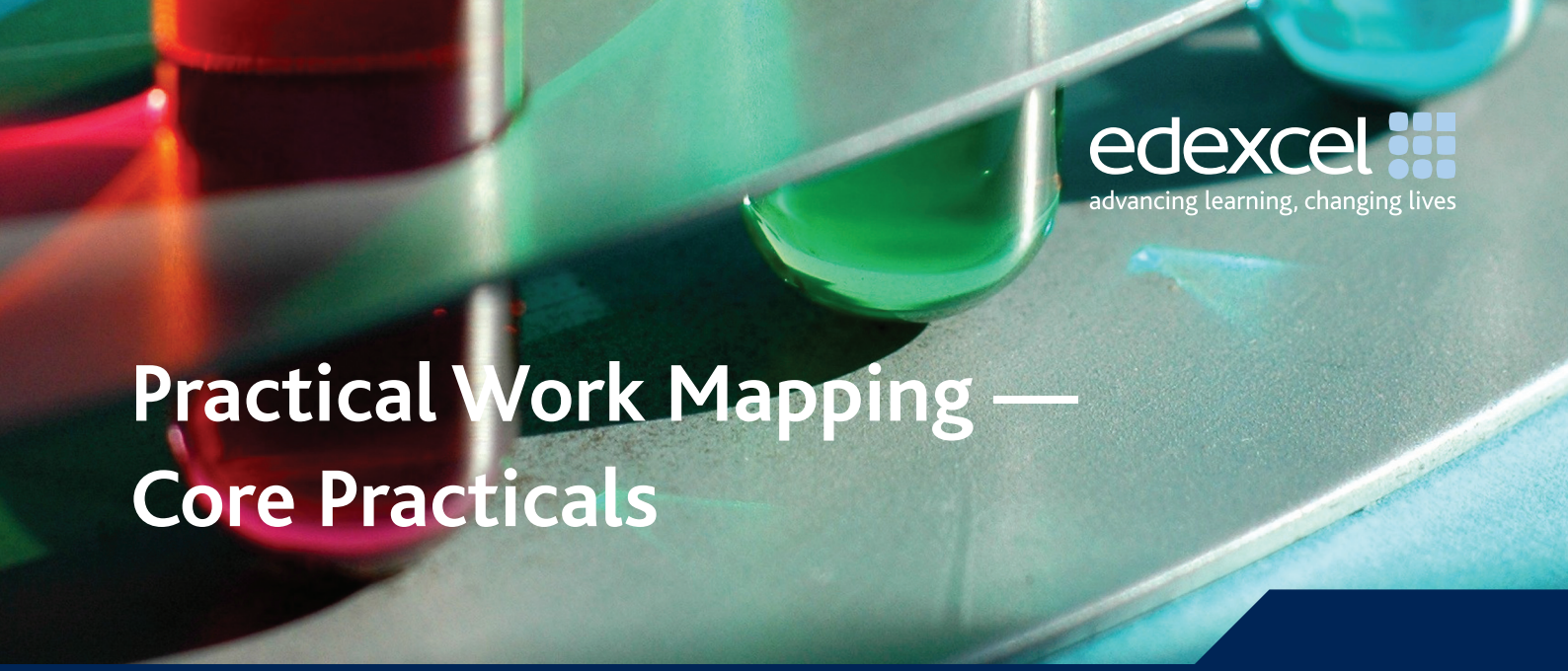

edexcel
advancing learning, changing lives

Practical Work Mapping — Core Practicals

GCE Chemistry

Edexcel Advanced Subsidiary GCE in Chemistry (8CH01)

First examination 2009

Edexcel Advanced GCE in Chemistry (9CH01)

First examination 2010

Issue 2
April 2008

A PEARSON COMPANY

Contents

Introduction

The following practicals can be found within *Units 1, 2, 4* or *5*, within the specification for the Edexcel GCE in Chemistry (8CH01/9CH01). These practicals are the **core practicals** that students should complete when studying *Units 1*, *2*, *4* and *5*. Many of these practicals, particularly in *Units 4* and *5*, state that students should '*describe and carry out, where appropriate* ...'. If you feel that it is not appropriate for your students to carry out these practicals they do not need to. **In all cases of laboratory work it is essential that centres carry out a detailed risk assessment.** If centres feel that any practicals listed here are too hazardous for their students to complete then an alternative method of studying them is acceptable, eg demonstration, video etc. For further information on risk assessments and chemical hazards please refer to the CLEAPSS website (www.cleapss.org.uk). They can be used to meet the requirements of Activity **a**: General Practical Competence (GPC), in the assessment of *Units 3* and *6*. They may also appear on the written examinations for *Units 1, 2, 4* or *5*, depending on which units they appear in. The core practicals are listed below with a **Core Practical Code** to make them easy to list on the student record sheets for *Units 3* and *6*.

