

**2016
PHYSICS**

Total marks : 70

Time : 3 hours

General instructions:

- i) *Approximately 15 minutes is allotted to read the question paper and revise the answers.*
- ii) *The question paper consists of 30 questions. All questions are compulsory.*
- iii) *Marks are indicated against each question.*
- iv) *Internal choice has been provided in some questions.*

N.B: *Check that all pages of the question paper is complete as indicated on the top left side.*

1. A metallic wire of resistance 40Ω is stretched to twice its length. Its new resistance would be **1**
(a) 20Ω (b) 80Ω
(c) 160Ω (d) 120Ω

2. A charged particle moving in a magnetic field has increase in its velocity, then its radius of the circular path will be **1**
(a) decrease (b) increase
(c) remain the same (d) become half.

3. A concave lens of focal length 20cm produces an image half the size of the real object. The distance of the real object is **1**
(a) 10cm (b) -20cm (c) -60cm (d) -40cm

4. If N_o is the original mass of the substance of half-life period $T=5\text{years}$, then the amount of substance left after 15 years will be **1**
(a) $\frac{N_o}{8}$ (b) $\frac{N_o}{16}$ (c) $\frac{N_o}{2}$ (d) $\frac{N_o}{4}$

5. A semi-conductor doped with a donor impurity is **1**
(a) p- type (b) n- type (c) n-p-n type (d) p-n-p type

6. A carbon resistor has four coloured bands of brown, black, green and gold. Find the value of its resistance. **1**
7. What are coherent sources of light? **1**
8. Write Eintein's photoelectric equation. **1**
9. Draw the block diagram of the elements of communication system. **1**
10. How many NAND gates are required to make one OR gate? **1**
11. Calculate the magnetic field at the centre of a coil, carrying a current of 5A, bend in the form of a square of side 10m. **2**
12. **a.** Derive the expression for force per unit length between two parallel current carrying conductors. **2**
Or
b. Explain how to convert a galvanometer into ammeter.
13. **a.** The average emf induced in the secondary coil is 0.5V when the current in the primary changes from 5.0A to 2.5A in 0.2 sec. What is the mutual inductance of the coil? **2**
Or
b. A magnetic field has a magnitude of 16T. What is the magnitude of an electric field that stores the same energy per unit volume as this magnetic field?
14. What are ultraviolet rays? Give their two uses. **2**
15. **a.** Explain resolving power of microscope. **2**
Or
b. Explain polarisation by reflection and hence derive Brewster's law.
16. Explain sky wave propagation. **2**

17. a. Find the charge and its position which when placed between two identical charges Q , separated by a distance r , is in equilibrium with the other two charges.
- Or**
- b. A rectangular ABCD has length and breadth $2l$ and l . At two of the corners A and C charges $+q_1$ and $+q_2$ are placed. A third charge $-q$ is placed at the corner D. The net field at the corner B is found to be zero. Find $+q_1$ and $+q_2$ in terms of q .
18. Explain with diagram how a potentiometer can be used to find the internal resistance of a cell. 3
19. a. Prove that electric current flowing through a conductor is directly proportional to the drift velocity of electrons.
- Or**
- b. State and explain Kirchoff's second law. 3
20. What is magnetic dipole moment? Calculate the magnetic dipole moment of a revolving electron in an atom. 3
21. What is displacement current? Derive its mathematical expression. 3
22. Derive the expression of average power in a.c circuit. 3
23. a. Explain Davisson and Germer experiment.
- Or**
- b. Explain Hertz and Lenard's observation of photoelectric effect. 3
24. a. Find the activity of 1.00mg of radon ^{222}Rn , whose atomic mass is 222u, given that half life of radon is 3.8 days.
- Or**
- b. If 100mev of energy is release in the fission of a single nucleus, then how many fission must occur per second to produce a power of 1kW? 3
25. What is an equivalent lens? Obtain an expression for focal length of a combination of two thin lenses placed in contact. 3

26. Prove that radius of the n^{th} Bohr orbit of an atom is directly proportional to the square of the principal quantum number. **3**
27. Explain space wave propagation and derive the expression of area covered and maximum distance up to which transmission can be received. **3**
28. **a.** Explain the principle, construction and working of a Van de graff generator. **5**
Or
b. State and prove Gauss theorem. Using Gauss theorem, find the electric field due to a line charge.
29. **a.** Derive the expression for the fringe width in Young's double slit interference. Show that bright and dark fringes are equally spaced. **5**
Or
b. Explain reflecting type telescope with diagram and write its advantages over refracting type telescope. On what factor does its resolving power depend?
30. **a.** What is transistor? Explain with circuit diagram the working of transistor as an oscillator. **5**
Or
b. What is a p-n junction? Write its action in forward bias and reverse bias arrangement with proper circuit diagram.
