PHYSICS

BOOKS - CBSE COMPLEMENTARY MATERIAL PHYSICS (HINGLISH)

CBSE Examination Paper Delhi–2014

Set 1

1. Define the term 'mobility' of charge carriers.

Write its S.I. unit.

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2. “For any charge configuration, equipotential surface through a point is normal to the electric field.” Justify.

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3. Two spherical bobs, one metallic and other of glass, of the same size are allowed to fall freely from the same height above the ground.

Which of the two would reach the ground earlier and why ?

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4. Show variation of resistivity of copper as a function of temperature in a graph.

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5. A convex lens is placed in contact with a plane mirror. An axial point object at a

distance of $20cm$ from this combination, has its image coinciding with itself. What is the focal length of the convex lens ?

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6. Write an expression in a vector form for the Lorentz magnetic force $\vec{F}$ on a charge Q moving with velocity $\vec{V}$ in a magnetic field $\vec{B}$. What is the direction of the magnetic force?

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7. Out of the two magnetic materials. 'A' has relative permeability slightly greater than unity while 'B' has less than unity. Identify the nature of materials 'A' and 'B'. Will their susceptibilities be positive or negative?

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8. Given a uniform electric field $\overrightarrow{E} = 5 \times 10^3 \hat{i} N/C$, find the flux of this field through a square of 10cm on a side whose plane is parallel to the y - z plane. What would

be the flux through the same square if the plane makes a 30° angle with the x-axis?

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9. For a single slit of width "a" the first minimum of the interference pattern of a monochromatic light of wavelength e occurs at an angle of $\frac{\lambda}{a}$. At the same angle of $\frac{\lambda}{a}$, we get a maximum for two narrow slits separated by distance "a". Explain.

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10. State the two Kirchhof's laws. Explain briefly how these rules are justified.

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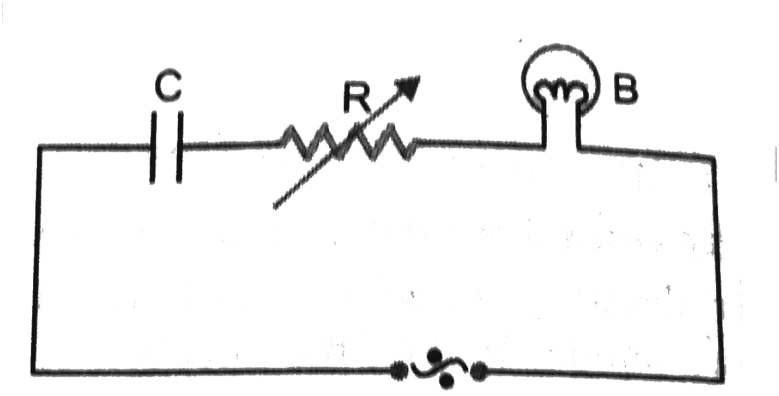
11. A capacitor C, a variable resistor R and a bulb B are connected in series to the ac mains in circuits as shown if Fig. The bulb glows with some brightness. How will the glow of the bulb change if (i) a dielectric slab is introduced between the plates of the capacitor, keeping

resistance T to be the same, (ii) the resistance R to be the same, (ii) the resistance R is increased keeping the same capacitance.



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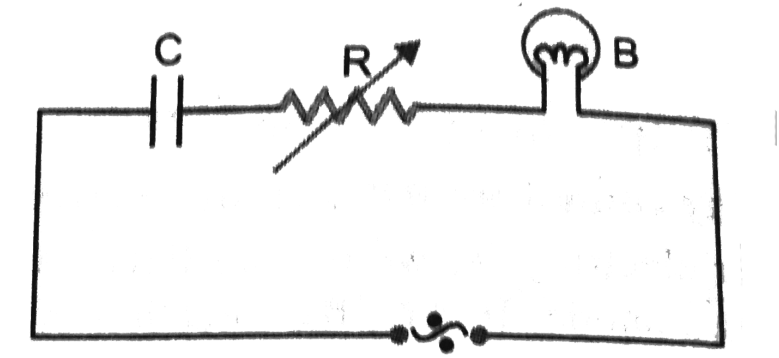

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13. With the help of labelled diagram, state the underlying principle of a cylclotron. Explain clearly how it works to accelerate the charged particles to high energies.

Show that cyclotron frequency is independent of energy of the particle. Is there an upper limit on the enregy acquired by the particle? Give reason.

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14. An electric dipole of length 4 cm, when placed with its axis making an angle of 60° with a uniform electric field, experiences a torque of $4\sqrt{3}$ Nm. Calculate the potential energy of the dipole, if it has charge $\pm$ 8 nC.

