Nanyang Technological University
Division of Chemistry and Biological Chemistry

Academic Year	2020/21	**Semester**	2
Course Coordinator	Felipe GARCÍA		
Course Code	CM8001		
Course Title	The Impact of Chemistry on Society		
Pre-requisites	None		
No of AUs	3		
Contact Hours	On-line activities -12 hours Team-Based Learning sessions - 36 hours		
Proposal Date			

Course Aims

Chemistry is central science and basic knowledge is required to help developed independent critical thinking for a better a better understanding of our world. The course provides an introduction to Chemistry in the context of selected current (or potential) socio-technological problems. The topics, facts and principles presented, are used to build key fundamental understanding and serve as a guide on how to live responsibly into the future.

The course comprises virtual laboratory simulations, multimedia and blog projects to provide you tools necessary to enhance both their understanding of the subject and learning experience.

Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) would be able to:

UNIT 1

1. Define the composition of dry air
2. Define concentration terms and express concentration in different units
3. Classify matter/gases as an element, compound or mixture
4. Explain naming of binary compounds
5. Explain the chemical reactions of combustion and oxidation
6. Balance chemical equations
7. Explain and elaborate on air pollutants
8. Explain Redox reactions

UNIT 2

1. Define ozone
2. Define UV light
3. Explain how ozone absorbs UV light
4. Explain how UV light affects people
5. Describe how ozone is formed and destroyed
6. Explain how the “ozone hole” occurs in Antarctica
7. Explain how the “ozone hole” occurs in September and October

UNIT 3

1. Define global warming
2. State evidences of global warming

3. Elaborate on the causes of global warming
4. Define climate forcings and climate feedbacks
5. Explain the Valence Shell Electron Pair Repulsion Theory
6. Elaborate on possible actions to curb global warming

UNIT 4

1. State the definition of heat
2. State the definition of temperature
3. State the first law of Thermodynamics
4. State the second law of Thermodynamics
5. Differentiate endothermic and exothermic reactions
6. Calculate bond energy
7. Elaborate on energy consumption
8. State the types of different fuel and their characteristics

UNIT 5

1. State where portable water comes from
2. Define electronegativity
3. Define hydrogen bonding
4. Define solution, solvent and solute
5. Express concentration on molarity
6. Define ions and elaborate on the different types of ions
7. Explain what surfactants are
8. State the 4 processes of water treatment
9. Define desalination and distillation
10. Define diffusion, osmosis and reverse osmosis

UNIT 6

1. State the definition of heat
2. State the definition of temperature
3. State the first law of Thermodynamics
4. State the second law of Thermodynamics
5. Differentiate endothermic and exothermic reactions
6. Calculate bond energy
7. Elaborate on energy consumption
8. State the types of different fuel and their characteristics

UNIT 7

1. State what is nuclear fission
2. State and describe the parts of a nuclear reactor
3. Explain what is radiation
4. State the types of nuclear radiation
5. Give examples of nuclear disasters in the past and briefly explain what happened
6. State the effects of radiation on people
7. Describe the different storage methods of nuclear waste
8. State and compare alternative energy sources

UNIT 8

1. State what is nuclear fission
2. State and describe the parts of a nuclear reactor
3. Explain what is radiation
4. State the types of nuclear radiation
5. Give examples of nuclear disasters in the past and briefly explain what happened
6. State the effects of radiation on people
7. Describe the different storage methods of nuclear waste
8. State and compare alternative energy sources

UNIT 9

1. State what drugs are
2. Use line-angle drawing for molecular representation
3. Explain what are functional groups
4. Identify functional groups
5. Describe aspirin and how it works
6. State the different methods for drug discovery
7. Explain how receptors work
8. State the characteristics of drug addiction

UNIT 10

1. Define malnutrition and undernourishment
2. Describe fats and oils
3. Describe carbohydrates
4. Describe proteins
5. Describe vitamins and minerals
6. Explain metabolism
7. State some chemicals which are lethal

UNIT 11

1. Describe a galvanic cell
2. Explain the processes of oxidation and reduction
3. Define the term “cradle-to-cradle”
4. Describe how Hydro Electric Vehicles (HEVs) operate
5. Explain how fuel cells work
6. Explain electrolysis of water
7. Describe photovoltaic cells
8. State sources of renewable energy

UNIT 12

1. State what is DNA
2. State and identify the components of DNA
3. State the different DNA structures and how it replicates
4. Explain what are proteins and state their functions (in relation to DNA)
5. Explain what is Genetic Engineering
6. State some examples of Genetic Engineering
7. Discuss examples of primary and secondary cells and their underlying electrochemistry.

