INDIAN SCHOOL SOHAR No. of printed pages: 4
PRE BOARD EXAMINATION 2018-19
PHYSICS (THEORY)

CLASS: XII **Max Marks: 70**
DATE: 08/01/2019 **Duration: 3 Hours**

General Instructions:

(i) All questions are compulsory. There are 27 questions in all.

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

(iii) Section A contains five questions of **one mark** each, Section B contains seven questions of **two marks** each; Section C contains twelve questions of **three marks** each and Section D contains three questions of **five marks** each.

(iv) There is no overall choice. However, internal choice has been provided in two questions of one mark, two questions of two marks, four questions 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:

$c = 3 \times 10^8$ m/s
$h = 6.6 \times 10^{-34}$ J s
$e = 1.6 \times 10^{-19}$ C
$\mu_0 = 4\pi \times 10^{-7}$ Tm A^{-1}
$\varepsilon_0 = 8.854 \times 10^{-12}$ C^2 N^{-1} m^{-2}
$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \, Nm^2C^{-2}$
Mass of electron = 9.1×10^{-31} kg
Mass of neutron = 1.675×10^{-27} kg
Mass of proton = 1.673×10^{-27} kg
Avogadro's number = 6.023×10^{23} per gram mole
Boltzmann constant = 1.38×10^{-23} JK^{-1}

Section –A

1. A 4Ω non-insulated resistance wire is bent in the middle by 180^0 and both the halves are twisted with each other. What will be its new resistance?
2. The power factor of ac circuit is 0.5. What is the phase difference between voltage and current?

OR

How sharpness of the resonance is related to Quality Factor in a series LCR circuit.

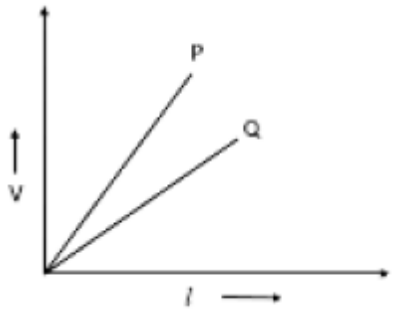
3. Identify the part of the electromagnetic spectrum to which the following wavelengths belong:
(i) 1mm (ii) 10^{-11} m

OR

Identify the part of em spectrum used for night photography.

4. An n-type semiconductor has a large number of electrons but still it is electrically neutral. Explain.

5. The variation of potential difference V with length *l* in case of wires P and Q of two potentiometers are as shown below. Which one of these, will you prefer comparing emfs of two primary cells and why?



Section –B

6. A point charge 10μC is placed at a distance of 5cm directly above the centre of a square of side 10cm. What is the magnitude of the electric flux through the square?
7. The oscillating magnetic field in a plane electromagnetic wave is given by
   $B_y = (8 \times 10^{-6}) \sin (2 \times 10^{11} t + 300 \pi x)$ T
   (i) Calculate the wavelength of the electromagnetic wave.
   (ii) Write down the expression for oscillating electric field.
8. A proton and an electron have same velocity. Which one has greater de-Broglie wavelength and why?

9. In the ground state of hydrogen atom, its Bohr radius is 5.3×10^{-11}m. The atom is excited such that the radius becomes 21.2×10^{-11}m. Find the value of principal quantum number and total energy of atom in excited state.

   OR

   Show that the orbital radius is proportional to n^2, where n is the principal quantum number.
10. What do you mean by ground wave communication? What is the range of frequency used for it? Explain why it cannot be used for long distance communication using high frequencies.

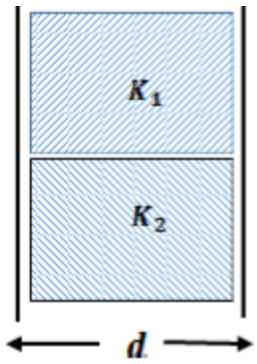
    OR

    Sky waves are not used in transmitting TV signals. Why? State the two methods which can be used for the transmission of TV signals.
11. Derive the expression for the potential due to a point charge Q at a point in space.
12. Mention the function of any two of the following used in communication system:
    (i) Transducer
    (ii) Repeater
    (iii) Band pass filter

Section – C

13. Consider three charges q_1, q_2 and q_3 each equal to q placed at the vertices of an equilateral triangle of side *l*. What is the force on a charge Q placed at the centroid of the triangle?

