OCR
Oxford Cambridge and RSA

GCE

Science

Unit **G641**: Remote Sensing and the Natural Environment

Advanced Subsidiary GCE

Mark Scheme for June 2014

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/ = alternative and acceptable answers for the same marking point
(1) = separates marking points
not = answers which are not worthy of credit
reject = answers which are not worthy of credit
ignore = statements which are irrelevant
allow = answers that can be accepted
( ) = words which are not essential to gain credit
__ = underlined words must be present in answer to score a mark
ecf = error carried forward
AW = alternative wording
ora = or reverse argument

Annotations: the following annotations are available on SCORIS.

BP	Blank Page – this annotation **must** be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
✓	correct response
×	incorrect response
bod	benefit of the doubt
nbod	benefit of the doubt **not** given
ECF	error carried forward
^	information omitted
I	ignore
R	reject

Question			Expected Answer	Mark	Additional Guidance
1	(a)		the dirtier the water / greater the pollution, the larger the amount of green algae ORA **;**	1	REJECT if implication that increase in algal population **causes** increase in pollution
	(b)		*Trout description (1 mark):* population decreases as water becomes more dirty /polluted ORA**;** *explanation (2 marks) (**any two):*** • trout need **high levels** of oxygen ORA can't survive/die in **low levels** of oxygen; • underwater (owtte) plant life dies AND so less **photosynthesis** so **less oxygen** produced **;** • plant life decays / rots AND bacteria using up oxygen / anaerobic conditions**;** *Water weed description (1 mark):* Least water weed when water is very clean and very dirty ORA (most water weed when water is (clean), fairly clean (or dirty) / most weed when some pollution is present **;** *Explanation(2 marks) (**any two):** :* • **More** nutrients **increase** growth of plants OR **more** sunlight i**ncreases** growth of plants ORA • (Sensible suggestion for higher levels when moderately dirty): polluted water may contain nutrients ORA clean water contains no nutrients • (sensible suggestion for no weed when very dirty): algae covers surface (obscuring sunlight), preventing **photosynthesis** (at bottom / of water weed) • OVP large population of consumers (owtte) in clean water ORA / presence of toxic substances owtte;	6	Need at least a comparison of **population sizes** between two different pollutant levels ALLOW quoting relevant numbers NOT just "need oxygen" Need at least a comparison of **population sizes** between two different pollutant levels OR use of terms "least", "most" etc. ALLOW quoting relevant numbers NOT just plants need nutrients / sunlight. Needs to suggest a relationship CON if photosynthesis mentioned in context of algae
	(c)		any named substance that is nitrogen / phosphorus-containing **;**	1	NOT nitrogen, phosphorus ALLOW fertiliser, sewage etc

Question			Expected Answer	Mark	Additional Guidance
	(d)		**Regulates / controls/ allows** the passage of molecules / substances owtte **into and out of** the cell **;** **AND** *Max t**hree** from:* • Diffusion / passive transport / facilitated diffusion AND no energy / ATP needed**;** • **through** phospholipid bilayer / protein channels **;** • smaller <u>molecules</u> (allow correct named molecules eg CO_2, O_2) through bilayer AND larger molecules / ions (allow correct named examples) through protein channels • ion / molecule moves from high concentration to low concentration / down concentration gradient **;** *Max **three**from:* • active transport AND requires energy / ATP **;** • through protein channel (if not mentioned above) • changes shape of protein (channel) **;** • ion moves from low concentration to high concentration / against concentration gradient ;	1 4	ALLOW **"controls** what enters and leaves the cell" **IGNORE** lincorrect naming of small molecules Reference to the concentration gradient must be correct for the type of transport. Mention of phospholipid bilayer CONs this mark Must be in context of active transport / use of energy Reference to the concentration gradient must be correct for the type of transport **QWC** If used, the following technical words should be spelled correctly: active transport passive transport concentration / concentration gradient molecule diffusion ion *Maximum 4 marks if any technical word is spelt incorrectly*
			Total	**13**	

Question			Expected Answer	Mark	Additional Guidance
2	(a)	(i)	1 700 000 / 70 000 000 x 100 2.4 / 2.43 / 2.428…;	2	0.024% scores 1 if working is shown
		(ii)	Not all wavelengths can be absorbed AW (some/green) light is reflected / scattered ; falls on wrong part of plant / where there are no / fewer chloroplasts AW light is transmitted / passes through leaves;	2	ACCEPT not enough chlorophyll to absorb NOT only green light is absorbed
	(b)		**A** photosynthesis ; **B** eating ; **C** excretion / death / decay ; **D** respiration ;	4	ALLOW: consumption, digestion etc IGNORE movement etc
	(c)		87 400 - (50 450 + 22 950) AW 1600 + 7800 + 4600 ; 14 000 ($kJm^{-2}yr^{-1}$) ;	2	
	(d)	(i)	**Input** (into the ecosystem) equals **output** (into the ecosystem) ;	1	NOT input and output stay the same / are constant ALLOW input and output are balanced
		(ii)	• carbon taken in (by producers) to form **biomass/glucose;** • some carbon transferred (as biomass) to consumers / decay organisms OWTTE • (biomass) converted to carbon dioxide / releases carbon in **respiration / decay**; • carbon dioxide taken in by **photosynthesis** equals carbon dioxide produced in **respiration / decay ;** • if carbon dioxide levels **increase**, photosynthesis **increases** (to return carbon dioxide to original level) ORA **ANY three**	3	**ACCEPT** 'carbon dioxide' for 'carbon' throughout ALLOW combustion Respiration can be in context of producers, consumers or decay organisms Needs to suggest negative feedback process
			Total	**14**	

