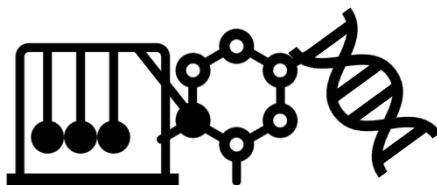




# Subject Sharing



**SCIENCE DEPARTMENT**

We nurture students to become **Reflective Thinkers** and **Caring Citizens**  
who **Lead to Serve** the Nation and the World.



# Upper Secondary Sciences

Subjects	Offered to students taking subjects at G3 level only	Offered to students taking a combination of subjects at G3 & G2 Level	Offered to students taking a combination of subjects at G2 & G1 Level
G3, 6091 Physics	✓		
G3, 6092 Chemistry	✓		
G3, 6093 Biology	✓		
G3, 5086 SCI(P/C)	✓	✓	
G3, 5088 SCI(C/B)	✓	✓	
G2, 5015 SCI(P/C)		✓	✓
G2, 5017 SCI(C/B)		✓	✓
G1, 5148 Science			✓

\*minimum class size of 10 students



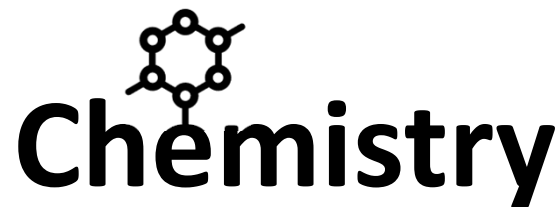
# Pure Sciences vs. Combined Sciences

- **Scope** of Learning
- **Depth** of Learning
- Assessment **format**
- Assessment **demand**

# Physics



Sections	Topics		
	O-Level [G3]	O-Level (Science) [G3]	N-Level (Science) [G2]
Measurements	1. Physical Quantities, Units and Measurements	1. Physical Quantities, Units and Measurements	1. Physical Quantities, Units and Measurements
Newtonian Mechanics	2. Kinematics	2. Kinematics	2. Kinematics
		3. Force and Pressure	3. Force and Pressure
	3. Dynamics	4. Dynamics	4. Dynamics
	4. Turning Effects of Forces	5. Turning Effects of Forces	
	5. Pressure		
	6. Energy	6. Energy	5. Energy
Thermal Physics	7. Kinetic Particle Model of Matter	7. Kinetic Particle Model of Matter	6. Kinetic Particle Model of Matter
	8. Thermal Processes	8. Thermal Processes	7. Thermal Processes
	9. Thermal Properties of Matter		
Waves	10. General Wave Properties	9. General Wave Properties	8. General Wave Properties
	11. Electromagnetic Spectrum	10. Electromagnetic Spectrum	9. Electromagnetic Spectrum
	12. Light	11. Light	
Electricity and Magnetism	13. Static Electricity		
	14. Current of Electricity		
		12. Electric Charge and Current of Electricity	10. Electric Charge and Current of Electricity
	15. D.C Circuits	13. D.C Circuits	11. D.C Circuits
	16. Practical Electricity	14. Practical Electricity	12. Practical Electricity
	17. Magnetism		
	18. Electromagnetism		
		15. Magnetism and Electromagnetism	
	19. Electromagnetic Induction		
Radioactivity	20. Radioactivity	16. Radioactivity	13. Radioactivity



# Chemistry



Sections	O-Chemistry [G3]	O-Sci (Chemistry) [G3]	N-Sci (Chemistry) [G2]
Matter – Structures and Properties	1. Experimental Chemistry	1. Experimental Chemistry	1. Experimental Chemistry
	2. The Particulate Nature of Matter	2. The Particulate Nature of Matter	2. The Particulate Nature of Matter
	3. Chemical Bonding and Structure	3. Chemical Bonding and Structure	3. Chemical Bonding and Structure
Chemical Reactions	4. Chemical Calculations	4. Chemical Calculations	4. Chemical Calculations
	5. Acid-Base Chemistry	5. Acid-Base Chemistry	5. Acid-Base Chemistry
	6. Qualitative Analysis	6. Qualitative Analysis	6. Qualitative Analysis
	7. Redox Chemistry	7. Redox Chemistry	-
	8. Patterns in the Periodic Table	8. Patterns in the Periodic Table	7. Patterns in the Periodic Table
	9. Chemical Energetics	9. Chemical Energetics	-
	10. Rate of Reactions	10. Rate of Reactions	-
Chemistry in a Sustainable World	11. Organic Chemistry	11. Organic Chemistry	8. Organic Chemistry
	12. Maintaining Air Quality	12. Maintaining Air Quality	9. Maintaining Air Quality

