UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Physical Chemistry 1 (at Distance)
Module Code	CFS4032-B
Academic Year	2022/3
Credits	20
School	School of Chemistry and Biosciences
FHEQ Level	FHEQ Level 4

Contact Hours	
Type	Hours
Online Tutorials (Synchronous)	25
Practical Classes or Workshops	6
Directed Study	150
Interactive Learning Objects	19
Interactive Learning Objects	Assessment 1: An examination in January will cover LOs 1 - 4 Assessment 2: Summative examination in May will cover LOs 1 - 7

Availability	
Occurrence	Location / Period
DLA	University of Bradford / Academic Year

Module Aims
This module will introduce students to undergraduate level physical chemistry. By the end of this module students should have developed an understanding of important physical chemistry concepts, and associated mathematical concepts, to enable them to understand states of matter, chemical thermodynamics, kinetics and principles of spectroscopy.

Outline Syllabus

Introductory Concepts: Units, conversions and nomenclature; electro-magnetic spectrum; Newtonian mechanics; equations of state.

Properties of Matter: mathematical descriptions of ideal and real gases; kinetic theory of gases; Maxwell-Boltzmann distribution of molecular speeds and collisions in ideal and real gases; Introduction to attractive and repulsive forces.

Thermodynamics: Laws of thermodynamics (zeroth, first, second and third laws); state functions; heat capacity; enthalpy; internal energy; entropy; Hess's Law; Kirchoff equation; Gibbs energy; thermodynamic and Boltzmann definitions of entropy.

Chemical Equilibria: Thermodynamic equilibrium constants; relationship between Gibbs energy, chemical changes, thermodynamic activities, reaction quotient and chemical potential; Van't Hoff equation.

Fundamental Kinetics: monitoring reactions and calculating reaction rates; derivation and application of rate equations of elementary reactions; half-lives; Arrhenius equation and activation energy.

Kinetics of Complex Reactions: determination of mechanistic pathways for reversible, parallel and consecutive reactions; chain reactions; steady state and equilibrium approximations; transition-state theory; catalysis (homo- and hetero-geneous); enzyme catalysis and Michaelis-Menten equation.

Principles of Spectroscopy: energy-wavelength relationship; quantisation of rotational, vibrational & electronic energy; absorption & emission processes; population of energy levels; energy transitions and selection rules; examples of spectroscopic methods.

Environmental Chemistry: Environmental pollutants (land, sea and air) and spectroscopic detection.

Library Skills: Introduction to library and bibliographic databases; search and selection of literature; quality assessment of literature sources.

Learning Outcomes

Outcome Number	Description
01	Understand the effect of P, V, T and amount of matter on the idealised behaviour of gases.
02	Use the ideal gas equation, understand the limitations of the ideal gas law and discuss the real behaviour of gases.
03	Determine equilibrium constants and Gibbs free energies of reactions from data provided.
04	Predict the response of equilibria to changes in concentration, temperature and pressure.
05	Explain and be able to express mathematically reaction kinetics and interpret the data from 0, 1st and 2nd order reactions.
06	Determine activation energies and reaction mechanisms from kinetic data.
07	Describe spectroscopic methods used in detection of environmental pollutants and explain the spectroscopic principles of the methods.
08	Use library resources and bibliographic databases to investigate a defined case study and produce an essay on spectroscopic detection of pollutants.
09	Select literature sources to support scientific arguments based on relevance and quality

Learning, Teaching and Assessment Strategy

This module will be delivered using a 'flipped' learning and teaching strategy: this means you will be provided with taught material which you will need to study before the class takes place. This material will be presented in a range of media including podcasts, vodcasts, and directed reading and will be delivered through the University's VLE. On-line activities such as quizzes, discussions and wikis will support the taught material.
The majority of classes will be hosted and facilitated online using collaborative software. These sessions will require you to use the knowledge you have gained through completion of the pre-work and apply it to real world problems in the discipline of physical chemistry. Furthermore, the problems will require you to take a collaborative approach to solving them, helping you develop key employability skills in a peer-learning environment.
You will interact with your course tutor and other group members on a regular, timetabled basis which will be supported via teleconferencing facilities. In these sessions, your group will be encouraged to explore both the core content and reflect on your approach to solving problems.
Your active engagement with the online discussions and activities will be crucial to success in this module and evaluation of engagement will inform the support you receive from your Supervisory Team.
Interaction with the course tutor and other group members on a regular, timetabled basis will be supported via the use of teleconferencing facilities. In these sessions, groups will be encouraged to both explore the core content and reflect on their approach to problem solving. Active engagement with online discussions and activities will be crucial to the success achieved in this module and evaluation of engagement will inform the support that is required from the Supervisory Team.

Assessment 1: An examination in January will cover LOs 1 - 4
Assessment 2: Summative examination in May will cover LOs 1 - 7

Mode of Assessment

Type	Method	Description	Weighting
Summative	Examination - Closed Book	Summative closed book examination (2 Hrs)	50%
Summative	Coursework - Written	Scientific Report (1000 words)	25%
Summative	Online MCQ Examination	MCQ examination (1.5 hrs)	25%

Reading List

To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html

Please note:
This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.
