RECOGNISING ACHIEVEMENT

GCE

Geology

Advanced GCE **F795/01**

Evolution of Life, Earth and Climate

Mark Scheme for June 2010

Oxford Cambridge and RSA Examinations

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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.

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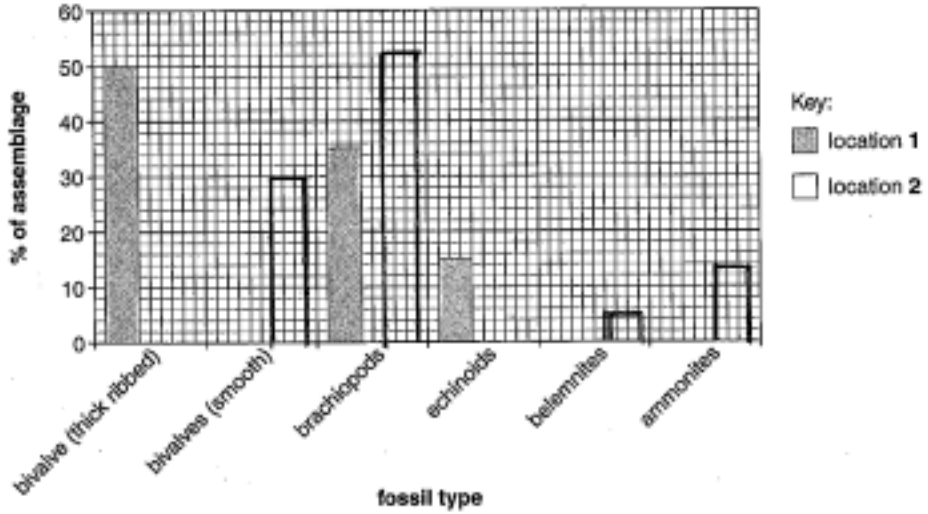
Question			Expected Answers	Marks	Additional Guidance
1	a	i	aperture – line to top right of diagram protoconch – line to centre of the fossil (first whorl) rib – to any of the curved lines dividing up the cephalopod	1 1 1	lines should touch feature or area to max of 1mm away
		ii	planispiral / in one plane / evolute	1	accept planospiral
	b	i	ammonitic must be complex with frills goniatitic should be simple with no frills and rounded or angular curves saddles / lobe labels	1 1 1	if wwr but with correct labels = 1 needs at least one lobe and saddle allow labels not on the specification e.g. venter, aperture arrow
		ii	nautiloid	1	
		iii	body chamber – houses soft parts / head/ tentacles /AW septa – divides shell into chambers / chamber wall / joins to outside of shell / strengthens shell	1 1	accept where it lived / internal organs / storing the creature
		iv	named change eg septal necks / position of siphuncle / ornament stated description / diagram of early form to show morphological change chosen • septal necks point back / retrosiphonate • siphuncle central • no ribs / no ornamentation • fully coiled • involute • small living chamber description / diagram of late form to show morphological change chosen • septal necks point forward near aperture / prosiphonate • siphuncle lateral / close to venter • ribs / complex venter / keel and sulcus / lappet • heteromorphs / uncoiled • evolute • large living chamber	1 any 1 any 1	diagrams are optional allow septal necks central allow septal necks near venter

	c		<u>vertical movement</u> control gas / fluid levels in chambers / use the siphuncle movement of ions cause <u>osmotic</u> effects increased gas movement upwards / more water movement downwards <u>buoyancy</u> controlled <u>horizontal movement</u> jet propulsion water forced out of hyponome / funnel propels animal backwards swim by using tentacles	any 2 any 2	allow 2 marks for more gas increases buoyancy moves up and more water decreases buoyancy moves down not gas not siphon allow controls direction using tentacles
	d		actively hunt / predators / catch prey using tentacles tentacles pass food to the mouth beak (breaks up food) may scavenge	any 2	
			Total	**19**	

Question			Expected Answers	Marks	Additional Guidance
2	a	i	trilobite / trilobita	1	
		ii	compound eye – fossil B on cephalon either side of glabella genal spine – fossil C running alongside thorax glabella – central portion of either B or C (on the cephalon) facial suture - line on cheek of fossil B	1 1 1 1	
		iii	bottom portion below thorax in area of fused segments (area with 3 spines)	1	must shade all the pygidium on B
	b	i	gill – area between pleuron and appendage jointed appendage – leg area on bottom of diagram	1 1	
		ii	walked / ran / crawled / moved along the sea floor / AW using appendages / jointed limbs / legs created tracks / trails / *Cruziana* / grazing	any 2	
	c		<u>Nektonic</u> separated pleura allow greater surface area to float more than 6 pleura so many legs greater flexibility to swim / directed movement inflated glabella / fat filled glabella floatation device to remain in water column spines present for protection from predators eyes facing forwards / on stalks		responses in pairs – one mark for the morphological adaptation described and explanation 1 mark per pair max 1 if have 2 descriptions but no explanation

			360° vision / looking down / see in front and down / could see its prey	max 2	
			<u>infaunal</u> no eyes / blind eyes not needed as no light / in burrow pitted cephalon / sensory hairs present allow animal to make sense of environment / detect currents large shovel shaped cephalon / wide cephalic shield burrowing into sediment / increase surface area on soft sediment long genal spines help support in soft sediment / mud	any 2	responses in pairs – one mark for the morphological adaptation described and explanation 1 mark per pair max 1 if have 2 descriptions but no explanation
			<u>planktonic</u> small body / small and light / few mms long small for floating in water column few thoracic segments / few legs no need for flexibility / movement / walking inflated glabella and or pygidium / fat or gas filled for buoyancy in water column no eyes / blind eyes not needed as just floating / no directed movement / may be in deep water with no light	any 2	responses in pairs – one mark for the morphological adaptation described and explanation 1 mark per pair max 1 if have 2 descriptions but no explanation
			Total	**16**	

Question			Expected Answers	Marks	Additional Guidance
3	a	i	13 + 5 = 18%	1	
		ii	 4 or 3 bars plotted correctly = 2 marks 2 or 1 bars plotted correctly = 1 mark	2	use the overlay within half a square for height
		iii	shallow quiet sea / low energy shallow conditions / AW no thick shelled forms / thin / fragile / smooth shelled forms only/ no ornamentation / ORA mostly whole shells / 60% whole (marine swimmers such as) belemnites and ammonites (may indicate fall out) / sink when dead	1 any 2	must have both energy and depth / named environment e.g. lagoon allow deeper than A ignore anything on brachiopods and echinoids

	b	**i**		brachiopod	bivalve	5	use the overlay mark in rows 6 correct = 5 marks 5 correct = 4 marks 4 correct = 3 marks 3 correct = 2 mark 1 or 2 correct = 1 mark
			lophophore	✓			
			ligament		✓		
			permanent gape between shells		✓		
			made of $CaCO_3$	✓	✓		
			diductor and adductor muscle scars	✓			
			zig–zag commisure	✓			

		ii	recognisable elongate shell drawn (eg *Mya* or *Solen*) no ornamentation / growth lines gape foot / siphons	1 any 2	broader than it is high must be labelled
		iii	byssus / horny thread on outside of shell cement on base of shell / left valve attachment large (adductor) muscle scars inequivalved / one large valve (left) other lid-like (right) strengthened shell / streamlined / unornamented shell covered in layer of periostracum	any 2	not ribbing or ornamentation e.g. *Mytilus*
				16	

Question			Expected Answers	Marks	Additional Guidance
4	a	i	present day reefs in equatorial / tropical regions / between 30°N and 30°S we assume that old reefs had same requirements as new ones / past reefs existed on equator / tropics / AW rocks moved away from equator on continents / continental drift	1 1 1	accept description of reef / coral growth conditions
		ii	just below sea level / approximately 15m depth / within photic zone clear water for light photosynthesis (of algae that live within them) / sediment clogs coral polyps high energy levels for high oxygen levels / nutrients 30 – 40 ppt salts / normal salinity (3 – 4%) water temperature between 23°C and 29^{o}C	any 3	accept 1 – 20 m just shallow, warm and clear = 1
		iii	recognisable rugose coral suitable labels from tabulae, corallite, dissepiments, symmetry labelled as bilateral, columella,/ axial structure, septa (major or minor), calice, growth lines	1 any 2	horn shaped, columella, dissepiments, tabulae, septa (2 of these to show it is rugose)
	b	i	plant / named plant / tree / leaves / bark / stem / root	1	D = fern E = *Lepidodendron*
		ii	gastropod / spider / other named plant / terrestrial organism named / reptile / amphibian / insect / freshwater bivalve / mussel	1	check terrestrial organism is Carboniferous
		iii	low energy environment / deltaic marsh / bog / swamp description of cyclothem development rapid sedimentation / buried in fine sediments plants fall into anoxic / anaerobic environment low amount / no bacterial action	any 3	argillaceous
			Total	**14**	

Question			Expected Answers	Marks	Additional Guidance
5	a	i	long term weather patterns / over a long period of time average weather / rain / temperature / wind patterns / standard weather / description of a climate zone / e.g. Britain as a temperate climate	1 1	long term is the key
		ii	global lower temperatures ice at both poles / large glaciers / large ice caps / high albedo lower sea level / higher ^{18}O	 any 2	accept world wide for global max 1 mark is just general statement about colder and more ice
	b	i	crust depressed by weight of ice / sediment / beach cut when area depressed by ice ice removal allows crust to rise /may rise further than original position	 1 1	
		ii	MOR higher when spreading rate high / heating and expansion of magma causes upwelling / displacement of water / ORA sea level is raised / ORA	 1 1	accept more rock forming
		iii	low sea level may indicate water in ice caps / ice caps tie up water at poles surface ocean layer expands and sea level falls / ORA surface ocean layer contracts / ORA	 1 1	ORA for warm periods
	c	i	X mark on point of low relative sea level at base of Triassic	1	
		ii	highs in species match highs in sea level / sea level very low, species diversity is low / positive correlation	 1	allow use of figures for comparison
		iii	global catastrophe - meteorite impact / excessive volcanic activity / global climate change	 1	Deccan traps not Siberian
	d		correlation of rocks / biostratigraphy / zone fossils / to date the rocks / relative dating used in oil industry / brought up as rock chipping / drill cores	1 1	
			Total	**15**	

Question			Expected Answers	Marks	Additional Guidance
6			**Main Characteristics**		
			235 to 251 Ma before present	1	
			decline was gradual / over several Ma	1	
			mainly affected shallow sea dwellers / open sea dwellers less affected	1	
			96% (allow 90 – 98%) marine (invertebrate) species extinct	1	
			extinction of marine life: eg. trilobites, corals (tabulate / rugose)	1	
			reduction in numbers of other fossils eg. ostracods, foraminifera, brachiopods, cephalapods, crinoids, bryzoans	1	
			extinction of terrestrial life: eg. large amphibians / 77% of tetrapods	1	
			reduction in numbers of 'coal measures' fauna / pteridophytes	1	
			diagram / graph to show number of species and extinctions	1	
				Max 4	
			Possible Causes		
			assembly of supercontinent Pangaea	1	
			desert conditions are poor conditions for life / fewer nutrients into the ocean	1	
			sea levels fell / regressions	1	
			related to large scale glaciations (eg. Australia, S America, S Africa, India, Antarctica)	1	
			seas hypersaline / pH change in ocean	1	
			lack of habitat / reduced shallow seas / reduced shelf environment	1	
			large scale volcanicity (e.g. Siberian Traps)	1	not Deccan
			poisonous gas emissions / named gases kill organisms / greenhouse gases	1	S not acceptable
			acid rain / ash falls / pyroclastics	1	
			led to fluctuations in climate / explanation of climate change with reason (e.g. volcanic winter)	1	
			disruption to food chains	1	
			methane hydrates released	1	
			methane adds to greenhouse gases	1	
			possible meteorite impact / iridium layer /shocked quartz / crater	1	
			any other correct cause e.g. anaerobic sea water	Max 7	
			Total	**10**	

7			**<u>way up criteria</u>** description of suitable example (eg desiccation cracks, rootlets, burrows, grading, sole structures, pillow lavas, cross-bedding, vesicles / weathering at top of flow, fossils in life position) labelled diagram of chosen way up structure / diagram has labels showing age relationship / younger and older rocks explanation of distinguishing way up / how upper is distinguished from lower use of way up structure in structural geology / inverted beds / overfold / recumbent fold / helps with law of superposition **<u>included fragments</u>** description of suitable example (e.g. xenolith, derived fossil, clast in a conglomerate) labelled diagram of chosen example / diagram has labels showing age relationship / younger and older rocks explanation of distinguishing how upper unit is distinguished from lower / how fragment is older / explanation of how it forms / state law of included fragments date events such as erosion / unconformities / intrusions / igneous activity / radiometric dating **<u>cross cutting relationships</u>** description of suitable example (eg dyke, unconformity, cross bedding, fault, transgresive sill, batholith) labelled diagram of chosen cross cutting relationship / diagram has labels showing age relationship / younger and older rocks explanation why cross cut rock is older ora / state the law date events such as erosion / unconformities / intrusions / igneous activity / radiometric dating / faulting	1 1 1 max 4 1 1 1 1 max 4 1 1 1 1 max 4	not just intrusion
			Total	**10**	

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