

2016
PHYSICS
(Theory)

Full Marks : 70

Pass Marks : 21

Time : Three Hours and *Fifteen Minutes

(*15 minutes are given as extra time for reading questions)

All questions are compulsory.

The figures in the right margin indicate full marks for the questions.

Question Nos. 1 to 10 are 'Very Short Answer' type questions carrying 1 mark each.

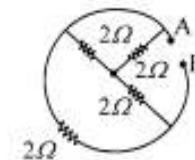
1. What is a dielectric material? 1
2. Two wires of equal length, one of copper and the other manganin have the same resistance. Predict with reason which wire is thicker. 1
3. State Ampere's circuital law. 1
4. Define eddy current. 1

P.T.O.

5. Name the electromagnetic wave which has highest frequency. 1
6. Why is the width of interference fringes decrease when the red light is replaced by blue light? 1
7. What is the purpose of famous Davisson and Germer experiment? 1
8. Write the expression for binding energy per nucleon of mass number A having a mass defect Δm . 1
9. What is a truth table? 1
10. Distinguish between sky wave propagation and space wave propagation giving one point. 1

Question Nos. 11 to 20 are 'Short Answer Type-II' questions carrying 2 marks each.

11. A proton and an electric dipole are separately placed at rest in an electric field. State the direction of linear displacement of both. 1+1=2
12. Find the equivalent resistance across AB in the given figure. 2



13. Write any two factors on which current sensitivity of a galvanometer depends.

2

14. Give any two distinguishing points between an ammeter and a voltmeter.

2

15. The electric mains in a house is marked as 220V, 50Hz. Find an equation of the instantaneous voltage.

2

16. Draw the graph showing the variation of reactance with the frequency of an a.c. in a circuit containing only (i) a capacitance (ii) an inductor.

1+1=2

17. If the wavelength of electromagnetic radiation is doubled, find the changes that take place in frequency and energy of the electromagnetic radiation.

1+1=2

18. Draw a neat labelled ray diagram of a reflecting type (Newtonian) telescope.

2

19. For a given metal, is photoelectric emission possible for all frequencies of incident radiation? Explain your answer.

2

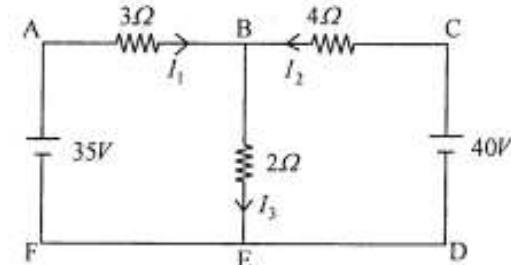
20. Using $1 \text{ a.m.u} = 931 \text{ MeV}$, calculate the mass of C-12 atom.

2

Question Nos. 21 to 27 are 'Short Answer Type-I' questions carrying 3 marks each.

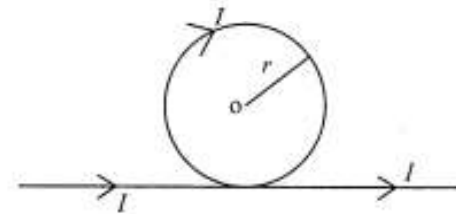
21. Using Kirchhoff's law, calculate the value of I_3 in the electrical circuit shown in the figure.

3



22. Find the magnitude and direction of magnetic field at the centre O of the circular part of the loop formed by an infinitely long conductor carrying current I as shown in figure.

3



23. Two identical loops, one of silver and another of aluminium are rotated with the same speed in the same magnetic field. In which case will induced e.m.f. and induced current be more? Explain your answer.

$1\frac{1}{2}+1\frac{1}{2}=3$

24. Distinguish between interference and diffraction by giving three points.

3

25. A palmist looks at the fingerprints with a magnifying glass of power +10D. Find the maximum magnification of the fingerprint. 3
26. Give three distinguishing points of β -rays and γ -rays. 3
27. What is space wave propagation? Give two examples of communication system which use space wave propagation. 1+2=3

Question Nos. 28 to 30 are 'Long Answer Type' questions carrying 5 marks each.

28. Derive an expression for the electric field of an electric dipole at any point on equatorial line of it. 5

Or

Derive an expression for the potential of an electric dipole at any point. 5

29. Prove mathematically that the width of the dark and the bright fringes in interference is equal. 5

Or

Show that $\frac{1}{f} = (\mu - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$ in case of a convex lens where the symbols have their usual meaning. 5

30. Discuss the working of a transistor as an oscillator by using a circuit diagram. Write the expression for frequency of oscillation. 4+1=5

Or

Discuss the working of an n-p-n transistor in CE configuration as an amplifier by using a circuit diagram. What is the phase relationship between the input and output signals? 4+1=5

Question Nos. 31 to 34 are 'Multiple Choice Type' questions carrying 1 mark each. Choose the correct answer out of the four alternatives and rewrite the correct answer.

31. By increasing the temperature, the specific resistance of a conductor and a semiconductor 1

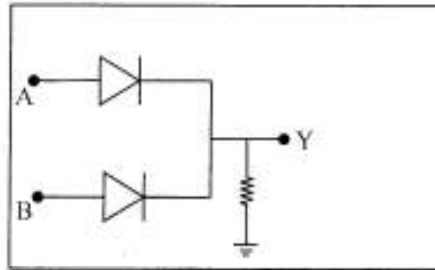
- (A) increases for both
 (B) decreases for both
 (C) increases, decreases respectively
 (D) decreases, increases respectively

32. If an electron and a photon propagate in the form of waves having the same wavelength, it implies that they have same 1

- (A) energy
 (B) momentum
 (C) angular momentum
 (D) velocity

33. In the circuit given, A and B represent two inputs and Y represents the output. The circuit represents _____ 1

- (A) NAND gate
- (B) AND gate
- (C) NOR gate
- (D) OR gate



34. In modulation process, the audio signal is termed as _____ 1

- (A) modulating wave
- (B) modulated wave
- (C) carrier wave
- (D) none of above