

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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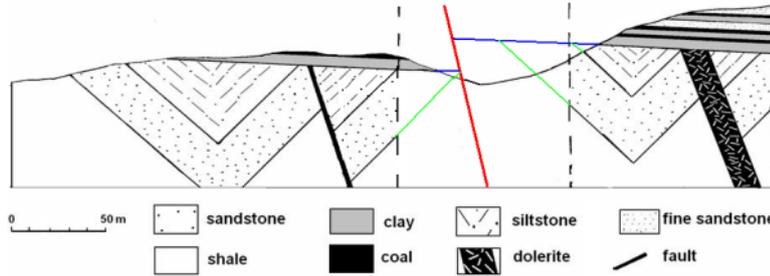
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Question	Expected answers	Marks
1 (a) (i)	unconformity at base of Triassic conglomerate/accept as a line or point outlier circular area in south with Triassic clays above conglomerate	1 1
(ii)	sill drawn – any width parallel to beds/min 2cms length (mark available if drawn either side or both sides of fault/ either one or two sills parallel)	1
(iii)	east / right side outcrop of Devonian sandstone in centre of anticline is wider on upthrow side / narrower on downthrow outcrop of Carboniferous shales in centre of syncline is narrower on upthrow side / wider on downthrow outcrop widths are different	1
(b) (i)	east – west in centre / offset closer to steeper side of Devonian sandstone and Carboniferous shales	1
(ii)	centre of map - anticline asymmetrical steeper limb (62°) dips south/E-W trend south of map - syncline asymmetrical steeper limb (62°) dips south/E-W trend max 1 for antiform/anticline / synform/syncline direction for 2 nd mark	1 1
(iii)	oldest – folds - fault unconformity youngest	1
(iv)	using Law of cross cutting relationships fault cuts the fold axial plane trace so is younger than fold fault goes under unconformity / unconformity cuts fault so is younger folds go under the unconformity do not accept relative dating	any 1
(c) (i)	Pb – galena Zn - sphalerite	1 1
(ii)	calcite	1
(iii)	hydrothermal fluids/hot water rise into a joint / fracture in the rock minerals precipitate out and crystallise first minerals are galena / sphalerite near edges as high temperature formation/least soluble then all calcite in centre formed at a lower temperature/most soluble	any 2
Total		14

Question Expected answers Marks

- 2(a)(i) dip $40^\circ \pm 3^\circ$ 1
 throw 40 m \pm 5 1

(ii)



- any fault structure within the blank area 1
 anticline lines extended / unconformity line(s) extended 1
- (iii) clay on south side of central hill / accept where clay outcrops at the surface 1
- (iv) beds dip to the south and they are on a steep slope / clay impermeable and saturated / clay weak incompetent rock 1
- (b) shale then sandstone and then siltstone laid down / deposited
 beds folded into symmetrical folds / anticline and synclines
 beds faulted by reverse faults/dip-slip fault
 dyke (dolerite) intruded (along a fault)
 erosion / uplift form unconformity
 clay, coal and fine sandstone laid down/deposited
 cyclothem in a subsiding basin/delta
 faulted with downthrow to the north
 area tilted $3^\circ \pm 2$ to south
 erosion creates outlier / produces present day surface
 Max 1 for fold and fault any 7

