



Grade 10 Learning Outcomes

Below are the learning outcomes of the course stating what students are expected to know/be able to do upon completion of the course.

Schoolwide Learner Outcomes

The 5 Steps Academy students develop the following global competencies (to the extent reasonable for their age group) to thrive in the unpredictable and fast-changing:

- Courage to try and make mistakes and the ability to learn from mistakes.
- Respect people regardless of their age, gender, nationality, religion, beliefs, or opinions.
- Discipline in self-development and achievement of dreams.

Mathematics

By the end of the course students should be able to:

- Understand basics of functional analysis (asymptotes, domain and range, inverse function)
- Understand radical functions and expressions
- Understand correlation
- Understand linear regression
- Visualize set expressions and solve word problems with sets
- Solve word problems on probability of combined events
- Perform basic statistical data analysis
- Understand matrix vocabulary
- Understand matrix operation rules
- Add and subtract matrices
- Multiply a matrix by a scalar
- Multiply two matrices
- Understand properties of vectors and operations on vectors
- Use graphing calculator (including G-solve, abs value, set domain and range, zoom in and out)
- Solve Cambridge IGCSE 0607 past papers questions (extended)

English

By the end of the course students should be able to:

- read easily, fluently and with good understanding
- develop the habit of reading widely and often, for both pleasure and information
- acquire a wide vocabulary, an understanding of grammar and knowledge of linguistic conventions for reading, writing and spoken language
- appreciate our rich and varied literary heritage



- write clearly, accurately and coherently, adapting their language and style in and for a range of contexts, purposes and audiences
- use discussion in order to learn; they should be able to elaborate and explain clearly their understanding and ideas
- are competent in the arts of speaking and listening, making formal presentations, demonstrating to others and participating in debate.

Grammar and Vocabulary:

- Memorize and correctly apply the meanings of 250 core words.
- studying their effectiveness and impact in the texts they read
- drawing on new vocabulary and grammatical constructions from their reading and listening, and using these consciously in their writing and speech to achieve particular effects
- analysing some of the differences between spoken and written language, including differences associated with formal and informal registers, and between Standard English and other varieties of English
- using linguistic and literary terminology accurately and confidently in discussing reading, writing and spoken language.

Reading

- read and appreciate the depth and power of the English literary heritage through:
 - reading a wide range of high-quality, challenging, classic literature and extended literary non-fiction, such as essays, reviews and journalism. This writing should include whole texts. The range will include:
 - at least one play by Shakespeare
 - works from the 19th, 20th and 21st centuries
 - poetry since 1789, including representative Romantic poetry
 - re-reading literature and other writing as a basis for making comparisons
 - choosing and reading books independently for challenge, interest and enjoyment.
- understand and critically evaluate texts through:
 - reading in different ways for different purposes, summarising and synthesising ideas and information, and evaluating their usefulness for particular purposes
 - drawing on knowledge of the purpose, audience for and context of the writing, including its social, historical and cultural context and the literary tradition to which it belongs, to inform evaluation
 - identifying and interpreting themes, ideas and information
 - exploring aspects of plot, characterisation, events and settings, the relationships between them and their effects
 - seeking evidence in the text to support a point of view, including justifying inferences with evidence
 - distinguishing between statements that are supported by evidence and those that are not, and identifying bias and misuse of evidence



- analysing a writer's choice of vocabulary, form, grammatical and structural features, and evaluating their effectiveness and impact
- making critical comparisons, referring to the contexts, themes, characterisation, style and literary quality of texts, and drawing on knowledge and skills from wider reading
- make an informed personal response, recognising that other responses to a text are possible and evaluating these.

Writing

- write accurately, fluently, effectively and at length for pleasure and information through:
 - adapting their writing for a wide range of purposes and audiences: to describe, narrate, explain, instruct, give and respond to information, and argue
 - selecting and organising ideas, facts and key points, and citing evidence, details and quotation effectively and pertinently for support and emphasis
 - selecting, and using judiciously, vocabulary, grammar, form, and structural and organisational features, including rhetorical devices, to reflect audience, purpose and context, and using Standard English where appropriate
- make notes, draft and write, including using information provided by others [e.g. writing a letter from key points provided; drawing on and using information from a presentation]
- revise, edit and proof-read through:
 - reflecting on whether their draft achieves the intended impact
 - restructuring their writing, and amending its grammar and vocabulary to improve coherence, consistency, clarity and overall effectiveness
 - paying attention to the accuracy and effectiveness of grammar, punctuation and spelling.

