

**CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ**

Autumn Examination 2015/2016

Module Title: Laboratory Practice (CA module)

Module Code: BIOL6003

School: Science and Informatics

Programme Code: SNHSC_8_Y1
SHERB_8_Y1
SPHB1_8_Y1
SBIOS_7_Y1
SCEBS_8_Y1

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Instructions: Answer **Question 1** and any **three** other questions.
All questions carry equal marks (25 marks).

Duration: 2 hours

Sitting: Autumn 2016

Requirements for this examination: Calculator

Note to Candidates: Please check the Programme Title and the Module Title to ensure that you have received the correct examination paper.
If in doubt please contact an Invigilator.

Q1. COMPULSORY QUESTION

Answer **all** parts. Show **all** of your calculations.

- (a) List two general safety precautions when working in a laboratory. **(2 marks)**
- (b) Describe how you would prepare 200 ml of a 0.5% (w/v) sodium chloride solution. Name one possible source of error in making up this solution. **(5 marks)**
- (c) Explain the difference between systematic and random error. **(2 marks)**
- (d) Convert 0.035ml to microlitres (μl) and state which of the following pipettes would be used to deliver this volume: P10, P100, P1000. **(3 marks)**
- (e) Calculate the number of grams of solute required for the preparation of 2 L of 0.32M NaHCO_3 (molecular weight of $\text{NaHCO}_3 = 84 \text{ g/mol}$). **(4 marks)**
- (f) Explain the difference between precision and accuracy. **(2 marks)**
- (g) Explain what is meant by the absorption maximum (λ_{max}) of a solution. Use a diagram to illustrate your answer and label all axes appropriately. **(5 marks)**
- (h) What two pH buffers are used to calibrate the pH meter when making a solution that is pH 5? **(2 marks)**

Q2. Write comprehensive notes on five of the following:

- (a) Analytical balances
- (b) Buffers
- (c) Standard operating procedures
- (d) MSDS
- (e) Autoclave quality assurance
- (f) Biosafety

(5 x 5 marks)

Q3.

- (a) What is the Beer-Lambert Law? (5 marks)
- (b) Draw a labelled graph that demonstrates the Beer-Lambert Law. (5 marks)
- (c) Explain what a “blank” solution and state the purpose of a blank solution in spectrophotometry. (5 marks)
- (d) Explain what stray light is and explain why it is important to consider stray light in spectrophotometry experiments. (5 marks)
- (e) A stock solution of a compound with a molar absorptivity ϵ of 100,000 L mol⁻¹ cm⁻¹ gives an absorbance reading of 1 using a cuvette with a pathlength of 1cm. Calculate the concentration of the stock. (5 marks)

Q4.

- (a) Explain what centrifugation is. (3 marks)
- (b) Why do protocols for centrifugation typically specify the amount of acceleration to be applied to a sample rather than specifying a rotational speed such as revolutions per minute (rpm)? (4 marks)
- (c) What is relative centrifugal force (rcf)? (5 marks)
- (d) A protocol states to centrifuge a sample for 10 mins at 6000g. The radius of the rotor is 7.2 cm. What rpm should be set on the centrifuge? (show your calculations).
$$\text{RCF} = 1.118 \times 10^{-5} \cdot r \cdot \text{rpm}^2$$
 (5 marks)
- (e) Explain why is it important to ensure a centrifuge is balanced. (3 marks)
- (f) List 4 practices which should be followed when centrifuging hazardous material. (5 marks)

Q5.

- (a) Explain how the process of gel electrophoresis separates DNA fragments. **(7 marks)**
- (b) Explain why DNA has an overall negative charge. **(3 marks)**
- (c) Why is the fact that DNA has a negative charge so important in the gel electrophoresis process? **(5 marks)**
- (d) Why is a molecular weight marker used when running an agarose gel? **(5 marks)**
- (e) What is the purpose of SYBR Safe in gel electrophoresis? **(5 marks)**