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15. A proton and deutron are accelerated through the same accelerating potential. Which one of the two has (a) greater value of

de-broglie wavelength associated with it, and (b) less momentum? Give reasons to justify your answer.

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16. A proton and a deuteron are accelerated through the same accelerating potential. Which one of the two has less momentum? Give reasons to justify your answer.

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17. Monochromatic light of frequency 6.0×10^{14} Hz is produced by a laser. The power emitted is 2×10^{-3} W. The number of photons emitted, on the average, by the source per second is

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18. Draw a plot showing the variation of photoelectric current versus the intensity of incident radiation on a given photosenstive surface.

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19. A 12.5 eV electron beam is used to bombard gaseous hydrogen at room temperature. Upto which energy. Level the hydrogen atoms would be excited ? Calculate the wavelengths of the first memeber of Lyman and first member of Balmer series.

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20. A potentiometer wire of length 1 m has a resistance of 100Ω. It is connected to a 6V battery in series with a resistance of 5Ω. Determine the emf of the primary cell which gives a balance point at 40cm.

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21. (a) Draw a labelled ray diagram showing the formation of a final image by a compound microscope at least distance of distinct vision.

(b) The total magnification produced by a compound microscope is 20. The magnification produced by the piece is 5. The microscope is focussed on a certain object. The distance between the objective and eyepiece is observed to be 14cm. If least distance of distinct vision is 20cm, calculate the focal length of the objective and the eye piece.

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22. The total magnification produced by a compound microscope is 20. The magnification produced by the eye piece is 5. The microscope is focussed on a certain object. The distance between the objective and eye piece is observed to be $14cm$. If least distance of distinct vision is $20cm$, calculate the focal length of objective and eye piece.

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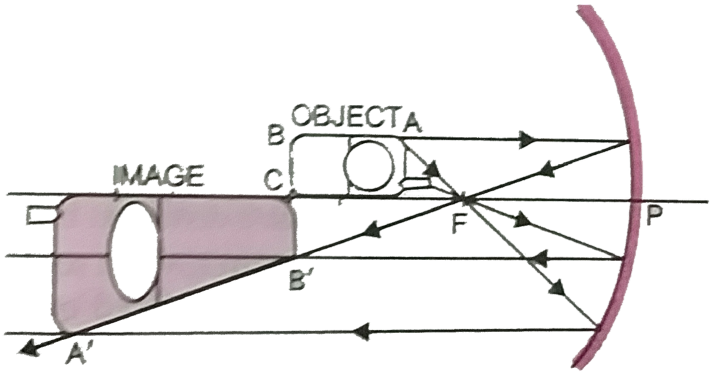
23. A mobile phone lies along the principal axis of a concave mirror as shown in Fig. Show by suitable diagram, the formation of its image. Explain why the magnification is not uniform, and distortion will occur depending on the location of the mobile with respect to the mirror.



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24. Suppose that the lower half of a concave mirror's reflecting surface is covered with an opaque non-reflecting material. What effect will this have on the image of an object placed in front of the mirror ?

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25. Obtain the expression for the energy stored in a parallel plate capacitor of

capacitance C charged to a potential V.

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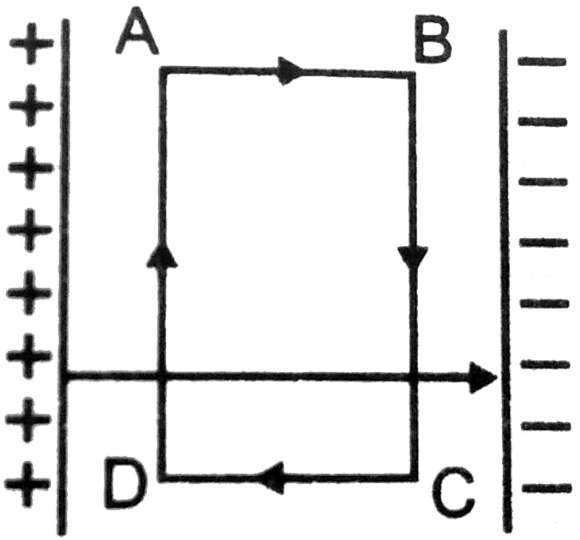
26. A uniform electric field E axis between two charged plates as shown in Fig. What would be work done in moving a charge q along the

closed recetangualr path ABCDA ?



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27. Find out the capacitance of parallel plate capacitor of plate area A and plate separation d.

