

# 5101-X PHYSICS

**Time : 3 Hours]**

**[Maximum Marks : 70**

## **Section-A**

1 each

1. In homes electrical devices are connected in parallel. Why ?
2. Is photoelectric emission possible at all frequencies ?
3. What is the value of one atomic mass unit (amu) in terms of energy ?
4. The energy gap of silicon is 1.1 eV. What does it mean ?
5. Under what conditions a transistor works as an open switch ?

## **Section-B**

2 each

6. What do you understand by eddy currents ? How can they be minimised ?

*Or*

Distinguish between reactance and impedance of an a.c. circuit.

7. The near point of a person is at 40 cm from the eye. Find the power of the lens he should use while reading at 25 cm.

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**Turn Over**

8. Define half life of a radioactive substance and derive an expression for it.
9. Why is NAND gate known as universal gate ?
10. Why are TV signals not transmitted using sky waves ?

**Section-C**

3 each

11. Show that the electric field at any point is equal to the negative of the potential gradient at that point.
12. How many electrons pass through a wire in 2 minutes, if the current passing through the wire is 0.3 ampere ?

*Or*

What is the drift velocity of electrons in a copper conductor having cross-sectional area of  $5 \times 10^{-6} \text{ m}^2$  if the current is 10 A ? Assume that there are  $8 \times 10^{28}$  electrons/ $\text{m}^3$ .

13. What is Wheatstone Bridge ? Apply Kirchhoff's laws to Wheatstone bridge to derive the condition for balancing the bridge.
14. Derive an expression for magnetic field at a point well inside a solenoid carrying current. <https://www.jkboseonline.com>
15. State and explain Faraday's law of electromagnetic induction.
16. Calculate the impedance of series LCR circuit.

17. Give two uses of each of the following :

- (a) Gamma rays
- (b) Infrared rays
- (c) Ultraviolet rays

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**A-1-X**

18. What are Polaroids ? Mention some of their practical uses.
19. (a) What is the momentum of electron if its de-Broglie wavelength is  $2\text{\AA}$  ?  
(b) The maximum kinetic energy of a photoelectron is 5 eV. What is its stopping potential ?
20. Discuss the energy level diagram in case of hydrogen atom.
21. Draw V-I characteristics of a  $p-n$  junction diode in (a) forward bias  
(b) reverse bias.
22. Explain surface wave and sky wave propagation of radio waves.

**Section-D**

23. Sona and Mona are friends both studying in 12th class. Sona is a 'arts' student and Mona is a 'science' student. Both of them go to market to purchase sunglasses. Sona feels that any coloured glasses with fancy look are good enough. Mona tells her to look for UV protection glasses, polaroid glass and photosensitive glasses.

**Read the above passage and answer the following questions :**

- (a) What are UV protection glasses, polaroid glasses and photosensitive glasses ?
- (b) What values are displayed by Mona ?

**Section-E**

5 each

24. What is an electric dipole ? Deduce an expression for torque on an electric dipole placed in a uniform field. Hence define dipole moment.

*Or*

State Gauss theorem. Derive an expression for electric field intensity at a point due to an infinite plane sheet of charge density.

25. Give the principle, construction and working of a moving coil galvanometer.

*Or*

Using Ampere's law, derive an expression for magnetic field at a point due to a long straight current carrying conductor.

26. State Huygen's principle. Verify Snell's law of refraction using it.

*Or*

Describe an astronomical telescope. Derive an expression for its magnifying power when final image is formed at infinity.

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