# PHYSICS

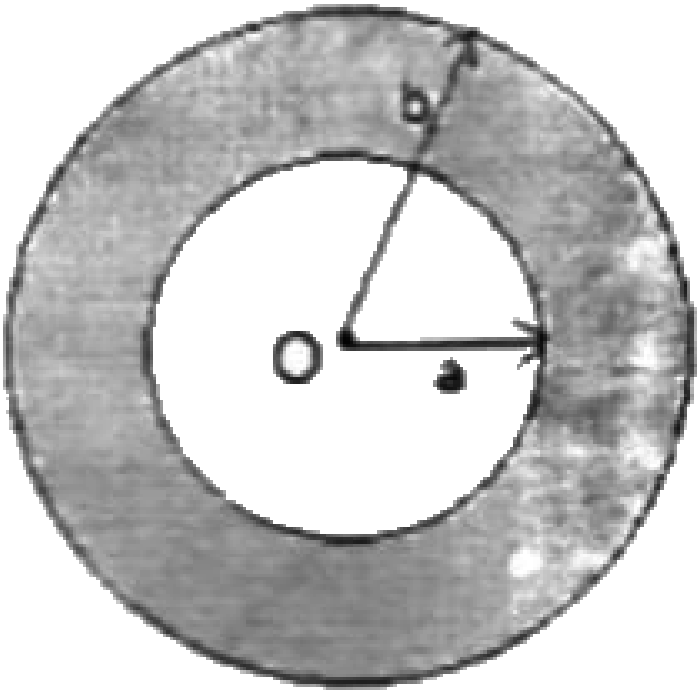
# BOOKS - CBSE COMPLEMENTARY MATERIAL PHYSICS (HINGLISH)

# SAMPLE QUESTION PAPER 2019

## Section A

**1.** Figure shows a point charge +Q, located at a distance R/2 from the centre of a spherical metal

shell. Draw the electric field lines for the given




system.

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**2.** Give an exmple of amateral each for which temperature coefficient of resistivity is (i) positive,

(ii) negative.

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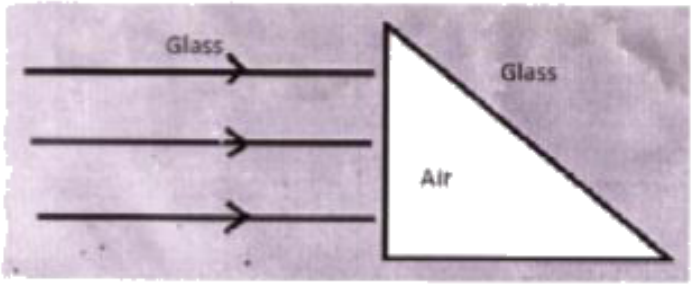
**3.** State the factors on which the refractive index of a material medium for a given wavelength depends.

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**4.** Sketch the emergent wavefront.

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**5.** In the wave picture of light, intensity of light is determined by square of the amplitude of wave. What determines the intensity of light in the photon picture of light?

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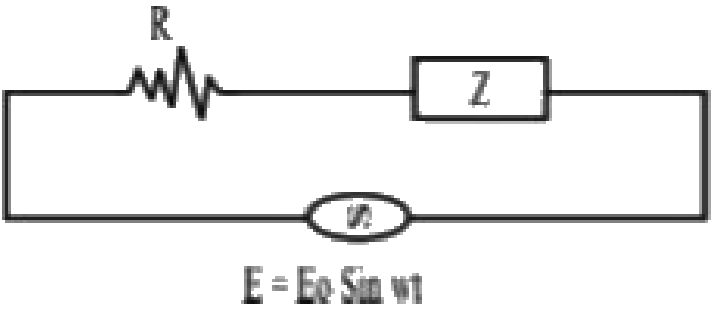
## Section B

**1.** Analternating voltage $E = E_0 \sin \omega t$ is applied to a circuit containing a resistor R connected in series with a black box. The current in the circuit is found to be $= I_0 \sin(\omega t + \pi/4)$.




State whether the element in the black box is a capacitor or inductor.

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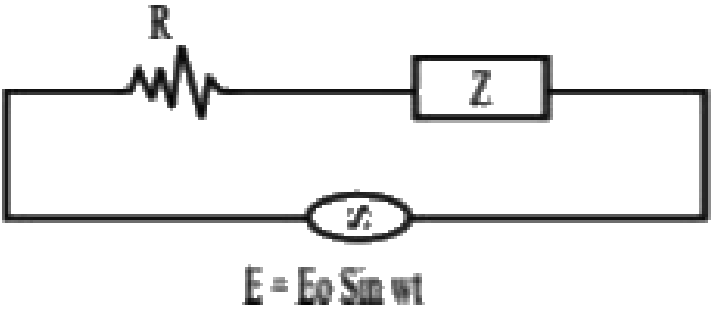
**2.** Analternating voltage $E = E_0 \sin \omega t$ is applied to a circuit containing a resistor R connected in series with a black box. The current in the circuit is found to be $= I_0 \sin(\omega t + \pi/4)$.




Draw the corresponding phasor diagram and find the impedance in tems of R.