list or reverse order max 4

**QWC1
 Total 14**

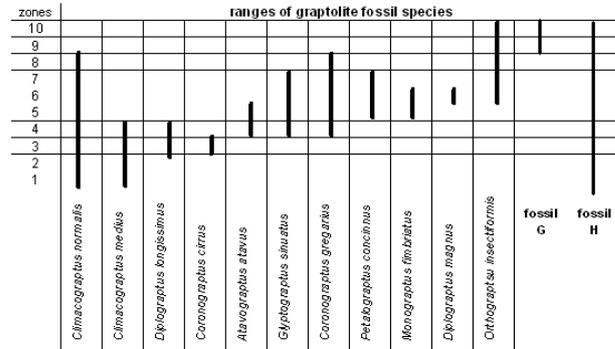
QWC

- 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
3(a)(i)	A rhyolite / andesite	1
	B obsidian	1
	C gabbro	1
(ii)	flow banding to show irregular contorted layers of different colours / minerals	1
	conchoidal to show shell-like pattern of concentric semi circular lines	1
(b)(i)	garnet crystal is porphyroblast and plagioclase or augite is phenocryst	1
	(ii) D has biotite crystals bent around the garnet so garnet formed last after the other mineral / garnet has inclusions showing growth around them / metamorphic texture contains garnets is foliated / shows preferred alignment	1
(ii)	E phenocrysts formed first as they took longer to crystallise / two stages of cooling / igneous as contains augite and randomly orientated crystals / shows lack of pressure	1
	Max 1 D= metamorphic E = igneous	
(iii)	D schist / gneiss	1
	E basalt / dolerite	1
(c)	regional metamorphism / heat and pressure produces the zones shales contain clay minerals rich in Al and silicates new minerals such as micas / biotite / garnet / polymorphs can form kyanite and sillimanite are polymorphs of Al_2SiO_5 low grade / low temperatures and pressures forms biotite (chlorite as well) medium forms garnet / kyanite high grade forms kyanite / sillimanite increasing grade from west to east Max 1 reference to rock sequence slate, schist, gneiss	any 5
	QWC	1
		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**
 4(a) *Monograptus* showing one stipe and theca
 1 for drawing 1
 1 for any 2 labels of stipe/ theca / rhabdosome / nema / sicula / virgella / *Monograptus* 1

(b) (i)



as shown on diagram G in 9 and 10 and 1

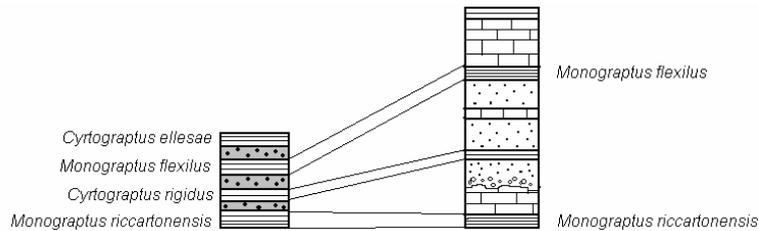
(ii) H a range longer than 8 zones 1

(iii) J 3
 K 5
 L 6

3 correct answers 2 marks, 1./2 correct 1 mark 2

(c) (i) biostratigraphic / biostratigraphy do not accept relative dating 1

(ii) join shales for each zone (centre zone not essential) / one line on diagram is acceptable 2



(iii) M deep sea / deep marine / abyssal plain / turbidite 1
 N shallow sea / continental shelf / high energy 1

Max 1 M= low energy N = high energy environments

Total 11

Question Expected answers

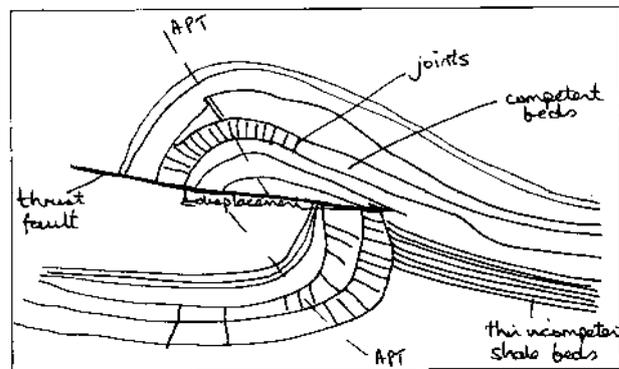
Marks

5

dip of lower part of centre fold between 70 and 90
 dip on upper part of fold left side 10 – 35 right side 40-60
 fault (nearly horizontal) / thrust fault
 fault displacement of 150 cm +/- 20
 crest / limbs of fold labelled
 nappe / recumbent fold / overfold
 fold with maximum pressure from the right
 axial plane of fold labelled and inclined
 joints / tension joints
 thick competent beds / thin incompetent beds
 bedding plane / bed measured thickness / laminations
 Max 4 with no measurements

any 5

Total 5



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