SAMPLE PAPER
Physics
Class XII

Time : 3 Hours **Max. Marks : 70**

General Instructions :

(i) All questions are compulsory.
(ii) An internal choice has been provided in one question of 2 marks, one question of 3 marks and three questions of 5 marks. You have to attempt only one of the choices in such questions
*(iii) Question numbers **1** to **5** are very short answer type questions, carrying **one** mark each.*
*(iv) Question numbers **6** to **12** are short answer type questions, carrying **two** marks each.*
*(v) Question numbers **13** to **24** are short answer type questions, carrying **three** marks each.*
*(vi) Question numbers **25** to **27** are long answer type questions, carrying **five** marks each.*
(vii) Use of calculators is not permitted. However, you may use log tables, if necessary.

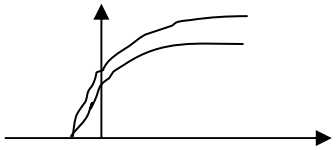
Q.1> Which physical quantity has the SI unit as
a. C-m
b. Vm

Q.2> State the phase relationship b/w current and voltage in an ac circuit for
a. Pure resistor
b. Pure inductor

Q.3> Name the type of communication corresponding to the case where the signal is
a. A continuos signal essentially similar to the information
b. A discrete and binary coded version of the information

Q.4> An electron and a proton with equal momenta enter a magnetic field perpendicular to the field lines. What is the ratio of the radii of curvature of their trajectories.

Q.5> In a photoelectric experiment, the following graphs were obtained b/w current and voltage. Name the characteristic of the incident radiation that was kept constant



Q.6> Write the expression for force per unit length b/w 2 parallel,
infinite current carrying conductors. Hence define the SI unit of current.

Q.7> State the principle of an ac generator. Write the expression for the maximum emf produced in it.

Q.8> An incident beam of light of intensity Io is made to fall on a polaroid A. Another Polaroid B is so oriented to A that there is no light emerging out of B. A third Polaroid C is now introduced b/w A and B such that its axis bisects the angle b/w the axis of A and B. What is the intensity of light b/w

a. A and C
b. B and C

Give reasons for your answer

Q.9> A bulb and a capacitor are connected in series to an ac source. The bulb glows with some brightness. How will the brightness of the bulb change when a dielectric slab is introduced b/w the plates of the capacitor
Give reasons for your answer

OR

Q.9> A bulb and an inductor are connected in series to an ac source. The bulb glows with some brightness. How will the brightness of the bulb change when an iron rod is introduced in the inductor.
Give reasons for your answer

Q.10> Two metal plates A and B are kept parallel to each other 1cm apart in air. A is given a positive potential of 10V and the outer surface of B is earthed.

a. What is the magnitude, direction and type of electric field existing b/w A and B
b. What is the work done in moving a charge b/w 2 points on plate A

Q.11> 2 capacitors of 3F and 6F are charged to potential of 2V and 5V respectively. These two are then connected in parallel. Find the charge across each of the two.

Q.12> A series combination of 2K ohm and 1K-ohm resistors is connected across a battery of 6V and negligible internal resistance. The potential difference across the 2K ohm resistor is found using a
(1) 30K-ohm voltmeter (2) 1K ohm voltmeter (3) both these voltmeters connected across it
If the readings obtained are V1, V2 and V3 then arrange them is ascending order.
How will the three reading compare if the potential difference was measured across the series combination of 2K and 1K resistor

Q.13> Define the term modulation. Name the three types of modulation used for message signal using a sinusoidal carrier wave. Explain the meaning of any one of them.

Q.14> Explain how optical communication system offers the possibility of millions of channels with increased bandwidth. Give an additional advantage of optical communication system over a system using coaxial cables.

Q.15> Two nearby narrow slits are illuminated by monochromatic light. Name the pattern obtained on the screen. One of the slits is now completely covered. Name the pattern now observed. Write 2 differences b/w them

Q.16> A nucleus makes a transition from one permitted energy level to another level of lower energy. Name the part of electromagnetic spectrum to which the emitted photon belongs. What is the order of its energy in eV. Write 4 characteristic of nuclear forces.

Q.17> A small square loop of side 2mm is placed inside and normal to the axis of a long solenoid. The solenoid has 2000 turns wound over a length of 2m. If the current in the solenoid changes from 1A to 3A in π/100 of a second, calculate the emf induced in the loop.

