RECOGNISING ACHIEVEMENT

GCE

Geology

Advanced GCE **A2 7884**

Advanced Subsidiary GCE **AS 3884**

Mark Schemes for the Units

June 2008

3884/7884/MS/R/08

Oxford Cambridge and RSA Examinations

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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.

Any enquiries about publications should be addressed to:

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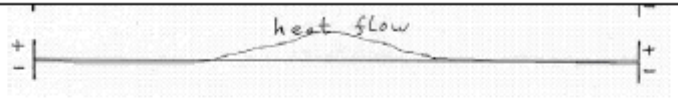
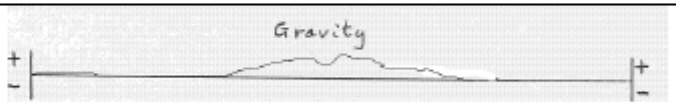
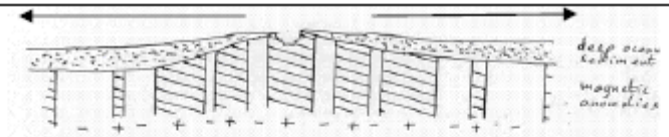
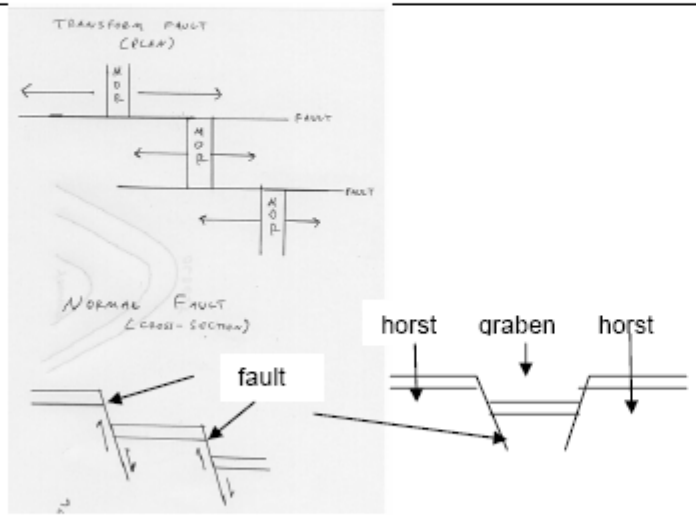
Advanced GCE Geology (7884)

Advanced Subsidiary GCE Geology (3884)

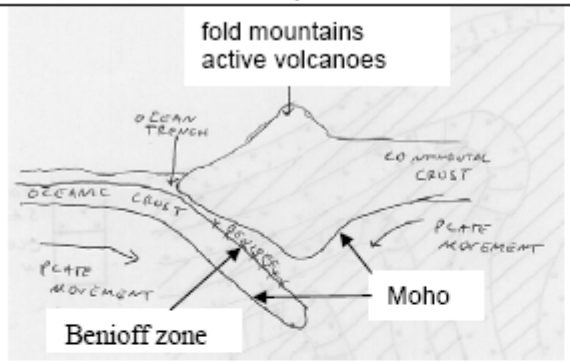
MARK SCHEMES FOR THE UNITS

2831 Global Tectonics and Global Structures

Question			Expected Answers	Marks	Additional Guidance
1	a	i		1	line at 0 either side of MOR positive over the MOR
		ii	high over MOR because of magma / volcanoes / rising (hot) convection currents	1	
		iii		1	line at 0 either side of MOR positive over the MOR allow dip at axial rift
		iv	high over MOR due to excess mass / ridge / mountains / high land	1	
		v		2	1 for each correct arrow
	b	i	sediments get thicker further away from the MOR / symmetrical about the MOR because there is more time for the sediments to accumulate / crust older away from MOR / fine sediment deposited at constant rate	1 1	description explanation check diagram for annotations and link to diagram is scoris give mark where appropriate
		ii	stripes are parallel to MOR / Stripes symmetrical about the MOR formed from cooling magma at the MOR / explanation of iron rich minerals taking on magnetism / reversals cause stripes	1 1	description explanation

		iii	age increases away from the MOR / symmetrical about the MOR youngest at MOR where new crust or rock is created	1 1	description explanation
	c		3.33 cm / year working shown	1 1	 working shows distance over time not just D/T 50/1.5
	d	i	transform normal / step / graben or rift valley	any 1	
		ii		2	1 for correct diagram 1 for 2 correct labels MOR labelled / sense of movement arrows drawn / description of sea floor spreading / transform fault can only get label marks if the diagram is correct 1 for correct diagram 1 for correct sense of movement arrows drawn and fault labelled
	d	iii	transform normal / step / graben or rift valley	any 1	only give a particular fault once
		iv	as for part ii above	2	see part ii above

			Total	**20**	

Question			Expected Answers	Marks	Additional Guidance
2	a	i	 1 for each correct label: • the Benioff Zone • oceanic trench • fold mountains • active volcanoes • the Moho.	5	The continental must be thicker than the oceanic crust If oceanic v oceanic then can get all marks except the fold mountains Benioff zone on top surface of oceanic crust fold mountains root zone not essential fold mountains and volcanoes need to be in a similar position otherwise 1 max Moho either at the base of the oceanic or continental crust
		ii	1 for 2 correct arrows	1	
	b	iii	compression faulting / thrust / reverse faults folding / any named fold	any 2	

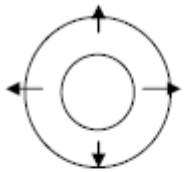
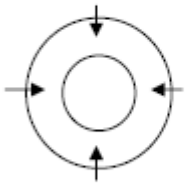
<table>
<tr>
<td></td>
<td>c</td>
<td>i</td>
<td>
<table>
<tr><th>characteristic</th><th>oceanic crust</th><th>continental crust</th></tr>
<tr><td>average density (g/cm^3)</td><td>3.0 g/cm^3 +/- 0.1</td><td>2.7 – 2.5g/cm^3</td></tr>
<tr><td>average depth (km)</td><td>7 km +/- 3 km</td><td>35 km +/- 5 km</td></tr>
<tr><td>average composition</td><td>basic / basaltic / mafic / any basic rock</td><td>acid / intermediate / granite / granodiorite / felsic / andesite / ryholite any appropriate acid or intermediate rock</td></tr>
<tr><td>age range</td><td>Present to Jurassic
0 – 200 Ma +/- 20 Ma</td><td>Present to Precambrian
0 – 4000 Ma / >1,000 Ma</td></tr>
</table>
1 – 2 correct = 1
3 – 4 correct = 2
5 – 6 correct = 3
7 – 8 correct = 4
</td>
<td>4</td>
<td>density, and depth must be a single number</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii</td>
<td>direct observation / drilling / mining / density / gravity surveys / ophiolites (give once) / looking at rock samples

direct observation / drilling / mapping / mining / chemical analysis / ophiolites (give once) / looking at rock samples</td>
<td>1

1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii</td>
<td>seismic surveys / use of P and S waves
recognition of the Moho / recognition of a discontinuity
reflection / refraction
timing of wave arrivals / seismic waves speed up in the mantle
diagrams / velocity changes from crust to mantle</td>
<td>any 2</td>
<td>not “defraction”</td>
</tr>
</table>

			Total	16	

Question			Expected Answers	Marks	Additional Guidance
3	a		synform or syncline / overfold / overturned / asymmetric / dip measurements / open / rounded	any 2	
	b	i	***stress*** = the forces acting on a rock / force per unit area / the cause of deformation / description of shear / compression / tension / pressure exerted ***strain*** = the resulting deformation of the rock / changing dimension / changing shape of rock	1 1	 must mention deformation or change in shape or dimensions
		ii	from the right	1	arrow within 45 of the horizontal
		iii	A = elliptical B = circle	1 1	
	c	i	a bed that tends to maintain constant thickness when folded / rock resistant to stresses / rocks deform in a brittle manner / rock with little internal shear or flow / rock will fracture when folded / rock will undergo limited plastic deformation	1	not just strong
		ii	limestone	1	
	d		fault there is displacement / movement along the fracture joint there is no displacement / relative movement along the fracture	1 1	only 1 mark if not mentioned that it is a fracture or crack

		e	dome  basin  circular shapes / 3D diagram = 1 3 correct dip arrows for the dome pointing out and basin arrows in = 1 <u>beds</u> labelled oldest in centre of dome and youngest in centre of basin = 1	3	max 1 for correct cross section diagrams max 2 if only 1 correct diagram
			Total	**14**	

Question			Expected Answers	Marks	Additional Guidance
4			**P waves** compression / push-pull movement / longitudinal / or diagram fastest waves / primary waves body waves controlled by incompressibility / will pass through solid and liquid	 1 1 1 1 1 max 2	 must get wave name correct
			S waves shear / sideways movement / transverse / or diagram slower than P faster than L / secondary waves body waves controlled by rigidity / will not pass through liquids / will only pass through solids	 1 1 1 1 max 2	 must get wave name correct
			L waves surface waves / Love waves / Rayleigh waves / or diagram slowest most destructive	 1 1 1 max 2	 must get wave name correct max 1 if 2 good points but have the wrong name
					max 4 for the characteristics

			Outer core liquid and inner core solid	1	
			P waves can pass through inner and outer core	1	
			P waves slow down by the liquid outer core	1	ecf if the wave name is incorrect but can get all these marks
			P waves refracted at outer core / follow curved paths	1	
			creates a P wave shadow zone 103° - 142°	1	+/- 3° Only 1 mark if the P and S wave shadow zones have no angles
			P waves speed up in solid inner core	1	
			P wave that goes straight through core (pP) is faster than expected due to solid inner core	1	
			S waves stop at the outer core	1	
			S wave shadow zone created by liquid outer core 103° - 103°	1	Only 1 mark if the P and S wave shadow zones have no angles +/- 3°
			Gutenberg discontinuity mantle - outer core boundary where P waves slow or S waves stop	1	
			outer core – inner core discontinuity where P waves speed up	1	
			L waves of no use as they do not pass through the Earth	1 max 4	

					mark labelled diagrams as text
			Total	8	

Quality of Written Communication

2 marks (**technical terms**) Answers are structured clearly and logically, so that the candidate communicates effectively, uses a wide range of specialist terms with precision and spelling, punctuation and grammar are accurate.

1 mark (**organisation**) There are shortcomings in the structure of the answer, however, the candidate is able to communicate knowledge and ideas adequately, a limited range of specialist terms are used appropriately and spelling, punctuation and grammar are generally accurate with few errors.

0 marks There are severe shortcomings in the organisation and presentation of the answer, leading to a failure to communicate knowledge and ideas. There are significant errors in the use of language, spelling, punctuation and grammar, which makes the candidate's meaning uncertain.

[quality of written communication max 2]

			Total	**10**	

2832 The Rock Cycle - Processes and Products

General advice to Assistant Examiners on the procedures to be used

YOU WILL BE REQUIRED TO UNDERTAKE 10 PRACTICE AND 10 STANDARDISATION SCRIPTS BEFORE STARTING TO MARK LIVE SCRIPTS.

1. The schedule of dates for the marking of this paper is very important. It is vital that you meet these requirements. If you experience problems then you must contact your Team Leader (Supervisor) without delay.

2. An element of professional judgement is required in the marking of any written paper. Candidates often do not use the exact words which appear in the detailed sheets which follow. If the science is correct and also answers the question then the mark(s) should normally be credited. If you are in doubt about the validity of any answer then consult your Team Leader (Supervisor) by phone, the messaging system within SCORIS or e-mail.

3. Correct answers to calculations always gain full credit even if no working is shown. (The 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)

4. Some questions may have a 'Level of Response' mark scheme. Any details about these will be in the rationale.

5. If an answer has been crossed out and no alternative answer has been written then mark the answer crossed out.

6. In addition to the award of 0 marks, there is a NR (No Response) option on SCORIS.

   Award 0 marks

   - if there is any attempt that earns no credit (including copying out the question or some crossed out working)

   Award NR (No Response)

   - if there is nothing written at all in the answer space
     OR
   - if there is any comment which does not in any way relate to the question being asked (eg 'can't do', 'don't know')
     OR

- if there is any sort of mark which is not an attempt at the question (eg a dash, a question mark)

7. 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
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Highlighting is also available to highlight any particular points on the script.

9. The Comments box
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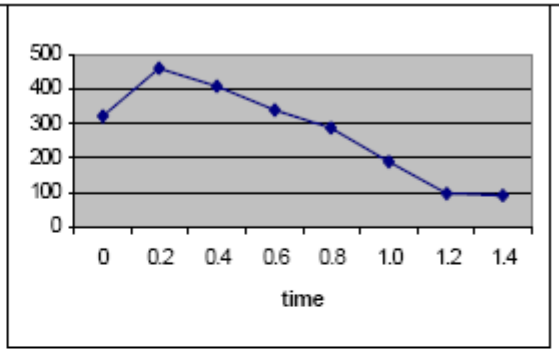
10. Please send a brief report on the performance of the candidates to your Team Leader (Supervisor) by the end of the marking period. The Assistant Examiner's Report Form (AERF) can be found on the Cambridge Assessment Support Portal. This should contain notes on particular strengths displayed, as well as common errors or weaknesses. Constructive criticisms of the question paper / mark scheme are also

Question			Expected Answers	Marks	Additional Guidance
1	(a)	(i)	mudflow / on the flank of a volcano / water and fine grained pyroclastic material / torrential rain / melting of snow and ice produce mudflow	any 2	NOT landslide
		(ii)	they flow down slopes / follow depressions in topography / follow river valleys; analysis of deposits from previous events	1 1	
	(b)		ash falls affect runways / damage aircraft / cover buildings / renders unusable as air base / between 5-10cm of ash fall / large amount of ash / specific health reference (e.g. respiratory problems)	any 2	NOT general health references NOT volcanic bombs Allow evacuation due to ash
	(c)		acid / intermediate volcano / strato volcano / mainly explosive style of eruption / high viscosity lava solidifies near vent / island arc volcano	any 2	NOT just gas
	(d)	(i)	well sorted – all grains same / similar size; poorly sorted – grains all different sizes	1 1	If any other property mentioned as well as size e.g. shape, max 1
		(ii)	well sorted grains drawn all the same size and poorly sorted grains drawn of different sizes; scale showing sizes between 0.0625 and 2mm	1 1	
		(iii)	roundness – angular grain size – rudaceous / coarse sorting – poorly sorted ecf part (ii) name - breccia	1 1 1 1	Allow values 1mm to 40mm (must be a range)
			Total	**16**	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	thermal / contact	1	
		(ii)	no mineral alignment; heat only / high temperature only; lack of pressure / no pressure; thermal metamorphism	any 2	
		(iii)	altered / changed area of (country) rock / baked; by heat from intrusion / by contact / thermal metamorphism	1 1	NOT 'metamorphism' as 'altered' as this is given in the question
		(iv)	lower thermal conductivity of sandstone / shale conducts heat better / sandstone requires higher temperature to metamorphose / shale requires lower temperature to metamorphose / variation in dip of contact steeper to the north	1	
		(v)	C= spotted rock / andalusite slate / spotted slate D= hornfels E= marble F = metaquartzite / quartzite	1 1 1 1	Allow 'spotted shale'

	(b)	(i)	5-6 points plotted correctly 7-8 points plotted correctly line drawn correctly	1 1 1	
		(ii)	1.2 x10^{5}yr	1	
		(iii)	370^{0}C /1.2 x10^{5}yr = 0.000308 / 308x10^{-6} ^{0}C per year	1 1	Allow rounding from 0.0003 to 0.00031 / Units must be in ^{0}C per year
		(c)	the rate would be slower / take longer to cool	1	
			Total	**17**	

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	H altered country rock above and below / included fragments from overlying shale / rock	1 1	Reasons must relate to sill
		(ii)	detached / derived from country rock / included in igneous rock / country rocks invaded by igneous rock / fragment of earlier solidified portion of igneous rock having slightly different composition.	any 2	
		(iii)	small holes / cavities / found in lavas / produced by gas bubbles trapped when lava solidified.	1	NOT 'trapped air'
		(iv)	G erupted at surface / extrusive but H did not /intrusive; pressures are lower at surface; allowing bubbles to rise to top of lava flows / AW	any 2	
		(v)	weathered on exposure to atmosphere; at the surface; contain minerals rich in iron; oxidised / oxidation of iron produces red (rusty) colour; soil formation / laterite	any 2	
	(b)	(i)	baked margin(s)	1	
		(ii)	heat from an igneous body recrystallises country rocks/ heat from an igneous body alters country rocks / contact metamorphism causes alteration of country rocks	1	NOT 'change in temperature'
	(c)	(i)	cuts across beds / bedding planes	1	

		(ii)	follows the beds	1	
		(iii)	J = transgressive sill K= sill L= dyke M= batholith 1 name correct = 1 2 names correct =2 3 or 4 names correct =3 concordant / discordant / discordant correct ecf	 3 1	If ticks in both columns NO MARKS
			Total	**17**	

Question			Expected Answers	Marks	Additional Guidance
4			breakdown / decomposition of rocks and minerals; in situ / in place / without transportation involving chemical, mechanical and biological processes;	any 2	
				Max 2	
			hydrolysis decomposition and reaction with water; feldspars break down to form clay; silica insoluble residue ; salts (of K, Na or Ca) in solution	any 3	
				Max 3	
			carbonation rainwater containing CO_2 becomes (carbonic) acid; it reacts with carbonates; dissolves limestone; to form soluble hydrogen carbonates / $Ca\,CO_3 + H^+ + HCO_3^- \rightarrow Ca^+ + 2HCO_3^-$	any 3	
				Max 3	
			exfoliation separation of surface layers of rock; by thermal expansion and contraction / expansion due to pressure release environments with wide diurnal temperature range / erosion of overlying strata pressure release on erosion of overlying strata; onion skin weathering	any 3	
				Max 3	
			frost shattering water enters fractures in rock; freezing causes expansion / water increases in volume / expands when frozen; pressure forces rock apart; breaks fragments away from rock	any 3	

				Max 3	
			Diagrams marked as text		
			Processes	Max 7	Max 7 if weathering defined and only 2 processes described
				8	
			Answers are structured clearly and logically, so that the candidate communicates effectively, uses a wide range of specialist terms with precision and spelling, punctuation and grammar are accurate.	2	QWC
			There are shortcomings in the structure of the answer, however, the candidate is able to communicate knowledge and ideas adequately, a limited range of specialist terms are used appropriately and spelling, punctuation and grammar are generally accurate with few errors.	1	
			There are severe shortcomings in the organisation and presentation of the answer, leading to a failure to communicate knowledge and ideas. There are significant errors in the use of language, spelling, punctuation and grammar which makes the candidate's meaning uncertain.	0	
			Total	**10**	

2833 Economic and Environmental Geology

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I = ignore
R = reject

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Question			Expected Answers	Marks	Additional Guidance
1	a	i	built on different rock types – differential settling / different hardnesses / strength (1) built on a fault – zone of weakness / may move / may have earthquakes / may reactivate(1) (dipping) beds of sandstone and conglomerate – may get slippage along bedding planes / may be unstable (1) sandstone / conglomerate will have low load bearing strength (if poorly consolidated / uncemented) / weak (1) foliated schist – may get slippage along foliation / cleavage planes (1)	any 2	**not** discussion of permeability /porosity **not** discussion of landslips / stability of valley sides
		ii	(leakage may occur along) fault plane / fault is zone of permeability (1) (leakage may occur through permeable) sandstone / conglomerate (1) (leakage may occur along) bedding planes (1) (leakage may occur along) joints / foliation in schist (1)	any 2	
		iii	water adds weight / increases (hydrostatic) pressure / increases pore fluid pressure / rocks become saturated / waterlogged / absorb water / water acts as a lubricant / causes loss of friction / loss of cohesion / reduces brittle failure limit	any 2	**not** reactivation of fault unless reason given
	b	i	unconformity drawn correctly (1) permeable / suitable named rock drawn / labelled / water percolating through rock above unconformity (1) impermeable / suitable named rock drawn / labelled below unconformity (1) spring labelled in correct position / at boundary of two rock types (1) water table drawn in correct position (1)	any 3	**allow** if permeable rock above impermeable but no unconformity (1)
		ii	rocks act as a natural filter / water contains dissolved minerals / water has not been treated with chemicals / water is not chlorinated	1	**allow** rock cleans or purifies water **not** water is not polluted / contaminated **allow** ORA
	c		renewable – water is recharged / replenished (by rainfall) / goes round the water cycle / can be used again within relatively short time scale (1) sustainable – provided rate of use or extraction does not exceed rate of recharge or replenishment / provided the water can be cleaned and reused (1)	2	**allow** AW
			Total	**12**	

