

COURSE OVERVIEW

UNIT PLAN

LESSON	PRIMER VIDEO	KNOWLEDGE		ACTIVITY	REFLECTIVE
		LOs	UNEP Q2	Discuss, reformat, compare...	Global Competency
Lesson 1	Lesson 1	S2, L1	2	Compare country profiles over time	1
	Character focus - Apollo as leader	S2, L3	16	Identify character traits	2
	Plot - change over time, impact of ozone depletion	S3	17	Characteristics of systems change	
Lesson 2	Lesson 2	H2, S1	1	Role play - by farmer, banker, parent, scientist...	2
	What is ozone and ozone depletion?	L3, L4	4, 6, 7	Tik Tok - debate	3
	Plot - attempt to change the future	S1	5	Communicate for influence	1
Lesson 3	Lesson 3	H5	10	Ozone timeline	1
	History of ozone depletion/ripple effect	H2, H3, L2	15	Ozone and SDGs	4
	Plot - individual action can make a difference	H2, L4, L5	20	Campaign design	4

GLOBAL COMPETENCY DIMENSIONS

- 1 - Examine local, global and intercultural issues
- 2 - Understand and appreciate the perspectives and world views of others
- 3 - Engage in open, appropriate and effective interactions
- 4 - Take action for collective well-being and sustainable development

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LEARNING OBJECTIVES

	KEY SCIENCE	AUDIENCE	EVIDENCE / OBJECTIVE	IDENTIFIER	UNEP QS
SCIENCE	Invisible gaseous layer	Tweens (Age 7-12)	Explain ozone formation / characteristics	S1	1
			Recognise the important role of ozone of protecting species from UV radiation.	S2	2
	Relationship with nature	Teenagers (Age 13-18)	Identify how ozone and climate are connected, but not causal	S3	17,18
			Acknowledge ozone recovery and seasonal changes	S4	9
			Understand natural impacts on ozone such as volcanoes and the sun	S5	13
HUMAN IMPACT	Compromised by	Tweens (Age 7-12)	Identify the pollution that affects the ozone - ODSs (ozone-depleting substances such as CFCs and halons)	H1	7,8
			Recognise that pollution from the previous generation persists and will impact future generations	H2	15,20
	Restored by	Teenagers (Age 13-18)	Appreciate that this challenge requires international regulations and cooperation	H3	15
			Appreciate that individual personal behaviours and consumer choices have an impact on ozone	H4	6
	Distribution		Recognise the impact of ozone on a local / regional / global scale	H5	12
LONG-TERM PROGRESS	Requires continuous care	Tweens (Age 7-12)	Identify the consequences of unsustainable ozone depletion	L1	2
			Acknowledge the role of global regulations and the ozone treaties	L2	15,19
	Requires awareness and understanding	Teenagers (Age 13-18)	Acknowledge that continued progress on ozone requires a broad base of awareness and support	L3	6
			Understand continued progress relies on Assessment Panels	L4	15
			Acknowledge ozone recovery is a source of hope for other global environmental challenges	L5	6,20

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OZONE POSITIVE BEHAVIOURS

- GC1** - Examine local, global and intercultural issues
 - GC2** - Understand and appreciate the perspectives and world views of others
 - GC3** - Engage in open, appropriate and effective interactions
 - GC4** - Take action for collective well-being and sustainable development
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- > Leads/participates in school programmes to use more sustainable materials.
 - > Improves waste-management programmes in schools (like Eco Club).
 - > Check fridge or air conditioning unit at home or school to see if it is CFC-free.
 - > Minimise AC use and keep units well maintained.
 - > Join ozone events or youth initiatives.
 - > Chooses public transportation/biking/walking over driving.
 - > Chooses eco-friendly products, reduces consumption of plastic products.
 - > Chooses sustainable brands.
 - > Asks for sustainable products, advocates for sustainable changes in personal life and in school.
 - > Connects with others on environmental issues.
 - > Creates ride-share or bicycle share programme at school/parents work.
 - > Organises or participates in sustainability events, teaches family how to reduce carbon footprint.
 - > Talks with family about sustainable habits at home.

UNEP QUESTIONS

- 1 - What is ozone?
- 2 - Why do we care?
- 3 - How is ozone distributed?
- 4 - How is ozone measured?
- 5 - How are halogen source gases involved?
- 6 - How are human activities involved?
- 7 - What are reactive halogen gases?
- 8 - What happens as a result of chlorine and bromine reactions in the stratosphere?
- 9 - Why is the ozone hole only over Antarctica?
- 10 - How severe is depletion over Antarctica?
- 11 - Is there depletion of the Arctic ozone layer?
- 12 - How large is the depletion of the global ozone layer?
- 13 - Do the sun and volcanoes affect the ozone layer?
- 14 - What controls the production of ozone-depleting substances?
- 15 - Has the Montreal Protocol been successful?
- 16 - Does ozone depletion affect ground-level UV radiation?
- 17 - Does ozone depletion affect climate change?
- 18 - How is the Montreal Protocol also helping Earth's climate?
- 19 - How has the Montreal Protocol expanded?
- 20 - How are ozone levels expected to change in the decades ahead?

Click here for additional information:

<https://ozone.unep.org/20-questions-and-answers>

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OZONE POSITIVE BEHAVIOURS L3+L5:L21+L5:L22

ENGAGEMENT IN ACTIVITIES /20

Standard of Excellence 17-20	Proficient 12-16	Acceptable 6-11	Not Acceptable 0-5
Students readily engaged in activities and consistently showed leadership in each of the assigned activities.	Students willingly engaged in activities and frequently showed leadership in each of the assigned activities.	Students engaged in activities and occasionally showed leadership in each of the activities.	Students reluctantly engaged in activities and rarely showed leadership in the activities.

