# B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, NOVEMBER 2011

## First Semester

### Core Course – METHODOLOGY IN PHYSICS

(Common for B.Sc. Physics (Model – I), B.Sc. Physics (Model – II),
B.Sc. Physics – Electronic Equipment Maintenance, B.Sc. Physics – Instrumentation)

Time : Three Hours                                                                Maximum Weight : 25

*Answer* **all** *questions in Part A.*
*This contain four bunches of four objective questions.*
*For each bunch, Grade A will be awarded if all the 4 answers are correct,*
*B for 3, C for 2, D for 1 and E for 0.*

*Answer any* **five** *questions from Part B, any* **four** *from Part C and*
*any* **two** *from Part D.*

*Candidates can use Clark's tables and Scientific non-programmable calculators.*

## Part A (Objective Type)

*Weight* 1 for each bunch.

### BUNCH I

1. The amount of mustard dispensed from a machine at The Hotdog Emporium is normally distributed with a mean of 0.9 ounce and a standard deviation of 0.1 ounce. If the machine is used 500 times, approximately how many times will it be expected to dispense 1 or more ounces of mustard?

   (a)  5                                            (b)  16

   (c)  80                                           (d)  100

2. In a micrometer the shiny cylindrical part that the thimble causes to move towards the anvil is called :

   (a)  Spindle.                                     (b)  Sleeve.

   (c)  Screw.                                       (d)  Ratchet stop.

3. The control segment of a space segment consists of :

   (a)  A master control station.

   (b)  Four dedicated ground antennas.

   (c)  Six dedicated monitor stations.

   (d)  All of the above.

**Turn over**

4. S. Chandrasekhar was awarded Nobel prize in :

    (a)  1979.               (b)  1983.

    (c)  1989.               (d)  1980.

## BUNCH II

5. If a train is to move with velocity of light, its length would be :

    (a)  Infinite.            (b)  Unchanged.

    (c)  Zero.               (d)  Half the original.

6. For a constant-length pendulum, the periodic time depends on :

    (a)  Amplitude.         (b)  Length.

    (c)  Mass of pendulum.      (d)  'g'

7. If 'l' is the length of a simple pendulum and 'T' its period, the 'g' is given by :

    (a)  $(4\pi^2 l)/T^2$        (b)  $2\pi/(\sqrt{1/t})^2$

    (c)  $2\pi l/t$           (d)  $(4\pi l^2)/t^2$

8. Which of the following instrument will you use to measure the radius the radius of a thin copper wire.

    (a)  Screw gauge.        (b)  Meter scale.

    (c)  Sonar.            (d)  Laser range finder.

## BUNCH III

State whether the following statements are true *or* false :

9. _____ measures time more precisely.

10. The instrument which can measure both current and voltage _____.

11. _____ can be used to determine the distance of earth to a distant star directly with accurate astrometry.

12. The full form of GPS is _____.

BUNCH IV

Match the following :

| A | | B |
|---|---|---|
| 13. Galileo | – | Observation and analysis of sunspots |
| 14. Heisenberg | – | Nano technology. |
| 15. Maxwell | – | Quantum mechanics. |
| 16. Richard Feynmann | – | Classical electromagnetic theory. |

$(4 \times 1 = 4)$

## Part B (Short Answer Questions)

*Answer any* **five** *questions.*

*Weight 1 each.*

17. What are the limitations of a sun dial measuring time?

18. Write notes on passive and active sonars.

19. What do you mean by standard deviation? How can this be used in error reporting?

20. What are the contributions of S.N. Bose towards physics?

21. Explain how electricity magnetism and optics can be unifies.

22. Why is the invention of semiconductors considered revolutionary?

23. Discuss the working of an ammeter.

24. How does error propagate when we are dealing with powers?

$(5 \times 1 = 5)$

## Part C (Short Essay/Problems)

*Answer any* **four** *questions.*

*Weight 2 each.*

25. Convert the errors in the following measurements of the velocities of two carts on a track into fractional errors and per cent errors (a) $v = 55$ plus or minus 2 cm/s (b) $u = -20$ plus or minus 2 cm/s. (c) a cart's kinetic energy is measured as 4.58 plus or minus 2%.

26. A student measures gravity experimentally by measuring the time $t$ for a stone to fall from a height $h$ above the ground after making so many trials. She concludes that $T = 1.6$ plus or minus 0.1 s.

    $h = 46.2$ plus or minus 0.3 ft.

    She calculated $g$ as

    $g = 2h/t^2 = 2 \times 46.2$ ft/$(1.6s)^2 = 36.1$ft/s$^2$

    What is the uncertainly in her answer?

27. Find the effective mass and momentum corresponding to a photon of wavelength 649.3 nm.

28. If star A has a parallax angle about two times that of star B, what can we immediately determine about the relative distances of the two stars? Explain how we know this.

29. Discuss how spectrometer verniers and scale and telescope arrangements can be used for angle measurement.

30. How can we estimate the errors with reading scales and errors of digital instruments?

$(4 \times 2 = 8)$

### Part D (Essay Type Questions)

*Answer any* **two** *questions.*

*Weight 4 each.*

31. (a) Explain the uncertainties in measurement and need for error analysis.

    (b) Explain how errors can be estimated.

32. Explain different methods for measurement of length.

33. Explain the development of different models of the universe.

$(2 \times 4 = 8)$