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SVS-N 313 B-17

B.Sc. Vth Semester Degree Examination
PHYSICS
(Quantum Mechanics Statistical Mechanics & Material Physics)
Paper - 5.2
(New)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

Answer All the questions from section - A, any Five from section - B and any Four from section - C

SECTION - A

1. Whether Matter waves are electromagnetic waves?   (15 × 1 = 15)

2. Give the impression for de Broglie wavelength in terms of temperature.

3. Write any one property of wave function.

4. What do you mean by zero point energy.

5. Define degeneracy.

6. What is ensemble?

7. State the principle of equal a priori probability.

8. What is the unit of magnetic flux?

9. What is the permeability of a magnetic material?

10. Whether superconductor can expell magnetic field?

11. What is persist current in super conductor?

12. Which force dominates in nano materials?

13. How do you get the quantum film?

14. What will be the area to volume ratio in nano materials?

15. Mention any one use of superconductors.

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SECTION - B

Answer any **Five** of the following: $(5 \times 5 = 25)$

16. State and explain Heisenberg uncertainty principle.

17. Obtain the expression for the energy of a particle in a one - dimensional box.

18. Distinguish between microcanonical, canonical and grand canonical ensembles.

19. Mention the assumptions made by Maxwell-Boltzmann Statistics.

20. Compare para, dia and ferromagnetic materials.

21. Write a note on special features of nano materials.

22. Explain high temperature super conductivity.

SECTION - C

Answer any **Four** of the following : $(4 \times 10 = 40)$

23. a) Obtain the expression for Compton shift.

    b) Calculate the Compton wavelength for an electron

    Given : $h = 6.625 \times 10^{-34}$ J-S

    $m_e = 9.1 \times 10^{-31}$ kg, $c = 3 \times 10^8$ ms^{-1} $(7 + 3 = 10)$

24. a) Derive time independent Schrodinger's wave equation for one dimension.

    b) The certainty in velocity is 100m/s. Calculate the uncertainty in the position of $(7 + 3 = 10)$

    i) 20 gm bullet, and

    ii) a proton ($m_p = 1.67 \times 10^{-27}$kg)

25. a) Derive the expression for Bose-Einstein distribution law.

    b) Calculate the probability in tossing a coin 10 times we get $(6 + 4 = 10)$

    i) All heads

    ii) 5 heads 5 tails

    iii) 3 heads 7 heads

    iv) 7 heads 3 tails

26. a) Explain BCS theory of superconductivity.

b) Distinguish between Type-I and Type -II superconductors   (5 + 5 = 10)

27. a) Explain preparation of nano materials by Physical-Vapour-Deposition (PVD) method.

b) Explain special significance of nano materials.   (5 + 5 = 10)

28. a) State and explain Curie-Weiss law.

b) Explain the Langevin's theory of diamagnetism.   (5 + 5 = 10)

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