14. Two dielectric slabs of dielectric constants K_1 and K_2 are filled in between the two plates, each of area A, of the parallel plate capacitor as shown in the figure. Find the net capacitance of the capacitor.



15. Distinguish between diamagnetic and ferromagnetic materials in respect of their (i) intensity of magnetization (ii) behaviour in non-uniform magnetic field and (iii) susceptibility
16. An inductor 200mH, capacitor 500 μF and resistor 10Ω are connected in series with a 100V, variable frequency ac source. Calculate the i) Frequency at which the power factor of the circuit is unity.
    ii) Current amplitude at this frequency.
    iii) Q-factor.
17. With the help of a diagram show that angle of incidence is equal to angle of emergence when a light ray passes through a glass-slab.

    OR

    Derive the expression for the refractive index of a thin Prism.
18. In Young's double slit experiment, explain with reason in each case, how the interference pattern changes, when i) Width of the slits is doubled.
    ii) Separation between the slits is increased.
    iii) Screen is moved away from the slits.

    OR

    What is polarisation of light? State and derive Brewster's law.
19. In a plot of photoelectric current versus anode potential, how does,
    i) The saturation current varies with anode potential for incident radiations of different frequencies with the same intensity.
    ii) The stopping potential varies for incident radiations of different intensities with the same frequency.
    iii) Photoelectric current varies for different intensities with same frequency of incident radiations. Justify your answer in each case.
20. The half-life of a radioactive substance is 20s. Calculate (i) the decay constant (ii) time taken by the sample to decay by 7/8 th of its initial value.

    OR

    State the law of radioactivity. Derive the formula for the 'activity'.
21. Draw the circuit diagram of a full wave rectifier. Explain its working. Draw the input and output wave forms.
22. (i) State three important factors showing the need for translating a low frequency signal into a high frequency wave before transmission.
    (ii) Draw the sketch of a sinusoidal carrier wave, a modulating signal and a amplitude modulated wave.
23. With the help of a suitable ray diagram derive the mirror formula for a concave mirror.

24. Describe briefly how light emitting diode is fabricated and explain its working. Write any two important advantages of LEDs over conventional incandescent lamps.

OR

Describe briefly how a photo-diode is fabricated and explain its working. How is it used to detect the optical signals?

Section - D

25. State the working principle of a potentiometer. With the help of the circuit diagram, explain how a potentiometer is used to compare the emfs of two primary cells. Obtain the required expression used for comparing the emfs.

OR

a) State the principle of working of a meter bridge. With the help of the circuit diagram, explain how a meter bridge is used to obtain the unknown resistance. Derive the relevant formula used.

b) Why are the metal strips used in the meter bridge?

26. State the working principle of the moving coil galvanometer. With the help of a circuit diagram, find the relation between the deflection produced in the coil of a galvanometer and the current flowing through it.

OR

Explain the principle and working of a cyclotron with the help of a neat labelled diagram. Write the expression for cyclotron frequency.

27. A small telescope has an objective lens of focal length 140cm and an eyepiece of focal length 5cm. What is the:

i) Magnifying power of telescope for viewing distant objects when the telescope is in normal adjustment.

ii) Magnifying power of telescope when the final image is formed at the least distance of distinct vision.

iii) What is the separation between the objective and eyepiece when final image is formed at infinity?

iv) If this telescope is used to view a 100m tall tower located 3km away, what is the height of the image of the tower formed by the objective lens?

v) What is the height of the image of the tower if it is formed at the least distance of distinct vision?

OR

a) With the help of a ray diagram explain the image formation at a least distance of distinct vision by using a compound microscope. Derive an expression for its magnifying power.

b) What are the characteristic properties of objective and eyepiece lenses, which are used in compound microscope?