

(4)

Ex./M.Sc.-I/G-I/III/3/2017

OR

6. (a) 'An isotopically depleted mantle reservoir is responsible for generation of N-MORB through high degree of partial melting at shallow depth'—accept or reject the statement with reasons.
- (b) What do you mean by 'High- $\mu$  (HIMU) mantle reservoir? How do you differentiate the magma composition generated from HIMU reservoir from that of 'Enriched Mantle-II (EM-II) mantle reservoir by Nd-Sr-Pb isotopic signatures?
- (c) In which tectonic set up the alkali-olivine basaltic magma is commonly generated? Is it possible to differentiate this magma composition from that of a magma of continental origin from trace element normalized diagram? Justify with reasons.

$$4\frac{1}{2}+4\frac{1}{2}+3\frac{1}{2}=12\frac{1}{2}$$

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**MASTER OF SCIENCE EXAMINATION, 2017**

(1st Year, 1st Semester)

**APPLIED GEOLOGY**

**Paper : III**

**Igneous Petrology**

Time : Two hours

Full Marks : 50

Answer any **four** questions.

1. (a) Why does rock melting curve shift to lower temperature in the hydrous system?
- (b) State the mechanism that determines the solubility of  $H_2O$  in silicate melts. "Mafic melts generally can dissolve less water than felsic ones"—justify the statement.
- (c) How does the mechanism of  $CO_2$  solubility differ from that of  $H_2O$  solubility in silicate melts? How do the compositions of fluids in the C-O-H fluid system influence the solubility of  $CO_2$  in the silicate melt?
- (d) Why does hydrous granitic magma commonly solidify before erupting to the surface?

$$2\frac{1}{2}+3\frac{1}{2}+3\frac{1}{2}+3=12\frac{1}{2}$$

(Turn Over)

(2)

2. (a) "Water saturated system at high lithostatic pressure may be responsible for plagioclase rich composition of rock like anorthosite." State the validity of the statement with reasons.
- (b) Explain the following textures with reference to suitable phase diagram(s) : (i) A rock composed of phenocrysts of enstatite, smaller phenocrysts of anorthite in a eutectic groundmass of enstatite, anorthite and tridymite. (ii) A rock composed of phenocrysts of enstatite with forsterite core, smaller phenocrysts of anorthite in a eutectic groundmass of enstatite, anorthite and tridymite.
- (c) In what condition(s) would the hydrous minerals such as micas and amphiboles be stabilized in magma? How does the activity of water in a H<sub>2</sub>O-CO<sub>2</sub> mixture influence the stability of the hydrous phase?

$$3\frac{1}{2}+5+4=12\frac{1}{2}$$

OR

3. (a) What are melting mechanism and origin of M- and I-type granitoids? In what tectonic conditions are they formed?
- (b) Write short notes on (any **two**) :
- (i) Reverse zoning in plagioclase
- (ii) Leucite in volcanic rocks of syenitic composition
- (iii) Aluminous granite.

$$6\frac{1}{2}+6=12\frac{1}{2}$$

(3)

4. (a) What is Komatiite? 'The chemical characteristics of "Barbarton-type" komatiite is helpful in understanding the depth and degree of melting of source rock for the generation of Al-depleted komatiitic magma'—discuss with reasons.
- (b) What is 'Spinifex' texture? What are the factors that govern the growth of this texture typically in komatiite rocks but not in others?
- (c) 'Komatiite magmatism is effusive rather than explosive in nature'—accept or reject the statement with reasons.
- $$4\frac{1}{2}+4\frac{1}{2}+3\frac{1}{2}=12\frac{1}{2}$$
5. (a) What could be the primitive magma type of island arc set up? Discuss the role of subducting and overriding plate in magma generation in such tectonic setting.
- (b) 'The arc basalt can easily be identified from mid-oceanic ridge basalt through normalized trace element signatures.'— Explain how?
- (c) What is 'seriate' texture? Why this texture is commonly found in porphyritic andesite but not in basalts?

$$4\frac{1}{2}+4\frac{1}{2}+3\frac{1}{2}=12\frac{1}{2}$$

(Turn Over)