

Mark Scheme for June 2010

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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.

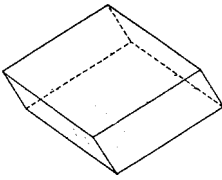
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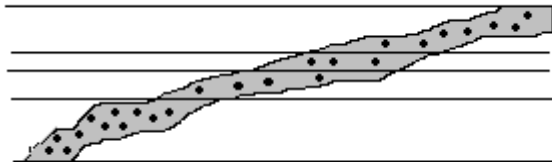

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Question	Expected answers	Marks
1 (a) (i)	A basic / mafic / correct rock name B acid / silicic / correct rock name C intermediate / correct rock name	3 correct 2 marks 1 or 2 correct 1 mark
(ii)	porphyritic basalt ecf	1 1
(iii)	large euhedral crystals / phenocrysts form first / cool slowly / at depth groundmass forms last / cools quickly / at surface two stages of cooling as a general point max 1 mark	1 1
(b)	quartz: hardness 7 / clear or grey crystals / vitreous or glassy lustre / no cleavage potash feldspar: hardness 6 / pink crystals / 2 sets of cleavage / twin crystal	1 1
(c)	A Ca rich / anorthite rich B Na rich / albite rich C equal Ca Na / andesine	3 / 2 correct 2 marks 1 correct 1 mark
(d)(i)	calcite	1
(ii)	1 mark for rhomb shape 1 mark for cleavage lines parallel to edges	1 1
		
(iii)	vesicular is holes in the rock where gas was trapped / <i>escapes</i> amygdaloidal is holes infilled later / after the rock formed / vesicles infilled / from groundwater diagram to show round / ellipsoid shapes with amygdales infilled and labelled <i>Diagrams marked as text</i>	1 1 1
	max 2 with no diagrams	
Total		16

Question	Expected answers	Marks
2(a)(i)	D – slate / <i>phyllite</i>	1
	E – marble	1
	F – gneiss	1
(ii)	impurities in the original limestone / parent rock chemical reaction as metamorphism occurs formation of new – green mineral / calc silicates / <i>wollastonite</i>	any 2
(iii)	high temperature and pressure conditions / high grade regional metamorphism deep in orogenic / fold mountain belt / at a destructive plate margin	any 2
(b)	red colour (green)/ crystal shape of cubic with corners removed / dodecahedron / hardness 7 / <i>can scratch glass</i>	any 1
(c)(i)	bar scale where 1 cm is 5 mm and 2 cm is 10 mm or scale of x 2	any 1
(ii)	G schist	1
	texture schistosity / porphyroblastic	1
(d)	H cataclasis	1
	J foliation	1
	K diagenesis	1
Total		14

Question	Expected answers	Marks
3(a)(i)	clear seas with no sediment / no terrestrial debris / far from land / no erosion / surrounded by deep water / <i>shallow water</i> warm / tropical / sub tropical water / water warm enough for calcium carbonate to precipitate out	1 1
(ii)	east is windward side so water is well oxygenated / upwelling of nutrients / wind brings in nutrients	1
(iii)	ooliths on shallow sea area / <10 m deep / around edge of platform / in high energy area / <i>high energy waves</i> strong currents or wave action rolls a sand grain / shell fragment CaCO ₃ accumulates in concentric layers around nucleus CaCO ₃ precipitated due to evaporation in warm, shallow sea	1 any 2
(b)(i)	evaporation	1
(ii)	halite M / potash salts anhydrite L / gypsum gypsum N / calcite 2 marks for correct sequence of letters M, L, N (all 3 correct) 1 mark for 2 or 1 correct	2
	OR 2 marks for correct salts potash / halite / anhydrite / gypsum / dolomite / calcite any 3 in right order	2
(c)	barred basin has restricted circulation sea water enters and evaporation occurs water becomes more saline so denser / salts concentrated in solution dense brine cannot go back across bar as water evaporates salts crystallise / precipitate out <i>least soluble crystallises first, most soluble last</i>	any 3
(d)	diagrams showing cubic salt crystals or cubic holes salt crystals form with cubic shape salt is dissolved out space infilled with sediment	1 any 2
Total		17

