

**PART A / BAHAGIAN A**

(1). (a). Define the following terms.

*Takrifkan istilah berikut.*

- (i). Brownfield Exploration/*carigali brownfield*
- (ii). Pathfinder elements/*elemen petunjuk*
- (iii). Channel sampling/*persampelan alur*
- (iv). Orientation Survey/*tinjauan orientasi*
- (v). Primary geochemical anomalies/*Anomali geokimia primer*

(5 marks/*markah*)

(b). You have a set of soil sampling Au results from the exploration program with a significant result. Write a short proposal of how you are going to continue the exploration works till you get the resources estimation block model.

*Anda mempunyai satu set keputusan persampelan tanah daripada program carigali dengan hasil yang memberangsangkan. Tuliskan satu cadangan ringkas bagaimana anda ingin meneruskan kerja-kerja carigali sehingga anda memperolehi jangkaan sumber model blok.*

(10 marks/*markah*)

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- (c). Selecting the right technique or combination of techniques of sampling is important in exploration drilling methods such as reverse circulation method (RC) and diamond drill (DD). Note down two advantages and two disadvantages for both methods. Which method is preferred to be used during the initial drilling program?

*Memilih teknik atau gabungan beberapa teknik yang betul di dalam persampelan adalah penting di dalam kaedah penggerudian seperti reverse circulation (RC) dan gerudi diamond (DD). Catatkan dua kelebihan dan dua kekurangan kedua-dua kaedah tersebut.*

(5 marks/markah)

- (2). (a). Geochemical survey is procedure taken during the planning in mineral exploration especially metallic mineral exploration activities. This involved various stages techniques, equipment and tools.

*Tinjauan geokimia ialah prosedur yang diambil semasa perancangan eksplorasi mineral terutamanya aktiviti carigali mineral metalik. Ini melibatkan beberapa peringkat teknik peralatan dan perkakas.*

State and elaborate the following statement:

*Nyatakan dan huraikan kenyataan berikut:*

- a. Mineral prospect  
*Prospek Mineral*
- b. Ore bodies or ore deposit  
*Jasad bijih atau longgokan bijih*
- c. Country rock and Grab samples  
*Batuan sekeliling dan sampel cekau*

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d. Cut of grade/'Halos' characteristic

*Gred pemotongan/ciri-ciri 'Halos'*

e. Syngenetic

*Singenesis*

(10 marks/markah)

(b). Exploration process for a mineral deposit is usually conducted in step-wise process. Illustrate the curve that show the number of prospects against exploration stage.

*Proses penjejakan bagi mendapan mineral kebiasaannya dijalankan secara proses berperingkat. Gambarkan lengkung yang menunjukkan bilangan prospek melawan peringkat eksplorasi.*

(10 marks/markah)

3. (a). Define the following terms.

*Takrifkan istilah berikut.*

(i) Major elements/ *unsur-unsur utama*

(ii) Minor elements/ *unsur-unsur minor*

(iii) Trace elements/ *unsur-unsur surih*

(iv) Blank report/ *Laporan kosong*

(v) Field duplicates/ *pendua lapangan*

(vi) Lab replicates/ *replikat makmal*

(6 marks/markah)

(b). The choice of analytical technique for a particular element depends upon number of factors such as stage of exploration, availability of specialized facilities, capital cost of instrumentation, speed, and convenience to user for undertaking the analysis. Colorimetry, ICP-MS, and XRF are common analytical

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techniques; compare and comment on the characteristic of these three techniques in a table.

*Pilihan teknik analisis untuk elemen tertentu bergantung kepada beberapa faktor seperti peringkat penerokaan, ketersediaan kemudahan yang khusus, kos modal instrumentasi, kelajuan, dan kemudahan kepada pengguna untuk menjalankan analisis. Kolorimetri, ICP-MS dan XRF ialah teknik analisis biasa digunakan; bandingkan dan ulaskan ciri ketiga-tiga teknik ini dalam jadual.*

(8 marks/markah)

- (c). Based on the data provided, illustrate the histogram of precision and accuracy of the data. Discuss how precision and accuracy data are significant to geochemical analysis.

*Berdasarkan data yang diberikan, gambarkan histogram kejituan dan ketepatan data. Bincangkan bagaimana kejituan dan ketepatan data adalah penting kepada analisis geokimia.*

Table 1: Precision and accuracy data/ Data kejituan dan ketepatan

<b>Precision/ Kejituan</b>	<b>Accuracy/Ketepatan</b>
Low/Rendah	Poor/Lemah
Good/Baik	Poor/Lemah
Low/Rendah	Good/Baik
Good/Baik	Good/Baik

(6 marks/markah)

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**PART B / BAHAGIAN B**

- (4). (a). Dispersion of elements or minerals occur in different environment and stages. Describe four conditions of geochemical dispersion. Which dispersion condition that related to secondary anomaly.

*Penyebaran unsur atau mineral berlaku di dalam persekitaran dan peringkat yang berbeza. Perihalkan empat keadaan penyebaran geokimia. Penyebaran yang manakah berkait dengan anomaly sekunder.*

(6 marks/markah)

- (b). State the meaning of geochemical anomaly. Explain five factors that influence the spread and intensity of geochemical anomaly.

*Jelaskan lima faktor yang mempengaruhi penyebaran dan keamatan anomaly geokimia.*

(6 marks/markah)

- (c). Geochemistry exploration of stream sediment, soil and rock will be through several general procedure including 'orientation survey'. Discuss five factors considered in the orientation survey for soil geochemistry exploration.

*Cari gali geokimia untuk sedimen arus, tanah dan batuan akan berpandu kepada beberapa peraturan seperti ukuran orientasi. Bincangkan lima faktor yang diambil kira di dalam ukuran orientasi untuk carigali geokimia tanah.*

(5 marks/markah)

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- (d). Explain the definition of prospecting geochemistry in mineral exploration. What is the other discovery tool in searching mineral deposit?

*Terangkan maksud geokimia carigali di dalam pencarian mineral. Apakah kaedah lain di dalam pencarian longgokan mineral.*

(3 marks/markah)

- (5). (a). Exploration is a range of activities to help determine if there are minerals under the surface. Explain the sequences of exploration process from regional study to resource drilling of ore body.

*Carigali merangkumi pelbagai aktiviti untuk membantu dalam menentukan kewujudan mineral di bawah permukaan. Terangkan jujukan proses carigali dari secara rantau sehingga ke penggerudian jasad bijih.*

(10 marks/markah)

- (b). In rock geochemistry sampling for mineral exploration, field notes is important to be recorded at project site. What things normally required to be wrote in the field notebook?

*Di dalam persampelan geokimia batuan untuk carigali mineral, nota lapangan adalah penting untuk dicatatkan di kawasan projek. Apakah perkara yang biasanya perlu dicatatkan di dalam buku catatan lapangan.*

(5 marks/markah)

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- (c). The challenge in mineral industry is to ensure the continuous supply of mineral to the nation and the need to search for a new mineral deposit. How to improve the exploration activity in order to overcome this challenge.

*Cabaran dalam industri mineral adalah memastikan bekalan mineral yang berterusan kepada negara dan keperluan untuk mencari longgokan mineral yang baru. Bagaimanakah cara pembaikan aktiviti carigali bagi menghadapi cabaran ini.*

(5 marks/markah)

- (6). Approaches and techniques in mineral exploration in stepwise process normally involved the following methods. Elaborate:

*Pendekatan dan teknik dalam carigali mineral secara berturutan biasanya melibatkan kaedah-kaedah berikut. Huraikan:*

- (a) Field geological methods  
*Kaedah geologi lapangan*
- (b) Geochemical methods  
*Kaedah geokimia*
- (c) Geophysical methods  
*Kaedah geofizik*
- (d) Drilling methods  
*Kaedah penggerudian*

(20 marks/markah)

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(7). Briefly discuss

*Bincangkan secara ringkas*

(a) Regional exploration

*Eksplorasi rantau*

(b) Stream Sediment

*Sedimen sungai*

(c) Please calculate the Ore Grade as % Mineral Content and % Elemental Metal for sulphide,

*Sila tentukan gred bijih sebagai % kandungan mineral dan % kandungan unsur bagi mineral sulfide.*

Given Chalcopyrite ( $\text{CuFeS}_2$ ) and Pyrite ( $\text{FeS}$ ),

*Diberi, iaitu kalkopirit ( $\text{CuFeS}_2$ ) dan ( $\text{FeS}$ ),*

If the ore contained 2% copper then it would have % Chalcopyrite

Relative atomic masses are: Cu = 63.5, Fe = 56 and S = 32

*Sekiranya bijih mengandungi 2% kuprum maka ianya harus mengandungi berapa % kalkopirit.*

*Berat jisim atom iaitu: Cu = 63.5, Fe = 56 and S = 32*

(20 marks/markah)

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