Roll No.: | | | | | | | | | | | Date: | | | | | | |

NORTHWEST ACCREDITATION COMMISSION, USA
SR. SECONDARY/12TH
2017-2018

Subject- PHYSICS (THEORY) | **Question Paper No. :** P H 2 1

Subject Code : PH1204 | **Question Paper Code:** P T 6 6

Total Time: 03.00 Hours. | **Total Marks: 70**

GENERAL INSTRUCTIONS

1. OPENING AND CHECKING OF THE QUESTION-BOOKLET

Break open the seal of the Question-Booklet only when the announcement is made by the Invigilator. After breaking the seal and before attempting the questions, student should immediately check for:

a) The number of the printed page in the Question-Booklet is the same as mentioned on the cover page of the Booklet and

b) Any printing error in the Booklet pages, if any.

Any discrepancy or error should be brought to the notice of the Invigilator who will then replace the Booklet. No additional time will be given for this.

2. No student, without the permission of the Superintendent or the Invigilator concerned, is to leave his/ her seat or the Examination Room.

3. FILLING UP THE REQUIRED INFORMATION ON QUESTION-BOOKLET AND ANSWER SHEET

After breaking open the seal and checking the Booklet, student should:

a) Fill up the **Question Paper No.** and **Question Paper Code** (mentioned on the cover of Question-Booklet) in the space provided on the First Answer Sheet.

b) Fill up his/her Roll Number on the First Answer Sheet and on each Supplementary Answer Sheet, if taken.

c) Student should mention the total number of **Supplementary Answer Sheet**, if taken, in the space provided on the First Answer Sheet and also fill up the Serial Number mentioned on each **Supplementary Answer Sheet** along with his/her Roll Number in the register maintained by the Invigilator. Student must tie all the Answer Sheets with the thread provided by the Invigilator.

4. INSTRUCTIONS ABOUT QUESTION PAPER

This Question Paper is divided into three Sections – A, B and C. All Sections are compulsory. Attempt all Sections as per instructions.

a) Section A question No. 1 to 4 are very short questions carrying 3 marks each in approximately 20-30 words.

b) Section B question No. 5 to 11 are short questions carrying 4 marks each in approximately 30-50 words.

(C) Section C question No. 12 to 16 are long questions carrying 6 marks each in approximately 80-120 words.

5. Student found in possession of Cellular Phone / Mobile Phone / Pager or any other Communication Device and/or any Book/Note whether using or not, will be liable to be debarred for taking examination(s) either permanently or for specified period or/and dealt with as per law or/and ordinance of the School/SERI according to the nature of offence, or/and he/she may be proceeded against and shall be liable for prosecution under the relevant provision of the Statutory Law.

THE ANSWER SHEET IS TO BE RETURNED ON COMPLETION OF THE TEST

This Question Paper **MUST** be attached with Answer Sheet

Sample Paper

SECTION A

Total number of questions: 4	Marks allocated to each question: 3	Total marks: 12

Question 1. Draw a plot showing the variation of de Broglie wavelength of electron as a function of its K. E.

Question 2. Why is the frequency of outgoing and incoming signals different in a mobile phone?

Question 3. Distinguish between unpolarised and a linearly polarised light. Describe, with the help of a diagram, how unpolarised light gets linearly polarised by scattering.

Question 4. A variable frequency AC source is connected to a capacitor. Will the displacement current change if the frequency of the AC source is decreased?

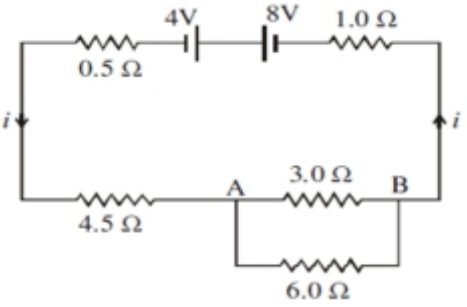
SECTION B

Total number of questions: 7	Marks allocated to each question: 4	Total marks: 28

Question 5. (a) Two spherical conductors of radii R1 and R2 (R2 > R1) are charged. If they are connected by a conducting wire, find out the ratio of the surface charge densities on them.

(b) A steady current flows in a metallic conductor of non-uniform cross-section. Which of these quantities is constant along the conductor : current, current density, electric field, drift speed?

Question 6. In the circuit shown in the figure, find the current through each resistor.



Sample Paper

Question 7. Define the following using suitable diagrams: (i) magnetic declination and (ii) angle of dip. In what direction will a compass needle point when kept at the (i) poles and (ii) equator?

OR

Distinguish between n-type and p-type semi-conductors on the basis of energy band diagrams. Compare their conductivities at absolute zero temperature and at room temperature.

Question 8. Derive the expression for the magnetic energy stored in a solenoid in terms of magnetic field B, area A and length l of the solenoid carrying a steady current I. How does this magnetic energy per unit volume compare with the electrostatic energy density stored in a parallel plate capacitor?

Question 9. (a) Derive the mathematical expression for law of radioactive decay for a sample of a radioactive nucleus.

(b) How is the mean life of a given radioactive nucleus related to the decay constant?