Practical Work in the Edexcel GCE in Chemistry (8CH01/9CH01)

Unit 1: The Core Principles of Chemistry

Specification code	Practical Activity	Core Practical Code
1.3j	Make a salt and calculate the percentage yield of product, eg preparation of a double salt (ammonium iron(II) sulfate from iron, ammonia and sulfuric acid).	CP1
1.3k	Carry out and interpret the results of simple test tube reactions, such as displacements, reactions of acids, precipitations, to relate the observations to the state symbols used in equations and to give practise writing full and ionic equations.	CP2
1.4f	Evaluate the results obtained from experiments using the expression: *energy transferred in joules = mass × specific heat capacity × temperature change* and comment on sources of error and assumptions made in the experiments. The following types of experiments should be performed: i experiments in which substances are mixed in an insulated container and the temperature rise measured ii simple enthalpy of combustion experiments using, eg a series of alcohols in a spirit burner iii plan and carry out an experiment where the enthalpy change cannot be measured directly, eg the enthalpy change for the decomposition of calcium carbonate using the enthalpy changes of reaction of calcium carbonate and calcium oxide with hydrochloric acid.	CP3

Unit 2: Application of Core Principles of Chemistry

Specification code	Practical Activity	Core Practical Code
2.4d	Carry out experiments to determine the effect of an electrostatic force on jets of liquids and use the results to determine whether the molecules are polar or non-polar.	CP4
2.5c	Carry out experiments to study the solubility of simple molecules in different solvents.	CP5
2.7.1g	Describe and carry out the following: i experiments to study the thermal decomposition of group 1 and 2 nitrates and carbonates ii flame tests on compounds of group 1 and 2 iii simple acid-base titrations using a range of indicators, acids and alkalis, to calculate solution concentrations in g dm-3 and mol dm-3, eg measuring the residual alkali present after skinning fruit with potassium hydroxide.	CP6
2.7.2b	Describe and carry out the following chemical reactions of halogens: i oxidation reactions with metal and non-metallic elements and ions such as iron(II) and iron(III) ions in solution ii disproportionation reactions with cold and hot alkali, eg hot potassium hydroxide with iodine to produce potassium iodate(V).	CP7
2.7.2c	Carry out an iodine/thiosulfate titration, including calculation of the results and evaluation of the procedures involved, eg determination of the purity of potassium iodate(V) by liberation of iodine and titration with standard sodium thiosulfate solution.	CP8
2.7.2d	Describe and carry out the following reactions: i potassium halides with concentrated sulfuric acid, halogens and silver nitrate solution ii silver halides with sunlight and their solubilities in aqueous ammonia solution iii hydrogen halides with ammonia and with water (to produce acids).	CP9
2.8f	Carry out simple experiments to demonstrate the factors that influence the rate of chemical reactions, eg the decomposition of hydrogen peroxide.	CP10
2.10.1d	Demonstrate an understanding of, and practise, the preparation of an organic liquid (reflux and distillation), eg oxidation of alcohols.	CP11

Specification code	Practical Activity	Core Practical Code
2.10.2c	Carry out the preparation of an halogenoalkane from an alcohol and explain why a metal halide and concentrated sulfuric acid should not be used when making a bromoalkane or an iodoalkane.	CP12
2.10.2e	Carry out the reactions described in 2.10.2d i, ii, iii.	CP13

Unit 4: General Principles of Chemistry I — Rates, Equilibria and Further Organic Chemistry

Specification code	Practical Activity	Core Practical Code
4.3c	Investigate reactions which produce data that can be used to calculate the rate of the reaction, its half-life from concentration or volume against time graphs, eg a clock reaction.	CP14
4.3e	Investigate the reaction of iodine with propanone in acid to obtain data for the order with respect to the reactants and the hydrogen ion and make predictions about molecules/ions involved in the rate-determining step and possible mechanism (details of the actual mechanism can be discussed at a later stage in this topic).	CP15
4.4g	Carry out experiments and relate the results to disorder and enthalpy changes including: i dissolving a solid, eg adding ammonium nitrate crystals to water ii gas evolution, eg reacting ethanoic acid with ammonium carbonate iii exothermic reaction producing a solid, eg burning magnesium ribbon in air iv endothermic reaction of two solids, eg mixing solid barium hydroxide, Ba(OH)2.8H2O with solid ammonium chloride.	CP16
4.8.2c	Describe and carry out, where appropriate, the reactions of carbonyl compounds limited to: i oxidation with Fehling's or Benedict's solution, Tollens' reagent and acidified dichromate(VI) ions ii reduction with lithium tetrahydridoaluminate (lithium aluminium hydride) in dry ether iii nucleophilic addition of HCN in the presence of KCN, using curly arrows, relevant lone pairs, dipoles and evidence of optical activity to show the mechanism iv the reaction with 2,4-dinitrophenylhydrazine and its use to detect the presence of a carbonyl group and to identify a carbonyl compound given data of the melting temperatures of derivatives v iodine in the presence of alkali.	CP17