Course Content

S/N	Topic	Approx. Lecture Hours
1	**<u>The Air We Breathe:</u> * Composition of Air & Concentration Terms: -** Composition of Dry Air - Other Gases in the Air - What else do we breathe? - Concentration Terms - Concentration in Percentage (%) - Concentration in ppm and ppb - Other Gases that are Present in Air * Classifying Matter: - Classifying Matter * Elements, Compounds, and Mixtures: - Elements – Compounds – Molecules - Types of Matter * Naming Binary Compounds: Naming Binary Compounds * Chemical reactions: - Chemical reactions – Balancing equations * Air pollutants: - What is in the air we breathe? - Air Pollutants: Risk Assessment - Characteristics of Risk Perception - Air Pollutants - Carbon Monoxide (CO) - Carbon Monoxide (CO) - Carbon Monoxide (CO) - Sulphur Dioxide (SO_2) - Sulphur Trioxide (SO_3) - Nitrogen Monoxide (NO) - Volatile Organic Compound (VOC) - Nitrogen Dioxide (NO_2)- Ozone (O_3) - Ozone (O_3) – Secondary Pollutant - Oxidation and Reduction: Redox - Redox – Catalytic Converters – Particulates.	3
2	**<u>Protecting the Ozone Layer:</u>** * Introduction: - Ozone Layer * Ozone Layer * Basic Structure and Bonding: - Structure and bonding - Examples Of Alkaline Metals * Chemical Bonding: - Chemical bonding – Electronegativity - Ionic Bonds - Metallic Bonds - Chemical Bonding - Covalent Bonds - Representing Molecules with Lewis Structures * Electromagnetic Radiation: - Electromagnetic Radiation - Interaction of Radiation with Molecules - Electromagnetic Radiation * Protecting the Ozone Layer – Formation and Destruction: Radiation, Oxygen and Ozone - The Chapman Cycle - Natural Destruction of Ozone - CFCs and Ozone - How CFCs destroy Ozone - Further Evidence – Alternatives - UV Light and You - Skin Cancer - Your protection: Sunscreens and Sunblock - Some Compounds in Sunscreens - Ozone Hole - STE: Stratosphere-Troposphere Exchange - Ozone Hole - Why does the Antarctic develop a hole? - Why does the Antarctic develop a hole? - Why Then Does the Artic Not Have a Hole? - Global response to depleting ozone.	3
3	**<u>The Chemistry of Global Climate Change:</u>** * Introduction: - Introduction * The Evidence: - Climate Change: How Do We Know? * The effects: - Climate Change: Future Effects * Earth's Vital signs * Earth's Temperature: - How Warm will the Planet Get? – Uncertainties - Green House Gasses - Land Use – Clouds - Carbon Cycle - Ocean Circulation – Precipitation - Loss of Polar Ice Cap * Green House Effect – Earth's Energy Balance: - Awareness - The Earth's Energy Balance - Greenhouse Gases * Valence Shell Electron Pair Repulsion Theory: - How to Draw Lewis Structures (Review) - Lewis Structures - Representation of Methane - Valence Shell Electron Pair Repulsion Theory - Methane Molecule- ammonia Molecule - water Molecule - Carbon Dioxide Molecule - Ozone Molecule * How Do	3

