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# **GCE MARKING SCHEME**

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**SUMMER 2017**

**GEOLOGY - GL2a**  
**1202/01**

## **INTRODUCTION**

This marking scheme was used by WJEC for the 2017 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

**GCE GEOLOGY - GL2a**

**SUMMER 2017 MARK SCHEME**

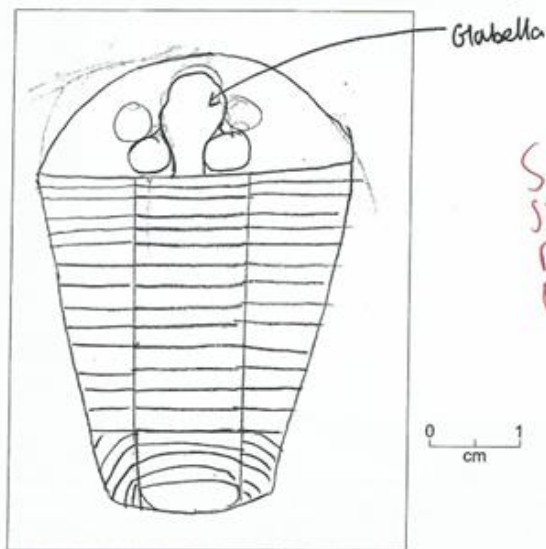
| <b>Q</b>     | <b>Marks</b>                                | <b>Expected Answer</b>   | <b>Acceptable Answer</b>   | <b>Do Not Accept</b>   |
|--------------|---|--|--|--|
| <b>1 (a)</b> | (1)<br><br>(1)<br><br>(1)                   | <ul style="list-style-type: none"> <li>It formed by rapid cooling</li> <li>It has a mafic composition</li> <li>It is the product of a lava flow</li> </ul>   | <ul style="list-style-type: none"> <li>It is the product of an intrusion (only instead of product of a lava flow)</li> </ul>   | <ul style="list-style-type: none"> <li>If more than 3 boxes are ticked, deduct 1 mark for each box which is wrongly chosen to a minimum of 0</li> </ul>  |
| <b>b</b>     | (1)+(1)+(1)<br><br><br>credit up to 3 these | <ul style="list-style-type: none"> <li>Both are crystalline/made of crystals/interlocking</li> <li>A not foliated, B foliated/schistose</li> <li>A finer, B coarser (or quantified crystal sizes that indicate this)</li> <li>Both are equicrystalline/equigranular</li> </ul> | <ul style="list-style-type: none"> <li>B has alignment</li> <li>B is porphyroblastic, A is not (or is equicrystalline/equigranular)</li> <li>A and B both medium or fine crystal size</li> </ul> | <ul style="list-style-type: none"> <li>Any answers relating to composition</li> <li>Any answers referring to "sorting"</li> <li>Any reference to lamination, cleavage, porphyritic</li> <li>One is igneous and one metamorphic</li> <li>Any answers that only refer to the texture of one sample without comparison</li> </ul> |
|              | <b>Total 6</b>                              |  |  |  |

| Q        | Marks          | Expected Answer  | Acceptable Answer  | Do Not Accept   |
|----------|----------------|--|--|---|
| 2 (a)(i) | (1)<br><br>(1) | <ul style="list-style-type: none"> <li>Angular or sub-angular</li> <li>Poorly sorted</li> </ul>  | <ul style="list-style-type: none"> <li>Any answer with reference to sub-rounded as long as it includes angular or sub-angular</li> <li>Very poorly sorted</li> </ul> | <ul style="list-style-type: none"> <li>Any answer with reference to rounded or well-rounded</li> <li>Any answer with reference to moderately sorted, moderately well sorted or well sorted</li> </ul> |
| (ii)     | (1)<br><br>(1) | <ul style="list-style-type: none"> <li>Short transport/movement distance or equivalent</li> <li>Reason mark =Angular grains show lack of erosion/attrition/abrasion or equivalent</li> </ul> |  | <ul style="list-style-type: none"> <li>A reason mark stating simply “because the grains are angular” without any link to “lack of attrition” type of answer</li> </ul>                                |
| (iii)    | (1)            | <ul style="list-style-type: none"> <li>Greywacke</li> </ul>  |  | <ul style="list-style-type: none"> <li>Any answer if more than one box ticked</li> </ul>  |
| b (i)    | (1)            | <ul style="list-style-type: none"> <li>3 m</li> </ul>  | <ul style="list-style-type: none"> <li>2.8 – 3.2 m</li> </ul>  |   |
| (ii)     | (1)            | <ul style="list-style-type: none"> <li>W at the boundary of Bed C1 and bed C2</li> </ul>   |  | <ul style="list-style-type: none"> <li>Any answer that does not touch the boundary between C1 and C2</li> </ul>   |

