# WCAIR Training Programme

# Placement Application Questionnaire

# Introduction

The [Wellcome Centre for Anti-Infectives Research (*W*CAIR)](https://wcair.dundee.ac.uk) was established in 2017 at the University of Dundee. Combining the [Drug Discovery Unit (DDU)](https://drugdiscovery.dundee.ac.uk/), [Parasitology](https://www.lifesci.dundee.ac.uk/msca/mp), and [Mode of Action](https://modeofactiondundee.org/) teams, we bridge the gap between research and drug development. Our staff work to industry standards in early stage, small molecule drug discovery translating world-class biology into novel drug targets and candidate drugs.

*W*CAIR aims to accelerate innovation in drug discovery, with an ambition to radically increase the rate and success of delivering drug candidates by fundamentally redesigning the drug discovery processes. You can read more about our progress in a number of our portfolios in the [WCAIR report](https://issuu.com/univeristyofdundee/docs/issuu_wcair_three_year_report) and [DDU Annual Report](https://drugdiscovery.dundee.ac.uk/annual-report)

At *W*CAIR, we are passionate about sharing our scientific work with as many people as we can. This includes those close to us in Dundee, throughout Scotland and across the world. To achieve this, we have a busy [public engagement](https://wcair.dundee.ac.uk/public-engagement) programme.

# Building Capacity through Training

*W*CAIR Training wants to support scientists working in drug discovery, especially those working in countries most affected by the diseases we work in. We do this by a mix of short courses, online training, and training placements in Dundee.

We have trainers in the disciplines of Medicinal Chemistry and Drug Metabolism and Pharmacokinetics (DMPK). They will provide bespoke theoretical and practical training to visiting scientists. This may include learning new skills or a refresher of existing skills in a new lab. We hope our visitors will take this knowledge back to their home institutions and share it with their colleagues.

To help us provide the best training possible, we will need to assess your understanding of key areas. This will allow us to tailor your experience in Chemistry and/or DMPK at *W*CAIR.

On the following pages are a series of questions in Medicinal Chemistry and DMPK. Please answer the questions without the use of reference material. It is not important that you attain the correct answer, these questions are designed to assess your understanding and allow us to personalise your training. If you do not understand a question or cannot answer, please say so.

## Synopsis of the Training

*Medicinal Chemistry/ Computational Medicinal Chemistry*: how to synthesise new chemical entities (NCEs) which are used to explore novel druggable targets.

*Drug Metabolism and Pharmacokinetic Sciences (DMPK)*: how to set up assays to find out the fate of the NCEs in the body and time course of the NCEs through the body.

All practical placements will be preceded by ~3 months of online training, where your trainer will spend time explaining some theoretical aspects of your placement. This means that your time in Dundee will be focused on practical skills in the lab, data analysis and understanding the different roles of scientists within a drug discovery programme.

For a practical placement, WCAIR strive to provide you with full access to resources utilised in drug discovery projects. What resources you will be exposed to, will be based on your uniquely tailored placement plan, created by you and your trainer. Exposure to these resources is not just limited to practical work. A large part of drug discovery is the interaction and communication with different disciplines. WCAIR aim to introduce you to drug discovery team dynamics and have you as a fully integrated member of the team.

# WCAIR resources

[**Free online training resources**](https://wcair.dundee.ac.uk/training/training-resources/). These include short talks/animations on areas in drug discovery.

[**Short Courses (online/in-person)**](https://wcair.dundee.ac.uk/training/short-courses/). WCAIR provide short courses that can be tailored to institution needs.

[**Publications**](https://wcair.dundee.ac.uk/category/publications/).

# DMPK Laboratory Skills Assessment Test

### Question 1

With science constantly evolving, method development is happening all the time in DMPK. If you were developing a new experimental method how would you go about it?

### Question 2

Metabolism makes up 70% of a drugs overall clearance. Can you explain the different phases of metabolism, which enzymes are involved and draw a schematic of how each phase would affect the following compound?



### Question 3

You are required to make a 250mM Tris buffer containing 250mM sucrose at pH 7.4. How will you make this buffer and how will you ensure that your pH is correct? Show your calculations.

M.Wt of Tris Base is 121.14 NH2(CH2OH)3

M.Wt of Sucrose is 342.30 (C12H22O11)

### Question 4

You are running a fluorescence based CYP Inhibition experiment. A cofactor is required with a protein concentration of 6 Units/mL of Glucose-6-Phosphate Dehydrogenase enzyme. Calculate the volume of enzyme needed to achieve 20mL of cofactor? Enzyme is supplied at 5785 Units/mL.

# Medicinal Chemistry Laboratory Skills Assessment Test

### Question 1

Propose a liquid extraction workup to isolate the components of a mixture of *p*-toluidine, benzoic acid and 1-methylnaphtalene dissolved in ethyl acetate. Justify your reasoning.

### Question 2

Suggest a retro then forward synthesis for the druglike molecule below, using starting materials with no more than 1 ring:



### Question 3

Rank the following organic compounds in order of increasing acidity. Explain your reasoning.



### Question 4

Identify the functional groups present in the below molecule? What are the main intermolecular interactions that each group can do with its receptor? Suggest one or more analogues to obtain a more hydrophilic molecule and explain your reasoning.