# Bio**DNA**logy

Sections	Topics		
	O-Level [G3]	O-Level (Science)[G3]	N-Level (Science)[G2]
Cells and the Chemistry of Life	1. Cell Structure and Organisation	1. Cell Structure and Organisation	1. Cell Structure and Organisation
	2. Movement of Substances	2. Movement of Substances	2. Movement of Substances
	3. Biological Molecules	3. Biological Molecules	3. Biological Molecules
The Human Body – Maintaining Life	4. Nutrition in Humans	4. Nutrition in Humans	4. Nutrition in Humans
	5. Transport in Humans	5. Transport in Humans	5. Transport in Humans
	6. Respiration in Humans	6. Respiration in Humans	6. Respiration in Humans
	7. Excretion in Humans		
	8. Homeostasis, Co-ordination and Response in Humans		
	9. Infectious Diseases in Humans	7. Infectious Diseases in Humans	7. Infectious Diseases in Humans
Living Together – Plants, Animals and Ecosystems*	10. Nutrition and Transport in Flowering Plants	8. Nutrition and Transport in Flowering Plants	8. Nutrition and Transport in Flowering Plants
	11. Organisms and their Environment	9. Organisms and their Environment	
Continuity of Life	12. Molecular Genetics	10. Molecular Genetics	
	13. Reproduction	11. Reproduction in Humans	
	14. Inheritance	12. Inheritance	



# Depth of Learning

# Physics

### ENERGY

- Energy stores and transfers
- Work, Power and efficiency (Efficiency for O-Phy only)
- Energy resources (For O-Phy only)

2023 O-Level Physics [G3]	2023 O-Level Science (Physics) [G3]	2023 N-Level Science (Physics) [G2]
(a) show an understanding that there are energy stores, e.g. kinetic, potential (gravitational, chemical, elastic), nuclear and internal, and that energy can be transferred from one store to another: (i) Mechanically (by a force acting over a distance), (ii) Electrically (by an electric current), (iii) By heating (due to a temperature difference), (iv) By propagation of waves (both electromagnetic and mechanical)	(a) show an understanding that there are energy stores, e.g. kinetic, potential (gravitational, chemical, elastic), nuclear and internal, and that energy can be transferred from one store to another: (i) Mechanically (by a force acting over a distance), (ii) Electrically (by an electric current), (iii) By heating (due to a temperature difference), (iv) By propagation of waves (both electromagnetic and mechanical)	(a) show an understanding that there are energy stores, e.g. kinetic, potential (gravitational, chemical, elastic), nuclear and internal, and that energy can be transferred from one store to another: (i) Mechanically (by a force acting over a distance), (ii) Electrically (by an electric current), (iii) By heating (due to a temperature difference), (iv) By propagation of waves (both electromagnetic and mechanical)
(b) recall and apply the relationships for kinetic energy ( $E_k = \frac{1}{2}mv^2$ ) and gravitational potential energy near the Earth's surface ( $E_p = mgh$ ) to new situations or to solve related problems	(b) recall and apply the relationships for kinetic energy ( $E_k = \frac{1}{2}mv^2$ ) and gravitational potential energy near the Earth's surface ( $E_p = mgh$ ) to new situations or to solve related problems	(b) recall and apply the relationships for kinetic energy ( $E_k = \frac{1}{2}mv^2$ ) and gravitational potential energy near the Earth's surface ( $E_p = mgh$ ) to new situations or to solve related problems
(c) state the principle of the conservation of energy and apply the principle to new situations or to solve related problems	(c) state the principle of the conservation of energy and apply the principle to new situations or to solve related problems	(c) state the principle of the conservation of energy and apply the principle to new situations or to solve related problems
(d) recall and apply the relationship <i>work done = force × distance moved in the direction of the force</i> to new situations or to solve related problems	(d) recall and apply the relationship <i>work done = force × distance moved in the direction of the force</i> to new situations or to solve related problems	(d) recall and apply the relationship <i>work done = force × distance moved in the direction of the force</i> to new situations or to solve related problems
(e) recall and apply the relationship <i>power = energy transfer / time taken</i> to new situations or to solve related problems	(e) recall and apply the relationship <i>power = energy transfer / time taken</i> to new situations or to solve related problems	(e) recall and apply the relationship <i>power = energy transfer / time taken</i> to new situations or to solve related problems
(f) calculate the efficiency of an energy transfer using the formula <i>efficiency = useful energy output / total energy input</i>		
(g) discuss the use of non-renewable energy resources such as fossil fuel and nuclear fuel, and renewable energy resources such as biofuel, wind, tides, hydropower, geothermal reservoirs and solar to generate electricity in terms of efficiency of energy transfer, cost, reliability and their environmental impact		

