BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF CHEMISTRY

MAIN EXAMINATION PAPER

PROGRAMME:	**BSc (Hons) CHEMICAL TECHNOLOGY**
COURSE:	**LABORATORY TECHNIQUES**
COURSE CODE:	**CH 112**
DURATION:	**2 HOURS**

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions in **Section A** and **THREE** questions from **Section B.**
2. **Section A** carries a total of **40 marks** and each question in **Section B** carries **20 marks.**
3. Each question should start on a fresh page and marks will be allocated as indicated

SECTION A

Question 1

(a) Define Good laboratory practices (GLP). **[2 marks]**

(b) Outline the GLP five requirements considered when setting up laboratory premises.

(c) Explain what would be the result of the following errors in TLC technique?

(i) Too much of a sample is applied on the plate. **[1 mark]**

(ii) The solvent pool in the developing jar is too deep. **[1 mark]**

(iii) The developing solvent is too non-polar. **[1 mark].**

(d) Explain what is meant by the following terms when applied to laboratory information?

(i) Accuracy **[2 mark]**

(ii) Precision **[2 mark]**

(e) List two requirements material/sample transfer usually has to meet. **[2 marks]**

(f) Explain the three classes that can be used to categorize degree of burning. **[6 marks]**

(g) Casualties should always be treated in the order of priority, usually given by the "3 Bs". Which are these "3Bs". **[3 marks]**

(h) Explain why you need to add boiling chips or anti-bumping granules (rough beads or chips of marble, glass, tile or silicon carbide) when refluxing or distilling. **[4 marks]**

(i) Explain why it not advisable to add boiling chips to hot liquids. **[2 mark]**

(j) Briefy explain three methods that are used to measure pH of materials. **[6 marks]**

(k) Distinguish between endpoint and equivalence point and briefly explain why the endpoint is usually a little higher. **[3 marks]**

SECTION B: ANSWER THREE QUESTION FROM THIS SECTION

Question 2

(a) Explain how you would make calibration standard solution using serial dilutions. **[4 marks]**

(b) Outline advantages and disadvantages of using a direct dilution or serial dilution method. **[7 marks]**

(c) Draw typical labelled assemblies of apparatus for azeotropic distillation (Dean-Stark) and briefly explain how you the apparatus can be used to remove water by-product in a toluene reaction medium. **[7 marks]**

(d) Explain why it is not advisable to dry volumetric glassware in an oven. **[2 marks]**

Question 3

(a) Define the "melting point" of a substance and explain its purpose. **[3 marks]**

(b) Explain three factors that might affect the melting point of a substance. **[6 marks]**

(c) How are the initial and final temperatures of the melting range determined?

(d) Explain the technique of mixed melting point and why it always works. **[2 mark]**

(e) You are employed as a lab technician at food processing company and you are required to calibrate a thermometer.

(i) Explain why a thermometer should be calibrated regularly. **[2 marks]**

(ii) Explain how you can calibrate the thermometer. **[7 marks]**

Question 4

(a) The crude product of an organic reaction may contain a coloured impurity. Explain how you can decolourise the solution. **[2 marks]**

(b) Explain why an excessive of decolourising agent should be avoided. **[2 marks]**

(c) Outline the step followed when weighing by difference. **[3 marks]**

(d) List three fundamental and essential "ingredients" necessary to produce the chemical reaction that is called fire. **[3 marks]**

(e) List four type of fire extinguishers and give example of fuel sources where each type can be applied. **[6 marks]**

(f) Explain the following acronym PASS for properly using the fire extinguisher. **[4 marks]**

Question 5

You are required to perform the following reaction in your laboratory session.

(a) Draw a well labelled diagram to show the apparatus that you will use for the reaction. **[5 marks]**

(b) Outline three precautions that you need to follow. **[3 marks]**

(c) Assume you are supposed to obtain the product as white precipitate, but for some reasons no precipitation is taking place. Outline the five methods that should be tried in order to induce crystallisation or precipitation. **[5 marks]**

(d) If you start with 50g of aniline and 50g of benzaldehyde. Calculate the percentage yield if you obtained 40g of product. **[3 marks]**

(e) Briefly explain factors that might lead to lower yields and yields over 100%. **[4 marks]**

Question 6

(a) List two actions that must be taken to ensure employee safety in emergencies. **[2 marks]**.

(b) Explain what must be included in an emergence action plan **[4 marks]**

(c) Briefly explain the design of a fume-hood and its mode of operation **[4 marks]**

(d) Discuss methods that are used to clean glassware in a laboratory. **[10 marks]**

END OF EXAMINATION