



FACULTY OF SCIENCE

DEPARTMENT OF GEOLOGY

MODULE APG3B10 – ECONOMIC GEOLOGY

CAMPUS APK

SSA EXAM JANUARY 2017

DATE: JANUARY 2017

SESSION

ASSESSOR(S)

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INTERNAL MODERATOR

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DURATION 3 HOURS

MARKS 180

NUMBER OF PAGES: 4 PAGES

INSTRUCTIONS: Answer all the questions.

QUESTION 1: INTRODUCTION (9 marks)

1.1 Provide definitions for the following:

1.1.1 Hypogene deposit.

(2)

1.1.2 Epigenetic deposit.

(2)

1.1.3 Epithermal deposit.

(3)

1.2 Name two elements that appear to have no economic value.

(2)

(9)

QUESTION 2: IGNEOUS ORE-FORMING PROCESSES (36 marks)

2.1 The following questions are related to the role that basaltic magmas and lavas play in metallogeny.

2.1.1 In what geological settings are basaltic rocks most commonly formed?

(3)

2.1.2 How are basaltic melts formed in the mantle?

(2)

2.1.3 According to Goldschmidt's classification, what element types are generally enriched in basaltic rock-hosted ore deposits?

(2)

2.2.1 Define a kimberlite.

(4)

2.2.2 Why are diamonds considered to be xenocrysts in their host rocks?

(2)

2.3 What are the differences between S- and I-type granites?

(8)

2.4 Using the Irvine model, explain how monomineralic chromite layers can form.

(5)

2.5 Use sketches to explain the difference and the reasons for the "fountain" and "plume" models of new magma injections into differentiated magma chambers. What are the implications to the potential for ore formation of the "fountain" and "plume" magma injection models?

(10)

(36)

QUESTION 3: MAGMATIC-HYDROTHERMAL ORE-FORMING PROCESSES (32 marks)

3.1.1 What is a supercritical fluid?

(3)

3.1.2 What is the effect of salinity on water's ability to form a supercritical fluid?

(2)

3.2 Provide four possible conditions under which pegmatites can form.

(8)

3.3 Magmatic-hydrothermal ores formed from "wet" granites have are likely to have a higher tungsten (W) than copper (Cu) content. Why?

(8)

3.4 Name four commodities that can be enriched in skarns and for each skarn type, name the type of magma that is associated with it formations.

(8)

3.5.1 Are high-sulfidation epithermal gold deposits considered to have formed proximal or distal to the magmatic source?

(1)

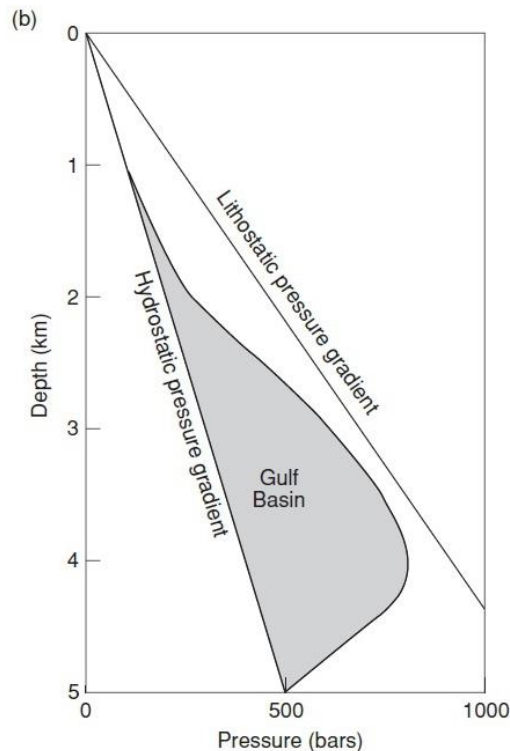
3.5.2 How was gold most likely transported in solution in high-sulfidation and low-sulfidation epithermal gold deposits?

(2)

(32)

QUESTION 4: HYDROTHERMAL ORE-FORMING PROCESSES (50 marks)

4.1 The figure below, taken from “An Introduction to Ore-forming Processes” by Robb (2005), illustrates the variation of fluid pressure with depth in the Gulf Coast sediments of the southern USA.



4.1.1 What is the source of the water causing the hydrostatic pressure indicated in the figure?

(1)

4.1.2 What is illustrated by the shaded region in the figure?

(2)

4.1.3 What causes the feature referred to in question 4.1.2?

(3)

4.1.4 The water referred to in question 4.1.1 typically increases in salinity with depth. What process causes this salinity increase and how does it work?

(7)

4.2 What is the main difference in how a fluid flows through rock at shallow and deeper crustal levels?

(2)

4.3 Give **two** examples each of the following:

4.3.1 Hard metals.

(2)

4.3.2 Borderline metals.

(2)

4.3.3 Soft metals.

(2)

4.4 Shortly describe the following alteration types by referring to how it happens, the alteration mineral assemblage associated with it and the temperature range associated with it. Also mention an ore deposit/ore forming environment with which this type of alteration is associated.

4.4.1 Phyllic alteration.

(5)

4.4.2 Propylitic alteration.

(5)

4.5 VMS deposits have well-developed metal zonation patterns. Make a sketch to illustrate the zonation pattern and explain how it develops.

(15)

4.6 Why did Mississippi Valley Type (MVT) deposits tend to form in low latitudinal settings?

(4)

(50)

QUESTION 5: SURFICIAL AND SUPERGENE ORE-FORMING PROCESSES (18 marks)

5.1.1 Name and shortly explain the two main processes involved in laterite formation.

(4)

5.1.2 How do nickel laterites form?

(7)

5.1.3 How are platinum group elements (PGE) enriched in laterites?

(4)

5.2 Under what conditions and from which precursor minerals do illite clays form?

(3)

(18)

QUESTION 6: SEDIMENTARY ORE-FORMING PROCESSES (35 marks)

6.1 Name ore minerals that can be concentrated to form economic placer deposits.

(5)

6.2.1 What are the differences between entrainment sorting and shear sorting?

(8)

6.2.2 What kind of sorting will occur at a ripple/dune crest and why?

(3)

6.3 Where and how do ironstone deposits form?

(7)

6.4 What are the optimal environmental and geological conditions required to form metalliferous black shales?

(6)

6.3.3 What are oil shales and how do they form?

(6)

(35)