## TOPIC 2. THE PARTICULATE NATURE OF MATTER

- Kinetic Particle Theory
- Atomic Structure

2023 O-Level Chemistry [G3]	2023 O-Level Science (Chemistry) [G3]	2023 N-Level Science (Chemistry) [G2]
2.1(a) describe the solid, liquid and gaseous states of matter and explain their interconversion in terms of the kinetic particle theory and of the energy changes involved	2.1(a) describe the solid, liquid and gaseous states of matter and explain their interconversion in terms of the kinetic particle theory and of the energy changes involved	2.1(a) describe the solid, liquid and gaseous states of matter and explain their interconversion in terms of the kinetic particle theory and of the energy changes involved
2.1(b) describe and explain evidence for the movement of particles in liquids and gases (treatment of Brownian motion is <b>not</b> required)	-	-
2.1(c) explain everyday effects of diffusion in terms of particles, e.g. the spread of perfumes and cooking aromas; tea and coffee grains in water	-	-
2.1(d) state qualitatively the effect of molecular mass on the rate of diffusion and explain the dependence of rate of diffusion on temperature	-	-
2.2(a) state the relative charges and approximate relative masses of a proton, a neutron and an electron	2.2(a) state the relative charges and approximate relative masses of a proton, a neutron and an electron	2.2(a) state the relative charges and approximate relative masses of a proton, a neutron and an electron
2.2(b) describe, with the aid of diagrams, the structure of an atom as <b>consisting of</b> protons and neutrons (nucleons) in the nucleus and electrons arranged in shells (energy levels) (knowledge of s, p, d and f classification is <b>not</b> required; a copy of the Periodic Table will be available in Papers 1 and 2)	2.2(b) describe, with the aid of diagrams, the structure of an atom as <b>consisting of</b> protons and neutrons (nucleons) in the nucleus and electrons arranged in shells (energy levels) (knowledge of s, p, d and f classification is <b>not</b> required; a copy of the Periodic Table will be available in the examination)	2.2(b) describe, with the aid of diagrams, the structure of an atom as <b>consisting of</b> protons and neutrons (nucleons) in the nucleus and electrons arranged in shells (energy levels) (knowledge of s, p, d and f classification is <b>not</b> required; a copy of the Periodic Table will be available in the examination)



## MOVEMENT OF SUBSTANCES

- Diffusion
- Osmosis
- Active Transport (*O-Level Biology only*)

2023 O-Level Biology [G3]	2023 O-Level Science (Biology)[G3]	2023 N-Level Science (Biology)[G2]
(a) define <i>diffusion</i> and describe its role in nutrient uptake and gaseous exchange in plants and humans	(a) define <i>diffusion</i> and describe its role in nutrient uptake and gaseous exchange in plants and humans	(a) define <i>diffusion</i> and describe its role in nutrient uptake and gaseous exchange in plants and humans
(b) define <i>osmosis</i> , <b>investigate</b> and describe the effects of osmosis on plant and animal tissues	(b) define <i>osmosis</i> , <b>investigate</b> and describe the effects of osmosis on plant and animal tissues	(b) define <i>osmosis</i> , <b>investigate</b> and describe the effects of osmosis on plant and animal tissues
(c) define <i>active transport</i> and discuss its importance as an energy-consuming process by which substances are transported against a concentration gradient, as in ion uptake by root hairs and uptake of glucose by cells in the villi		



# Pure Sciences

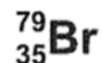
Paper	Type of Paper	Duration	Marks	Weighting
1	Multiple Choice	1 h	40	30%
2	Structured and Free Response	1 h 45 min	80	50%
3	Practical	1 h 50 min	40	20%

# Combined Sciences

Paper	Type of Paper	Duration	Marks	Weighting
1	Multiple Choice	1 h	40	20.0%
2	Structured and Free Response (Physics)	1 h 15 min	65	32.5%
3	Structured and Free Response (Chemistry)	1 h 15 min	65	32.5%
4	Structured and Free Response (Biology)	1 h 15 min	65	32.5%
5	Practical Test	1 h 30 min	30	15.0%

# 5086/5088 Science(Chemistry)

11 One of the isotopes of bromine has the symbol shown.



- (a) (i) Complete Table 11.1 to show the relative mass and relative charge of the particles found in this isotope.

Table 11.1

particle	relative mass	relative charge
electron		
proton		1+
neutron	1	

[2]

- (ii) Determine the number of each of these particles found in one atom of this isotope.

electrons .....

protons .....

neutrons .....