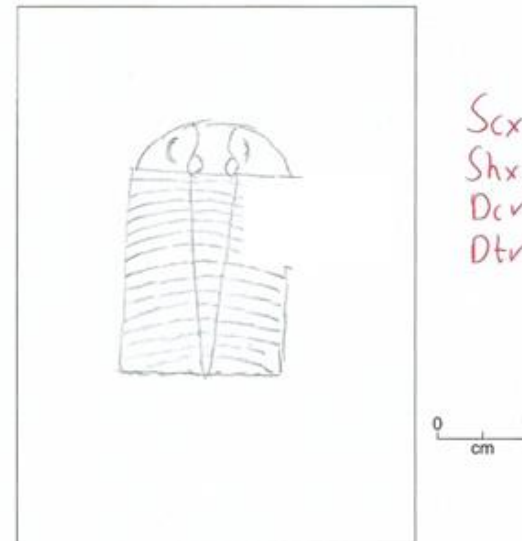
| Q     | Marks           | Expected Answer  | Acceptable Answer  | Do Not Accept  |
|-------|-----------------|--|--|--|
| (iii) | (1)             | <ul style="list-style-type: none"> <li>Reference to load cast or flame structure or load &amp; flame, or convolute bedding</li> </ul>  | <ul style="list-style-type: none"> <li>Flute cast</li> </ul>   | <ul style="list-style-type: none"> <li>Reference to any other sedimentary structure</li> </ul> |
|       | (1)             | <ul style="list-style-type: none"> <li>Load casts point down or flame structures point up</li> </ul>                                   | <ul style="list-style-type: none"> <li>Flute cast points down</li> </ul>                                     |  |
|       | (1)             | <ul style="list-style-type: none"> <li>Discussion of sand sinking into mud or reference to relative density of sand and mud</li> </ul> | <ul style="list-style-type: none"> <li>Erosion (of finer sediment and infill by coarser sediment)</li> </ul> |  |
| c     | (1)             | <ul style="list-style-type: none"> <li>Locality 3</li> </ul>   |  |  |
|       | <b>Total 11</b> |  |  |  |

| Q        | Marks  | Expected Answer  | Acceptable Answer  | Do Not Accept   |
|----------|--|--|--|---|
| 3 (a)(i) | (1) <b>sc</b><br>(1) <b>sh</b><br>(1) <b>dc</b><br>(1) <b>dt</b> | <ul style="list-style-type: none"> <li>Drawn to correct scale (9-12 cm long on the diagram)</li> <li>Accurate shape ie not too long and thin, or short and fat</li> <li>Extent of detail of features in the cephalon i.e glabella and eyes/or furrows</li> <li>Extent of detail in thorax/pygidium i.e many segments drawn</li> </ul> <p>(see marked examples on the next page)</p> <p>Please mark using ticks labelled with the corresponding letters <b>sc, sh, dc</b> and <b>dt</b> as shown in marked examples</p> |  |   |
| (ii)     | (1)  | <ul style="list-style-type: none"> <li>Glabella correctly located in centre region of cephalon</li> </ul>  |  |   |
| b (i)    | (1)  | <ul style="list-style-type: none"> <li>Brachiopod</li> </ul>   |  |   |
| (ii)     | (1)<br>(1)   | <ul style="list-style-type: none"> <li>B is on upthrow side of fault or C is on the downthrow side</li> <li>B has foliation indicating regional metamorphism (so older)</li> </ul>   | <ul style="list-style-type: none"> <li>B is metamorphic, C is not</li> </ul> | <ul style="list-style-type: none"> <li>B has foliation without development into metamorphism</li> </ul> |