Question	Expected answers	Marks
4(a)	<p>P <u>well</u> rounded well sorted</p> <p>Q well rounded / rounded poor / moderate</p> <p>R sub rounded / <u>sub</u> angular poor</p> <p>1 – 2 = 1 Mark</p> <p>3 – 4 = 2 Marks</p> <p>5 – 6 = 3 Marks</p>	
(b)(i)	<p><i>desert / beach / shallow marine (descriptions need to match the environment) because</i></p> <p><i>quartz present / compositionally mature</i></p> <p><i>grains about 1 mm in size</i></p> <p><i>very well sorted</i></p> <p><i>well rounded</i></p> <p><i>texturally mature</i></p> <p><i>Marks are for reason NOT environment</i></p> <p><i>If incorrect environment allow Max 1</i></p>	any 2
(ii)	<p>marine because</p> <p>contains brachiopods which only live in the sea</p> <p>silt and mud matrix deposited in the sea</p> <p>well rounded but with poor to moderate sorting shows much transport</p>	any 2
(iii)	<p>fluvial / alluvial fan / turbidite / greywacke environment / deep sea because</p> <p>rapid deposition due to larger more angular grains / <i>short transport</i></p> <p>immature as composition of feldspar and rock fragments</p>	1 1
(c)(i)	<p>grains measure 1.3 or 1.4 mm so reading from graph</p> <p>max 20 – 30 (<i>within range</i>)</p> <p>min 9 – 13 (<i>within range</i>)</p>	1 1
(ii)	<p>taking 0.0003 grain size = 0.1 – 0.2 accept similar range for anywhere in clay silt area</p>	1
(d)(i)	<p>diachronous beds where a bed of sand cuts across time lines / fossil zones / where a bed is older in one place than in another / eg a sand bar moves through time – Bridport to Cotswold sand / Greensands</p> <p>diagram min 1 mark</p>	
	 <p style="text-align: right;">sand bed</p> <p style="text-align: right;">beds / time lines</p>	any 3
(ii)	<p>lithological variation / lateral change where one bed / time unit is a sandstone in one place but a clay elsewhere / where a bed changes rock type / sandstone washout in a coal seam</p> <p>diagram min 1 mark</p>	
	 <p style="text-align: right;">bed</p> <p style="text-align: center;">clay sand</p>	any 3
	<p><i>lateral change in grain size shown by turbite Max 1</i></p>	
		Total 18

5 (a) Describe the processes of differentiation by which a variety of rock types can be produced from a single parent magma.	Marks
gravitational settling/ magmatic segregation	1
minerals with highest temperature form first	1
minerals are denser than surrounding liquid therefore sink	1
known as cumulus crystals	1
form layer rich in this mineral at base	1
cumulate layer	1
remaining liquid depleted in early formed constituents	1
	max 5
fractional crystallisation	1
minerals form in a distinct order / crystallise in a distinct order known as Bowen's reaction series	1
olivine forms first on discontinuous side	1
later minerals become progressively richer in iron	1
Ca rich plagioclase forms first / becomes richer in Na	1
magma becomes more acidic / felsic	1
quartz is the last mineral to form	1
only forms if magma saturated in SiO ₂	1
2 distinct arms, discontinuous and continuous	1
case studies of Palisade or Skaergaard max 2	1
	max 7
Filter Pressing	1
mechanical squeezing of the melt	1
magma starts to crystallize with early formed crystals	1
melt squeezed, early formed crystals removed	1
left with magma depleted in early formed crystals	1
aplite veins are an example	1
	max 4
Assimilation / contamination	1
magma rises towards surface	1
melts (incorporates) some country rock	1
changes composition accordingly e.g. basic magma gains acid rock	1
incomplete assimilation shown by xenoliths	1
	max 4
Magma mixing	1
Process by which 2 magma sources mix	1
Gives rise to a magma of a different composition	1
Often leads to composite intrusions	1
	max 3
mark labelled diagrams as text	
Total	11

5(b) Describe how turbidite sequences and oozes form in deep marine basins. Marks

turbidite sequences

turbidity flows due to earth movements / sediment flows down continental slope / submarine avalanches / slides down canyons / into oceanic trench	1
speed of flow up to 100 km/h down slope / evidence of breaking cables	1
rapid deposition / rapid change in energy at foot of slope / on abyssal plain / on deep ocean floor	1
proximal deposits near foot of slope / high energy forms coarser and thicker deposits of greywacke	1
distal deposits further away on abyssal plain forms finer and thinner greywacke	1
flute casts and sole structures on base of greywackes	1
graded bedding in beds as grains settle out from turbidity flow	1
shales / fine grained sediments / mudstones / oozes/ finely laminated beds	1
anaerobic / anoxic / reducing conditions	1
fossils such as graptolites and pelagic trilobites possible in the shales	1
turbidite deposits form Bouma sequence / fining upwards sequence	1
	max 8

oozes

low energy conditions	1
sediment mainly falling from suspension/planktonic organisms forming calcareous oozes / mainly microfossils / lack of macrofossils	1
below carbonate compensation depth (5 km) no carbonate deposition	1
chalk, calcareous deposits form from foraminifera, coccoliths	1
siliceous deposition below CCD	1
siliceous oozes / radiolarian oozes / chert form from the remains of siliceous skeletons e.g. sponges, radiolaria some diatoms	1
lack of light / low biological activity / beneath photic zone so fossil only by sinking from surface waters	1
manganese nodules form by chemical reaction in sea water	1
wind blown / aeolian sediments or volcanic ash form red clay / bentonite clays	1
	max 8

Total 12

QWC 2

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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