[3]

- (iii) An atom of another isotope of bromine has twice the number of nucleons as one atom of  ${}_{20}^{40}\text{Ca}$ .

Deduce the number of neutrons present in an atom of this isotope of bromine.

..... [1]

# 6092 Chemistry



A2 Some elements have many isotopes.

Table 2.1 shows information about three isotopes of element X.

Table 2.1

isotope	element X		
	1	2	3
number of protons	16	16	16
number of neutrons	13	14	15
number of electrons	16	16	16
number of electrons in outer shell	6	6	6

(a) Use data from the table to show that 1, 2, and 3 are isotopes of the same element.

.....  
.....  
..... [2]

(b) Explain how the data suggests that the three isotopes have the same chemical reactions.

.....  
..... [1]

# 6093 Biology

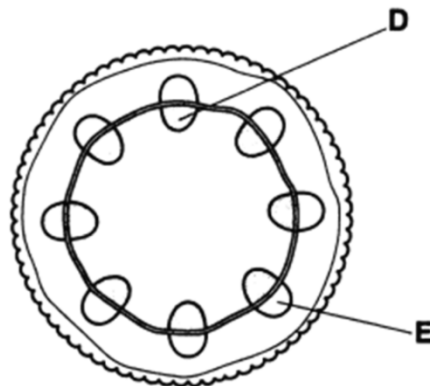
(c) Special cells in the rubber tree, called lactifers, produce latex. Latex is a liquid containing several substances, including proteins and sugars. Latex can be moved both up and down inside the main stem (trunk) of the tree.

State the name of the tissue that is involved in this transport.

..... [1]

# 5088 Science (Biology)

6 Fig. 6.1 is a section of a dicotyledonous stem.



**Fig. 6.1**

(a) Name tissues **D** and **E** and describe their functions.



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G3, 5086 SCI(P/C)	✓	✓	
G3, 5088 SCI(C/B)	✓	✓	
G2, 5015 SCI(P/C)		✓	✓
G2, 5017 SCI(C/B)		✓	✓
G1, 5148 Science			✓

\*minimum class size of 10 students



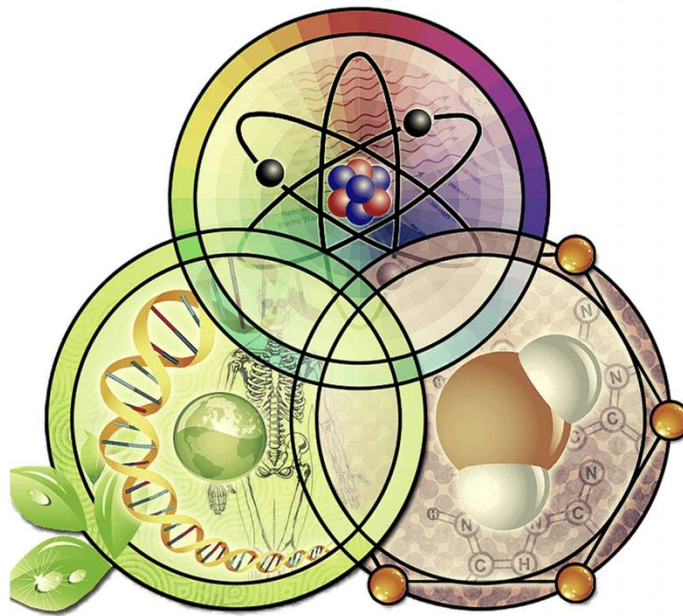
# Pure Sciences vs. Combined Sciences

- **Scope** of Learning
- **Depth** of Learning
- Assessment **format**
- Assessment **demand**



# Consideration factors

## PERSONAL Interest



# Consideration factors

## YOUR Future Aspiration



Science course @ JC			
H2 Science	H2 Science	H2 Science	H1/H2 Arts
<ul style="list-style-type: none"> <li>• <b>Mathematics (O-Level Additional Math)</b></li> <li>• <b>Chemistry (O-Level Chemistry)</b></li> <li>• <b>Biology or Physics or Computing</b></li> </ul>			<ul style="list-style-type: none"> <li>• <b>Art</b></li> <li>• <b>Economics</b></li> <li>• <b>Literature in English</b></li> <li>• <b>Geography</b></li> <li>• <b>History</b></li> <li>• <b>Music</b></li> </ul>