	Molecules Trap Heat: - Molecular Geometry and Absorption of Infrared Radiation - The infrared spectrum for CO_2 - Methane's "exercises" * Quantitative Concepts * How Warm will the Planet Get? - What We Know - What Might be True - Climate Models * What Can We Do About Climate Change? - Intergovernmental Panel on Climate Change (IPCC) - Conclusions from the 2007 IPCC Report - Kyoto Protocol – 1997 Conference - Emission Trading - Carbon Tax *Global Warming – "Quick Fixes".	
4	**Energy from Combustion: * Introduction * Thermodynamics: -** First Law of Thermodynamics (Potential / Kinetic Energy) - Power plants are inevitably inefficient - Power Plant Efficiency - What are *units* of heat? - A Typical Power Plant - Bomb calorimeters - Are all fuels created equal? - Endothermic and exothermic reactions - Energy Changes at the Molecular Level * Energy Consumption: - Fossil Fuels - Requirements for Formation of Fossil Fuel - Requirements for Formation of Fossil Fuel - Petroleum (Crude Oil) - Alkanes with One to Eight Carbons - How do we use each barrel (42 gal) of petroleum? - Use of the Barrel other than as Energy - Straight-Run Gasoline - How to Increase Gasoline Yield - Octane: Isomers - Structural Isomers of Octane (C_8H_{18}) - Knocking and Octane Ratings - Knocking and Octane Ratings - Gasoline Additives: Octane Enhancers - Should We Use Oxygenated Fuel Additives? – Diesel - Problems with Diesel Engines - How do Different Fuels Stack Up? - Characteristics of Different Fuel - Proven Reserves (Oil) - Characteristics of Different Fuel - Proven Reserves (Coal) – Orimulsion - Global Primary Energy Consumption * Alternative Resources: - Coal Gasification - Coal Liquefaction – Biomass – Ethanol – Biodiesel - Problems with Biofuels - Garbage as Energy - Biogas used in China since 1970s - Biomass Gasification - Final Perspective - Alternative Energy? - Or Increase Efficiency?	3
5	**The Water We Drink:** * Introduction: - Water Footprint - International Water Footprint (per capita) - Where Does Portable Drinking Water Come From? * Electronegativity and Bonding - Different Representations of Water * Solutions and Solutes: - Concentration Terms – Molarity - How to prepare a 1.00 M NaCl solution - Dissolution of NaCl in Water - Forming Ions - Naming of Ionic Compounds - What is hard or soft water? - How does non-electrolytes dissolve in water? - Oil, fats: high proportion of hydrocarbons (CH) in the molecule * Soaps and Detergents – Surfactants (Surface Active Agents) – Soap – Detergents - Chemistry of Laundry - Chemistry of Laundry – Shampoo – Bodywash - 2-in-1 Shampoo - Cell Membranes * Safety and Treatment: - Water Treatment - Schematic drawing of a typical municipal water treatment facility – Cholera - Chlorination of water supply - By-products of Chlorination: Trihalomethanes - Alternatives to Chlorination - How PUB does Water Purification - Maximum Contaminant Level Goal (MCLG) and Maximum Contaminant Level (MCL) - Cadmium (Cd) - Lead (Pb) - Mercury (Hg) - Making Freshwater from Saltwater	3
6	**Neutralising the Threat of Acid Rain:** * Introduction - So, what does 'acid' mean to you? * The "Chemistry" of Acids: - What is an 'acid'? - Then, what	3