KNOWLEDGE - NOTES AND RESPONSES /20

Standard of Excellence 17-20	Proficient 12-16	Acceptable 6-11	Not Acceptable 0-5
Notes and responses demonstrate a thorough understanding of the complexity of the issues. Students develop a sound judgment based on solid evidence.	Notes and responses demonstrate an understanding of the complexity of the issues and the ability to support their opinion.	Notes and responses demonstrate an ability to summarise and restate the key issues.	Notes and responses indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

GLOBAL COMPETENCY DIMENSIONS /20

Standard of Excellence 17-20	Proficient 12-16	Acceptable 6-11	Not Acceptable 0-5
Students demonstrate a thorough understanding of key concepts.	Students demonstrate an understanding of key concepts.	Students demonstrate a general understanding of key concepts.	Students indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

PROJECTS - PRODUCTS /20

Standard of Excellence 17-20	Proficient 12-16	Acceptable 6-11	Not Acceptable 0-5
Projects demonstrate a thorough understanding of concepts. Effective and competent communication of key concepts.	Projects demonstrate an understanding of concepts. Effective communication of key concepts.	Projects demonstrate a general understanding of concepts. Communication of key concepts is evident.	Projects indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

PEER PRESENTATIONS /20

Standard of Excellence 17-20	Proficient 12-16	Acceptable 6-11	Not Acceptable 0-5
Contribution demonstrates a thorough understanding of stewardship. Effective and competent communication of key concepts.	Contribution demonstrates an understanding of stewardship. Effective communication of key concepts.	Contribution demonstrates a general understanding of stewardship. Communication of key concepts is evident.	Contribution indicates a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

STUDENT ASSESSMENT

LEARNING OBJECTIVE

Question 1: What is ozone?

Answer A: A man-made gas that sits about 30 to 50km from the surface of the earth in the mesosphere, the third layer of the atmosphere.

Answer B: A natural gas that surrounds planet earth. The ozone is in the second layer of the atmosphere called the stratosphere. It is 10 to 15km from the surface of the earth.

Answer C: A natural gas that surrounds earth. It is present in the fourth layer of the atmosphere called the troposphere 5 to 10km from the surface of the earth.

Answer D: A man-made gas present 250km from the surface of the earth in the thermosphere.

Question 2: Why do we care?

Answer A: Ozone in the high atmosphere acts as a barrier that protects the earth from harmful radiation from the sun. It acts as earth's sunscreen.

Answer B: Ozone in the high atmosphere protects life on earth. It forms a shield against meteorites crashing into the surface of the earth.

Answer C: Ozone in the high atmosphere act as a barrier that protects earth from radiation from the moon.

Answer D: Ozone is the name for the harmful radiation from the sun.

Question 3: How is ozone measured?

Answer A: Ozone in the atmosphere is measured by instruments at the north and south poles. The instruments compare the relative weight of ozone to water.

Answer B: Ozone in the atmosphere is measured by aircraft. The instruments measure the speed of sound transmission through ozone at set altitudes.

Answer C: Ozone in the atmosphere is measured by instruments on the ground and in the air on aircraft, and satellites. The instruments either draw air samples into a detection chamber or measure remotely over long distances using ozone's unique optical absorption or emission properties.

Answer D: Ozone in the atmosphere is measured by the international space station. The instruments measure the amount ozone deflects radio waves.

Question 4: How are human activities involved?

Answer A: Pollution from human activities has caused the ozone to thin. The main culprits are road construction because of the removal of vegetation and application of asphalt.

Answer B: Pollution from human activities has caused the ozone to thin. The main culprits are chemicals called CFCs (Chlorofluorocarbons), they are mostly used in refrigerants, aerosols, and plastic products.

Answer C: Pollution from human activities has caused the ozone to thin. The main culprits are air travel because the gases are released high above the surface of the earth.

Answer D: Pollution from human activities has caused the ozone to thin. The main culprits are production of electronics because of the chemical involved and scale of production.

Question 5: How is ozone expected to change in the decades ahead?

Answer A: Since the Antarctic Convention in 1961 CFC pollution has reduced and a long period of recovery started. Ozone's thinnest areas are near the north and south poles, by about 2060 the hole could be reduced down to under one million square kilometres.

Answer B: Since the Paris Agreement in 2016 CFC pollution has reduced and a long period of recovery started. Ozone's thinnest areas are near the north and south poles, by about 2060 the hole could be reduced down to under two million square kilometres.

Answer C: Since the Rio Declaration in 1992 CFC pollution has reduced and a long period of recovery started. Ozone's thinnest areas are near the north and south poles, by about 2060 the hole could be reduced down to under ten million square kilometres.

Answer D: Since the Montreal Protocol in 1987 CFC pollution has reduced and a long period of recovery started. Ozone's thinnest areas are near the north and south poles, by about 2060 the hole could be reduced down to under twenty-one million square kilometres.

STUDENT ASSESSMENT

ATTITUDE/BEHAVIOUR

Question 1: Have you talked to your friends or family about ozone?

Answer A: *Never*

Answer B: *Maybe once*

Answer C: *More than once*

Answer D: *Several times*

Question 2: Have you personally experienced the effects of reduced ozone?

Answer A: *Never*

Answer B: *Maybe once*

Answer C: *More than once*

Answer D: *Several times*

Question 3: Have you thought about how ozone affects people in other parts of the world?

Answer A: *Never*

Answer B: *Maybe once*

Answer C: *More than once*

Answer D: *Several times*

Question 4: Have you discussed with your parents or guardians ways to protect the ozone layer?

Answer A: *Never*

Answer B: *Maybe once*

Answer C: *More than once*

Answer D: *Several times*