MODULE SPECIFICATION

Module Title:	The Physical World	**Level**:	5	**Credit Value**:	20

Module code:	SCI521	New ✓ Existing ☐	**Code of module being replaced**:	N/A

Cost Centre:	GAFS	**JACS3 code**:	F170

Trimester(s) in which to be offered:	1	**With effect from:**	September 16

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

Scheduled learning and teaching hours	50 hrs
Guided independent study	150 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered	Core	Option
BSc (Hons) Chemistry with Education	✓	☐
BSc (Hons) Chemistry with Green Nanotechnology	✓	☐

Office use only
Initial approval July 2016
APSC approval of modification July 2016 Version 1
Have any derogations received SQC approval? Yes ☐ 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

At the end of this module, students will be able to:

1. Correlate the laws of thermodynamics to the physical transformations of substances.
2. Differentiate between the various molecular energy levels on the basis of quantum theory.
3. Demonstrate the effect of catalysis on the energetics of a chemical reaction by applying the knowledge of chemical kinetics.
4. Explore and explain the physical world in a broad scope based on the knowledge learned in this module to solve practice problems.

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	KS3
		KS5	KS10
2	Differentiate between the various molecular energy levels on the basis of quantum theory.	KS1	KS3
		KS5	KS10
3	Demonstrate the effect of catalysis on the energetics of a chemical reaction by applying the knowledge of chemical kinetics.	KS1	KS3
		KS5	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	KS5
		KS6	KS10

Transferable/key skills and other attributes
• Literacy • Numeracy • Problem solving • Time management • IT skills • Note Taking

Derogations
None

Assessment: Please give details of indicative assessment tasks below.

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 (2 hours) (50%)

Please indicate the type(s) of assessment (eg examination, oral, coursework, project) and the weighting of each (%). Normally, each intended learning outcome should be assessed only once.

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

Bibliography:
Essential reading
Atkins, P. and De Paula, J. (2014) Physical Chemistry. 10th Edition. Oxford: Oxford University Press.
Other indicative reading
Levine, I. N. (2008) Physical Chemistry. 6th Edition. USA: McGraw-Hill Higher Education.