KENDRIYA VIDYALAYA SANGATHAN, HYDERABAD REGION
SAMPLE PAPER – 05 (2017-18)

SUBJECT: PHYSICS (043)

BLUE PRINT : CLASS XII

UNIT		VSA (1 mark)	SA - I (2 marks)	SA – II (3 marks)	VBQ (4 marks)	LA (5 marks)	Total
I	**Electrostatics**	1(1)	--	6(2)	--	--	**7(3)**
II	**Current Electricity**	1(1)	--	3(1)	4(1)	--	**8(3)**
III	**Magnetic Effects of Current and Magnetism**	--	2(1)	6(2)	--		**8(3)**
IV	**Electromagnetic Induction & Alternating Currents**	--	--	3(1)	--	5(1)	**8(2)**
V	**Electromagnetic Waves**	--	--	3(1)	--	--	**3(1)**
VI	**Optics**	1(1)	2(1)	6(2)	--	5(1)	**14(5)**
VII	**Dual Nature of Radiation and Matter**	--	2(1)	3(1)	--	--	**5(2)**
VIII	**Atoms and Nuclei**	--	2(1)	3(1)	--	--	**5(2)**
IX	**Electronic Devices**	--	2(1)	--	--	5(1)	**7(2)**
X	**Communication Systems**	2(2)	--	3(1)	--	--	**5(3)**
	Total	**5(5)**	**10(5)**	**36(12)**	**4(1)**	**15(3)**	**70(26)**

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SUBJECT: PHYSICS **MAX. MARKS : 70**
CLASS : XII **DURATION : 3 HRS**

General Instruction:

(i) ***All*** *questions are compulsory. There are* ***26*** *questions in all.*

(ii) *This question paper has* ***five*** *sections : Section A, Section B, Section C, Section D and Section E.*

(iii) *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.*

(iv) *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.*

(v) *You may use the following values of physical constants wherever necessary :*

$c = 3\times10^{8}\, m/s, \quad h = 6.63\times10^{-34}\, Js, \quad e = 1.6\times10^{-19}\, C, \quad \mu_0 = 4\pi\times10^{-7}\, TmA^{-1},$

$\varepsilon_0 = 8.854\times10^{-12}\, C^2N^{-1}m^{-2}, \quad m_e = 9.1\times10^{-31}\, kg, \quad \frac{1}{4\pi\varepsilon_0} = 9\times10^{9}\, Nm^2C^{-2},$

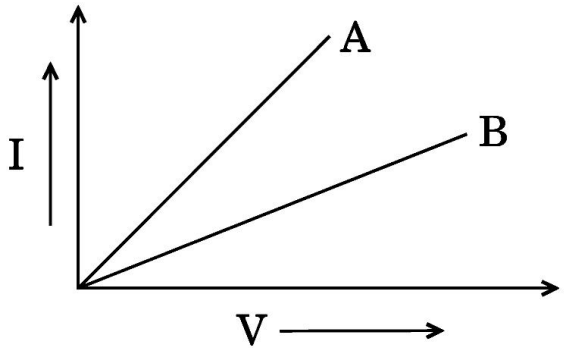
Mass of neutron $= 1.675\times10^{-27}\, kg$, Mass of proton $= 1.673\times10^{-27}\, kg$,

Avogadro's number $= 6.023\times10^{23}$ per gram mole, Boltzmann constant $= 1.38\times10^{-23}\, JK^{-1}$

SECTION – A
Questions 1 to 5 carry 1 mark each.

1. For the same angle of incidence, the angle of refraction in two media A and B are 25^0 and 35^0 respectively. In which medium is the speed of light less ?

2. Two metallic resistors are connected first in series and then in parallel across a d.c. supply. Plot of I – V graph is shown for the two cases. Which one represents a parallel combination of the resistors and why ?



3. Write the function of a transducer in communication system.

4. The charging current for a capacitor is 0.25A. what is the displacement current across its plates?

5. A signal of 5KHz frequency is amplitude modulated on a career wave of frequency 2MHz. What are the frequencies of the side bands produced?