Question			Expected Answers	Marks	Additional Guidance
2	a	i	iron ore minerals / magnetite are dense / heavy / high temperature / crystallise early (1) basic magma is fluid / has a low viscosity (1) iron ore minerals / magnetite sink through magma / undergo gravity settling / magmatic segregation / differentiation / fractional crystallisation (1) magnetite forms a cumulate layer at the base of the intrusion (1)	any 2	
		ii	use of a (proton) magnetometer (1) detects variations / anomalies in Earth's magnetic field (1) results plotted on a map / lines joining points of equal magnetic field strength / used to delineate size of ore body (1) iron / magnetite is magnetic / gives (positive) magnetic anomaly (1)	any 2	
		iii	shaded area across the hillside, immediately overlying and / or downhill of the magnetite layer (1)	1	anomaly must go across the hillside to a reasonable extent
		iv	iron ore minerals / magnetite will be weathered / eroded from magnetite rich layer (1) weathered material will move / be transported downhill (1) soils immediately overlying and/or down slope of magnetite rich layer / target will have anomalous values (1) soils upslope of magnetite rich layer / target will have background / normal values (1)	any 2	**not** magnetite is in soil without an explanation
	b	i	in plunge pool of waterfall (1) immediately upstream of dyke projecting into river bed (1)	2	if shading at more than 2 sites allow 1 mark max
		ii	cassiterite is dense / heavy / has a density of 7g/cm^3 / hard / has a hardness of 7 / insoluble / chemically unreactive / inert (1)	1	
		iii	(exposed) mineral veins at surface undergo weathering / erosion (1) ore minerals are separated from gangue minerals into individual grains (1) ore minerals are transported downstream / in water (1) the current velocity / flow slackens at the sites of deposition (1) there is insufficient energy for the ore minerals to continue to be transported / they are preferentially deposited (1)	any 2	**not** any repetition of density or hardness from (ii)
			Total	**12**	

Question			Expected Answers	Marks	Additional Guidance
3	a		100 / 2 = 50 °C / km	1	
	b	i	(ground)water is heated by hot rocks / magma / radioactive decay of minerals / Earth's internal heat energy (1) hot groundwater is trapped in permeable rock / aquifer below impermeable rock (1) (cold water is pumped down and) hot water / steam rises / is pumped up (1) rocks can be artificially fractured to increase permeability (1) water is re-injected into the ground to maintain the pressure (1) hot water / steam is passed through a heat exchanger / turbine (1)	any 2	
		ii	water is acidic / corrosive / corrodes pipes / dissolved ions / salts are precipitated / crystallise / block pipes (1)	1	
	c	i	lignite / brown (coal) (1) bituminous (coal) (1)	2	peat → lignite → bituminous (coal) → anthracite **allow** 1 letter incorrect in spelling
		ii	name – compaction / diagenesis / lithification / coalification (1) description – peat is compressed / squeezed by weight of accumulating sediments / overburden / load / (confining) pressure / during burial (1)	2	description must give reason
		iii	carbon content increases (1) fossils are destroyed (1) amount of water decreases (1) percentage of volatiles / any correctly named gas decreases (1) hardness increases (1) density increases (1) colour gets darker / reflectance increases (1) calorific value / the amount of energy produced when burnt increases (1) ash / waste gases produced on burning decreases (1)	any 2	

3	d	i	originates as plankton / free-floating marine micro organisms (1) requires reducing / anoxic / anaerobic conditions (1) low energy environment (1) burial / compaction occur (1) role of (anaerobic) bacteria causing partial decay (1) the plankton is converted to sapropel / kerogen / hydrocarbons (1) requires temperatures of 50 to 200ºC (oil window) (1) at temperatures of 100 to 200°C oil is converted to gas (1) the petroleum takes time to mature / maturation occurs (1)	any 2	
		ii	reservoir rock - highly porous (and permeable) rock containing oil and gas / rock capable of storing oil and gas (1) cap rock - impermeable rock above reservoir rock / prevents oil and gas migrating / escaping (upwards) (1)	2	
	e		labelled diagram and / or descriptions of trap structures: anticline; fault; salt dome; unconformity; lithological – reef / wedge-edge / channel fill / pinch out for each trap structure mark labels as text: correct named / labelled / drawn trap structure (1) cap / impermeable / suitable named rock in correct position (1) reservoir / permeable / suitable named rock in correct position (1) oil / gas in correct position and horizontal (1)	7	maximum of 3 traps – if more than 3 award marks for best 3. any 3 for each trap maximum 3 marks per trap (labelled diagram / description of each trap) max 2 marks per trap if no diagram
			Total	**21**	

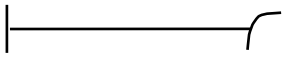
2834

Question		Expected answers	Marks
1	(a) (i)	mollusca / mollusc	1
	(ii)		

fossil	fossil group
A	gastropod
B	belemnite / belemnoidea / coleoid / cephalopod

			1
			1
	(iii)	guard – any part of fossil B on right, **not** phragmocone;	1
		apical angle – top of fossil A, indicated as an angle;	1
		columella – inside body of fossil A	1
	(iv)	swam in water column / nektonic / pelagic; moved by jet propulsion; used tentacles / similar to present day cuttle fish / squid / octopus; fed by active hunting /catching food / predator	Any 2
	(b)(i)	C – (free) cheek / genal spine;	1
		D – pygidium;	1
		E – pleuron / thoracic segment / (jointed) leg	1
	(ii)	animals moulted when alive / ecdysis; segments separate during moulting; has many segments in thorax / has cephalon, thorax, pygidium; muscles that hold segments together rot / disarticulate; fragmented due to transport / currents after death / brittle / may be scavenged; chitinous and so are not as resistant / not made of calcite / aragonite	Any 2
	(iii)	(many) legs or pleura; walking on substrate large compound eyes (on top of body); 360 degree vision / good all round vision on substrate / for active hunting wide cephalon / flattened / streamlined / genal spine; don't sink into sediment (dorsal) exoskeleton; protection from predators above flexible / articulated thorax; enrolment for protection sensory pits /cephalic fringe; allow detection of food in deep / dark water mouth on underside / had gnathobases; allows grazing / scavenging on sea floor answers in pairs, each pair 2 marks	4
			Total **17**

Question	Expected answers	Marks
2(a)(i)	umbilicus – zone excluding last whorl - labelled on left view of fossil;	1
	keel – ridge on venter - labelled on right view of fossil;	1
	sulcus – groove in venter - labelled on right view of fossil	1
(ii)	any relevant label (eg rib, protoconch, venter, body chamber, one whorl, aperture, evolute coiling) **not** growth line; **not** septum	1
(b)(i)		

suture type	geological range	suture diagram	
nautiloid	Cambrian to Recent		1
goniatitic	Devonian to **Permian**		1
ceratitic / ceratite	Carboniferous to Triassic		1
ammonitic / ammonite	Permian to **Cretaceous / K-T boundary**		2

missing answers in bold

(ii)	increase strength / increased habitation of niches / exploit new environments / greater depth range	1
(c)(i)	fallout from higher in water column / don't live on bottom; bottom anoxic / reducing / anaerobic; idea of sulphur / bacteria; low energy / not broken up; iron-rich / organic sediment / iron-rich water;	Any 2
(ii)	deposited in older sediments / made of resistant material; weathered / eroded / transported; deposited in new / younger sediments;	Any 2
(iii)	rocks may appear <u>older</u> / fossil is from an <u>older</u> time period / suggests fossil is <u>younger</u> than it is / AW	1
		Total **15**