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**3.** The magnetic field in a plane electromagnetic wave is given by:

$By = 12 \times 10^{-8} \sin\left(1.20 \times 10^{7} z + 3.60 \times 10^{15} t\right) T.$

Calculate the

Energy density associated with the

Electromagnetic wave.

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**4.** The magnetic field in a plane electromagnetic wave is given by:

$By = 12 \times 10^{-8} \sin\left(1.20 \times 10^{7} z + 3.60 \times 10^{15} t\right) T.$

Calculate the

Speed. of the wave

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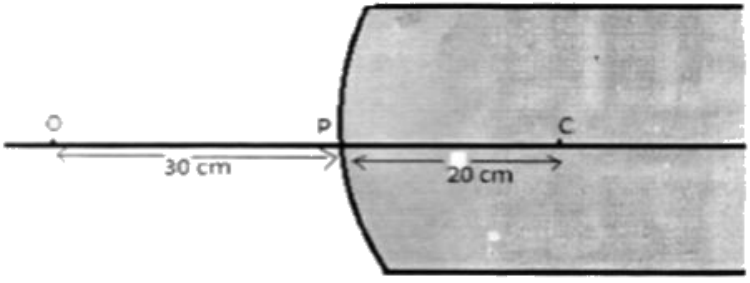
**5.** A spherical convex surface of radius of curvature 20 cm, made of glass $(\mu = 1.5)$ is placed in air Find the position of the image formed, if a point object is placed at 30 cm in front of the convex surface on the principal axis.



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**6.** Name the optoelectronic device used for detecting optical signals and mention the biasing in which it is operated. Draw its I-V characteristics.

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**7.** A monochromatic light source of intensity 5 m W emits $\left(8x10^{15}\right)$ photons per second . This light ejects photoelectrons from a metal surface. The

stopping potential for this setup is 2.0 V. Calculate the work function of the metal.

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**8.** The following table shows some measurements of the decay rate of a radionuclide sample. Find the disintegration constant.

| Time (min) | lnR(Bq) |
|---|---|
| 36 | 5.08 |
| 100 | 3.29 |
| 164 | 1.52 |
| 218 | 1.00 |

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## Section C

**1.** How many electrons must be added to one plate and removed from the other so as to store 25.0 J of energy in a 5.0 nF parallel plate capacitor?

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**2.** a. How many excess electrons must be added to one plate and removed from the other to give a

$5.000nF$ parallel plate capacitor $25.0J$ of stored energy ?

b. How could you modify the geometry of this capacitor so that can store $50.0J$ of energy without changing the charge on its plates?

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**3.** A point charge +Q is placed at the centre 0 of an uncharged hollow spherical conductor of inner radius 'a' and outer radius 'b'.Find the following.

The magnitude and sign of the charge induced on

the inner and outer surface of the conducting shell.

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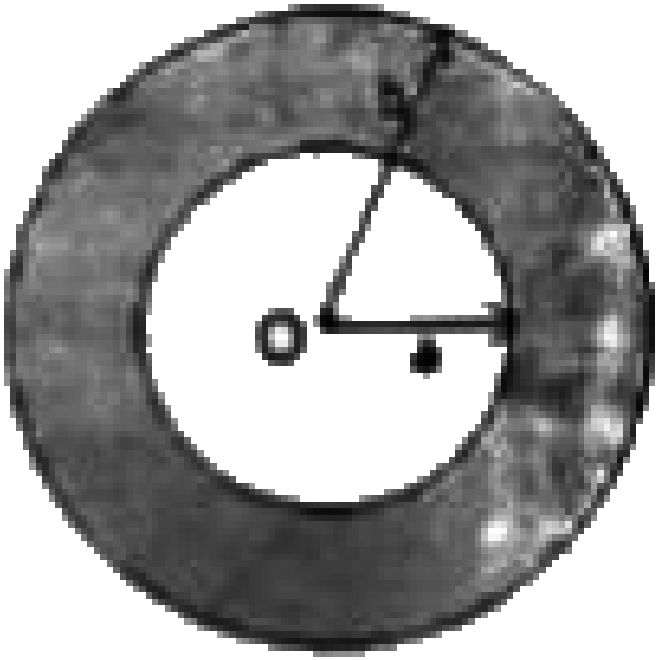
**4.** A point charge +Q is placed at the centre 0 of an uncharged hollow spherical conductor of inner radius 'a' and outer radius 'b'.Find the following.

The magnitude of electric field vector at a distance (i) $r = \frac{a}{2}$, and $(ii) r = 2b$, from the

centre of the shell.



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**5.** The following table gives the length of three copper wires, their diameters, and the applied potential difference across their ends. Arrange

the wires in increasing order according to the following:

The magnitude of the electric field within them.

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**6.** The following table gives the length of three copper wires, their diameters, and the applied potential difference across their ends. Arrange the wires in increasing order according to the following:

The drift speed of electrons through them, and

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**7.** The following table gives the length of three copper wires, their diameters, and the applied potential difference across their ends. Arrange the wires in increasing order according to the following:

The current density within them.

| Wire no. | Length | Diameter | Potential Difference |
|---|---|---|---|
| 1 | L | 3d | V |
| 2 | 2L | d | V |
| 3 | 3L | 2d | 2V |

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**8.** With the help of a diagram, explain the principle of a device which changes a low voltage into a high voltage but does not violate the law of conservation of energy. Give any one reason why the device may not be 100% efficient.

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**9.** In a double slit experiment, the distance between the slits is 3 mm and the slits are 2 m away from the screen. Two interference patterns can be seen on the screen one due to light with wavelength 480 nm, and the other due to light

with wavelength 600 nm. What is the separation on the screen between the fifth order bright fringes of the two interference patterns?

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**10.** What do you understand by the statement 'Light from the sun is unpolarised'. Explain how does sunlight gets polarized by the process of scattering?

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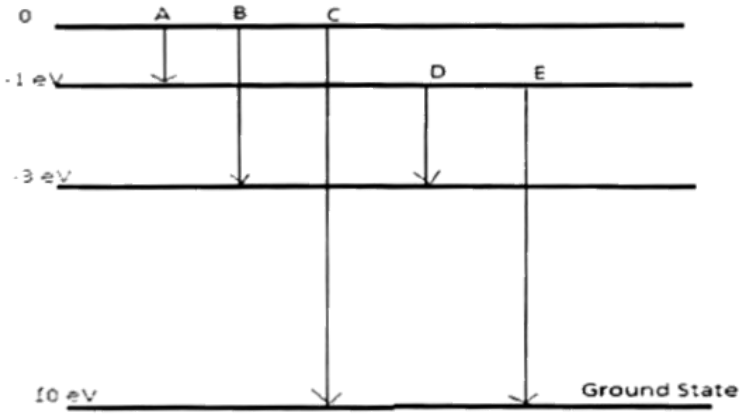
**11.** Name the experiment which confirms the existence of wave nature of electrons. Derive the expression for de-Broglie wavelength of an electron moving under a potential difference of V volts, (ii) An electron and a proton have the same Kinetic Energy, Which of these particles has the shorter de-Broglie wavelength?

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**12.** VARIATION OF BINDING ENERGY OF PER NUCLEON WITH MASS NUMBER


**13.** A message signal of frequency 20 KHz and peak voltage of 20 volts is used to modulate a carrier signal of frequency 2 MHz and peak voltage of 40 volts. Determine (i) modulation index, (ii) the side bands produced. Draw the corresponding frequency spectrum of amplitude modulated signal.

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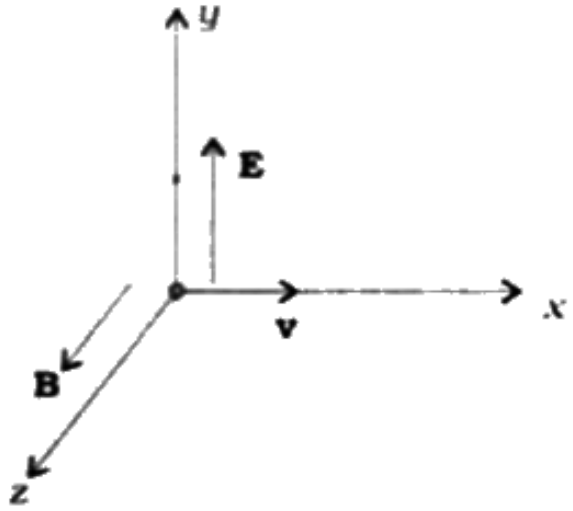
**14.** A particle of charge q is moving with velocity v in the presence of crossed Electric field E and Magnetic field B as shown. Write the condition under which the particle will continue moving along x- axis. How would the trajectory of the particle be affected if the electric field is switched

off?

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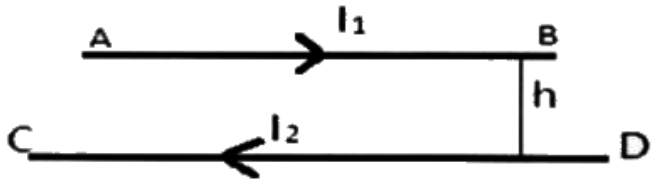
**15.** A horizontal wire AB of length T and mass 'm' carries a steady current $I_1$ free to move in vertical plane is in equilibrium at a height of 'h' over another parallel long wire CD carrying a steady

current $I_2$ which is fixed in a horizontal plane as shown. Derive the expression for the force acting per unit length on the wire AB and write the condition for which wire AB is in equilibrium.

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**16.** The energy levels of an atom of element X are shown in the diagram. Which one of the level transitions will result in the emission of photons

of wavelength 620 nm? Support your answer with mathematical calculations.

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**17.** An angular magnification (magnifying power) of $30X$ is desired using an objective of focal length $1.25cm$ and an eye piece of focal length $5cm$. How will you set up the compound microscope ?

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**18.** Draw a ray diagram of an astronomical telescope for the final image formed at least distance of distinct vision?

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**19.** An astronomical telescope has an angular magnification of magnitude 5 for distant objects. The separation between the objective and an eye piece is cm and the final image is formed at infinity. Calculate the focal length of the objective and the focal length of the eye piece?

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