OR

Define the term 'critical angle' for a pair of media.

A point source of monochromatic light 'S' is kept at the centre of the bottom of a cylinder of radius 15.0 cm. The cylinder contains water (refractive index 4/3) to a height of 7.0 cm. Draw the ray diagram and calculate the area of water surface through which the light emerges in air.

Question 10. A circuit containing an 80 mH inductor and a 250 μF capacitor in series connected to a 240 V, 100 rad/s supply. The resistance of the circuit is negligible.

(a) Obtain rms value of current.

(b) What is the total average power consumed by the circuit?

Question 11. Explain by drawing a suitable diagram that the interference pattern in a double slit is actually a superposition of single slit diffraction from each slit. Write two basic features which distinguish the interference pattern from those seen in a coherently illuminated single slit.

OR

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.

Sample Paper

SECTION C

Total number of questions: 5	Marks allocated to each question: 6	Total marks: 30

Question 12. (a) Show how Biot-Savart law can be alternatively expressed in the form of Ampere's circuital law. Use this law to obtain the expression for the magnetic field inside a solenoid of length 'l', cross-sectional area 'A' having 'N' closely wound turns and carrying a steady current 'I'.

Draw the magnetic field lines of a finite solenoid carrying current I.

(b) A straight horizontal conducting rod of length 0.45 m and mass 60 g is suspended by two vertical wires at its ends. A current of 5.0 A is set up in the rod through the wires.

Find the magnitude and direction of the magnetic field which should be set up in order that the tension in the wire is zero.

OR

(a) Write two important limitations of Rutherford model which could not explain the observed features of atomic spectra. How were these explained in Bohr's model of hydrogen atom?

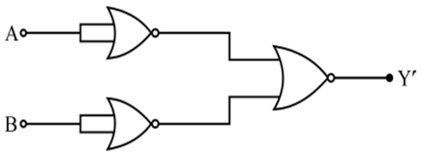
Use the Rydberg formula to calculate the wavelength of the Hα line.

(Take R = 1.1 × 107 m–1).

(b) Using Bohr's postulates, obtain the expression for the radius of the nth orbit in hydrogen atom.

Question 13. (a) Explain briefly, with the help of circuit diagram, the working of a full wave rectifier. Draw its input and output waveforms.

(b) Identify the logic gate equivalent to the circuit shown in the figure. Draw the truth table for all possible values of inputs A and B.

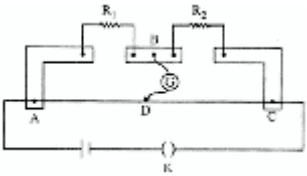


OR

(a) State Kirchhoff's rules for an electric network. Using Kirchhoff's rules, obtain the balance condition in terms of the resistances of four arms of Wheatstone bridge.

Sample Paper

(b) In the meter bridge experimental set up, shown in the figure, the null point 'D' is obtained at a distance of 40cm from end A of the meter bridge. If a resistance of 10 Ω is connected in series with R1, null point is obtained at AD = 60 cm. Calculate the values of R1 and R2.



Question 14. (a) In Rutherford scattering experiment, draw the trajectory traced by a-particles in the coulomb field of target nucleus and explain how this led to estimate the size of the nucleus.

(b) Describe briefly how wave nature of moving electrons was established experimentally.

(c) Estimate the ratio of de-Broglie wavelengths associated with deuterons and a-particles when they are accelerated from rest through the same accelerating potential V.

OR

(a) Define a wavefront. How is it different from a ray?

(b) Depict the shape of a wavefront in each of the following cases.

(i) Light diverging from point source.

(ii) Light emerging out of a convex lens when a point source is placed at its focus.

(iii) Using Huygen's construction of secondary wavelets, draw a diagram showing the passage of a plane wavefront from a denser into a rarer medium.

Question 15. (a) Draw a ray diagram showing the image formation by a compound microscope. Obtain expression for total magnification when the image is formed at infinity.

(b) How does the resolving power of a compound microscope get affected, when

(I) focal length of the objective is decreased.

(ii) the wavelength of light is increased?

Give reasons to justify your answer.

OR

State the principle of working of p-n diode as a rectifier. Explain, with the help of a circuit diagram, the use of p-n diode as a full wave rectifier. Draw a sketch of the input and output waveforms.

Sample Paper

Question 16. (a) Describe Young's double slit experiment to produce interference pattern due to a monochromatic source of light. Deduce the expression for the fringe width.

(b) How are infrared waves produced? Why are these referred to as 'heat waves'? Write their one important use.

OR

(a) Draw a schematic arrangement of Geiger-Marsden experiment showing the scattering of a-particles by a thin foil of gold. Why is it that most of the a-particles go right through the foil and only a small fraction gets scattered at large angles?

Draw the trajectory of the a-particle in the coulomb field of a nucleus. What is the significance of impact parameter and what information can be obtained regarding the size of the nucleus?

(b) Estimate the distance of closest approach to the nucleus (Z = 80) if a 7.7 MeV α-particle before it comes momentarily to rest and reverses its direction.

END OF THE QUESTION PAPER

Sample Paper