Question			Expected Answer	Mark	Additional Guidance
3	(a)		at least one complete wavelength drawn **;** correct wavelength (6 squares) **;** amplitude correctly labelled **;**	3	NOT spiked waveforms, needs to be symmetrical above and below the line ALLOW between 5.5 and 6.5 If more than one wave, all wavelengths must be in this range
	(b)		colours in the correct order **;** violet at LHS **;**	2	ACCEPT letters
	(c)	(i)	gas changes (from red) to any colour except red OWTTE;	1	ACCEPT white
		(ii)	(hotter gas emits) shorter wavelength / higher frequency (of light)/ owtte **;**	1	IGNORE references to colour
	(d)	(i)	Infrared / ultraviolet **;**	1	ACCEPT IR/ UV IGNORE thermal, near etc
		(ii)	IR has longer wavelength than visible light / too long to be detected / longer than 850nm AW UV has shorter wavelength than visible light / too short to be detected / shorter than 400nm **;**	1	ACCEPT correct answer in terms of frequency ACCEPT 800-900nm **ecf** from incorrect identification of **em radiation** in (d) (i) ACCEPT 300-450nm
	(e)	(i)	retina **;**	1	
		(ii)	• rods + cones **;** • rods = white / shades of grey / low light / whole spectrum / wide **range** of frequencies; • cones = **narrow** frequency range / **specific** frequencies **;** • colours / red, blue, green **;**	4	NOT don't detect colour NOT see in the dark IGNORE black
			Total	**14**	

Question			Expected Answer	Mark	Additional Guidance
4	(a)		glucose + oxygen → carbon dioxide + water AND ATP formed; ATP formed from ADP + Pi; first stage: occurs in cytoplasm **;** breakdown of glucose / glycolysis; second stage: occurs in mitochondria **;** Most ATP produced in 2nd stage AW valid description of 2nd stage e.g. oxidative phosphorylation , Krebs cycle OWTTE **;** *any 4*	4	**IGNORE references to aerobic and anaerobic, lactic acid** **Only award mark for breakdown of glucose if clear reference to 1st stage of process** Award 1 mark for cytoplasm followed by mitochondria as sites of respiration, if no other reference to stages **QWC** If used, the following technical words should be spelled correctly : glycolysis oxidation cytoplasm mitochondria *Maximum 3 marks if any technical word is spelt incorrectly*
	(b)	(i)	to see if the **indicator** / CO_2 levels changes even **with no plants or animals present ;** AW to see if amount of light affects the i**ndicator** / CO_2 levels owtte **;**	1	
		(ii)	A E F G **;**	1	more than 1 tick = 0 marks
		(iii)	• F and G **;** • Both will go (yellow to) red or purple OR F goes purple, G goes red / less change for G than for F • photosynthesis would increase / no photosynthesis in dark, but photosynthesis occurs in light/photosynthesis now occurs in the light**;** • **photosynthesis** removes carbon dioxide AW carbon dioxide levels decrease (overall)**;**	4	ACCEPT both go less yellow IF two tubes identified, correct comment is needed about colour change in each AWARD 1 mark for correct colour if only F or G correctly identified IGNORE colour changes for any tubes apart from F and G
			Total	**10**	

Question			Expected Answer	Mark	Additional Guidance
5	(a)		• **converts** information from sensor into a number / information generates a number **;** • between 0 – 255 **;** • depending on the intensity of the radiation (received by sensor) **/** the higher the intensity, the higher the number ORA**;** • (information relayed back to Earth) as radio waves **;** • (To create image), number **converted** back into a shade of grey/determines brightness of pixel; • In image / pixels 0 = black or 255 = white / higher number = brighter ; *any 4*	4	IGNORE reference to sensor detecting radiation ALLOW 1-256 Last two marking must clearly refer to production of image / pixel
	(b)	(i)	sunny / (fairly) clear sky / dry **;**	1	**ACCEPT** hot / warm / mild **IGNORE** cold
		(ii)	so that it looks more realistic / white **;**	1	NOT to makes them easier to see / interpret
		(iii)	• they are cold **;** • cold features emit less infrared / heat / radiation / ora **;** • so would appear black on the **original** (positive) image / this is a **negative**, so looks white**;**	3	Can score this mark even if 1st MP is wrong No ecf from first MP
			Total	**9**	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored