

Model Question Paper
HP Board of School Education Dharamshala
Term -II Session : 2021-22
Subject : Physics Class: XII (Regular)

Time : 3 hours

Max. Marks : 50

General Instructions:

1. The question paper has 31 questions. All the questions are compulsory. The internal choice is given where applicable.
2. Questions number 1 to 20 are multiple choice questions carrying one mark each. Questions number 21 to 25 are very short answer type questions carrying 2 marks each. Questions number 26 to 29 are short answer type questions carrying 3 marks each and questions number 30 to 31 carry four marks each.
3. There is no negative marking

Section A (MCQ)

1. In a coil of self inductance 5 H, the rate of change of current is 2 A/s. The emf induced in the coil will be
A) 10 V B) – 10 V C) 5 V D) – 5 V
2. A rectangular loop and a circular loop are moving out of a uniform magnetic field region to a field free region with a constant velocity \mathbf{v} , in which loop you expect the induced emf to be constant during the passage out of the field region?
A) Only rectangular loop B) Only circular loop C) Both rectangular and circular loops
D) Neither circular nor rectangular loop
3. Dimensional formula for mutual inductance is
A) $[M L^{-2} T^{-2} A^2]$ B) $[M L^2 T^{-2} A^{-2}]$ C) $[M L^{-2} T^{-2} A^{-1}]$ D) $[M L^2 T^{-3} A^{-1}]$
4. For a series LCR circuit connected to an ac source at resonance, which statement is correct?
A) $X_C = X_L$ B) Resonant frequency, $\omega_0 = \frac{1}{\sqrt{L}}$ C) $Z = R$ D) All of the above
5. The magnetic field in a plane electromagnetic wave is given as
 $B_y = (2 \times 10^{-7}) \sin (0.5 \times 10^3 x + 1.5 \times 10^{11} t)$. What is the wavelength of the wave?
A) 1.26 cm B) $1.5 \times 10^{11} \text{ m}$
C) 1.26 m D) $0.5 \times 10^3 \text{ m}$
6. The ratio of speed of gamma rays to radio waves in vacuum is
A) 0 B) 1
C) < 1 D) > 1
7. Rainbow is a phenomenon due to
A) Dispersion B) Refraction
C) Reflection D) All of the above

8. Match the following

1. Blue colour of sky

a. Refraction

2. Mirage

b. Scattering of light

3. Splitting of light through prism in seven colours

c. Total internal reflection

4. Twinkling of stars

d. Dispersion

A) 1- c, 2- a, 3 – b, 4 – d

B) 1- b, 2- a, 3 – d, 4 – c

C) 1- b, 2- c, 3 – d, 4 – a

D) 1- d, 2- c, 3 – b, 4 – a

9. Which of the following is an evidence of transverse nature of light?

A) Interference B) Dispersion C) Polarisation D) Diffraction

Study the following paragraph and answer questions no. 10 and 11 based on it.

Wave nature of light was convincingly demonstrated for the first time by Thomas Young in 1801 by a wonderful simple experiment. First he used sunlight to pass through two closely spaced pinholes and he observed two darkish lines on both sides of a bright line. Encouraged by this he repeated the experiment with spirit flame as a light source with a little salt in it to produce bright yellow sodium light. This time he was delighted to observe a number of regularly spaced dark lines.

10. The spirit flame and salt was used by Thomas Young to

A) To establish particle nature of light B) To get monochromatic light

C) To get polychromatic light D) To increase intensity of the diffraction pattern

11. If the pinholes are replaced by two slits separated by one mm and green light of wavelength 500 nm is used to get the pattern at a screen placed 1 metre away the regular spaced dark lines called fringes will have an approximate separation of

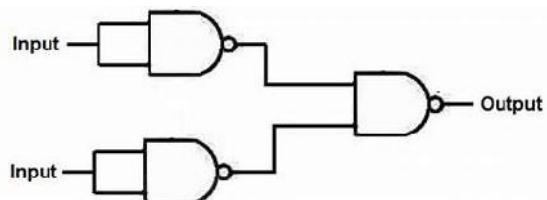
A) 5mm B) 50 mm C) 100 mm D) 1000 mm

12. An electron is accelerated through a potential difference of 100 V. What is the de Broglie wavelength associated with the electron?