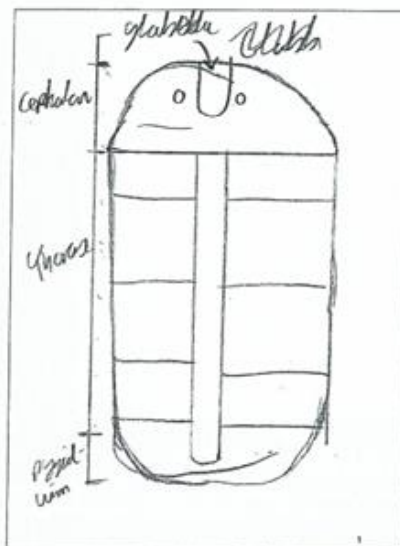
| Q     | Marks                                 | Expected Answer  | Acceptable Answer | Do Not Accept  |
|-------|---------------------------------------|--|-------------------|--|
| (iii) | 2 of the following 3 points (1) + (1) | <p>No credit for selecting D, but if B selected then no credit for any explanation comments</p> <ul style="list-style-type: none"> <li>• D is sedimentary or marine or low energy and good for preserving fossils/deposited where fossils lived</li> <li>• Fossils will have been destroyed/damaged or equivalent in B</li> <li>• By heat and pressure/by regional metamorphism</li> </ul> |                   | <ul style="list-style-type: none"> <li>• “D is sedimentary or shale ” without further development</li> <li>• Rock Unit B “does not contain fossils” without explanation that they have been destroyed</li> </ul> <p>“B is metamorphic” without further development</p> |
|       | <b>Total 10</b>                       |  |                   |  |