Question Expected answers **Marks**

3(a)

information	fossil type		
composed of calcium carbonate	brachiopod	bivalve	**both**
has a pedicle foramen	**brachiopod**	bivalve	both
line of symmetry is normally along the hinge line, between the two valves	brachiopod	**bivalve**	both
has a lophophore to feed	**brachiopod**	bivalve	both
has growth lines and ribbing	brachiopod	bivalve	**both**
usually has two valves of even size	brachiopod	**bivalve**	both

one mark per row 5

(b)(i) recognisable drawing of internal morphology of burrowing bivalve; 1
correct labels of left valve / right valve / pallial line / dentition / teeth and sockets / pallial sinus / (adductor) muscle scars / siphons / foot / shell thickness / ligament / hinge line Any 3
max 2 for labels if contradictions

(ii) uses (muscular) foot / foot probes down into sediment / foot swells;
adductor muscle contracts / valves close / squeezes water out of shell / expelled water liquefies sediment;
foot retracts / contracts and shell moves down / foot pulls shell down; Any 2

(iii) extend siphons up the burrow;
inhalant siphon takes in currents of water / particles;
exhalent siphon takes out waste;
particle feeder / filter feeder / **not** filtering food from sediment;
extraction of particles in gills Any 2

(c)(i) soft substrate (fine sediment)
suitable labelled diagram of correct bivalve (eg *Gryphaea, Pecten, Spondylus, Cardium*)
suitable adaptation described;
detail of adaptation / reason for adaptation 3

(ii) hard substrate (rock)
suitable labelled diagram of correct bivalve (eg *Mytilus, Ostrea, Pholas*)
suitable adaptation described;
detail of adaptation / reason for adaptation 3

Total **19**

Question	Expected answers	Marks
4 (a) (i)	100% = 0 / 50% = 1250 / 25% = 2500 / 12.5% = 3750 / 6.25% = 5000 5 points plotted correctly = 2 marks; 3 points plotted correctly = 1 mark curve of best fit passing through correct plotted points = 1 mark	3
(ii)	400 Ma +/- 50Ma / correct from student graph ecf must have correct units	1
(iii)	Time taken for <u>half</u> <u>parent</u> (atoms/isotopes/elements) to decay	1
(iv)	$^{238}U - ^{206}Pb$ / $^{235}U - ^{207}Pb$ / $^{87}Rb - ^{87}Sr$ ignore mass numbers	1
(b) (i)	<u>absolute dating</u> method gives rise to a number / exact date / precise date / age in millions of years / uses radiometric / half lives / isotopic methods;	1
	<u>relative dating</u> method does not give rise to a number / gets things in right order / chronological order / says which things are older / younger / described example of relative dating	1
(ii)	all deposited at the same time / idea of an event horizon / chronostratigraphy; deposited quickly / short lived event; global event / widespread event; can be radiometrically dated / gives absolute age; each ash fall has unique chemistry / has same composition	Any 2
(c)	meterorite impact; causing change in climate / fires / impact winter / tsunamis volcanic activity; causing change in climate / volcanic winter / changes in water chemistry formation of super continent / named super continent / increased activity at ocean ridges; causes sea level variation / limits shelf environments for diversity / affects ocean circulation ice age / snowball Earth / greenhouse Earth; animals or plants cannot live / rising or lowering of sea levels / restriction of continental shelf / anoxic ocean water allow any other plausible explained event any two pairs for 2 marks (description and explanation)	4
		Total **15**

Question		Expected answers	Marks
5(a)	**1**	labelled / named diagram of pendent form, eg *Didymograptus*	1
	2	labelled / named diagrams of horizontal / reclined / mixed / complex forms, eg *Dicellograptus* or *Didymograptus*	1
	3	labelled / named diagram of scandent form, eg *Monograptus*	1
	4	labelled diagrams to show difference between uniserial and biserial forms	1
	5	diagrams of thecal shape	1
		diagram marks max 5	
		no marks for dendroids	
	6	early forms Ordovician / range Ordovician - Silurian	1
	7	general evolution from forms with more stipes (and many individuals) to forms with few or only one stipe (and very few individuals)	1
	8	early forms had numerous stipes, eg *Tetragraptus*	1
	9	later forms single stipe, eg *Monograptus*	1
	10	later forms / *Monograptus* are Silurian	1
	11	early forms pendent, eg *Didymograptus* / stipes evolved from pendent to scandent	1
	12	change to reclined or horizontal forms, e.g. *Dicellograptus*	1
	13	complex forms of curves and spirals, e.g. *Cyrtograptus*	1
	14	change to mixed forms, e.g. *Dicranograptus* or scandent forms	1
	15	general evolution from uniserial to biserial back to uniserial	1
	16	early forms uniserial, e.g. *Tetragraptus, Didymograptus*	1
	17	change to biserial single-stiped form, e.g. *Diplograptus*	1
	18	late forms / Silurian forms are uniserial, e.g. *Monograptus*	1
	19	general evolution from simple thecae to complex thecae	1
	20	detail of simple / sigmoidal / hooked / isolated theca / details of thecal shapes	1
	21	3 or more correctly named genera	1
		if list / diagrams only = max 6	
		no diagrams = max 10	
		Total **12**	

Question	Expected answers	Marks
5(b)	**Regular** **versus** **Irregular**	
	Morphology	
1	hemispherical / dome shape test vs. heart-shaped test / high point to posterior	1
2	radial / 5 fold vs. bilateral symmetry	1
3	periproct / anus on top / in apical system vs. anus posterior / moved out of apical system	1
4	no subanal fasciole vs subanal fasciole / cilia developed to waft waste away	1
5	peristome / mouth central on oral surface vs. mouth moved towards anterior	1
6	mouth has jaws / Aristotle's lantern vs. mouth has no jaws	1
7	no labrum / lip vs. mouth with labrum / lip	1
8	no anterior groove vs. anterior groove	1
9	large spines vs. short / no spines	1
10	large tubercles / bosses vs. none	1
11	no plastron vs. plastron	1
12	extended ambulacra vs. petaloid ambulacra	1
	Mode of life	
13	benthonic epifaunal / vagrant vs. infaunal / burrower	1
14	grazer / scavenger vs. filter feeder	1
15	rocky shore / high energy dweller vs. soft sediment / low energy dweller	1
16	spines for locomotion / defence vs. short spines for digging	1
17	examples of difference in use of tube feet between the two forms	1
18	waste dispersed on surface vs. sanitary burrow	1
	Age	
19	Palaeozoic / mainly Carboniferous / Palaeozoic to present vs. Mesozoic to present	1
	labelled diagrams to illustrate the two forms	max 5
	mark labels as text no diagrams max 10	
		Total **11**

