No. of Printed Pages : 4 **RPH-001**

Ph. D. (Physics)
Term-End Examination
December, 2019

RPH-001 : RESEARCH METHODOLOGY

Time : 2 Hours *Maximum Marks : 50*

Note : All questions are compulsory. Internal choices are given.

1. Attempt any *two* parts adhering to the word limit given therein : 2×10=20

   (a) What is the relevance of studying history of Science for a researcher in Physics ? Answer in not more than 500 words giving due justification.

   (b) Outline the major steps of the 'method of science' giving an example for each step. Limit your answer to 500 words.

   (c) Discuss the major features of scientific knowledge giving suitable examples from the history of science. In your answer, bring out the difference in scientific knowledge and other forms of human knowledge. Limit your answer to 500 words.

2. Attempt any *two* parts : 2×5=10

   (a) Discuss *five* factors you should take into consideration while selecting a research problems. Limit your answer to **250** words.

   5

   (b) Explain the following principles of experimental design : $2\frac{1}{2}+2\frac{1}{2}$

      (i) Principle of replication

      (ii) Principle of randomization

   (c) Explain and illustrate the "Two group simple randomized design." State the limitation of this research design. 4+1

3. Attempt any *one* part : 1×10=10

   (a) (i) Explain each of the following terms used in statistics : 5

      Statistical inference, population, simple random sampling, estimator, sampling distribution.

      (ii) What is χ^2-test ? Write its test statistic. What is the typical null hypothesis in this test ? How is it tested ? 1+1+1+2

(b) Write the expression for variate z in terms to standard error. The shelf lives of nano-particles prepared by a typical synthesis route have been tested using 60 different random samples. The mean sample shelf life is 10 months with a population standard deviation of 1 month. Find an interval estimate with confidence levels of (i) 95% and (ii) 99%. [Given : At 95% confidence $z = \pm 1.96$ and at 99% confidence $z = \pm 2.58$.]   2+8

4. Attempt any *two* parts :   2×5=10

(a) (i) State any *four* acts that are not considered to be infringement of copyright under the Indian Copyright Act.   4

(ii) What is the definition of plagiarism as per UGC gazette notification on Promotion of Academic Integrity and Prevention of Plagiarism in HEIs ?   1

(b) (i) Why is it necessary to protect an invention as patent ?   2

(ii) What is the term of a patent in India ?   1

(iii) What are the different ways to exercise patent rights ?   2

(c) (i) What precautions will you take in handling hazardous chemicals in a laboratory ?   3

(ii) State any *four* measures that should be taken by HEIs to prevent plagiarism, as per UGC notification. 2