

NATIONAL EXAMINATIONS - December, 2002

98-BS-14 Geology

3 hours duration

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of the assumptions made.
2. Candidates may use one of two calculators, the Casio or Sharp approved models. This is a Closed Book examination.
3. Five questions constitute a complete paper. Only the first five questions as they appear in your answer book will be marked.
4. All questions are of equal value. The marks assigned to the subdivisions of each question are essentially of equal value.

- 1.A Draw a cross-section of the type of plate boundary that exists along most of the eastern edge of the Pacific Ocean, labelling all the rock units involved.
- B For this cross-section, explain what causes magma to be generated and why earthquakes occur at differing depths.
- C Define the following geologic terms:  
(i) basalt, (ii) caldera, (iii) bomb, (iv) obsidian, (v) shield cone.
- D In a labelled sketch, show the following igneous forms intruding sedimentary strata:  
(i) sill, (ii) pipe (or neck), (iii) laccolith, (iv) dyke (or dike), (v) batholith.
- 2.A Sketch and briefly explain Bowen's Reaction Series.
- B Name two important minerals present in each of:  
(i) granite, (ii) gabbro, (iii) sandstone, (iv) shale, (v) schist.
- C What one major recognition characteristic would you use to distinguish between:  
(i) fine-grained galena and graphite?  
(ii) calcite and quartz?  
(iii) limonite (goethite) and hematite?  
(iv) azurite and malachite?  
(v) magnetite and ilmenite?
- D How would you distinguish between:  
(i) pegmatitic and porphyritic granite?  
(ii) limestone and massive basalt?  
(iii) gabbro and diabase?  
(iv) shale and phyllite?  
(v) amygdular (or amygduloidal) and vesicular basalt?
- 3.A Describe the ways in which streams move material. Indicate, in a cross-section of a stream, where the various particle sizes are normally carried.
- B Explain briefly, with the aid of sketches, how the following form.  
(i) alluvial terraces, (ii) alluvial fans, (iii) point bars, (iv) levees.
- C Sketch typical stream hydrographs from (i) a rural area and (ii) an urban area that were subjected to the same rainfall event. Explain why they are different.
- D Explain with the aid of sketches (i) why there are no beaches on headlands, but there are often beaches at bay heads, and (ii) how a tombolo forms.
- E Explain why engineers build groynes and breakwaters, and how and why these structures change the configuration of a coast.

- 4.A Describe in a sentence or two how the following landforms are created:  
(i) horn, (ii) cirque, (iii) truncated spur, (iv) roche moutonnée?
- B Of what type of material(s) are the following typically composed?  
(i) drumlin, (ii) esker, (iii) kame moraine, (iv) glaciolacustrine deposit.
- C Explain why there are presently marine beaches hundreds of feet:  
(i) above sea level around Hudson's Bay.  
(ii) below sea level off the coast of Nova Scotia.
- D Explain with the aid of sketches how (i) kettles, (ii) medial moraines form.
- E Describe engineering problems associated with permafrost.
5. Describe mass wasting as fully as possible. Give examples when possible. Include subsidence as a type of mass wasting.
6. A Explain briefly the origin of the following:  
(i) loess, (ii) ventifact, (iii) desert pavement, (iv) crossbeds.
- B Sketch and label four (4) types of sand dunes. Explain briefly the conditions that caused each type to form.
- C What is the name for the equation  $V = K (h/l)$ ? What do each of the letters stand for?
- D Draw a cross-section of an artesian system with flowing and non-flowing wells.
- E Use "before" and "after" diagrams to show how an acceptable small farm well near a septic tank can become contaminated when a new neighbour puts in another farm well.
- 7.A Use a labelled sketch to show a plunging symmetrical anticline. Show on your sketch the position of the axial plane and the axis.
- B Use a labelled sketch to show an oblique-slip normal fault. Show slickensides and the location where gouge is most likely to occur.
- C Explain the terms: (i) nonconformity, (ii) joint set, (iii) graben, (iv) thrust fault.
- D A drill hole at A (elevation 180 m) intersects a fault at a depth of 10 m. A second hole at B (elevation 220 m), 200 m from A, intersects the same fault at a depth of 150 m. A third hole at C (elevation 300 m), 200 m due east of B and 200 m from A, intersects the fault at a depth of 30 m. A is north of the line BC. What is the strike and dip of the bed?
- E Explain clearly how data from three seismographs can be used to geographically locate an earthquake event.