Quality of written communication

2 marks	Answers are structured clearly and logically, so that the candidate communicates effectively, uses a wide range of specialist terms with precision and spelling, punctuation and grammar are accurate.
1 mark	There are shortcomings in the structure of the answer, however, the candidate is able to communicate knowledge and ideas adequately, a limited range of specialist terms are used appropriately and spelling, punctuation and grammar are generally accurate with few errors.
0 marks	There are severe shortcomings in the organisation and presentation of the answer, leading to a failure to communicate knowledge and ideas. There are significant errors in the use of language, spelling, punctuation and grammar which makes the candidate's meaning uncertain.

max 2

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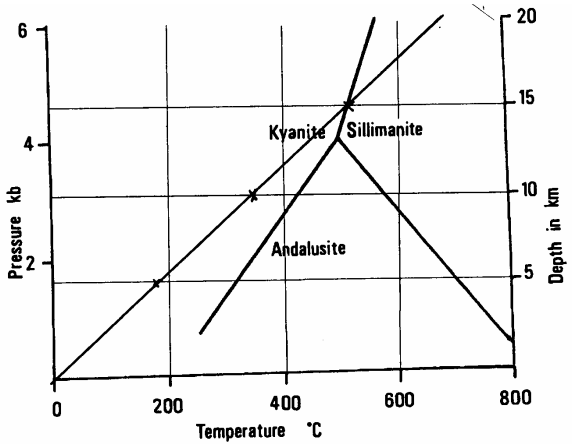
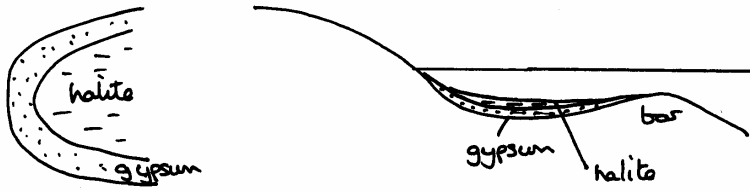
Question	Expected answers	Marks
1(a) (i)	A shale	1
	B slate /	1
	Slate to phyllite / slate to s chist or any correct sequence Max 1	
(ii)	compaction / *compression of sediment* weight of overlying sediment / *load pressure* *reduction in pore space*	Any 2
(iii)	temperature / *heat* / directed stress	1
(b)	diagenesis is low T and P / less than 2 kb and less than 200°C	1
	metamorphism higher T and P	1
(c) (i)	polymorph	1



(ii)	clay *mineral* / named clay mineral illite / kaolinite / montmorillonite	1
(iii)	500°C *(+/- 10)* and 4 kb	1
(d) (i)	line correct plotted through 175 at 5km, 350 at 10 km 525 at 15 km	1
(ii)	kyanite and sillimanite *Allow ecf on d (i)*	1
(iii)	(kyanite) in schist and (sillimanite) in gneiss these are regional metamorphism / index minerals med to high temp and pressure *Allow ecf on d (ii)*	Any 2

(e)		water is produced as the muscovite breaks down / muscovite is a hydrated mineral / *muscovite is dehydratated* *water is driven off* water is a volatile / gas / escapes / moves through cracks in lattice structure *composition of rock is changed and cannot change back / system is open / water not available to re-react*	Any 2
(f)	(i)	mylonite / cataclastic rock / *fault breccia*	1
	(ii)	high pressure along fault / thrust planes crushed minerals / ground up rock / *rock flour* frictional *heating* / recrystallisation *minerals stretched at right angles to maximum stress*	Any 2
			19
			Total **19**

Question	Expected answers	Marks
2(a)(i)	C – arkose / *feldspathic sandstone*	1
	D – chalk	1
	E – coal (bituminous)	1
(ii)	alluvial fan / fluvial / high energy / *flash floods*	1
	close to source / rapid deposition / before weathering causes potash feldspar to break down / *short transport history*	1
	Allow ecf from (a) (i)	
(iii)	delta / rapid growth of vegetation / equatorial conditions / *swamp*	1
	anaerobic conditions / rapid burial	1
	Allow ecf from (a) (i)	
(b)	quartz no cleavage calcite 3 sets of cleavage	
	quartz hexagonal / t*riclinic* crystals drawn and labelled with name	
	calcite rhombohedral drawn and labelled with name / *dogtooth / nailhead*	
	conchoidal fracture on quartz crystals not calcite	Any 2
	Written comparison max 1	
(c)	F – gypsum / *selenite*	1
	G - halite	1
(d)(i)	evaporation of sea water	
	water is super saturated with salts / *dense brine / increased salinity*	
	(gypsum is) precipitated first as least soluble	
	(halite) later as more soluble	
	sea water within basin is more saline	
	diagram of basin	
	calcite – gypsum – halite – K salts *(2 in sequence)*	Any 4



labelled diagram max 3 no diagram max 3

(ii)	calcite – gypsum – halite – K salts	
	water evaporates and sequence of salts is precipitated	
	evaporites covered by sediment	
	new sea water enters and cycle restarts	Any 2
	No repetition with (i)	
(iii)	indicate hot / tropical conditions / *arid / desert*	1
	rate of evaporation exceeds precipitation	1
	General statement for conditions = Max 1	
	do not allow lists	**19**
		Total **19**

Question	Expected answers	Marks
3(a)(i)	200 m +/- 30m (150m is incorrect)	1
	largest crystals here / cooled from bottom up and top down so last cooled in the centre / *last cooled area cools slowly / area is well insulated*	1
(ii)	olivine crystallised early / at high temps / *olivine is at top of B.R.S.* crystals are dense sink by gravity settling	Any 2
(iii)	fine grained – basalt	1
	rest – dolerite / gabbro	1
(iv)	quartzite / metaquartzite	1
(b)(i)	iron and magnesium used / richer in olivine layer rest of magma depleted in Fe and Mg fine grained chilled margin original composition of magma detail using magmatic differentiation to explain changes	Any 2
(ii)	olivine is mafic so less silica / olivine uses up little silica	1
(iii)	requires long period of <u>time</u>	1
	thin sill <u>cools quickly</u> so no time for fractionation / gravity settling	1
(c)	most Na rich at 200 m / last formed Ca rich in rest of sill explanation of Continuous Reaction part of Bowens Reaction Series / *Ca rich Plagioclase at high temperatures, Na rich at low temeperatures*	Any 2
		14

