

B.Sc. 1st Semester (Hons.) Examination,

November-2014

CHEMISTRY

Optional-I

Math-I

Time allowed : 3 hours] [Maximum marks : 40

Note : Attempt one question from each section and Question No. 9 is compulsory. Each question carries equal marks.

Section-I

1. (a) Prove that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.
 (b) Simplify $(x + \sqrt{x^2 - 1})^6 + (x - \sqrt{x^2 - 1})^6$.
2. (a) If ${}^{56}P_{r+6} : {}^{54}P_{r+3} = 30800 : 1$, find rP_2 .
 (b) Find the condition that the root of $ax^3 + bx^2 + cx + d = 0$ are in A.P.

Section-II

3. (a) Prove that $\tan \theta + \cot \theta$ can never be equal to $\frac{3}{2}$.
 (b) If $2 \cos \theta = x + \frac{1}{x}$, prove that $2 \cos 3\theta = x^3 + \frac{1}{x^3}$.

4. Evaluate

$$(a) \quad \lim_{x \rightarrow 3} \frac{x^2 - x - 6}{x^3 - 3x^2 + x - 3}$$

$$(b) \quad \lim_{x \rightarrow \frac{\pi}{2}} \frac{\cos x}{\frac{\pi}{2} - x}$$

Section-III

5. Find $\frac{dy}{dx}$ of the following

$$(a) \quad y = \frac{\sqrt{x+1} + \sqrt{x-1}}{\sqrt{x+1} - \sqrt{x-1}}$$

$$(b) \quad x^y = e^{x-y}$$

6. (a) Test for local maxima or local minima, if any, for the function $f(x) = (x-3)^4$

(b) Given the perimeter of a rectangle, show that its diagonal is minimum when it is a square.

Section-IV

7. Evaluate :

$$(a) \quad \int \frac{(x+1)(x+\log x)^3}{2x} dx$$

(b) $\int x^3 \log 2x \, dx$

8. (a) Find the area of circle whose equation is

$$x^2 + y^2 = 2ax$$

(b) Find $\int \sec^3 x \, dx$

Section-V

9. (a) If $A = \{a, b, c\}$ and $B = \{4, 5\}$, then find $A \times B$.

- (b) Define Domain of a function.

(c) Find $\frac{dy}{dx}$ when $y = \log(1-x)$

(d) Evaluate $\int \frac{\log x}{x} \, dx$

(e) Find $\tan 15^\circ + \tan 75^\circ$

- (f) What is the minimum value of $|\sin x|$.

$$1+1+2+1+2+1$$