Arts course @ JC			
H2 Arts	H2 Arts	H2 Arts	H1/H2 Science
<ul style="list-style-type: none"> <li>• <b>Economics</b></li> <li>• (any one) <b>Art or Literature in English or Geography or History or Music</b></li> <li>• (any one) <b>Art or Literature in English or Geography or History or Music</b></li> </ul>			<ul style="list-style-type: none"> <li>• <b>Biology</b></li> <li>• <b>Chemistry</b></li> <li>• <b>Physics</b></li> <li>• <b>Combined Science</b></li> <li>• <b>Mathematics</b></li> <li>• <b>Computing</b></li> </ul>



# Word of Advice

- **JC entry requirement: L1 R5 (one Humanities + two Math/Science + Best 2)**
- **Poly entry requirement: L1 R2 B2**

2 Language	2 Arts	1/2 Math	2 Science (JC) 1 Science (Poly)
<b>1. English</b> <b>2. Mother Tongue</b>	<b>1. Pure Humanities</b> <ul style="list-style-type: none"> <li>• Geography</li> <li>• History</li> <li>• Literature</li> <li>• Higher Art</li> </ul> <b>2. Elective Humanities</b> <ul style="list-style-type: none"> <li>• SS + Geo</li> <li>• SS + Hist</li> <li>• SS + Lit in EL</li> </ul>	<b>1. Elementary Mathematics</b> <b>2. Additional Mathematics</b>	<ul style="list-style-type: none"> <li>• Chemistry</li> <li>• Biology</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• Chemistry</li> <li>• Physics</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• Chemistry</li> <li>• Sci (Phy, Chem)</li> <li>• Sci (Chem, Bio)</li> </ul>



Programme Information

Programme Details

Curriculum Overview

Curriculum: Phases

Curriculum: Electives

NUS Common Curriculum for Healthcare Professionals Education

NUS Medicine Pathway Programmes

Tuition Fees & Financial Aid

Student Life

Office for Students

Application

NUS Medicine Pre-requisites

## NUS Medicine Pre-requisites

### Bachelor of Medicine and Bachelor of Surgery (MBBS)

Please refer below for the pre-requisites for the different pre-university qualifications. For further enquiries regarding your qualification's pre-requisites, please contact the NUS Office of Admissions [here](#) →



#### SINGAPORE-CAMBRIDGE GCE 'A' LEVEL CERTIFICATE

A good H2 pass in Chemistry and H2 pass in either Biology or Physics. Of the best six subjects (i.e. 4 content-based subjects, H1 GP and H1 PW), used in the computation of the University Admission Score, at least one content subject to be from a contrasting discipline.

The 4 content-based subjects can be of the following combinations:

- 4 H2 content-based subjects OR
- 3 H2 and 1 H1 content-based subjects

Supplementary qualification is **not required** (eg. BMAT/UCAT).

[View Full Requirements](#) →



## SINGAPORE-CAMBRIDGE GCE 'A' LEVEL CERTIFICATE

A good H2 pass in Chemistry and H2 pass in either Biology or Physics.

Of the best six subjects (i.e. 4 content-based subjects, H1 GP and H1 PW), used in the computation of the University Admission Score, at least one content subject to be from a contrasting discipline.

The 4 content-based subjects can be of the following combinations:

- 4 H2 content-based subjects OR
- 3 H2 and 1 H1 content-based subjects

Supplementary qualification is **not required** (eg. BMAT/UCAT).

[View Full Requirements](#) →

# Holistic Education



2 Language	2 Arts	1/2 Math	2 Science (JC) 1 Science (Poly)
<b>1. English</b> <b>2. Mother Tongue</b>	<b>1. Pure Humanities</b> <ul style="list-style-type: none"> <li>• Geography</li> <li>• History</li> <li>• Literature</li> <li>• Higher Art</li> </ul> <b>2. Elective Humanities</b> <ul style="list-style-type: none"> <li>• SS + Geo</li> <li>• SS + Hist</li> <li>• SS + Lit in EL</li> </ul>	<b>1. Elementary Mathematics</b> <b>2. Additional Mathematics</b>	<ul style="list-style-type: none"> <li>• Chemistry</li> <li>• Biology</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• Chemistry</li> <li>• Physics</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• Chemistry</li> <li>• Sci (Phy, Chem)</li> <li>• Sci (Chem, Bio)</li> </ul>

- **CCA (Social and Leadership development)**
- **Student Initiated Learning (SIL) – Explore new interest, Engage in new experiences**
- **Deepening Learning through participation in seminars, talks, competitions**

# Word of Advice

## for *Learning of Science at Upper Secondary*



- 2-year course
- **New topics, new connections, new depth**
- Your ability to connect concepts and apply concepts in new situations will be challenged, not just memory work!
- Seek to understand first, not memorise
- The accurate use of scientific terms is important! – these must memorise.
- **Consistency is key!**
- **Always clarify, Take notes & Organise work**