

Roll No.

Total No. of Pages : 02

Total No. of Questions : 08

**PHD (Chemical)**  
**LABORATORY PRACTICES AND SAFETY**

Time : 3 Hrs.

Max. Marks : 100

**INSTRUCTIONS TO CANDIDATES :**

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

Q1 a) How many significant figures present in each of the following term?

i)  $1.40 \times 10^3$ , ii) 6.01, iii) 02947.1, iv) 583.02, v)  $98.1 \times 0.03$  (10)

b) What are the requirements of collection and preserving of sample? (10)

Q2 a) Discuss the different sources of errors. (10)

b) Consider the following three data sets A, B and C. (10)

A = {9, 10, 11, 7, 13}

B = {10, 10, 10, 10, 10}

C = {1, 1, 10, 19, 19}

i) Calculate the mean of each data set.

ii) Calculate the standard deviation of each data set.

iii) Which set has the largest standard deviation?

iv) Is it possible to answer question iii) without calculations of the standard deviation?

Q3 a) What is the role of desiccator? What types of chemicals are stored in desiccator? (5)

b) What safety measurements need to be taken for cleaning volumetric glassware? How glasswares are calibrated? (5)

- c) Differentiate between soft and heat resistant glasswares. (5)
- d) Why the cleaning of glassware is very important? (5)
- Q4 a) How the reagent grade water can be prepared? (5)
- b) How the quality of the chemical can be assessed? (5)
- c) What is the difference between detection limit and analytical sensitivity? (5)
- d) Differentiate between laboratory reagent grade and analytical grade chemicals. (5)
- Q5 a) How 0.1N solution of sodium hydroxide and sodium carbonate can be prepared and how these solutions can be standardized? (10)
- b) What is a reagent solution? What purpose does it serve? (5)
- c) How much bleach is needed to prepare 10%, 50 mL bleach solution? (5)
- Q6 a) Explain exactly what you would do when performing the following laboratory instructions : (10)
- i) Extract the aqueous layer three times with 1.0 mL portions of methylene chloride,
- ii) Wash the organic layer with 1.0 mL of aqueous sodium bicarbonate.
- b) At which cases of solvent separation ; fractional and vacuum distillations are required? Discuss the procedure for fractional distillation. (10)
- Q7 a) What is waste minimization? How can we reduce waste disposal? (10)
- b) How the intensity of computer usage in the modern world and workplace cause health and safety issues? (10)
- Q8 a) How do you handle compressed gases safely? (5)
- b) Discuss the safe ways to dispose hazards and non-hazards chemicals. (5)
- c) What safety measures need to be taken in the stockroom? (5)
- d) What are the different types of fire extinguisher used in chemical laboratory and discuss the role of each. (5)