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

NORTHWEST ACCREDITATION COMMISSION, USA
HIGH SCHOOL DIPLOMA (Sr. Secondary/12TH) 2018-2019

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 contains 4 questions which are very short carrying 3 marks each in approximately 20-30 words.

b) Section B contains 7 questions which are short carrying 4 marks each in approximately 30-50 words.

c) Section C contains 5 questions which are long 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. Using the concept of force between two infinitely long parallel current carrying conductors, define one ampere of current.

Question 2. To which part of the electromagnetic spectrum does a wave of frequency 5 x 1011 Hz belong?

Question 3. Why is it found experimentally difficult to detect neutrinos in nuclear β-decay?

Question 4. Why is the use of a.c. voltage preferred over d.c. voltage? Give two reasons.

SECTION B

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

Question 5. A convex lens of focal length 20 cm is placed coaxially with a convex mirror of radius of curvature 20 cm. The two are kept 15 cm apart. A point object is placed 40 cm in front of the convex lens. Find the position of the image formed by this combination. Draw the ray diagram showing the image formation.

Question 6. Write two basic modes of communication. Explain the process of amplitude modulation.

Draw a schematic sketch showing how amplitude modulated signal is obtained by superposing a modulating signal over a sinusoidal carrier wave.

OR

What is space wave propagation? State the factors which limit its range of propagation. Derive an expression for the maximum line of sight distance between two antennas for space wave propagation.

Question 7. A voltage V=V0 sin ωt is applied to a series LCR circuit. Derive the expression for the average power dissipated over a cycle.

Under what condition is (i) no power dissipated even though the current flows through the circuit, (ii) maximum power dissipated in the circuit?

Sample Paper

Question 8. What dose a polaroid consist of? Show, using a simple polaroid, that light waves are transverse in nature. Intensity of light coming out of a polaroid does not change irrespective of the orientation of the pass axis of the polaroid. Explain why.

Question 9. State Biot – Savart law. Deduce the expression for the magnetic field at a point on the axis of a current carrying circular loop of radius 'R' distant 'x' from the centre. Hence, write the magnetic field at the centre of a loop.

Question 10. Arrange the following electromagnetic wave in the order of their increasing wavelength:

(a) γ- rays (b) Microwaves

(c) X-rays (d) Radio waves

How are infra-red waves produced? What role dose infra-red radiation play in (i) maintain the Earth's warmth and (ii) physical therapy?

Question 11. How is a Zener diode fabricated? What causes the setting up of high electric field even for small reverse bias voltage across the diode?

Describe, with the help of a circuit diagram, the working of Zener diode as a voltage regulator.

OR

(a) Explain with the help of a diagram, how depletion region and potential barrier are formed in a junction diode.

(b) If a small voltage is applied to a p-n junction diode, how will the barrier potential be affected when it is (i) forward biased, and (ii) reveres biased?

SECTION C

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

Question 12. (a) Explain why, for a charge configuration, the equipotential surface through a point is normal to the electric field at that point. Draw a sketch of equipotential surfaces due to a single charge (-q), depicting the electric field lines due to the charge.

(b) Obtain an expression for the work done to dissociate the system of three charges placed at the vertices of an equilateral triangle of side 'a' as shown below.

Sample Paper

OR

(a) In young's double slit experiment, deduce the conditions for obtaining constructive and destructive interference fringes. Hence, deduce the expression for the fringe width.

(b) Show that the fringe pattern on the screen is actually a superposition of slit diffraction from each slit.

(c) What should be the width of each slit to obtain 10 maxima of the double slit pattern within the central maximum of the single slit pattern, for green light of wavelength 500 nm, if the separation between two slits is 1 mm?

Question 13. (a) Draw a schematic arrangement of Geiger-Marsden experiment showing the scattering of α-particles by a thin foil of gold. Why is it that most of the α-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.

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?

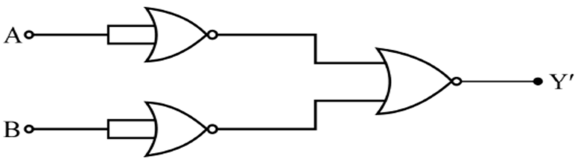
Use the Rydberg formula to calculate the wavelength of the Hα line.

(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 14. (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.



Sample Paper

OR

(a) 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.

(b) Using the concept of drift velocity of charge carriers in a conductor, deduce the relationship between current density and resistivity of the conductor.

Question 15. (a) If both the number of protons and neutrons in a nuclear reaction is conserved, in what way is mass converted into energy (or vice verse)? Explain giving one example.

(b) 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?

OR

Derive an expression for the impedance of a series LCR circuit connected to an AC supply of variable frequency. Plot a graph showing variation of current with the frequency of the applied voltage. Explain briefly how the phenomenon of resonance in the circuit can be used in the Tuning mechanism of a radio or a TV set.

Question 16. (a) With the help of a labelled diagram, describe briefly the underlying principle and working of a step up transformer.

(b) Write any two sources of energy loss in a transformer.

(c) A step up transformer converts a low input voltage into a high output voltage.

Does it violate law of conservation of energy? Explain.

OR

(a) Draw a ray diagram to show refraction of a ray of monochromatic light passing through a glass prism. Deduce the expression for the refractive index of glass in terms of angle of prism and angle of minimum deviation.

(b) Explain briefly how the phenomenon of total internal reflection is used in fibre optics.

Sample Paper

END OF THE QUESTION PAPER

Sample Paper