	is a 'base'? - Characteristic properties of bases - Neutralisation Reaction - Drain cleaners are examples of strong base! * pH Values: - Measuring pH * Rain and Acid Rain: - Why is Rain Naturally Acidic? - Emissions of Sulphur and Nitrogen Oxides - How Does the Sulphur Get into the Atmosphere? - What about the NO_x? - Nitrogen Oxides * Effects of Acid Rain: - Effects of Acid Rain: Rusting Metal - Effects of Acid Rain: Rusting Metal - Effects of Acid Rain: Damage to Marble - Effects of Acid Rain: Damage to Lakes and Streams - Effects of Acid Rain: Decrease in Animal Populations - Ocean Acidification - Simplified Nitrogen Cycle - Effects of Acid Rain: Decrease in Vegetation - Effects of Acid Rain: Wildlife in Singapore * Acid rain control measures: - Control Measures - Not Enough Dust? - Dust? * Acid Deposition Haze & Human Health: Acid Deposition Haze and Human Health - Great Fog of London 1952 - Temperature Inversion -	
7	**The Fires of Nuclear Fission:** *Introduction: - What do you think of when you hear "nuclear energy"? - The Beginning of Nuclear Energy Nuclear Power Plants - Nuclear Energy Worldwide * Nuclear Fission: Nuclear Fission - Isotopes and Nuclear Reactions - A Chain Reaction with U-235 - A Chain Reaction with U-235 - A Chain Reaction with U-235 - A Chain Reaction with U-235 * Nuclear Reactor: Nuclear Reactors- Basic of a Nuclear Reactor - Fuel Pellets - Basic of a Nuclear Reactor – Metal Rods - Basic of a Nuclear Reactor – Primary Coolant - Basic of a Nuclear Reactor – Secondary Coolant * Radioactivity: - Discover of Radioactivity - Types of Nuclear Radiation – Radiation - U-238 Radioactive Decay Series * Nuclear Disasters: - Chernobyl Disaster - Chernobyl Disaster – What Happened * Nuclear Radiation and You: - Effects of Nuclear Radiation - What Causes the Cell or Tissue Damage? - What Causes the Cell or Tissue Damage? - Radiation Around Us - Measurement of Nuclear Radiation * Nuclear Weapons: - Nuclear Weapons * Nuclear Fuel Cycle: - Nuclear Fuel Cycle - How long does a radioactive sample "last"? * Storage of Nuclear Waste: - Nuclear Waste - Storage of HLW * The to be or not to be of Nuclear Power?: - What are the Risk Associated with Nuclear Power Plants? - So are There Alternatives?	3
8	**The World of Polymers and Plastics:** * Introduction: - Introduction * Polymers: - Polymers - Polymers in Nature - Linkages in Synthetic Polymers - How Do Polymers Stick Together? - Geckos and Dispersion Forces - Ways to Control Properties of Polymers * Addition Polymers - Addition Polymers - Polyethylene: Addition Polymerization - Other Addition Polymers - Low Density Polyethylene (LDPE) - High Density Polyethylene (HDPE) - Polyethylene Fuel Tanks – Fluorination - Polytetrafluoroethlene (PTFE) - Teflon in the Manhattan Project - How to Coat PTFE onto Surfaces – Goretex - Teflon Toxicosis - Polyvinyl Chloride (PVC) - Orientation of Monomer - Other Addition Polymers – Polystyrene - Absorbent Polymer: Diapers * Condensation Polymers: - Condensation Polymers - Condensation Polymers: Polyester - Condensation Polymer: Polycarbonates - Condensation Polymer: Polyamides - Bullet Stopping Polyamide: Kevlar * Polymers and recycling: - Synthetic Polymers - The "Big Six" - Groups Found in Polymers - Paper or Plastic? - Recycling of Plastic - Biomass for Polymers – Biopolymers - Production and Energy Demands.	