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28. Two charged spherical conductors of radii R_1 and R_2 when connected by a connecting wire acquire charges q_1 and q_2 respectively. Find the ratio of their charge densities in terms of their radil ?

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29. State Ampere's circuital law, expressing it in integral form.

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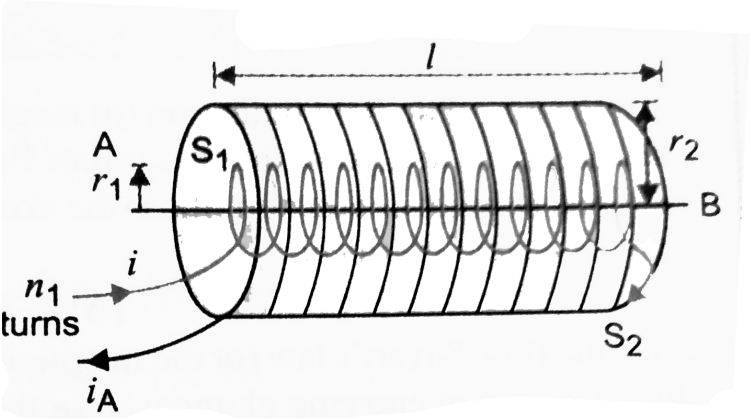
30. Two long coaxical insulated solenoid's S_1 and S_2 of equal lengths are would one over the other as shown in figure. A steady current $'T'$ flows through the inner solenoid S_1 to the other end B, which is connected to the outer solenoid S_2 through which the same current flows in opposite direction so as to come out at end A. If n_1 and n_2 are the number of turns per unit length, find the magnitude and direction of net magnetic field

at a point (i) inside on the axis and (ii) outside the combined system.



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31. Name the em waves which are suitable for radar systems used in aircraft navigation. Write the range of frequency of these waves.

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32. If the earth did not have atmosphere, would its average surface temperature be higher or lower than what it is now? Explain

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33. An em wave exers pressure on the surface on which it is incident. Justify?

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34. Deduce the expression, $N = N_{0e}^{-\lambda t}$, for the law of radioactive decay.

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35. Write symbolically the process expressing the β^+ decay of $._{11}^{22}Na$. Also write the basic nuclear process underlying this decay.

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36. (a) Write symbolically the process expressing the β^+ decay of $._{11}Na^{22}$. Also write the basic nuclear process underlying this decay.

(b) Is the nucleus formed in the decay of the nucleus $._{11}Na^{22}$, an isotope or isobar?

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37. Two independent sources of light will not produce steady interference pattern because

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38. (a) (i) Two independent mono chromatic sources of light cannot produced a sustained interference pattern'. Give reason.

(ii) Light waves each of amplitude "a" and frequency "w", emanating from two coherent light sources superpose at a point. If the displacements due to these waves is given by $y_3 = a\cos\omega t$ and $y_2 = a\cos(\omega t + \phi)$ where ϕ is the phase difference between the two, obtain the expression for the resultant

intensity at the point.

(b) In Young's double slit experiment, using monochromatic light of wavelength λ, the intensity of light at a point on the screen where path difference is λ, is K units. Find out the intensity of light at a point where path difference is $\lambda/3$.

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39. In a Young's double slit experiment, using mono-chromatic light of wavelength λ, the

intensity of light at a point on the screen where the path defference is λ is k units. Find the intensity at a point where the path difference is $\lambda/3$.

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40. (a) How does one demonstrate, using a suitable diagram, that unpolarised light when passed through a Polaroid gets polarised?

(b) A beam of unpolarised light is incident a glass-air interface. Show using a suitable ray

diagram, that light reflected from the interface is totally polarised, when $\mu = \tan i_B$, when μ is the refractive index of glass with respect to air and i_B, is the Brewster's angle.

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41. (a) How does one demonstrate, using a suitable diagram, that unpolarised light when passed through a Polaroid gets polarised?

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diagram, that light reflected from the interface is totally polarised, when $\mu = \tan i_B$, when μ is the refractive index of glass with respect to air and i_B, is the Brewster's angle.

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42. Describe a simple experiment (or activity) to show that the polarity of emf induced in a coil is always such that it tends to produce a current which oppose the change of magnetic flux that produce it

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43. The current flowing through an inductor of self inductance L is continuously increasing. Plot a graph showing the variation of Magnetic flux versus the current

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44. The current flowing through an inductor of self inductance L is continuously increasing.

Plot a graph showing the variation of Induced emf versus dI/dt

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45. (a) Describe a simple experiment (or activity) to show that the polarity of emf induced in a coil is always such that it tends to produce a current which opposes the change of magnetic flux that produces it.

(b) The current flowing through an inductor of self inductance L is continuously increasing.

Plot a graph showing the variation of

(i) Magnetic flux versus the current

(ii) Induced emf versus dI/Dt

(iii) Magnetic potential energy stored versus the current.

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46. Draw a schematic sketch of an ac generator describing its basic elements. State briefly its working principle. Show a plot of variation of Magnetic flux

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47. (a) Draw a schematic diagram of an AC generator. Explain is working and obtain the expression for the instantaneous value of the emf in terms of the magnetic field B, number of turns N of the coil of area A rotating with angular frequency ω. Show how an alternating emf is generated by loop of wire rotating in a magnetic field.

(b) A circular coil of radius 10 cm and 20 turns is rotated about its vertical diameter with

angular speed of 50 rad s^{-1}. in a uniform horizontal magnetic field of $3.0 \times 10^{-2} T$.

(i) Calculate the maximum and average emf induced in the coil.

(ii) If the coil forms a closed loop of resistance 10Ω, calculate the maximum current in the coil and the average power loss due to Joule heating.

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48. Why is choke coil needed in the use fluoresent tube with ac mains ?

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49. (a) state briefly the processes involved in the formation of p-n how the depletion region is formed

(b) using the necessary ciruit diagrams show p-n jucntion are obtained in

(i) forward biasing (ii) reverse biasing how

these characteiistics are made use of in recitifcation

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50. Using the necessary circuit diagram, show how the V-I characteristics of a p-n junction are obtained in (i) forward biasing (ii) Reverse biasing. How are these characteristics made use of in rectification?

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Set Ii Questions Uncommon To Set I

1. Define the term electrical conductivity of a metallic wire. Write its SI unit.

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2. Show variation of resistivity of SI with temperature in a graph.

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3. An electric dipole of length 2 cm, when placed with its axis making an angle of 60° with a uniform electric field, experiences a torque of $8\sqrt{3}$ Nm. Calculate the potential energy of the dipole, if it has a charge of $\pm$ 4nC.

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4. A proton and alpha particle are accelerated through the same accelerating potential. Which one of the two has (a) greater value of

de-broglie wavelength associated with it, and (b) less kinetic energy? justify your answer.

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5. Given a uniform electrin field $E = 2 \times 10^3 \hat{i} N/C$ find the flux of this field through a square of side 20cm, whose plane is parallel to the y-z plane. What would be the flux through the same square, if the plane makes an angle of 30° with the x'' axis?

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6. A $12.9eV$ beam of electrons is used to bombard gaseous hydrogen atom at room temperature. Up to which energy level the hydrogen atoms would be excited?

Calculate the wavelength of the first member of Paschen series and first member of Balmer series.

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7. Answer the following:

(a) Name the em waves which are used for the treatment of certain forms of cancer. Write their frequency range.

(b) Thin ozone layer on top of stratosphere is crucial for human survival. Why?

(c) An em wave exerts pressure on the surface on which it is incident. Justify.

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8. The ozone layer on the top of the stratosphere is crucial for human survival.Explain why?

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9. Why is the amount of the momentum transferred by the em waves incident on the surface so small?

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10. A potentiometer wire of length 1.0 m has a resistance of 15 ohm. It is connected to a 5 V source in series with a resistance of 5Ω. Determine the emf of the primary cell which has a balance point at 60 cm.

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Set Iii Questions Uncommon To Set I And Ii

1. Define the term 'drift velocity' of charge carriers in a conductor and wire its

relationship with the current flowing through it.

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2. Plot a graph showing variation of current versus voltage for the material GaAs

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3. An electric dipole of length 1cm, which places with its axis making an angle of 60°

with uniform electric field, experience a torque ot $6\sqrt{3}Nm$, Calculate potential energy.

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4. A proton and alpha particle are accelerated through the same accelerating potential. Which one of the two has (a) greater value of de-broglie wavelength associated with it, and (b) less kinetic energy? justify your answer.

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5. A 12.3 eV electron beam is used to bombard gaseous hydrogen at room temperature. Upto which energy level the hydrogen atoms would be excited? Calculate the wavelengths of the second member of Lyman series and second member of Balmer series.

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6. Name the em waves which are produced during radioactive decay of a nucleus. Write their frequency range.

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7. Welders wear special glass goggles ro facemask with glass window to protect their eyes from

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8. Why are infrared waves often called as heat waves? Give their one application.

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9. A potentiometer wire of length 1 m has a resistance of 5Ω. It is connected to a 8 V battery in series with a resistance of 15Ω. Determine the emf of the primary cell which gives a balance point at 60 cm.

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