Specification code	Practical Activity	Core Practical Code
4.8.3d	Describe and carry out, where appropriate, the reactions of carboxylic acids. This will be limited to: i reduction with lithium tetrahydridoaluminate (lithium aluminium hydride) in dry ether (ethoxyethane) ii neutralization to produce salts, eg to determine the amount of citric acid in fruit iii phosphorus(V) chloride (phosphorus pentachloride) iv reactions with alcohols in the presence of an acid catalyst, eg the preparation of ethyl ethanoate as a solvent or as pineapple flavouring.	CP18
4.8.4b	Describe and carry out, where appropriate, the reactions of acyl chlorides limited to their reaction with: i water ii alcohols iii concentrated ammonia iv amines.	CP19
4.8.4c	Describe and carry out, where appropriate, the reactions of esters. This will be limited to: i their hydrolysis with an acid ii their hydrolysis with a base, eg to form soaps iii their reaction with alcohols and acids to explain the process of trans-esterification and recall how it is applied to the manufacture of bio-diesel (as a potentially greener fuel) and low-fat spreads (replacing the hydrogenation of vegetable oils to produce margarine).	CP20

Unit 5: General Principles of Chemistry II — Transition Metals and Organic Nitrogen Chemistry

Specification code	Practical Activity	Core Practical Code
5.3.1d	Set up some simple cells and calculate values of E_{cell} from standard electrode potential values and use them to predict the thermodynamic feasibility and extent of reactions.	CP21
5.3.1g	Carry out and evaluate the results of an experiment involving the use of standard electrode potentials to predict the feasibility of a reaction, eg interchange of the oxidation states of vanadium or manganese.	CP22
5.3.2g	Carry out experiments to: i investigate ligand exchange in copper complexes ii study the redox chemistry of chromium in oxidation states Cr(VI), Cr(III) and Cr(II) iii prepare a sample of a complex, eg chromium(II) ethanoate.	CP23
5.3.2j	Carry out and interpret the reactions of transition metal ions with aqueous sodium hydroxide and aqueous ammonia, both in excess, limited to reactions with aqueous solutions of Cr(III), Mn(II), Fe(II), Fe(III), Ni(II), Cu(II), Zn(II).	CP24
5.4.1d	Carry out the reactions in 5.4.1b where appropriate (using methylbenzene or methoxybenzene).	CP25
5.4.1e	Carry out the reaction of phenol with bromine water and dilute nitric acid and use these results to illustrate the activation of the benzene ring	CP26
5.4.2b	Describe and carry out, where appropriate (using butylamine and phenylamine), reactions to investigate the typical behaviour of primary amines. This will be limited to: i characteristic smell ii miscibility with water as a result of hydrogen bonding and the alkaline nature of the resulting solution iii formation of salts iv complex ion formation with copper(II) ions v treatment with ethanoyl chloride and halogenoalkanes, eg making paracetamol.	CP27
5.4.2d	Describe and carry out, where appropriate, the reaction of aromatic amines with nitrous acid to form benzenediazonium ions followed by a coupling reaction with phenol to form a dye.	CP28

Specification code	Practical Activity	Core Practical Code
5.4.2i	Describe and carry out, where appropriate, experiments to investigate the characteristic behaviour of amino acids. This will be limited to: i acidity and basicity and the formation of zwitterions ii separation and identification by chromatography iii effect of aqueous solutions on plane-polarised monochromatic light iv formation of peptide groups in proteins by condensation polymerization v reaction with ninhydrin.	CP29
5.4.3f	Describe and carry out, where appropriate, the preparation of a compound, eg cholesteryl benzoate (a liquid crystal) and of methyl 3-nitrobenzoate, requiring some of the following techniques: i refluxing ii purification by washing, eg with water and sodium carbonate solution iii solvent extraction iv recrystallization v drying vi distillation vii steam distillation viii melting temperature determination ix boiling temperature determination.	CP30

Edexcel, a Pearson company, is the UK's largest awarding body, offering academic and vocational qualifications and testing to more than 25,000 schools, colleges, employers and other places of learning in the UK and in over 100 countries worldwide. Qualifications include GCSE, AS and A Level, NVQ and our BTEC suite of vocational qualifications from entry level to BTEC Higher National Diplomas, recognised by employers and higher education institutions worldwide.

We deliver 9.4 million exam scripts each year, with more than 90% of exam papers marked onscreen annually. As part of Pearson, Edexcel continues to invest in cutting-edge technology that has revolutionised the examinations and assessment system. This includes the ability to provide detailed performance data to teachers and students which helps to raise attainment.

This document is Issue 2. We will inform centres of any changes to this issue. The latest issue can be found on the Edexcel website: www.edexcel.org.uk.

Acknowledgements

This document has been produced by Edexcel on the basis of consultation with teachers, examiners, consultants and other interested parties. Edexcel acknowledges its indebtedness to all those who contributed their time and expertise to its development.

References to third-party material made in this document are made in good faith. Edexcel does not endorse, approve or accept responsibility for the content of materials, which may be subject to change, or any opinions expressed therein. (Material may include textbooks, journals, magazines and other publications and websites.)

Authorised by Roger Beard
Prepared by Sarah Harrison

edexcel
advancing learning, changing lives

Qualifications and Curriculum Authority

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Rewarding Learning

April 2008

For more information on Edexcel and BTEC qualifications
please visit our website: www.edexcel.org.uk

Edexcel Limited. Registered in England and Wales No. 4496750
Registered Office: One90 High Holborn, London WC1V 7BH. VAT Reg No 780 0898 07