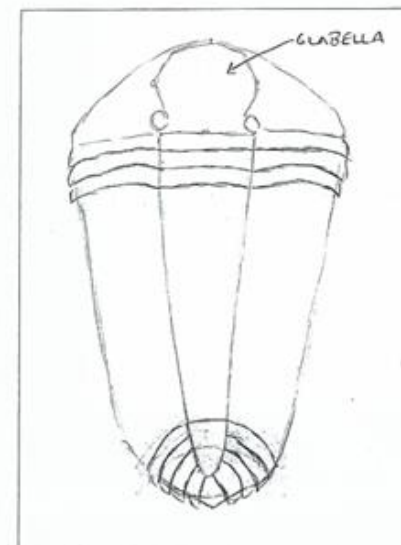
Sc✓  
Sh✓  
Dc✓  
Dt✓



Scx  
Shx  
Dcx  
Dtx



Sc✓  
Shx  
Dc✓  
Dtx  
5cm



Sc✓  
Sh✓  
Dc✓  
Dtx

Figure 3

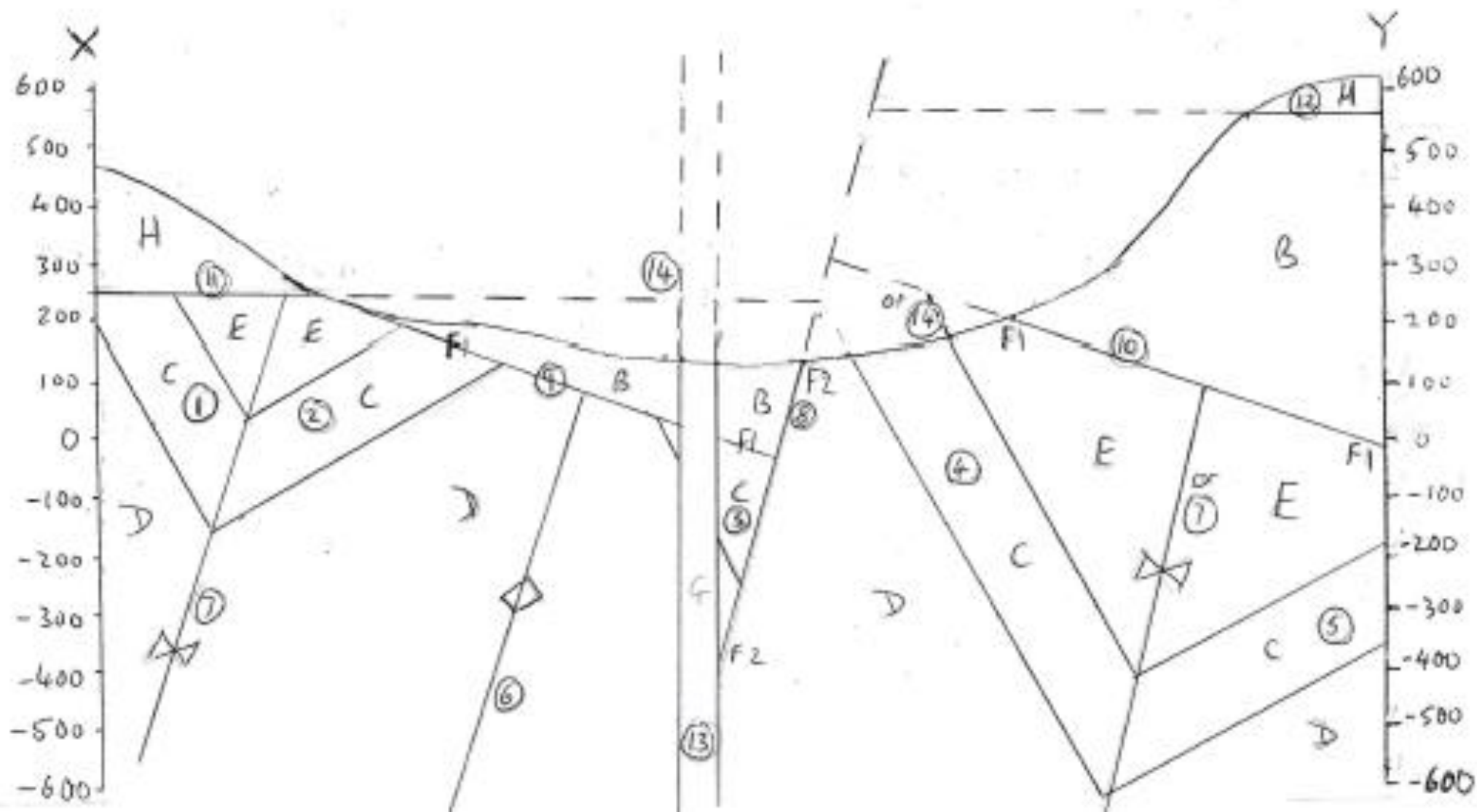
Figure 3



| Q     | Marks          | Expected Answer   | Acceptable Answer   | Do Not Accept   |
|-------|----------------|---|---|---|
| 4 (a) | (1)            | <ul style="list-style-type: none"> <li>Silky or pearly</li> </ul>                       | <ul style="list-style-type: none"> <li>Vitreous</li> </ul>  |   |
|       | (1)            | <ul style="list-style-type: none"> <li>Scratch the mineral with a fingernail</li> </ul> | <ul style="list-style-type: none"> <li>Reference to a list of hardness tests so long as it includes a fingernail</li> <li>look for cleavage planes or equivalent</li> </ul> | <ul style="list-style-type: none"> <li>A hardness test involving steel pins or copper coins without reference to fingernail</li> <li>A hardness test that refers to “nails” rather than “fingernails”</li> </ul>  |
|       | (1)            | <ul style="list-style-type: none"> <li>It scratches with a fingernail</li> </ul>        | <p>look at the crystal habit</p> <ul style="list-style-type: none"> <li>it has one (good/basal) cleavage</li> <li>it has a fibrous habit</li> </ul>                         | <ul style="list-style-type: none"> <li>Just the name of a test e.g. cleavage, habit, hardness</li> <li>Answers that appear in the wrong box ie the result within the description box</li> <li>“It scratched” without it clearly linking to a test using the fingernail</li> <li>It scratched with anything harder than a fingernail</li> <li>Any stated hardness value(s) without statement that it scratched with a finger nail</li> </ul> |
| (b)   | (1)            | <ul style="list-style-type: none"> <li>Gypsum</li> </ul>                                |   |   |
|       | <b>Total 4</b> |   |   |   |

| Q     | Marks                    | Expected Answer   | Acceptable Answer | Do Not Accept  |
|-------|--------------------------|---|-------------------|--|
| 5 (a) | (1)<br>(1)               | <ul style="list-style-type: none"> <li>Correct calculation ie. <math>570 - 290</math></li> <li><math>= 280</math> metres</li> </ul>   |                   |  |
| (b)   | (1)<br>(1)<br>(1)<br>(1) | <ul style="list-style-type: none"> <li>Downthrow<br/>F1 West      F2 West<br/>(<b>both</b> correct for one mark)</li> <li>Footwall<br/>F1 West      F2 East<br/>(<b>both</b> correct for one mark)</li> <li>F1 Thrust</li> <li>F2 Normal</li> </ul> |                   | <ul style="list-style-type: none"> <li>Only one correct of the pair</li> <li>Only one correct of the pair</li> <li>Reverse for F1</li> </ul> |
|       | <b>Total 6</b>           |   |                   |  |

