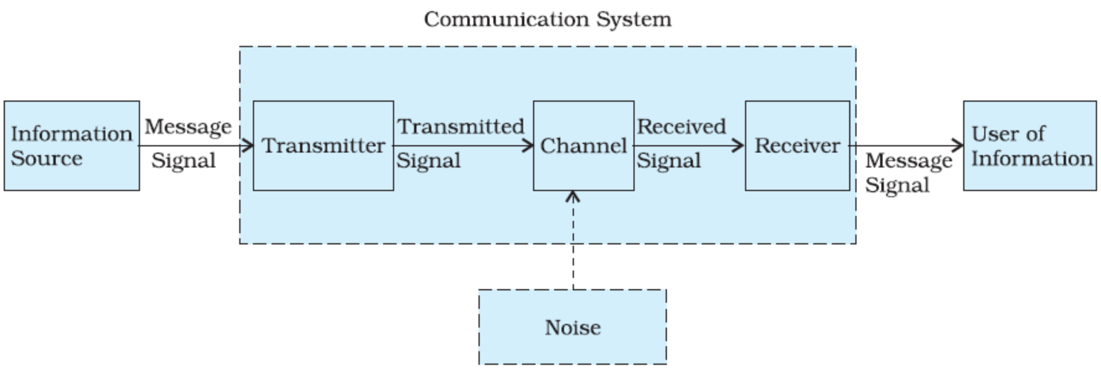
One important feature from input characteristics is that, the base current I_B is small as long as V_{BE} is less than the barrier voltage.

The variation in the output current with output voltage $(I_C \text{ vs } V_{CE})$ is known as output characteristics:



One important feature from output characteristics is that, for a given value of V_{CE}, larger is base current, larger will be the collector current I_c.

24. Device used for data transmission from one computer to another:
MODEM = modulator + demodulator
It modulates the outgoing signal at transmitting end & demodulates the incoming signal at the receiving end.



25. The resolving power of an astronomical telescope is defined as its ability to resolve the images of two point objects lying close and is given as: the reciprocal of the smallest angular separation between two point objects whose images can just be resolved by the telescope.

Resolving power of astronomical telescope- $\frac{1}{d\theta}=\frac{D}{1.22\lambda}$

(i) When the aperture of the objective lens is increased, the resolving power increases, because $R.P.\propto D$.

(ii) When the wavelength of the light is increased, the resolving power decreases, because $R.P.\propto 1/\lambda$.

26.

(a) Monu's frequent answers indicate his presence of mind with sharp memory and deep general knowledge. And, at his very young age all this proves him to be a brilliant child.

(b) Given,

Mass of paisa coin = 0.75 g

Atomic mass of Aluminium = 26.981 g

Avogadro's number = 6.023×10^{23}

$\therefore$ Number of aluminium atoms in one paisa coin

$$N=\frac{6.023\times 10^{23}}{26.9815}\times 0.75=1.6742\times 10^{22}$$

As the atomic no. of Aluminium is 13, so each atom of aluminium contains 13 protons and 13 electrons.

$\therefore$ Magnitude of positive and negative charges in one paisa coin

= Ne

= $1.674 \times 10^{22} \times 13 \times 1.60 \times 10^{-19}$ C

= 3.48×10^{4} C = 34.8 kC

27.

(a) Using Kirchhoff's first rule:

I+4A =2A+3A

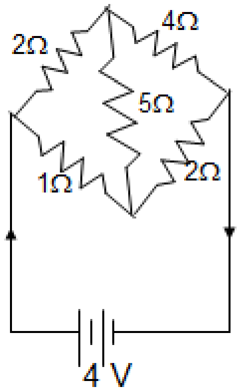
which gives I = 1A

(b)

(i) E_1=KL = 0.01 × 150 = 1.5 volt

(ii) If the internal resistance of the driver cell increases, the current through the wire AB decreases, and hence the potential gradient along the wire also decreases. Decrease in potential gradient increases the balancing length.

(c) The arrangement is equivalent to a balanced Wheatstone bridge as shown.



Therefore we can neglect the central resistance R = 5Ω.

So the equivalent resistance along upper arm= 2+4 =6Ω

Equivalent resistance along lower arm= 1+2 =3Ω

So, net equivalent resistance of the entire bridge

$$= \frac{6x3}{6+3} = \frac{18}{9} = 2\Omega$$

Thus, current drawn from the battery = I = 4/2 = 2A.

OR

(a) (a) $\beta = \frac{\Delta I_C}{\Delta I_B} = \frac{2\text{ mA}}{20\,\mu\text{A}} = 100 \quad (1)$

(b) The input resistance R_{BE} = $\frac{\Delta V_{BE}}{\Delta I_B} = \frac{20\text{ mV}}{20\,\mu\text{A}} = 1\,\text{k}\Omega$

(c) Transconductance = $\frac{\Delta I_C}{\Delta V_{BE}} = \frac{2\text{ mA}}{20\,mV} = 0.1\,\text{mho}$

(d) The change in input voltage is $R_L \Delta I_C = (5\,k\Omega)(2\text{ mA}) = 10\text{ V}$

The applied signal voltage = 20 mV

Thus, the voltage gain is,

$$= \frac{10\text{ V}}{20\,\text{mV}} = 500 \quad (1)$$

28.