Public Speaking

- Speak coherently and with ease in front of a large audience.
- Use PowerPoint or other presentation software effectively, understand how to use appropriate backgrounds and the right font size for headings. bullet points, images in a way that doesn't distract from the presentation.
- Conduct sufficient research to prepare presentation.
- speak confidently, audibly and effectively, including through:
 - using Standard English when the context and audience require it
 - working effectively in groups of different sizes and taking on required roles, including leading and managing discussions, involving others productively, reviewing and summarising, and contributing to meeting goals/deadlines
 - listening to and building on the contributions of others, asking questions to clarify and inform, and challenging courteously when necessary



- o planning for different purposes and audiences, including selecting and organising information and ideas effectively and persuasively for formal spoken presentations and debates
- o listening and responding in a variety of different contexts, both formal and informal, and evaluating content, viewpoints, evidence and aspects of presentation
- o improvising, rehearsing and performing play scripts and poetry in order to generate language and discuss language use and meaning, using role, intonation, tone, volume, mood, silence, stillness and action to add impact.

Physics

By the end of the course students should be able to:

5 Atomic physics

5.1 The nuclear atom

5.1.1 Atomic model

Core

- Describe the structure of an atom in terms of a positive nucleus and negative electrons

Supplement

- Describe how the scattering of α -particles by thin metal foils provides evidence for the nuclear atom

5.1.2 Nucleus

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Core

- Describe the composition of the nucleus in terms of protons and neutrons
- State the charges of protons and neutrons
- Use the term proton number Z
- Use the term nucleon number A
- Use the term nuclide and use the nuclide notation AX
- Use and explain the term isotope

Supplement

- State the meaning of nuclear fission and nuclear fusion
- Balance equations involving nuclide notation

5.2 Radioactivity



5.2.1 Detection of radioactivity

Core

- Demonstrate understanding of background radiation
- Describe the detection of α -particles, β -particles and γ -rays (+ are not included: α -particles will be taken to refer to β -)

5.2.2 Characteristics of the three kinds of emission

Core

- Discuss the random nature of radioactive emission
 - Identify α -, β - and γ -emissions by recalling
 - their nature
 - their relative ionising effects
 - their relative penetrating abilities
- (+ are not included, β -particles will be taken to refer to α -)

Supplement

- Describe their deflection in electric fields and in magnetic fields
- Interpret their relative ionising effects
- Give and explain examples of practical applications of α -, β - and γ -emissions

5.2.3 Radioactive decay

Core

- State the meaning of radioactive decay
- State that during α - or β -decay the nucleus changes to that of a different element

Supplement

- Use equations involving nuclide notation to represent changes in the composition of the nucleus when particles are emitted

5.2.4 Half-life

Core

- Use the term half-life in simple calculations, which might involve information in tables or decay curves

Supplement

- Calculate half-life from data or decay curves from which background radiation has not been subtracted



5.2.5 Safety precautions

Core

- Recall the effects of ionising radiations on living things
- Describe how radioactive materials are handled, used and stored in a safe way

Chemistry

By the end of the course students should be able to:

14 Organic chemistry

14.1 Names of compounds

Core

- Name and draw the structures of methane, ethane, ethene, ethanol, ethanoic acid and the products of the reactions stated in sections 14.4–14.6
- State the type of compound present, given a chemical name ending in -ane, -ene, -ol, or -oic acid or a molecular structure

Supplement

- Name and draw the structures of the unbranched alkanes, alkenes (not cis-trans), alcohols and acids containing up to four carbon atoms per molecule
- Name and draw the structural formulae of the esters which can be made from unbranched alcohols and carboxylic acids, each containing up to four carbon atoms

14.2 Fuels

Core

- Name the fuels: coal, natural gas and petroleum
- Name methane as the main constituent of natural gas
- Describe petroleum as a mixture of hydrocarbons and its separation into useful fractions by fractional distillation
- Describe the properties of molecules within a fraction
- Name the uses of the fractions as:
 - refinery gas for bottled gas for heating and cooking
 - gasoline fraction for fuel (petrol) in cars
 - naphtha fraction for making chemicals
 - kerosene/paraffin fraction for jet fuel
 - diesel oil/gas oil for fuel in diesel engines
 - fuel oil fraction for fuel for ships and home heating systems
 - lubricating fraction for lubricants, waxes and polishes
 - bitumen for making roads