SECTION – B
Questions 6 to 10 carry 2 marks each.

6. Write the conditions for observing a rainbow. Show by drawing suitable diagram, to understand the formation of rainbow.

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 the materials 'A' and 'B'. Will their susceptibilities be positive or negative.

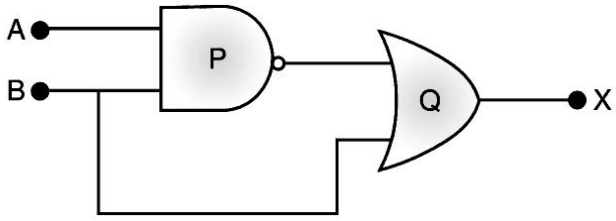
8. The wavelength λ of photon and the de-Broglie wavelength of an electron have the same value. Show that energy of photon is (2λ mc/h) times the kinetic energy of electron; where m, c and h have their usual meaning.

9. Given the value of the ground state energy of hydrogen atom as –13·6 eV, find out its kinetic and potential energy in the ground and second excited states.

10. The output of an OR gate is connected to both the inputs of an NAND gate. Draw the logic circuit of combination of gates and write its truth table.

OR

(i) Identify the logic gates marked P and Q in the given logic circuit.



(ii) Write down the output at X for the inputs A = 0, B = 0 and A = 1, B = 1.

SECTION – C

Questions 11 to 22 carry 3 marks each.

11. Two capacitors of capacitance 10 μF and 20 μF are connected in series with a 6 V battery. After the capacitors are fully charged, a slab of dielectric constant (K) is inserted between the plates of the two capacitors. How will the following be affected after the slab is introduced :
(a) the electric field energy stored in the capacitors
(b) the charges on the two capacitors
(c) the potential difference between the plates of the capacitors
Justify your answer.

12. Use Biot-Savart law to derive the expression for the magnetic field on the axis of a current carrying circular loop of radius R.
Draw the magnetic field due to a circular wire carrying current it.

OR

Derive an expression for the magnetic moment of an electron revolving around the nucleus in terms of its angular momentum. What is the direction of the magnetic moment of the electron with respect to its angular momentum?

13. (a) Why photoelectric effect cannot be explained on the basis of wave nature of light? Give reasons.
(b) Write the basic features of photon picture of electromagnetic radiation on which Einstein's photoelectric equation is based.

14. Two identical cells of emf 1.5 V each joined in parallel supply energy to an external circuit consisting of two resistances of 7Ω each joined in parallel. A very high resistance voltmeter read the terminal voltage of cells to be 1.4 V. Calculate the internal resistance of each cell.

15. How are electromagnetic waves produced? What is the source of energy of these waves? Write mathematical expressions for electric and magnetic fields of an electromagnetic wave propagating along the z-axis. Write any two important properties of electromagnetic waves.

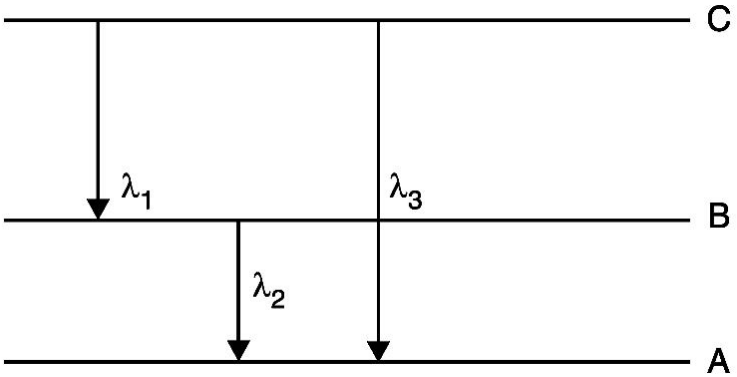
16. (a) For a glass prism ($\mu = \sqrt{3}$) the angle of minimum deviation is equal to the angle of the prism. Calculate the angle of the prism.
(b) Draw a ray diagram when incident ray falls normally on one of the two eqyal sides of a right angled isosceles prism having refractive index $\mu = \sqrt{3}$.

