

# CBSE SAMPLE PAPER 2014

## CLASS - XII

### PHYSICS {042}

**Time: 3 Hours**

**Max. Marks : 70**

#### General Instructions

- All questions are compulsory.
- There is no overall choice. However, some internal choices have been provided in some questions.
- Question number 1 to 8, carry one mark each, 9 to 16 carry two marks each, 17 to 25 carry three marks each, 26 carry four marks, 27 to 29 carrying five marks each
- Use of calculator is not permitted. However you may use log tables if necessary. You may use the following values of physical constants wherever necessary:

$$c = 3 \times 10^8 \text{ms}^{-1} ;$$

$$h = 6.6 \times 10^{-34} \text{Js} ;$$

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

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

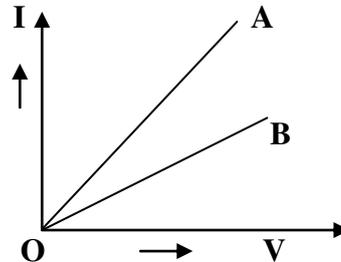
$$\text{Boltzmann constant } k = 1.38 \times 10^{23} \text{ JK}^{-1}$$

$$\text{Avogadro's number } N_A = 6.023 \times 10^{23} / \text{mole} \quad \text{Mass of neutron } M_n = 1.6 \times 10^{-27} \text{ kg}$$

---

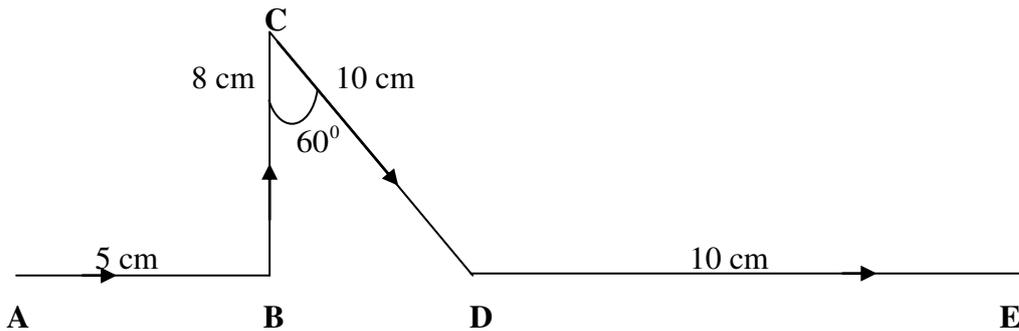
1. A ray of light incident on an equilateral glass prism ( $\mu_{\text{glass}} = \sqrt{3}$ ) moves parallel to the base of the prism inside it. What is the angle of incidence for this ray?
  2. A capacitor of capacitance  $C$  is being charged up by connecting it across a dc voltage source of voltage  $V$ .
  3. Two electrically charged particles having charges of different magnitude, when placed at a distance ' $d$ ' from each other, experience a force of attraction ' $F$ '. These two particles are put in contact and placed at the same distance from each other. What is the nature of new force between them? Is the magnitude of the force of attraction between them now more or less than ' $F$ ' ?
-

4. The V-I graph for series and parallel combinations of two metallic resistors are given. Which one represents series combination?



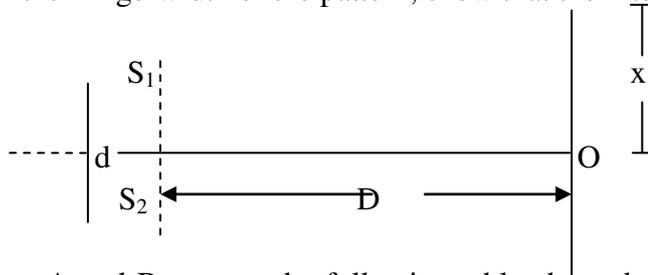
5. Show on a graph, the nature of variation of the (associated) de Broglie wavelength  $\lambda_B$  with the accelerating potential V for an electron initially at rest.
6. The mean life of a radioactive sample is  $T_m$ . What is the time in which 50% of this sample would be decayed?
7. A narrow stream of protons and deuterons having the same momentum values enters a region of uniform magnetic field directed perpendicular to their common direction of motion. What would be the ratio of the radii of the circular paths described by proton and deuteron?
8. A proton and an  $\alpha$  – particle, both initially at rest, are suitable accelerated so has to have the same kinetic energy. What is the ratio of their de Broglie wavelength?
9. Find the amount of work done in rotating an electric dipole of the dipole moment  $3 \times 10^{-8} \text{ cm}$  from its position of stable equilibrium to the position of unstable equilibrium in a uniform electric field of intensity  $10^4 \text{ N/C}$ .

