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Reg. No. : ....

Name : ....

Sixth Semester B.Sc. Degree Examination, March 2021.

First Degree Programme under CBCSS

Physics

Elective Course

PY 1661.4/PC 1661.5 – NANOSCIENCE AND TECHNOLOGY

(2015 – 2017 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in one or two sentences. Each question carries **1** mark:

1. Write the importance of nanoscale.

2. What is a quantum dot?

3. Compare the melting point of a metallic nano particle and its bulk counterpart.

4. Give two examples of zero dimensional materials.

5. Write any difference between an optical microscope and an electron microscope.

6. Mention any two methods for the preparation of nanoparticles.

7. Write any two uses of CNTS.

8. Name the allotropes of carbon?

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9. Write the names of two semiconductors whose combination can be used to fabricate a quantum cascade structure?

10. State any two applications of single electron transistor.

<div align="right">(10 × 1 = 10 Marks)</div>

SECTION – B

Answer **any eight** questions in one or two sentences. Each question carries **2** marks

11. Define the term *density of states*.

12. Write a short note on the scope and applications of nanotechnology.

13. What do you mean by the surface to volume ratio of a nanosystem?

14. Explain the photo electron spectroscopy in short.

15. Write a short note on sol-gel evaporation.

16. State and explain Braggs law.

17. What is inert gas condensation?

18. Explain any two properties of C_{60} in short.

19. Write a note on the discovery carbon clusters.

20. Write a note on the Nano electronic devices

21. What is the principle of a quantum cascade laser?

22. Explain any one of the synthesis methods of carbon nanotubes.

<div align="right">(8 × 2 = 16 Marks)</div>

SECTION – C

Answer **any six** questions. Each questions carries **4** marks

23. Write a note on the historical development of nanoscience.

24. What are excitons?

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25. Explain the electrical conductivity of nanoparticles in detail.

26. Consider a cube of 2cm side is divided into a large number of cubes of 10 nm side. Calculate the surface to volume ratio in both the cases.

27. What do you mean by sonochemical process?

28. What is the principle of scanning probe microscopy?

29. Write a note on Raman spectroscopy.

30. State the principle of a Resonant Tunnelling diode (RTD).

31. Explain the process of mechanical reinforcement by CNTs.

(6 × 4 = 24 Marks)

SECTION – D

Answer **any two** questions. Each question carries **15** marks

32. Write a detailed note on the Fermi gas and density of states. Explain the potential well structure in nanosystems. What do you understand by quantum confinement?

33. Explain the electron microscopy techniques (SEM & TEM). State the use of electron microscopy in nanoscience.

34. Explain the structure and properties of carbon nanotubes.

35. Write the principle, construction and applications of quantum cascade lasers.

(2 × 15 = 30 Marks)

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