9	**Molecules and Drugs:** *Introduction: - Drugs – Zoopharmacognosy - Drugs From Nature * Organic Chemistry – The Study of Carbon Compounds: - The Study of Carbon Compounds - Line-angle Drawings - Molecular Representations * Functional Groups: - Functional Groups - Ester Formation - Functional Groups in Aspirin - Polar Molecules - Salt Formation * Aspirin: - Aspirin - How Aspirin Works * Drug Discovery: - Penicillin - Other Methods for Drug Discovery - Brand Name or Generic? - Over-the-Counter Drugs - Herbal Medicine * Receptors: Morphine and Company – Receptors * Substance Abuse & Addiction: - Addiction – Opiates – Morphine – Heroin – Codeine – Amphetamines – Amphetamines – Cocaine - Cannabis and Marijuana	3
10	**Nutrition; Food for Thought:** * Introduction: - Introduction - What Impacts Food Production? - Food Production Utilises Natural Resources - Useful Terms - Some Facts - What are We Made of? *Fats and Oils: - Fats and Oils - Saturated and Unsaturated Fats - Partially Hydrogenated Fats - Trans fats – Cholesterol * Carbohydrates: - Carbohydrates - Sweetness Value of Natural and Synthetic Sweeteners * Proteins: - Proteins - Aspartame: A Dipeptide - Aspartame: A Dipeptide * Vitamins & Minerals: - Vitamins – Minerals * Metabolism: - Brief diagram on Metabolism - Energy from the Metabolism of Food – Metabolism * The Food Pyramid: Rebuilding the Food Pyramid - Fat and Heart Disease - Rebuilding the Food Pyramid - Percentage of Population Undernourished Worldwide - Percentage of Population Undernourished Worldwide * Stuff that Kill You: - Potassium Chloride - Thallium - Cyanide - “Nerve Gas”	3
11	**Energy from Electron Transfer:** * Introduction * Chemical to Electrical Energy: - A Laboratory Galvanic Cell - An Alkaline Cell - Lead-Acid Storage Batteries - Battery Ingredients: Cradle-to-Cradle - Hybrid Electric Vehicles (HEVs) * Fuel Cells – The Basics: - Comparing Combustion with Fuel Cell Technology - Methanol or Methane Gas Could be Converted to Hydrogen Gas Using a Reformer - Hydrogen for Fuel Cell Vehicles *Electrolysis of Water: - The Basics - Using Energy from the Sun to Split Water * Photovoltaic Cells: - The Basics - How does a Photovoltaic Cell Generate Electricity? - Schematic Diagram of a Solar Cell *Other Renewable Energy Sources: - Other Renewable Energy Sources - Other Renewable Energy Sources: Solar Thermal - Other Renewable Energy Sources: Wind - Other Renewable Energy Sources: Water - Other Renewable Energy Sources: Geothermal.	3
12	**Genetic Engineering and the Molecules of Life:** * Introduction: - Corn is Susceptible to the European Corn Borer - How Can Corn be Made to Resist Herbicide or Create its Own Insecticide? * The Chemistry of Heredity: - The Chemistry of Heredity - What makes up DNA? - Nucleotides - What does a segment of DNA look like? * Structure of DNA and DNA replication: - The Double Helix of DNA: -Complementary Base Pairs - Chargaff’s Rules - DNA Replication - Cracking the Chemical Code - Codons: How are they relevant in genetic expression? * Proteins: Form to Function * The Process of Genetic Engineering: A Representation of Genetic Engineering – Genetic	3

	Engineering - Making Chemical Synthesis Green from Genetic Engineering - Genetically-Engineered Agriculture Transgenic Plants	

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/Individual	Assessment Rubrics
TBL weekly session	Units 1-12	Competences for each UNIT 1-12 and civic mindedness	See below	See below	See Appendix 1
- TBL (iRA)		Competences for each UNIT 1-12	10	Individual	
- TBL (tRA)		Competences for each UNIT 1-12 and communication	5	Team	
- TBL (AE)		Competences for each UNIT 1-12 and communication	5	Team	
Labster Virtual laboratory	Units 1-12	Competences for each UNIT 1-12	15	Individual	
Multimedia project (NTU Blogs and Videos)	Units 1-12	Creativity, communication and characer	15	Team	
Final examination	All		50	Individual	
Total			100%		

Formative feedback

You will be given feedback in four ways:

1. Instant feedback will be given through the scratch cards during the TBL session
2. Through the discussion and marking of the AE.
3. Through tutorial sessions and/or 1-on-1 discussions with the course instructor (pre-scheduling required)
4. General feedback will be provided to the students following the final exam.

Learning and Teaching approach

Approach	How does this approach support students in achieving the learning

	outcomes?
Blend of online and face-to- face lectures	The bulk of the content will be delivered online. This allows (a) extensive use of animations and laboratory videos and (b) use of interactive questions so that students may immediately test their learning. Face to face TBL sessions, virtual laboratory simulations (using labster) and multimedia projects (NTU blogs and videos) will be employed throughout the course.

Reading and References

Chemistry in Context 9th Edition - by American Chemical Society (Author), ISBN10: 1260240843 ISBN13: 9781260240849

Course Policies and Student Responsibilities

(1) General

You are expected to complete all online activities before the TBL session

(2) Absenteeism

If you miss a session with a valid reason and approval (such as a medical certificate), the course average will used for that week. If you miss a TBL session without a valid approved reason the score for that week will be zero (note: the lowest two scores will not be used for the final course mark)

Academic Integrity

Good academic work is based on honesty and ethical behavior. Students must adhere to the principles of academic integrity and to the NTU Honor Code, a set of values shared by the whole university community.

Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. To avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors

Instructor	Office Location	Phone	E-mail
Felipe GARCÍA	SPMS-CBC-05-19	6592 1550	FGarcia@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	**Introduction to TBL**		Online and TBL
2	**UNIT 1**	Unit 1 LO	Online and TBL
3	**UNIT 2**	Unit 2 LO	Online and TBL
4	**UNIT 3**	Unit 3 LO	Online and TBL
5	**UNIT 4**	Unit 4 LO	Online and TBL
6	**UNIT 5**	Unit 5 LO	Online and TBL
7	**UNIT 6**	Unit 6 LO	Online and TBL

8	**UNIT 7**	Unit 7 LO	Online and TBL
9	**UNIT 8**	Unit 8 LO	Online and TBL
10	**UNIT 9**	Unit 9 LO	Online and TBL
11	**UNIT 10**	Unit 10 LO	Online and TBL
12	**UNIT 11**	Unit 11 LO	Online and TBL
13	**UNIT 12**	Unit 12 LO	Online and TBL
The above schedule is for illustrative purposes and is subject to the exigencies of the calendar			

Appendix 1: Assessment Criteria for all components

iRA and tRA – MCQ questions every week (approximately 15 marks in total each).

Standards		
Fail standard (0-5 marks)	**Pass standard (6-10 marks)**	**High standard (11-15 marks)**
Answers to the questions are mostly incorrect.	Answers to the questions are mostly correct.	Answers to the questions are almost always correct.

Application exercises questions every week (approximately 10 marks in total each week).

Standards		
Fail standard (0-3 marks)	**Pass standard (4-7 marks)**	**High standard (8-10 marks)**
Answers to the questions are mostly incorrect.	Answers to the questions are mostly correct.	Answers to the questions are almost always correct.

Virtual laboratory experiments

Standards		
Simulations	Completed	**Incomplete**
1.- Atomic structure I, II and III	Requisite	**All simulations must be completed** by the end of the course for this part to be accounted for the final grade
2.- Chemistry Safety	Requisite	
3.- Ideal Gas Law	Requisite	
4.- Ionic and Covalent Bonds -	Requisite	
5.- Equilibrium -	Requisite	
6.- Acids and Bases I, II and III	Requisite	
7.- Advanced Acids and Bases	Requisite	
8.- Titration	Requisite	
9.- Solution preparation	Requisite	
10.- Periodic table principles I, II	Requisite	
11.- Nuclear Magnetic Resonance	Requisite	
12.- Basic Chemistry Thermodynamics	Requisite	
- The above schedule might change slightly and is subject to the availability of the different of more appropriate simulations from Labster - Simulation units will be released weekly		

Multimedia Project - Blog

EVALUATION RUBRIC FOR BLOGs CM8001				
	Unsatisfactory	**Satisfactory**	**Good**	**excellent**
Overall blog page	No attempt was made to make the blog	- Poor quality entries, with non-structured information or theme. - Major grammatical or typographical mistakes	- Acceptable entry structure but not comprehensive information or theme - Minor grammatical or typographical mistakes	- Well written, structure and comprehensive information or theme. - Flawless in grammatical or typographical mistakes
Introduction	missing or incomplete	- Poor quality write up, non-structured difficult to read. - References used not indicated	- Acceptable quality write-up, poorly structured, "OK" to read. - References used poorly indicated	- Good quality write up, well-structured and easy to read - References used properly indicated
Chemical concept	missing or incomplete	- Poorly explained - References used not indicated	- Acceptable explanation References used poorly indicated	- Rigorously explained. - References used properly indicated.
Implications to society	Does not show connections and applications of concept beyond the classroom	- Poorly explained. - Implications are not related to the chemical concept used.	- Acceptable explanation. - Implications vague or difficult to connect with the chemical concept.	- Well- explained. - Implications clear and directly related with the chemical concept.
Meeting log	No evidence of group collaboration or preparation	Incomplete entries, consistently missing information	All the meeting logged in but minor information mission	All the information about (time, date, duration, location, participants, topics discussed, actions to be taken, review of the actions agreed during last meeting, problems,… filled in)