14.3 Homologous series

Core

- Describe the concept of homologous series as a 'family' of similar compounds with similar chemical properties due to the presence of the same functional group

Supplement

- Describe the general characteristics of a homologous series
- Recall that the compounds in a homologous series have the same general formula
- Describe and identify structural isomerism

14.4 Alkanes

Core

- Describe the properties of alkanes (exemplified by methane) as being generally unreactive, except in terms of burning
- Describe the bonding in alkanes

Supplement

- Describe substitution reactions of alkanes with chlorine

14.5 Alkenes

Core

- Describe the manufacture of alkenes and of hydrogen by cracking
- Distinguish between saturated and unsaturated hydrocarbons:
 - from molecular structures
 - by reaction with aqueous bromine
- Describe the formation of poly(ethene) as an example of addition polymerisation of monomer units

Supplement

- Describe the properties of alkenes in terms of addition reactions with bromine, hydrogen and steam

14.6 Alcohols

Core

- Describe the manufacture of ethanol by fermentation and by the catalytic addition of steam to ethene
- Describe the properties of ethanol in terms of burning



- Name the uses of ethanol as a solvent and as a fuel

Supplement

- Outline the advantages and disadvantages of these two methods of manufacturing ethanol

14.7 Carboxylic acids

Core

- Describe the properties of aqueous ethanoic acid

Supplement

- Describe the formation of ethanoic acid by the oxidation of ethanol by fermentation and with acidified potassium manganate (VII)
- Describe ethanoic acid as a typical weak acid
- Describe the reaction of a carboxylic acid with an alcohol in the presence of a catalyst to give an ester

14.8.1 Polymers

Core

- Define polymers as large molecules built up from small units (monomers)

Supplement

- Understand that different polymers have different units and/or different linkages

14.8.2 Synthetic polymers

Core

- Name some typical uses of plastics and of man-made fibres such as nylon and Terylene
- Describe the pollution problems caused by non-biodegradable plastics

Supplement

- Explain the differences between condensation and addition polymerisation
- Deduce the structure of the polymer product from a given alkene and vice versa
- Describe the formation of nylon (a polyamide) and Terylene (a polyester) by condensation polymerisation,
(Details of manufacture and mechanisms of these polymerisations are not required.)

14.8.3 Natural polymers



Core

- Name proteins and carbohydrates as constituents of food

Supplement

- Describe proteins as possessing the same (amide) linkages as nylon but with different units
- Describe the structure of proteins
- Describe the hydrolysis of proteins to amino acids. (Structures and names are not required.)
- Describe complex carbohydrates in terms of a large number of sugar units, • Describe the hydrolysis of complex carbohydrates (e.g. starch), by acids or enzymes to give simple sugars
- Describe the fermentation of simple sugars to produce ethanol (and carbon dioxide). (Candidates will not be expected to give the molecular formulae of sugars.)
- Describe, in outline, the usefulness of chromatography in separating and identifying the products of hydrolysis of carbohydrates and proteins

Biology

By the end of the course students should be able to demonstrate knowledge of the topics from Grades 7, 8 and 9 and master corresponding skills.

Modern History

By the end of the course students should be able to answer the following questions:

- The First World War, 1914–18
- Germany, 1918–45
- Russia, 1905–41
- The United States, 1919–41
- China, c.1930–c.1990
- South Africa, c.1940–c.1994
- Israelis and Palestinians since 1945

Students should be able to:

- recall, select, organise and deploy knowledge of the syllabus

content.



- construct historical explanations using an understanding of:
 - cause and consequence, change and continuity, similarity and difference
 - the motives, emotions, intentions and beliefs of people in the past.
 - understand, interpret, evaluate and use a range of sources as evidence, in their historical context.

Art History

By the end of the course students should be able to:

- Understand Baroque and Beyond
- Demonstrate knowledge of the development of art for the period from the Industrial Revolution to World War I
- Understand the Modern World During And After The World Wars
- Understand Contemporary Art

US History

By the end of the course students are expected to develop the following skills

- Making historical connections,
- Chronological reasoning (causation),
- Creating and supporting a historical argument.

and should be able to demonstrate an understanding of the following content areas:

Period 5: 1844-1877

Manifest Destiny

The Mexican-American War

The Compromise of 1850

Sectional conflict: regional differences

Failure of compromise



Election of 1860 and secession

Military conflict in the Civil War

Government policies during the Civil War

Reconstruction

Failure of Reconstruction

Comparison in Period 5

Period 6: 1865-1898

Contextualizing Period 6

Westward expansion: economic development

Westward expansion: social and cultural development

The "New South"

Technological innovation

The rise of industrial capitalism

Labor in the Gilded Age

Immigration and migration in the Gilded Age

Responses to immigration in the Gilded Age

Development of the middle class

Reform in the Gilded Age

Controversies over the role of government in the Gilded Age

Politics in the Gilded Age

Continuity and change in Period 6

Period 7: 1890-1945

Contextualizing Period 7

Imperialism: debates

The Spanish-American War



The Progressives

World War I: military and diplomacy

World War I: home front

1920s: innovations in communication and technology

1920s: cultural and political controversies

The Great Depression

The New Deal

Interwar foreign policy

World War II: mobilization

World War II: military

Postwar diplomacy

Comparison in Period 7

Period 8: 1945-1980

The Cold War from 1945 to 1980

The Red Scare

Economy after 1945

Culture after 1945

Early steps in the civil rights movement, 1940s and 1950s

America as a world power

The Vietnam War

The Great Society

The African American Civil Rights Movement, 1960s

The Civil Rights Movement expands

Youth culture of the 1960s

The environment and natural resources from 1968 to 1980



Society in transition

Continuity and change in Period 8

Period 9: 1980-present

Reagan and conservatism

The end of the Cold War

A changing economy

Migration and immigration in the 1990s and 2000s

Challenges of the 21st century

Causation in Period 9

Literature

By the end of the course students should be able to demonstrate the following:

- knowledge of the content of the text – through reference to detail and use of quotations from the text
- understanding of characters, relationships, situations and themes
- understanding of the writer's intentions and methods – response to the writer's use of language
- personal response – sometimes directly (answering questions such as 'What do you think?', 'What are your feelings about...?') and sometimes by implication (answering questions such as 'Explore the ways in which...')

Geography

By the end of the course students should be able to demonstrate the knowledge and understanding of:

- the wide range of processes, including human actions, contributing to the development of
(a) physical, economic and social environments and their effects on the landscape



(b) spatial patterns and interactions which are important within these environments

- the relationships between human activity and the environment
- the importance of scale (whether local, regional or global)
- the changes which occur through time in places, landscapes and spatial distribution.

Students should be able to:

- interpret and analyse geographical data
- use and apply geographical knowledge and understanding to maps and in numerical, diagrammatic, pictorial, photographic and graphical form
- use geographical data to recognise patterns in such data and to deduce relationships
- select and show understanding of techniques for observing and collecting data
- select and use techniques for organising and presenting data.
- reason and make judgements and decisions, including evaluation and conclusions, which demonstrate, where appropriate

(a) an appreciation of the attitudes, values and beliefs of others in issues which have a geographical dimension

(b) an awareness of the contrasting opportunities and constraints of people living in different places and under different physical and human conditions

(c) a willingness to review their own attitudes in the light of the views of others and new knowledge acquired

- make judgements and decisions and recognise how these are made within a geographical context as affected and constrained by

(a) the physical and human contexts in which decisions are made

(b) the values and perceptions of differing groups or individuals

(c) the choices available to decision-makers

(d) the increasing level of global interdependence and the need for sustainable development.

Economics



By the end of the course students should be able to:

- show knowledge and understanding of economic definitions, formulas, concepts and theories
- use economic terminology.
- select, organise and interpret data
- use economic information and data to recognise patterns and to deduce relationships
- apply economic analysis to written, numerical, diagrammatic and graphical data
- analyse economic issues and situations, identifying and developing links.
- evaluate economic information and data
- distinguish between economic analysis and unreasoned statements
- recognise the uncertainties of the outcomes of economic decisions and events
- communicate economic thinking in a logical manner.