17. Explain the following, giving reasons:
(a) When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have the same frequency as the incident frequency.
(b) When light travels from a rarer to a denser medium, the speed decreases. Does this decrease in speed imply a reduction in the energy carried by the wave?
(c) In the wave picture of light, intensity of light is determined by the square of the amplitude of the wave. What determines the intensity in the photon picture of light?

18. (a) A parallel plate capacitor C_1 having charge Q is connected to an identical uncharged capacitor C_2 in series. What would be the charge accumulated on the capacitor C_2?
(b) Three identical capacitors each of capacitance $3\,\mu$F are connected, in tern, in series and in parallel combination to the common source of V volt. Find out the ratio of the energies stored in two configurations.

19. (a) Define Self inductance. Write its SI units.
(b) A long solenoid with 15 turns per cm has a small loop of area 2.0 cm^2 placed inside the solenoid normal to its axis. If the current carried by the solenoid changes steadily from 2.0 A to 4.0 A in 0.1 s, what is the induced emf in the loop while the current is changing.

20. (a) State Bohr's quantization condition for defining stationary orbits. How does de-Broglie hypothesis explain the stationary orbits?
(b) Find the relation between the three wavelengths λ_1, λ_2 and λ_3 from the energy level diagram shown below:



21. (a) Distinguish between point to point and broadcast modes of communication. Give an example of each.
(b) Explain the basic concept of mobile telephoning.

22. Describe the principle construction and working of a cyclotron. Explain why an electron cannot be accelerated using a cyclotron.

SECTION – D

Questions 23 carry 3 marks each.

23. Renu, Ritu and Kajal lived in a resettlement colony where they observed most houses stole power from transmission lines using hooks. They had learnt in school about fire caused due to electric short circuit. They decided to make people aware of the risks involved and also the importance of paying their electricity bills. They got all their friends and responsible elders together and with the help of the electricity board, succeeded in changing the situation.

(a) What values did Renu, Ritu and Kajal have?

(b) A low voltage supply from which one needs high currents must have a very low internal resistance, why?

(c) A high tension supply of say 6 KV must have a very large internal resistance. Why?

SECTION – E

Questions 24 to 26 carry 5 marks each.

24. With the proper circuit diagram show the biasing of a (i) npn transistor (ii) pnp transistor in common base configuration. Explain the movement of charge carriers through different part of the transistor. Hence show that $I_E = I_C + I_B$.

Why in a transistor, base is made thin and doped with little impurity atoms? Explain briefly.

OR

Draw the circuit diagram for npn transistor in common emitter configuration. With the help of typical output characteristics write the expressions for (i) input resistance (ii) output resistance and (iii) current amplification factor.

When would you prefer to use a transistor as a common base or a common emitter amplifier?

25. (i) Draw a neat labelled diagram of a compound microscope. Explain briefly its working.

(ii) Why must both the objective and the eyepiece of a compound microscope have short focal lengths?

OR

Describe Young's double slit experiment to produce interference pattern due to a monochromatic source of light. Deduce the expression for the fringe width.

In Young's double slit experiment, the two ,slits are 0.03 cm apart and the screen is placed at a distance of 1.5m away from the slits, the distance between the central bright fringe and central bright fringe is 1 cm. Calculate the wavelength of light used.

26. A $2\mu F$ capacitor, 100Ω resistor and 8H inductor are connected in series with an AC source.

(i) What should be the frequency of the source such that current drawn in the circuit is maximum? What is the frequency called?

(ii) If the peak value of emf of the source is 200V, find the maximum current.

(iii) Draw the term 'Sharpness of Resonance'. Under what condition, does a circuit become more selective?

OR

(i) With the help of a neat and labelled diagram, explain the principle and working of a moving coil galvanometer.

(ii) What is the function of uniform radial field and how is it produced?