A) 123 nm B) 1.23 nm C) 12.3 nm D) 0.123 nm

13. An electron, an alpha particle and a proton have the same kinetic energy. Which of these particles has the shortest de Broglie wavelength?
 A) electron B) α – particle C) proton D) All have the same wavelength
14. Tritium has a half life of 12.5 years undergoing beta decay. What fraction of a sample of pure tritium will remain undecayed after 25 years?
 A) $1/2$ B) $1/4$ C) $3/4$ D) $1/10$

15. The output obtained in the following logic circuit consisting of NAND gates only is



- A) OR gate B) AND gate C) NOT gate D) NOR gate
16. Which of the following is a material preferred for solar cells?
 A) Cd S B) Cd Se C) Ga As D) Pb S
17. Match the following
- | | |
|---|-------------------------|
| 1. FM Broadcast | a) 3.7 G Hz to 4.2 G Hz |
| 2. Standard AM Broadcast | b) 88 to 108 M Hz |
| 3. Cellular Mobile Radio (Mobile to base station) | c) 540 to 1600 k Hz |
| 4. Satellite Communication (Downlink) | d) 896 to 901 M Hz |
- A) 1- c, 2- a, 3 – b, 4 – d
 B) 1- b, 2- c, 3 – d, 4 – a
 C) 1- b, 2- a, 3 – d, 4 – c
 D) 1- d, 2- c, 3 – b, 4 – a

18. Digital signals
- i) do not provide a continuous set of values
 - ii) represent values as discrete steps
 - iii) can utilize binary systems and
 - iv) can utilize decimal as well as binary systems
- Which of the above statements are true?
- A) i and ii only
 B) ii and iii only
 C) i, ii and iii but not iv
 D) All of i, ii, iii and iv

In question number 19 and 20, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct option out of the options given below

- A) If both assertion and reason are correct and R is true explanation of A.
- B) If both assertion and reason are correct and R is not the correct explanation of A.
- C) If assertion is true but reason is false.
- D) If both assertion and reason are false.

19. Assertion: When an external voltage V is applied across the p-n junction diode such that n-side is positive and p-side is negative, the diode is said to be reverse biased.

Reason: The magnitude of current in reverse bias is usually in mA.

20. Assertion: When an alpha decay occurs, the daughter nucleus gets shifted by two places towards left from the parent nucleus

Reason: Mass number of an alpha particle is 4

Section B

- 21. State Faraday's laws of electromagnetic induction.
 - 22. Write four Maxwell equations of electromagnetism in mathematical form only.
 - 23. What are the conditions for total internal reflection?
 - 24. State quantum condition and frequency condition of Bohr's theory of hydrogen atom.
- OR**
- Using Bohr's postulates, show briefly that radii of permitted orbits in hydrogen atom increase in the ratio 1: 4: 9: 16.
 - 25. Explain beta decay. Hence write mathematical equations for conversion of proton into neutron and vice versa.
 - 26. Using phasor diagram, obtain an expression for the impedance of a series LCR circuit.

OR

- Describe the principle and theory of a transformer. State one energy loss of transformer.
- 27. Derive an expression for the refractive index of the material of a prism in terms of the angle of prism and the angle of minimum deviation.
 - 28. Explain the effect of frequency of incident radiation on stopping potential. Plot a graph to show this variation.
 - 29. Modulation is necessary for mixing up of signals from different transmitters. Justify. Hence draw graphical variation for phase modulation.

30. By stating the assumptions used, derive the relation between the distance of object, distance of the image and radius of curvature of a convex spherical surface, when refraction takes place from optically rarer to optically denser medium and the image formed is real

OR

Describe the phenomenon of diffraction of light at a single slit to show the formation of diffraction fringes. Why secondary maxima are less intense than the central maximum?

31. Draw a labelled circuit diagram to show an n-p-n transistor as an amplifier in CE configuration. Describe the phase relationship between the input and output signals. Hence define ac current gain.