Q.18> Under what conditions is the heat produced in an electric circuit

a. Proportional to the resistance
b. Inversely proportional to the resistance

A resistance R is put in series with a voltameter having electrodes made from a metal having chemical equivalent 'E'. A mass m of the metal gets deposited in time t when a current is made to flow through the combination. Obtain an expression for the heat produced in the resistor during this time.

Q.19> For the potentiometer circuit shown in the figure, points X and Y represent the 2 terminals of an unknown emf E. A student observed that when the jockey is moved from the end A to B, the deflection in the galvanometer remains in the same direction. What are the 2 possible faults in the circuit.
If the deflection in the galvanometer at the end B is

a. More
b. Less

Than that at end A, which of the 2 faults listed above would be there in the circuit. Give reasons to support your answer.

Q.20> Name the part of electromagnetic spectrum to which the waves of wavelength (1) 1Å (2) 1cm belong Using Wein's law $\lambda T = 0.29$cmK, obtain the kelvin temp for these 2 wavelengths.

Q.21> A charge $-\sqrt{2}\mu C$ is placed at point (-1,0), $2\sqrt{2}\mu C$ at (0,0) and $-\sqrt{2}\mu C$ at (1,0). Calculate the net electric field intensity at point (0,1)

OR

Q.21> A point charge of 2μC is kept fixed at the origin. Another charge of 4μC is brought from a far off point to a point 50 cm from the origin. Calculate the electrostatic potential energy of this 2 charge system. Another charge of 1μC is brought to a point 100cm from each of the above two charges. What is the work done?

Q.22> A star converts all its hydrogen to helium achieving 100% helium composition. It then converts helium to carbon via the reaction

$${}_2He^4 + {}_2He^4 + {}_2He^4 \rightarrow {}_6C^{12} + 7.27MeV$$

The mass of the star is 5.0×10^{32} Kg and it generates energy at the rate of 5.0×10^{30} Watt. How long will it take to convert all the helium to carbon.

Q.23> The ratio of number density of free electrons to holes for two different materials A and B are equal to one and less than one respectively. Name the type of semiconductor to which A and B belong and draw their energy diagram.

Q.24> Neutrons in thermal equilibrium with matter at temp T are known to have an average kinetic energy of 3/2kT. Compute the DeBroglie wavelength associated with a neutron at 300K

Q.25> What are the 2 main considerations that have to be kept in mind while designing the objective of an astronomical telescope?
(b) Obtain an expression for the angular magnification and length of tube of an astronomical telescope in normal adjustment
(c) An astronomical telescope with objective of focal length 2m and an eyepiece of focal length 1cm is used to observe a pair of stars with an actual angular separation of 0.75. What would be their observed angular separation when viewed through the telescope

OR

Q.25> What are the 2 main ways of adjusting the position of the eyepiece while observing the final image in a compound microscope. Which of these is actually preferred and why
(b) Obtain an expression for the magnifying power of a compound microscope. Hence explain why
(1) We prefer objective and eyepiece of small focal length
(2) We regard the length of the microscope tube to be nearly equal to the distance b/w the objective and the eyepiece
(c) Calculate the magnification produced by a compound microscope of objective 1.5cm, eyepiece 2.5cm and a tube length of 30cm.
Q.26> How will dia, para and ferro magnetic materials behave when kept in an external, non-uniform magnetic field? Give 2 examples of each of these materials. Give 2 characteristics of ferromagnetic materials, which help us decide its suitability for making a (1) Permanent magnet (2) Electromagnet
Which of these properties should have high or low value for each of these two types of magnets?

OR

Q.26> What is Biot-Savart law. Use it to obtain the magnetic field at an axial point at a distance Z from the centre of a current carrying coil of radius a
Hence compare the magnitude of the magnetic field at the centre and at an axial point with z = √3a

Q.27> Draw the circuit diagram used to study the output characteristics of the n-p-n transistor in CE mode. Give the shape of these characteristics and use them to define
(1) Output resistance
(2) Current Amplification factor

0R

Q.27> Two signals A and B as shown are used one by one as the two inputs of the three gates G1, G2 and G3. The outputs obtained from the three gates are as shown. Identify each of the three gates
Which of them is called the universal gate. Explain using a figure, how a combination of suitable number of this gate can be used to get the other 2 gates.