MODULE SPECIFICATION PROFORMA

Module Code:	SCI524

Module Title:	**Essential Physical Chemistry**

Level:	5	**Credit Value:**	20

Cost Centre(s):	GAFS	JACS3 **code**:	F170

School:	Applied Science, Computing & Engineering	**Module Leader:**	Dr Jixin Yang

Scheduled learning and teaching hours	30 hrs
Guided independent study	170 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered (not including exit awards)	Core	Option
BSc (Hons) Chemistry	✓	☐

Pre-requisites
None.

Office use only
Initial approval: **Mar 18 – validation of BSc Chemistry** **Version no: 1**
With effect from: **Sept 18**
Date and details of revision: **Version no:**

Module Aims

In this module the student will be taught the applications of the laws of thermodynamics in relation to phase transformations and phase equilibria. Molecular motion in gases and liquids will be discussed. The student will be familiarised with quantum mechanics and the occurrence of various types of molecular energy levels. The kinetics of chemical reactions and catalysis form the concluding part of the course.

Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

At the end of this module, students will be able to		Key Skills	
1	Correlate the laws of thermodynamics to the physical transformations of substances.	KS1 KS5	KS3 KS10
2	Differentiate between the various molecular energy levels on the basis of quantum theory.	KS1 KS5	KS3 KS10
3	Demonstrate the effect of catalysis on the energetics of a chemical reaction by applying the knowledge of chemical kinetics.	KS1 KS5	KS3 KS10
4	Explore and explain the physical world in a broad scope based on the knowledge learned in this module to solve practice problems.	KS3 KS6	KS5 KS10

Transferable skills and other attributes

- Literacy
- Numeracy
- Problem solving
- Time management
- IT skills
- Note Taking

Derogations
N/A

Assessment:

Indicative Assessment Tasks:

Assessment 1: Coursework of approximately 10 short questions on problem solving in physical chemistry, plus a short research essay (50%)

Assessment 2: Exam to access the knowledge covered in this module (50%)

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1,2,3,4	Coursework	50		1,500
2	1,2,3	Examination	50	2 hours	

Learning and Teaching Strategies:

Methods of
delivery: Lectures
Problem solving workshops
Directed study *via* Moodle VLE
Student directed study

The basic factual material will be delivered by means of lectures. Lectures will be supported by workshops in which the students will be able to test their knowledge and understanding of the concepts covered. Students will further be able to develop their knowledge and understanding by reading additional course material and attempting problem sets and quizzes on Moodle VLE. Independent student-directed learning will enable students to delve more deeply into the subject material, enhancing their learning, while developing their IT skills.

Syllabus outline:

- The laws of thermodynamics: physical significance of entropy, Maxwell relations, thermodynamic equations of state, chemical potential, temperature and pressure; phase rule, states of matter and phase diagrams
- Quantum Theory: postulates of quantum mechanics, de Broglie equation, Schrödinger equation; applications of wave mechanics
- Molecular motion in gases and liquids, diffusion, kinetic theory of gases
- Introduction to statistical thermodynamics
- Chemical kinetics: kinetics of elementary and complex reactions

- Catalysis: heterogeneous and homogeneous catalysis; rate and selectivity
- Introduction to surface chemistry

Indicative Bibliography:

Essential reading

Atkins, P. and De Paula, J. (2014), *Physical Chemistry*. 10th ed. Oxford: Oxford University Press.

Other indicative reading

Levine, I.N. (2008), *Physical Chemistry*. 6th ed. McGraw Hill.