| Q | Marks  | Expected Answer  | Acceptable Answer   | Do Not Accept  |
|---|--|--|---|--|
| 6 | (1) 1<br>(1) 2<br>(1) 3<br>(1) 4<br>(1) 5<br>(1) 6<br>(1) 7<br>(1) 8<br>(1) 9<br>(1) 10<br>(1) 11<br>(1) 12<br>(1) 13<br>(1) 14<br>credit up to 13 correct answers of the 14 available | Correct location and dip angle for: <ul style="list-style-type: none"> <li>Top and base of bed C dipping 60° towards Y, close to X</li> <li>Top and base of bed C dipping 30° towards X, West of F2</li> <li>Base of bed C dipping 60° towards Y close to F2 (beneath F1)</li> <li>Top and base of bed C dipping 60° towards Y, East of F2</li> <li>Top and base of bed C dipping 30° towards X beneath F1 close to Y</li> <li>Any two correctly located fold axes</li> <li>Any 2 correct labels/symbols on fold axes</li> <li>F2 dipping 75° towards X at correct location</li> <li>F1 dipping 18° towards Y at correct location West of F2</li> <li>F1 dipping 18° towards Y at correct location East of F2</li> <li>Unconformity close to X, horizontal at 290m at correct location</li> <li>Unconformity close to Y, horizontal at 570m at correct location</li> <li>Dyke vertical and in correct location</li> <li>One projected correct cross-cut relationship above land surface as follows:<br/>dyke G cuts the unconformity or<br/>F2 cutting the unconformity or base of bed C or F1 cutting top of bed C</li> </ul> | <i>Candidates are asked to complete a sketch cross section not to construct, so the mark scheme allows for some variations in dips/positions of beds</i> <ul style="list-style-type: none"> <li>Approximate dip values for fold limbs/fault F1/unconformity:<br/>dipping at 30°, accept 25°-35°<br/>dipping at 60° accept 55°-65°<br/>dipping at 18°, accept 13°-23°<br/>horizontal, accept up to 5°</li> <li>Unconformity, igneous body and bed outcrops within 6 mm of correct location on the surface/beneath unconformities/beneath F1</li> </ul> | <ul style="list-style-type: none"> <li>Any dip angles outside the ranges stated in the acceptable answers</li> <li>Vertical axes of folds or axes that do not bisect fold limbs</li> <li>Do <b>not</b> credit arrows showing movement direction on faults</li> <li>Cross cutting relationship extensions above the land surface which are simply extensions involving both lines crossing each other. One line must be correctly cut-off by the other line</li> <li>F1 cutting bed C to the West of F2 below land surface</li> </ul> |
|   | <b>Total 13</b>  |  |   |  |



| <b>Q</b> | <b>Marks</b>                    | <b>Expected Answer</b>  | <b>Acceptable Answer</b> | <b>Do Not Accept</b>  |
|----------|---------------------------------|---|--------------------------|---|
| <b>7</b> | (1)<br>(1)<br>(1)<br>(1)<br>(1) | <ul style="list-style-type: none"> <li>• F2 younger than A</li> <li>• Intrusion G younger than A <b>and</b> F2</li> <li>• F1 younger than E</li> <li>• Folding younger than E but older than F1</li> <li>• Unconformity younger than E and folding and F1, but older than H</li> <li>•</li> </ul> |                          | <ul style="list-style-type: none"> <li>• Any arrow which is “level with” a box in the diagram. Arrows must point between/above/below the boxes</li> </ul> |
|          | <b>Total 5</b>                  |   |                          |   |