Assignments	missing or incomplete	- Poor quality answers, non-structured difficult to read. - References used not indicated	- Acceptable quality answers, poorly structured easy to read. - References used poorly indicated	- Good quality answers, well-structured and easy to read - References used properly indicated

Multimedia Project - Blog

EVALUATION RUBRIC FOR VIDEOs CM8001				
	Unsatisfactory	**Satisfactory**	**Good**	**excellent**
Content	- Not related the content of the blog, missing or incomplete	contains several inaccuracies or incorrect information	- mostly accurate, and demonstrates a surface understanding of concepts	- accurate, informative and thorough explanation of content
Chemical concept*	- Not filled in	- Poorly explained - References used not indicated	- Acceptable explanation - References used poorly indicated	- Rigorously explained. - References used properly indicated.
Chemical concept connectedness#	-Does not show connections and applications of concept beyond the blog and the classroom	- Demonstrates minimal understanding of real-world applications of concept	- Uses a clear example to illustrate\ real world connections and applications of concept	- Uses several examples to illustrate real world connections and applications of concept
Creativity	- No attempt was made to make presentation	- Majority of the information is cut and paste and shows little or no originality	- Video concept is original and shows clear effort of creativity in design	- Video concept is original, engaging and shows clear effort of creativity in design and presentation
Format	- No final presentation is given	- Serious technical, content or delivery issues hinder the objective of the presentation	- Contains minor technical, content or delivery issues and satisfies the given objective	- Free from technical, content or delivery issues and meets objective effectively

Preparation and Collaboration	- No evidence of group collaboration or preparation	- Little evidence of group collaboration and much over-dominance. Preparation appears to be minimal.	- Some evidence of group collaboration, but several members contributed minimally. Some preparation is evident.	- Clear attempt at group collaboration, but still some overdominance. Preparation is evident and class time is used productively.
***NOTE this evaluation criteria will apply mainly to the chemical concept video.** **#NOTE, this evaluation criteria will apply to application video.**				

Peer evaluation (peer form and instructions can be found in appendix 3)

EVALUATION PEER REVIEW FOR PART 1				
	Unsatisfactory*	**Satisfactory**	**Good**	**excellent**
COOPERATIVE LEARNING SKILLS	Average score of 1-2	3	4	5
SELF-DIRECTED LEARNING	1-2	3	4	5
INTERPERSONAL SKILLS:	1-2	3	4	5
PROJECT WORK	1-2	3	4	5
*** average from each section are used for the rubrick**				

EVALUATION PEER REVIEW FOR PART 2
A 10-15 min one-on-one meeting (or personalized feedback in the form of a email) will be arranged by the instructor to provide overall feedback given by the group to each of the students. Note: Explicit release of the feedback provided by the members of the team will performed at the instructors' discretion

Final exam – short answer questions and calculations (exam worth approximately 50 marks).

Standards		
Fail standard (0-19 marks)	**Pass standard (20-40 marks)**	**High standard (41-50 marks)**
Answers demonstrate the ability to repeat factual knowledge but not to apply it outside of the lecture context. Answers do not have a strong logical underpinning or maybe attempts to answer both ways at the same time.	Answers to the standard level question are correct and show the ability to apply concepts from the course, but a high level of critical thinking is absent. Answers are reasonably logical, but with gaps.	Answers to all questions show a high and consistent level of critical analysis of the information presented and creative solutions to the problems. Answers are highly logical and demonstrate strong reasoning. Answers are concise and to the point.

Appendix 2: CBC Programme Learning Outcome

The Division of Chemistry and Biological Chemistry (CBC) offers an undergraduate degree major in Chemistry that satisfies the American Chemical Society (ACS) curricular guidelines and equips students with knowledge relevant to the industry. Graduates of the Division of Chemistry and Biological Chemistry should have the following key attributes:

1. Competence

Graduates should be well-versed in the foundational and advanced concepts of chemical science, be able to evaluate chemistry-related information critically and independently, and be able to use complex reasoning to solve emergent chemical problems.

