

**ASSOCIATION OF CANADA LANDS SURVEYORS - BOARD OF EXAMINERS  
WESTERN CANADIAN BOARD OF EXAMINERS FOR LAND SURVEYORS  
ATLANTIC PROVINCES BOARD OF EXAMINERS FOR LAND SURVEYORS**

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**SCHEDULE II / ITEM 1  
GEODETIC POSITIONING**

**October 2003**

**Note: This examination consists of 6 questions on 2 pages.**

<u>Q. No</u>	<u>Time: 3 hours</u>	<u>Marks</u>	
		<u>Value</u>	<u>Earned</u>
1	a) Describe the NAD27, NAD83 adopted, NAD83(CSRS), and WGS84 datums. Be sure to name the reference ellipsoid, discuss its relationship with the geoid, include a description of how each datum is realized, describe the observations used and discuss the level of accuracy of the datum.  b) Discuss how to convert between and how accurately this conversion is between each of the following datums: a. NAD27 b. NAD83 adopted c. NAD83(CSRS) d. WGS84 datums and the International Terrestrial Reference Frame (ITRF).	25	
2	a) Define the following heights and discuss their use to describe where water will flow: a. ellipsoidal heights derived from GPS b. heights derived directly from levelling c. published CGVD28 orthometric heights d. geopotential height differences.  b) How can orthometric height be computed from ellipsoidal height?  c) How is gravity used to derive orthometric heights (on benchmarks that comprise the Canadian vertical network) from levelling observations? What gravity values are used in each case?	15	
3	a) Define geodetic azimuth. b) Define astronomic azimuth. c) Define grid azimuth (eg. derived from UTM coordinates). d) What information is necessary to convert geodetic azimuths to astronomic azimuths? e) What is the main information required to convert a geodetic azimuth to a grid azimuth?	10	
4	a) Describe the basic principle of measurement used by EDMs and GPS (using the carrier phase). How is the basic principle implemented differently in long range microwave EDMs, electro-optical EDMs and GPS?  b) How does rain affect microwave EDMs, electro-optical EDMs and GPS?	15	

5	<p>You are required to work on Canada Lands in a remote northern location and are required to integrate your survey (horizontally and vertically) into the Canadian Spatial Referencing System (CSRS). There are no nearby control monuments. You have decided to use GPS on the project.</p> <p>a) Name the top 5 GPS sources of errors and how you will mitigate each of them. What are some general methods to minimize many of the GPS errors?</p> <p>b) Discuss how you will integrate the survey into the CSRS (horizontally and vertically) and the specific information/data/products required to do the integration. How accurate will the integration be?</p>	25	
6	<p>a) Define inertial reference system and terrestrial reference system. Give an example of each reference system and when it is used.</p> <p>b) How are these two reference systems related to each other?</p>	10	
<b>Total Marks:</b>		100	