| Q | Mark   | Expected Answer  | Acceptable Answer  | Do Not Accept   |
|---|--|--|--|---|
| 8 | Credit up to 5 of the following points, but only for <b>one</b> igneous body | <p><b>PLUTON</b></p> <ul style="list-style-type: none"> <li>Discordant or equivalent</li> <li>Large body or equivalent</li> <li>Steep-sided intrusion</li> <li>Wide metamorphic aureole/zone of contact metamorphism or stated reasonable width</li> <li>Coarse crystal size or stated reasonable size</li> <li>Relevant named coarse grained rock e.g granite or gabbro</li> <li>Dykes or sills coming off it</li> <li>Bedding planes in country rock may be deformed by intrusion</li> </ul> <p><b>DYKE</b></p> <ul style="list-style-type: none"> <li>Discordant or equivalent</li> <li>Linear/narrow/sheet-like or equivalent</li> <li>Columnar joints</li> <li>Narrow zone of baked margin/ contact metamorphism (or stated reasonable size) or baked margin either side</li> <li>Medium or fine crystal size (or stated reasonable size)</li> <li>Relevant named coarse grained rock e.g granite or gabbro</li> <li>May have vesicles</li> </ul> <p><b>SILL</b></p> <ul style="list-style-type: none"> <li>Concordant or equivalent</li> <li>Linear/narrow/sheet like or equivalent</li> <li>Columnar joints</li> <li>Medium or fine crystal size (or stated reasonable size)</li> <li>Relevant named medium or fine grained rock</li> <li>e.g. dolerite or basalt</li> <li>Fragments of rock above may be included in it</li> <li>Baked margin/contact metamorphism above and below it or two baked margins</li> <li>May be transgressive, or “jumps from one bed to another” or equivalent</li> <li>May have vesicles</li> </ul> | <ul style="list-style-type: none"> <li>Raised upland area with tors</li> </ul> | <ul style="list-style-type: none"> <li>A mark for stating their chosen type of igneous body</li> <li>A mark for a named field location</li> <li>A mark for the presence of chilled margins</li> <li>A mark for an absence of a feature as evidence, e.g lack of a red surface indicates a sill</li> </ul> |

| Q | Marks           | Expected Answer  | Acceptable Answer | Do Not Accept |
|---|-----------------|--|-------------------|---------------|
|   |                 | <p><b>LAVA FLOW</b></p> <ul style="list-style-type: none"> <li>• Concordant or equivalent</li> <li>• Linear/narrow/sheet like or equivalent</li> <li>• Columnar joints</li> <li>• Fine crystal size (or stated reasonable size)</li> <li>• Relevant named medium or fine grained rock e.g. dolerite or basalt</li> </ul><br><ul style="list-style-type: none"> <li>• Fragments of lava flow may be included in the rock above</li> <li>• Baked margin/contact metamorphism below it only/ one baked margin only</li> <li>• May have an eroded upper surface</li> <li>• May have reddened/weathered upper surface</li> <li>• May have a pahoehoe or aa upper surface</li> <li>• May have (many) vesicles</li> <li>• Pillow lavas</li> </ul> <p>N.B. Points must be explicitly stated /labelled, not simply drawn without label or annotation</p> <p>Please see marked examples on the next page and in the marked example</p> |                   |               |
|   | <b>Total 13</b> |  |                   |               |

A lava flow has a single ~~traced~~ <sup>traced</sup> ~~margin~~ <sup>margin</sup> and a weathered ~~surface~~ <sup>surface</sup>, this is because the top of the ~~igneous~~ <sup>igneous</sup> body has been exposed to ~~exposed~~ <sup>exposed</sup> & ~~exposed~~ <sup>exposed</sup> after cooling, leaving an uneven and eroded surface. ~~on~~ <sup>on</sup> the presence of ~~vesicles~~ <sup>vesicles</sup> in an igneous body indicates a lava flow as the lack of pressure, due to it being on the surface, allowing the gas bubbles to escape, as the lava cools the bubbles left in the lava's surface remain leaving dent-like marks. The single ~~traced~~ <sup>traced</sup> ~~margin~~ <sup>margin</sup> occurs because, unlike sills/dykes etc., there is only one surface to ~~metamorphose~~ <sup>metamorphose</sup>.

gas  
escaping  
↑  
↓ vesicles

The ~~fine~~ <sup>fine</sup> ~~crystal~~ <sup>crystal</sup> size of lava flows is an indicator as sills and dykes + plutons are insulated beneath the surface and cool slower, leading to coarser crystals whereas lava flows are insulated so it cools quicker creating fine crystals. Columnar ~~jointing~~ <sup>jointing</sup> can indicate a lava flow, this is because as the flow cools it contracts creating typically hexagonal columns after the ~~cool~~ <sup>cool</sup> cooling is complete, due to cracking during the contraction.



Specimens: A = Basalt  
B = Schist  
C = Calymene Trilobite  
H = Gypsum

Photographs: Photograph 1 = Greywacke photomicrograph  
Photograph 2 = Load and Flame  
Photograph 3 = Brachiopod  
Photograph 4 = Dyke  
Photograph 5 = Lava Flow or sill