(a) Radius of circular path in magnetic field

$$r = \frac{mv}{qB}$$

Since $\text{Mass}_{\text{proton}}$ > $\text{Mass}_{\text{electron}}$

Therefore, radius of proton's circle will be larger

$$\frac{r_p}{r_e} = \frac{m_p}{m_e} = \frac{1.67x10^{-37}}{9.1x10^{-31}} = 1835$$

(b) Lorentz force on moving charge particle in magnetic field is always perpendicular to the velocity of the particle.

The work done by the magnetic force is

$$dW = \vec{F}.d\vec{\ell}$$

$$dW = Fd\ell \cos\theta$$

$$\text{but } \theta = 90^o$$

$$dW = 0$$

Thus on moving charged particle in uniform magnetic field no work is performed. Hence, the kinetic energy of the charged particle will remain constant.

(c)

(i) the field is reduced to hal

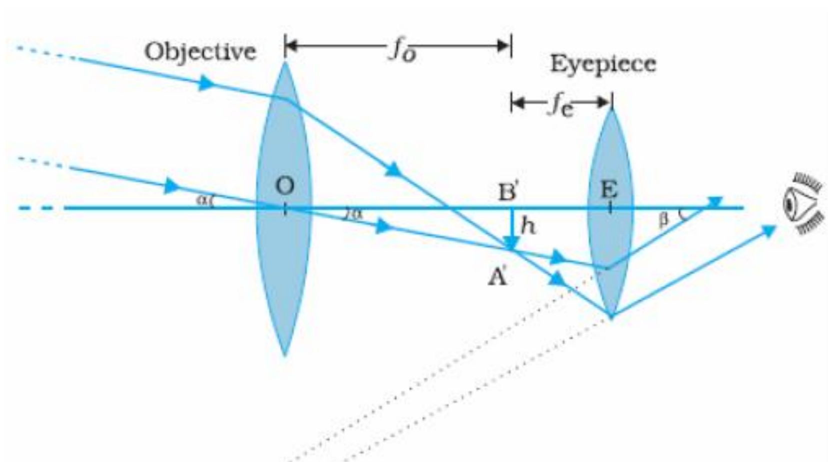
(ii) the field will be halved

(iii)the field will be perpendicular to the plane of the page, pointing downwards.

OR

(a) Magnifying power is the ratio of the angle subtended at the eye by the final image to the angle which the object subtends at the lens or the eye.

$$m = \frac{\beta}{\alpha} = \frac{h}{f_e} \cdot \frac{f_o}{h} = \frac{f_o}{f_e}$$



(b) Given

Magnification m = f_o / f_e and length of the tube, $f_o + f_e = L$

$8 = f_o / f_e$ & $f_o + f_e = 36$

Hence $8f_e + f_e = 36$

Or $f_e = 4$cm

Therefore, $f_o = 32$cm

(c)

Angular magnification

$$m = \frac{15}{0.01} = 1500$$

Let diameter of image be d. Then,

$$\frac{d}{1500} = \frac{3.48\times10^6}{3.8\times10^8}$$

$$\Rightarrow d = 13.7cm$$

29.

(a) We have μ = 1.55, f = 20 cm. Let R_1 = R & R_2 = -R

Now, $\frac{1}{f} = (\mu-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

By substituting the values, we get

$$\frac{1}{20} = (1.55-1)\left(\frac{1}{R} - \frac{1}{-R}\right) = 0.55\times\frac{2}{R}$$

Calculating for R, we have

R = 22cm

(b)

(i) Focal length of a lens is given as

$$\frac{1}{f} = (\mu-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

where assuming for μ = 1.55 & R_1 = R & R_2 = -R; we realise that f = R (numerically). If f is made too small in order to increase its magnifying power, the radius of curvature of the lens will also be very small. A very small R of a spherical lens can result in chromatic aberrations, which are undesirable.

(ii) Magnifying power of compound microscope

$$M = \frac{LD}{f_o f_e}$$

In order to have large M, we require to have both f_o & f_e small.

(c) For a simple microscope

Magnification $M = 1 + \frac{D}{f}$

Since $f_r > f_b$

Therefore, $M_b > M_r$

Thus, magnifying power will be more in blue light than in red light.

OR

The force acting on a charge carrier q is given by

$$\vec{F} = q\left(\vec{v} \times \vec{B}\right)$$

(i) Magnitude of force F will be maximum when $\left|\vec{v} \times \vec{B}\right|$ is maximum and it possible only when $\vec{v}$ and $\vec{B}$ are mutually perpendicular to each other.

As we know, $\left|\vec{v} \times \vec{B}\right|$ = v B sin 90^o = vB

Hence, F_{max} = qvB

(ii) F will be minimum when $\left|\vec{v} \times \vec{B}\right|$ is minimum having a zero value which is possible when angle between $\vec{v}$ and $\vec{B}$ is 0^o or 180^o. Means charge carrier is moving along (or opposite) the direction of magnetic field.

An electron travelling west to east on entering a chamber having uniform electrostatic field in north to south direction will be deflect towards north.
To prevent the electron from deflection from its straight line path, the direction of deflection due to magnetic field must be opposite to that of electrostatic field. Thus, magnetic field, B should be in vertically downward direction so that in accordance with Fleming's left hand rule the deflection of electron due to B is in horizontal plane from north to south and may nullify the deflection due to electrostatic field.