Total **14**

Question	Expected answers	Marks
4(a) (i)	clay is rock flour / *material is till (boulder clay) deposited as moraine* deposited by ice sheet / *glacier* ice carried boulders as erratics *material carried by / in ice all deposited together*	Any 2
(ii)	sands deposited as fluvioglacial / *fluvial* / *river* deposits braided channels *point bars on inside of meander bend* high energy with currents for cross bedding / changing energy water is meltwater from ice and rivers sort the moraines fine grained sands reworked by the wind if separate correct statements for J and K then 1 for each	Any 2
(iii)	varves seasonal deposits silts in spring with meltwater, clay in summer deposition in lake *OR* *deposition on flood plain of river / lower course* *repeated flooding* *silts, followed by clay*	Any 2
(iv)	*chronostratigraphic correlation:* *each layer represents one year (so can count and match year)* *OR* *lithostratigraphic correlation:* *matching same sequence / sequence of bed*	1 1 1 1
(b)(i)	striations are scratches formed as ice <u>containing rocks</u> moves over surface	1
(ii)	sandstone and shale are local Silurian rocks others are from a distance but all picked up by ice carried by ice and deposited together / *erratics*	Any 2
(c) unsuitable	clay has low load bearing strength sands are poorly consolidated whole sequence is weak sandstones may be porous / permeable	Any 2
suitable	excavate all glacial deposits (H – L) Silurian sandstone has a high bearing strength	1 1
		13
		Total **13**

Question	Expected answers	Marks	
5(a)	Describe the acid igneous rocks in terms of mineral composition and texture. Explain the origin of the acid igneous rocks at destructive plate boundaries.		
	Acid rocks mineral composition		
	rich in quartz	1	
	contains Na rich plagioclase	1	
	contains K feldspar / *potash feldspar / orthoclase feldspar*	1	
	contains mica (muscovite or biotite)	1	**max 3**
	Acid rocks texture		
	equigranular glassy, fine grained, medium grained, coarse grained	1	
	vesicular / amygdaloidal	1	
	flow banded	1	
	Porphyritic	1	
	poikilitic	*1*	**max 3**
	Origin of acid rocks		
	at continental-continental margins	1	
	partial melting at base of continental crust	1	
	magma moves up by diapiric action / *magma less dennse*	1	
	granite batholiths / plutons	*1*	
	partial melting due to depth of base of crust being below the 800°C thermal line	1	
	labelled diagram	1	
	at oceanic-continental margins	1	
	subducting oceanic plate *<u>partially</u>* melts	1	
	rising magma (at 1200°C)	1	
	causes melting of continental crust	1	
	acid magma made by differentiation of magma / assimilation	*1*	
	detail of any differentiation process	*1*	
	granite batholiths / plutons	*1*	
	rhyolite volcanoes	*1*	
	tuffs / agglomerate / pyroclastic flow deposits from volcanoes	*1*	
	labelled diagram	1	
			max 6
		diagrams as text	**11**

Question	Expected answers	Marks
5(b)	Explain the origin of two sedimentary structures that can be used as palaeocurrent indicators and two different sedimentary structures that can be used as way up indicators. Use diagrams to illustrate your answer.	
	palaeocurrent indicators possible are cross bedding, flute casts, imbricate structure, *tool marks, asymmetric ripples*	
	for each structure: 1 mark for correct choice and basic origin	1
	1 mark for origin detail / second point	1
	1 mark for labelled diagram	1
	cross bedding forms in rivers / sea / desert	1
	migration of front in direction of current and down current side only preserved	1
	diagram showing cross beds and current	1
	flute casts form where turbidity currents flow	1
	scouring by base of turbidity current causes hollow filled in by sediment	1
	diagram showing current and shape of flute casts	1
	imbricate structure forms in high energy currents	1
	pebbles all lined up by current	1
	diagram showing current and aligned pebbles	1
	tool marks *form where turbidity currents flow*	*1*
	mark made by object carried by current often v shaped	*1*
	diagram showing tool mark and current direction	*1*
	assymetric ripples *form in rivers / sea / desert*	*1*
	represent unidirectional current, steep slope is downcurrent	*1*
	diagram showing asymmetric ripple and current	*1*
	way up indicators possible are graded bedding, cross bedding, flute casts, ripple marks, desiccation cracks, *load casts, burrows* etc	
	for each structure: 1 mark for correct choice and basic origin	1
	1 mark for origin detail / second point	1
	1 mark for labelled diagram	1
	graded bedding forms where particles settle out in water	1
	large dense grains settle out faster fine grains last	1
	diagram to show arrangement of coarse / fine grains	1
	desiccation cracks form in hot, arid areas where evaporation is high	1
	mud dries out, cracks open and sediment infills	1
	diagram to show V shaped cracks wider at top	1
	load structures *form as a result of turbidity currents*	*1*
	dense wet sand sinks into lesss dense mud	*1*
	diagram to show load structure with sand into mud	*1*

	burrows *form as a result of biogenic action*	*1*
	organisms disturb sediment and destroy other structures	*1*
	diagram showing burrows with characteritic U shape	*1*
		12

QWC

2 marks	Answers are structured clearly and logically, so that the candidate communicates effectively, uses a wide range of specialist terms with precision and spelling, punctuation and grammar are accurate.
1 mark	There are shortcomings in the structure of the answer, however, the candidate is able to communicate knowledge and ideas adequately, a limited range of specialist terms are used appropriately and spelling, punctuation and grammar are generally accurate with few errors.
0 marks	There are severe shortcomings in the organisation and presentation of the answer, leading to a failure to communicate knowledge and ideas. There are significant errors in the use of language, spelling, punctuation and grammar which makes the candidate's meaning uncertain.

Total **25**

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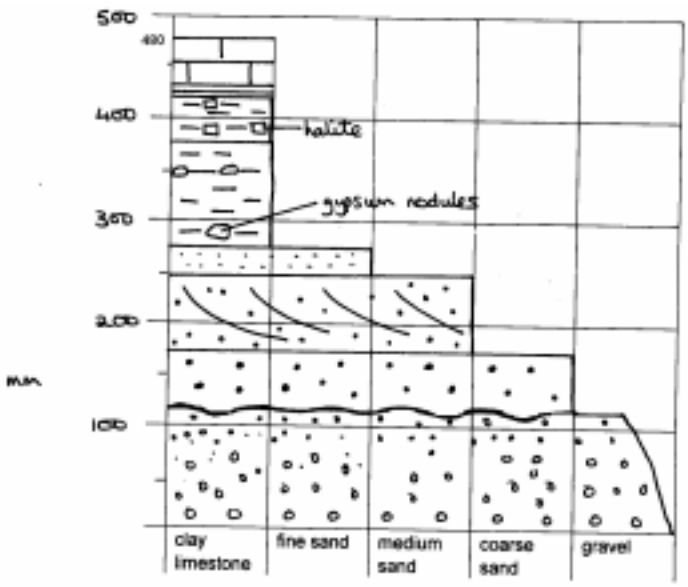
Question	Expected answers	Marks
1(a) (i)	edge of sandstone or edge of conglomerate NOT a single point	1
(ii)	synform / syncline asymmetrical / one limb dipping at 39° S and the other 31° or 32° N axial plane trending W – E plunging to the east	Any 3
(b)	law of <u>cross cutting</u> relationships	1
(c)	sandstone NOT calcareous all other beds are well cemented / impermeable / sandstone is porous / permeable / water is stored and passes through OR well cemented limestone 1 may be well jointed making it permeable 1	1 1
(d)	siltstone, calcareous sandstone and shale were laid down folded into a syncline plunging to the east by second period of folding fault Y cuts the beds fault X downthrows to west / normal or vertical fault erosion and uplift / unconformity conglomerate and limestone laid down rocks tilted 5° / to the east / caused fold plunge fault Z occurred erosion and uplift / unconformity sandstone laid down horizontally	Any 8
	If reverse order or list max 4	
	QWC1	
		Total **16**

QWC

1 mark	The candidate is able to communicate knowledge and ideas adequately, specialist terms are used appropriately and spelling, punctuation and grammar are generally accurate with few errors.
0 marks	There are severe shortcomings in the organisation and presentation of the answer, leading to a failure to communicate knowledge and ideas. There are significant errors in the use of language, spelling, punctuation and grammar which makes the candidate's meaning uncertain.

