OCR
Oxford Cambridge and RSA

GCE

Science

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

Advanced Subsidiary GCE

Mark Scheme for June 2017

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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.

Annotations: the following annotations are available on SCORIS.

✓	=	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	Rationale/Additional Guidance
1	a	i	Glucose/ sugar;	1	
		ii	Glucose + oxygen -> Carbon dioxide + water;	1	Accept correct formulae Ignore ATP
		iii	ATP	1	
	b		Cytoplasm; 2 molecules of ATP produced/ glycolysis; Mitochondria; Much more ATP produced/Krebs cycle/ details of oxidative phosphorylation	4	Accept: correct details of glycolysis
	c		Active transport; Biosynthesis;	2	NOT heat ACCEPT example of biosynthesis or a description of it
	d	i	Lack of oxygen	1	
		ii	Anaerobic produces less energy/fewer ATPs (ora); Anaerobic produces lactic acid;	2	
			Total	**[12]**	

Question			Expected Answer	Mark	Rationale/Additional Guidance
2	a		Burning petrol/diesel/fossil fuels in vehicle engines; Respiration; Burning fossil fuels for power/heating (owtte); any 2	2	NOT air pollution ACCEPT vehicle/car exhausts ACCEPT burning fossil fuels on its own for 1 mark
	b		Reactants and products : (reactants) CO_2 and H_2O; (products) O_2 and glucose/starch; Stages: Light dependent stage details; Light independent stage details; Where it occurs: Photosynthesis occurs in; Chlorophyll (absorbs light); Chloroplast / thylakoid membrane (is where reaction occurs); any 5	5	QWC If used, the following technical words should be spelled correctly: Photosynthesis Chlorophyll Thylakoid Chloroplast Maximum 4 marks if any technical word is spelt incorrectly Accept carbon dioxide for CO_2, water for H_2O and oxygen for O_2
	c		To make protein;	1	Accept for nucleotides / amino acids / any named plant nitrogen containing compound
	d		A = nitrogen fixing B = nitrifying C = denitrifying	3	
	e		Leaching out into rivers etc; When it rains; OR Harvesting of crops/livestock: Plant remains/waste don't decay into the soil;	2	ALLOW : denitrifying bacteria converting nitrates in the soil to nitrogen gas
	f		air	1	
	g	i	20 – 23%	1	
		ii	Increase pressure; Lower temperature;	2	Accept 400 (atm) Accept 350^0C
			Total	**[17]**	

Question			Expected Answer	Mark	Rationale/Additional Guidance
3	a	i	CCD is an array of thousands/millions of tiny sensors; (they) detect radiation; Converts to an electrical impulse; Convert to a number(between 0 & 255); **and any 3 from the following for maximum 4 marks** Depending on intensity; Black = 0, white = high number; Images made up of pixels; Number determines brightness of pixel;	4	QWC If used, the following technical words should be spelled correctly: Sensor Radiation Impulse Intensity Pixel Maximum 4 marks if any technical word is spelt incorrectly
		ii	Nitrogen molecules scatter blue light; oxygen molecules scatter blue light; Dust / water droplets scatter all wavelengths of light; any 2	2	
	b	i	Infrared images give more information/ can't see below clouds in visible image/ light reflected by clouds; Infrared shows (relative) temperatures; can use it at night; any 2	2	
		ii	Infrared has Lower frequency/ longer wavelength	1	
	c		More different shades available; More easily detected by the human eye;	2	
			Total	**[11]**	

Question			Expected Answer	Mark	Rationale/Additional Guidance
4	a		Wavelength = c/f 3 x 10^{8}/2.3 x 10^{17} ; 1.3 x 10^{-9} (for 2 marks as correct sig. fig).; m ;	4	1.30435 x 10^{-19} or 1.30 x 10^{-19} for 1 mark as incorrect number of sig. fig
	b	i	The spreading out of waves; After they pass an obstacle/gap in a barrier;	2	
		ii	The particles are a similar distance apart; As the wavelength of the wave;	2	
	c		Ionising (radiation); Damage/mutate DNA ;	2	
			Total	10	

Question			Expected Answer	Mark	Rationale/Additional Guidance
5	a		Energy stored (in kJ); Per m^2 per year;	2	
	b		Less intensity of sunlight; Lower temperature; Less water; Less nutrients; any 2	2	Assume answer refers to Boreal forest unless otherwise stated
	c	i	Bacteria/fungi;	1	Accept any suitable named example
		ii	Break down **dead** matter / decompose **dead** matter; To recycle nutrients;	2	ALLOW : produce nutrients
	d		**Reasons for decrease:** Population increase; Demand for land to grow crops; Demand for wood; **Reasons for concern:** Loss of species to develop new foods/medicines; Ecosystems become unsustainable; Reduced absorption of CO_2 leading to global warming	3	MAX 2 marks from either section
			Total	[10]	

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

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OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553