10. Find the magnitude of the force on each segment of the wire shown here, if a magnetic field of  $0.30T$  is applied parallel to AB and DE. (Take the value of the current flowing in the wire as 1 ampere).



11. An electric heater is connected, turn by turn, to a dc and an ac source of equal voltage. Will the rate of heat production be same in the two cases? Explain.

12. The intensity at central maxima O in a Young's double slit set-up is  $I_0$ . If the distance OP equals one-third of the fringe-width of the pattern, show that the intensity at point P would equal  $\frac{I_0}{4}$ .



13. Two students A and B prepare the following table about the electromagnetic waves. Rewrite this table in its correct form.

	Direction of			Peak value of	
Student	Electric field	Magnetic field	Propagation	Electric field	Magnetic field

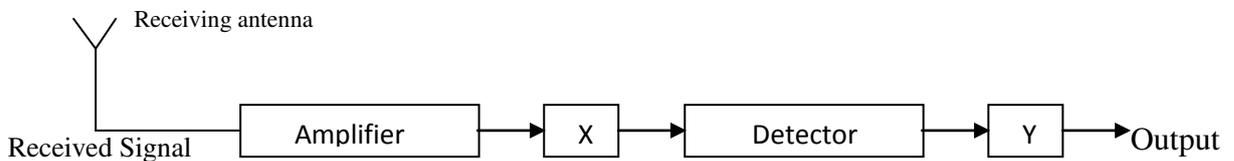
A	x-axis	x-axis	y-axis	E	$B = cE$
B	y-axis	z-axis	x-axis	$E = cB$	B

14. Light of wavelength  $2000 \text{ \AA}$  falls on a metal of work function  $4.2 \text{ eV}$ . What is the kinetic energy (in eV) of (i) the fastest and (ii) the slowest photoelectron, emitted from metal surface?
15. Name the physical quantity the SI unit of which is Becquerel (Bq). How is this quantity related to disintegration constant, half life, and mean life of the radioactive element?

**OR**

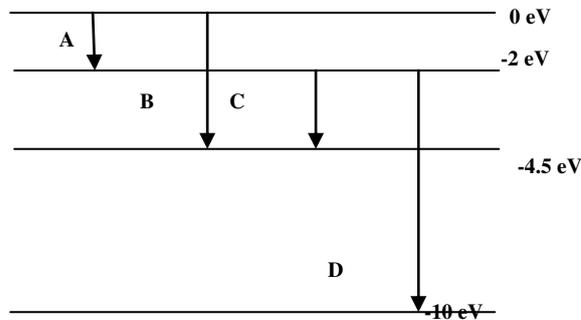
Write the equations for two types of  $\beta$ -decay. Why is it very difficult to detect the neutrino?

16. Block diagram of a receiver is as shown:



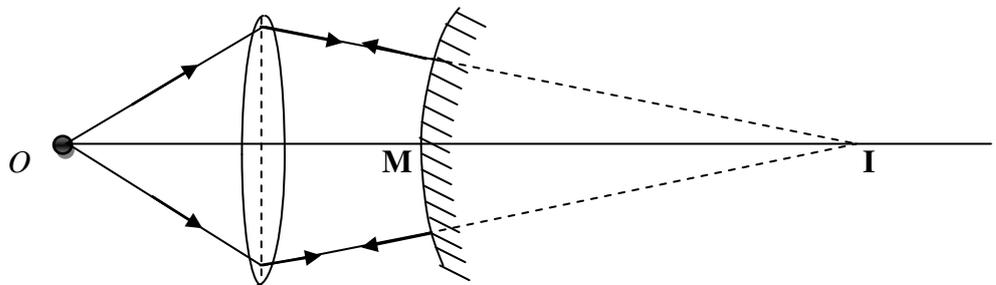
Identify X and Y. State their function.

17. A resistor of resistance  $400 \text{ }\Omega$  and a capacitor of reactance  $200 \text{ }\Omega$  are connected in series to a  $220\text{V}$ ,  $50 \text{ Hz}$  ac source. If the current in the circuit is  $0.49 \text{ A}$ , find the
- Voltage across the resistor and capacitor.
  - Value of inductance required so that voltage and current are in phase.
18. The energy levels of a hypothetical atom are as shown below. Which of the shown transitions will result in the emission of a photon of wavelength  $275 \text{ nm}^2$ ?

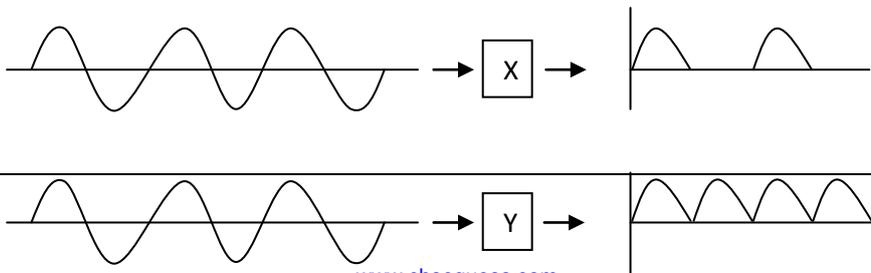


Which of these transitions corresponds to the emission of radiation of (i) maximum and (ii) minimum wavelength?

19. An object is placed at a distance of 15 cm from convex lens of focal length 10 cm. On the other side of the lens, a convex mirror is placed such that its distance, from the lens is equals the focal length of the lens. The image formed by this combination is observed to coincide with the object itself. Find the focal length of the convex mirror.



20. An ac signal is fed into two circuits X and Y and the corresponding outputs in the two cases have the wave forms shown below. Name the circuits X and Y. Also draw their detailed circuit diagrams.



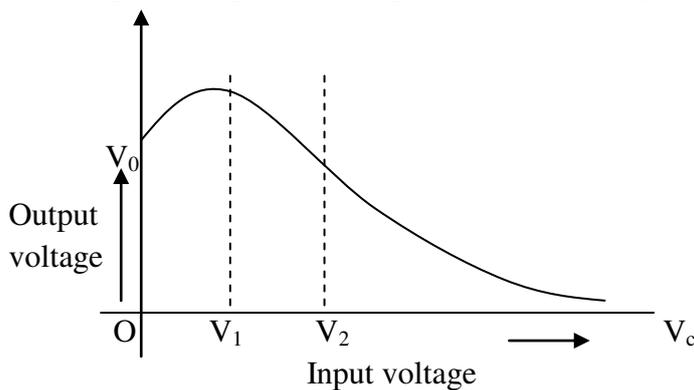
[www.cbseguess.com](http://www.cbseguess.com)

Other Educational Portals

**OR**

The transfer characteristic of a base-biased transistor in CE configuration is as shown. Name the region corresponding to the value (i) 0 to  $V_1$ , (ii)  $V_1$  to  $V_2$ , and (iii) greater than  $V_2$  of the input voltage applied to the transistor.

Identify the voltage range that should not be used if the transistor has to work as a switch. What is the practical use of transistor when it is operated in this voltage range? Name the source that results in a higher energy of the output of a transistor operated in this range?



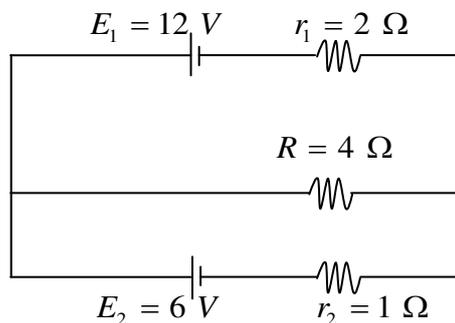
21. A charged particle of charge  $2\mu C$  and mass 10 milligrams, moving with a velocity of 1000 m/s, enters a uniform electric field of strength  $10^4 NC^{-1}$  directed perpendicular to its direction of motion. Find the velocity and displacement of the particle after 10 s.
22. Two capacitors with capacitances  $C_1$  and  $C_2$  are charged to potential  $V_1$  and  $V_2$  respectively and then connected in parallel. Calculate the common potential across the combination, the charge on each capacitor, the electrostatic energy stored in the system and the change in the electrostatic energy from its initial value.

23. Two convex lenses of equal focal length but of aperture  $A_1$  and  $A_2$  ( $A_2 < A_1$ ) are used as objective lenses in two astronomical telescopes having identical eyepieces. Compare the ratio of their
- resolving power,
  - normal magnifying power, and
  - Intensity of images formed by them. Which one of the two telescopes should be preferred? Why?

24. Give reasons for the following:

- For ground wave transmission, size of the antenna ( $l$ ) should be comparable to wavelength of signal, i.e.  $l = \frac{\lambda}{4}$ .
- Audio signal converted into an electromagnetic wave are not directly transmitted as such.
- The amplitude of the modulating signal is kept less than the amplitude of the carrier wave.

25. Find the potential difference across each cell and the rate of energy dissipation in R.



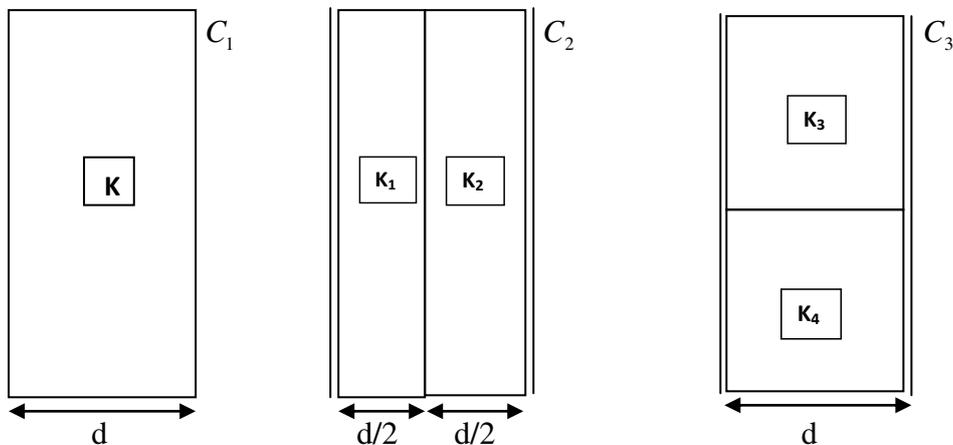
26. Ameer and Anjali want to purchase a new TV set. They looked at some branded TVs. The dealer showed them LCD and LED TVs. Now they were confused which set to buy. Finally after discussing with friends and reading relevant literature, they decided to purchase an LED TV.

- What value Ameer and Anjali are highlighted here?
- What is the difference between LED and LCD?

27. State the principle of a machine that can build up high voltage of the order of a few million volts. Explain the construction and working of this machine.

**OR**

Three identical parallel plate (air) capacitors  $C_1, C_2, C_3$  have a capacitance  $C$  each. The space between their plates is now filled with dielectrics as shown. If all the three capacitors still have equal capacitances, obtain the relation between the dielectric constants  $K, K_1, K_2, K_3$  and  $K_4$ .



28. (a) How does a paramagnetic material behave in the presence of an external magnetic field? Explain with help of appropriate diagram.

(b) What happens when temperature of a paramagnetic sample is lowered?

(c) To which of the two - a polar dielectric or a non - polar dielectric - does a paramagnetic material correspond? Justify your answer.

**OR**

(a) A magnet dipole is placed in a uniform magnetic field with its axis tilted with respect to its position of stable equilibrium. Deduce an expression for the time period of (small amplitude)

oscillation of this magnetic dipole about an axis, passing through its centre and perpendicular to its plane.

(b) If this bar magnet is replaced by a combination of two similar bar magnets placed over each other, how will the time period vary?

29. Using Huygen's construction of a wave front, explain the reflection of a plane wave front at a plane surface. Draw the shape of the refracted wave front when a plane wave front is incident on (i) prism (ii) convex mirror (iii) concave mirror. Illustrate with the help of diagrams the action of convex lens and concave lens on a plane wave front incident on it.

**OR**

(a) State the essential condition for the diffraction of light to take place.

A parallel beam of monochromatic light falls normally on a narrow slit and light coming out of the slit is obtained on the screen. Derive an expression for the angular width of the central bright maxima obtained on the screen.

(b) 'Diffraction defines the limit of optics'. Give a brief explanation of this statement.

\*\*\*Best of luck\*\*\*