Question	Expected answers	Marks
2 (a)	dyke drawn correct orientation and correct scale +/- 2mm	1
	both chilled margins drawn inside of dyke to correct scale +/- 1mm	1
	dip arrow NE 23° and youngest bed in NE corner	1
(b) (i)	finer crystals	1
(ii)	steady cooling contraction / shrinkage on cooling cooling around centres tensional forces pulling inwards or labelled diagram	Any 2
(c) (i)	A augite / pyroxene	1
	B plagioclase (feldspar)	1
(ii)	porphyritic	1
(iii)	large crystal / phenocryst crystallised first / cooled slowly finer crystal / ground mass cooled last / more quickly 2 stages of cooling	Any 2
(d) (i)	amygdaloidal texture	1
(ii)	holes / vesicles in cooling lava infilled with white mineral / secondary precipitated from groundwater	Any 2
		14

Question	Expected answers	Marks
3(a)	beds may be plotted to right hand edge of log grid or centre of each grid	
	vertical scale correct with all beds plotted correct thickness	2
	vertical scale correct with 4+ beds plotted correct thickness	1
	horizontal scale of grain size all beds plotted correct	2
	horizontal scale of grain size 4+ beds plotted correct	1
	symbols for beds 1 / symbol cross beds / uneven sandstone base / gravel fining up symbols for beds / symbol cross beds / uneven sandstone base / gravel fining up 4+	1
		max 6



if sequence inverted max 3 marks
if no beds but in blocks max 2 for scale and symbols

(b) **coarse gravel** – fluviatile / river / channel deposit / wadi and fast flowing / high energy / rapid deposition when energy drops / coarsest particles dropped first by flash flood

coarse sandstone alluvial fan / fluviatile / river / channel deposit with erosional base / wadi and fast flowing / high energy with rapid deposition / flash flood

medium sandstone in sand dunes / migrating shown by large scale cross bedding / wind blown / aeolian / red colour indicates arid / terrestrial

fine sandstone in rivers / fluvial / lake / shallow sea shown by mica

clays in playa lake / shallow sea / lagoon / barred basin deposited from suspension / low energy deposition

evaporites of gypsum and halite formed by evaporation / arid environment / detail of pseudomorphs evaporation and rise in water level dissolving and infilling

black shale– marine / low energy anaerobic to form pyrite / suitable for fossils

limestone – shallow sea / clear sea no sediment / suitable for fossils

general statements
whole sequence is fining up so decrease in energy
max 2 marks for energy level 1 for high in correct bed and 1 for low in correct bed
a second mark for detail on any one environment — Any 6

reverse order max 3 but ecf from (a)

QWC 1

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QWC

1 mark The candidate is able to communicate knowledge and ideas adequately, specialist terms are used appropriately and spelling, punctuation and grammar are generally accurate with few errors.

0 marks There are severe shortcomings in the organisation and presentation of the answer, leading to a failure to communicate knowledge and ideas. There are significant errors in the use of language, spelling, punctuation and grammar which makes the candidate's meaning uncertain.

Question	Expected answers	Marks
4(a)	beds and bedding planes plane of unconformity / erosion surface unconformity 4° - 10° joints angular boulders / pebbles / breccia / poorly sorted red sandstone / laminations dip of red sandstone beds 15° - 24° if no dip measurement then max 3	Any 4
(b)	rock: (fault) breccia (not mylonite)	1
	rocks crushed between fault surfaces white mineral deposited from hydrothermal fluids / groundwaters mineral cements rock fragments together / chemical weathering / oxidation forms red brown colour ecf	Any 2
(c)	hardness testing; second mark for detail of scratched by copper coin for 3 if calcite and not if quartz reaction with acid calcite yes but other white minerals no presence of cleavage 3 sets for calcite and none for quartz any other suitable test – specific gravity	Any 2
	1 mark for each of two different methods described (one word answers max 1 for 2 methods) or 2 marks for one method if detailed egs used.	
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Question	Expected answers	Marks
5 (a) (i)	C brachiopod / spirifer	1
	D rugose coral / lithostrotian	1
	E crinoid	1
(ii)	limestone	1
(iii)	shallow seas / between 5 to 50 m / in the photic zone clear water / no terriginous sediment / no mud tropical / temperatures 25 - 28°	Any 2
(b)	shape as globose, involute / small umbilicus simple goniatitic suture rounded venter any ornament faint growth lines	Any 2
	can be both marks from labelled sketch or 1 for sketch and 1 for description	
		8

Grade Thresholds

Advanced GCE (Geology) (3884, 7884)
June 2008 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u
2831	Raw	60	42	36	31	26	21	0
	UMS	90	72	63	54	45	36	0
2832	Raw	60	48	42	36	31	26	0
	UMS	90	72	63	54	45	36	0
2833	Raw	120	97	85	73	61	49	0
	UMS	120	96	84	72	60	48	0
2834	Raw	90	67	58	50	42	34	0
	UMS	90	72	63	54	45	36	0
2835	Raw	90	59	51	43	36	29	0
	UMS	90	72	63	54	45	36	0
2836	Raw	120	97	85	74	63	52	0
	UMS	120	96	84	72	60	48	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
3884	300	240	210	180	150	120	0
7884	600	480	420	360	300	240	0

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
3884	17.7	40.3	61.3	79.1	91.5	100.0	1143
7884	25.8	50.1	72.8	88.9	97.2	100.0	839

1982 candidates aggregated this series

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

INSET events for new GCE Geology

- for first teaching from September 2008 -

Get Started – *towards successful delivery of the new specification*.

These **full day** courses will give guidance and support to those planning to deliver the new AS level Geology (H087) and A2 Geology (H487) specifications from September 2008.

AS Course dates and codes –

Wed 24 Sept 08	Southampton	OSCE101
Wed 1 Oct 08	London	OSCE102
Wed 8 Oct 08	Manchester	0SCE103
Wed 15 Oct 08	Birmingham	OSCE104

A2 Course dates and codes –

Wed 4 Feb 09	London
Wed 11 Mar 09	Leeds

Fee – £160 including refreshments, lunch and course materials. £190 if you book within 7 days of the course date.

Places may be booked on these courses using the booking form available on-line (http://www.ocr.org.uk/training/alevel_inset_training.html). Please quote the course code in any correspondence.

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