2. Creativity

Graduates should be able to synthesize and integrate multiple ideas across the curriculum, and propose innovative solutions to emergent chemistry-related problems based on their training in chemistry.

3. Communication

Graduates should be able to demonstrate clarity of thought, independent thinking, and sound scientific analysis and reasoning through written and oral reports to audiences with varying technical backgrounds. They should also be able to effectively engage other professional chemists in collaborative endeavours.

4. Character

Graduates should be able to act in responsible ways and uphold the high ethical standards that the society expects of professional chemists.

5. Civic-mindedness

Graduates should be aware of the impact of chemistry on society, and how chemistry can be applied to benefit mankind. They should also be aware of and uphold the best chemical safety practices.

Appendix 3: Peer evaluation form

CM8001 Peer Evaluation Form		
NOTE: *denoted required field		
TEAM NUMBER: *		
Colleague you are evaluating (full name if possible): *		

PART I

Quantitative assessment (check one of the boxes for each of these areas)

A) COOPERATIVE LEARNING SKILLS: *******

1.- Arrives on time and remains with team during activities *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	2	3	4	5
○	○	○	○	○

2.- Demonstrates a good balance of active listening and participation *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	2	3	4	5
○	○	○	○	○

3.- Asks useful or probing questions *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	2	3	4	5
○	○	○	○	○

4.- Shares information and personal understanding *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	2	3	4	5
○	○	○	○	○

5.- Identifies references with relevant information *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	2	3	4	5

○	○	○	○	○

B) SELF-DIRECTED LEARNING:

1.- Is well prepared for team activities *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	**2**	**3**	**4**	**5**
○	○	○	○	○

2.- Shows appropriate depth of knowledge *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	**2**	**3**	**4**	**5**
○	○	○	○	○

3.- Identifies limits of knowledge *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	**2**	**3**	**4**	**5**
○	○	○	○	○

4.- Shows confidence in areas of understanding *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	**2**	**3**	**4**	**5**
○	○	○	○	○

C) INTERPERSONAL SKILLS:

1.- Gives instructive feedback *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	2	3	4	5
○	○	○	○	○

2.- Accepts instructive feedback *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	2	3	4	5
○	○	○	○	○

3.- Shows care and concern for others *

Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	2	3	4	5
○	○	○	○	○

D) PROJECT WORK

1.- Attends to the project meetings *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	2	3	4	5
○	○	○	○	○

2.- Actively participates on the project (Blog/video) *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	2	3	4	5
○	○	○	○	○

3.- Delivers the tasks allocated from for each meeting *
Never (1) - Sometimes (2) - Often (3) - regularly (4) - (Always (5)

1	2	3	4	5
○	○	○	○	○

PART II
Qualitative assessment (write at least one sentence for each of the following questions)

1.- What is the single most valuable contribution this person makes to your team? *

2. -What is the single most important thing this person could do to more effectively help your team? *

Peer evaluation brief guidelines

Here are some tips that can get you on track to giving productive and meaningful feedback:

1. Create safety. Believe it or not, people who receive feedback apply it only about 30% of the time. If the person receiving the feedback does not feel comfortable, this can cause the feedback to ultimately be unproductive.
Don't be unnecessarily mean-spirited. Your feedback usually will not be productive if it is focused solely on making the other person feel bad or make them look foolish in front of peers.

2. Be positive. Give at least as much positive feedback as you do negative. Positive feedback stimulates the reward centres in the brain, leaving the recipient open to taking a new direction. Meanwhile, negative feedback indicates that an adjustment needs to be made and the threat response turns on and defensiveness sets in.

You do not need to avoid negative, or corrective, feedback altogether - just make sure you follow it up with suggested solutions or outcomes.

3. Be specific. People generally respond better to specific, and positive directions.

Avoid vague statement such as, "You need to be more talkative in meetings." This feedback it is too ambiguous and can be interpreted in many different ways by different individuals. Say something specific and positive pointed at the task you want to be accomplished, such as, "You are smart. I want to hear at least one opinion from you in every meeting we are in together going forward."