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Ex./M.Sc.-I/GI/TH/III/3/2019

MASTER OF SCIENCE EXAMINATION, 2019

(1st Year, 1st Semester)

APPLIED GEOLOGY

Igneous Petrology

Paper : - III

Time : Two hours

Full Marks : 50

- (b) Under what condition fractionation of basaltic magma may produce anorthosites ? Discuss with reference to a suitable phase diagram.
- (c) How does M-type granite differ with I-type granite in their genesis ? Deliberate their suitable tectonic settings. $5\frac{1}{2}+3+4=12\frac{1}{2}$
6. (a) “At lower pressure effect of H₂O on lowering solidus temperature is maximum whereas the effect of CO₂ is maximum at higher pressure” – justify the validity of this statement with reasons accompanying necessary illustrations.
- (b) How CO₂ and H₂O in the mantle explain the presence of incipient melt at Low Velocity Zone beneath young oceans ? Why is it absent under Archean shield regions ?
- (c) “Below a critical activity of water hydrous mineral can never be stable at magmatic temperature” – Explain.
- (d) Why does the granitic magma produced from dehydration melting of hydrous minerals in continental orogenic setting commonly not erupt above the surface ? $3+3+4+2\frac{1}{2}=12\frac{1}{2}$

Answer ***Q.no. 1 & 4*** are compulsory.

Attempt ***Q.no. 2 or 3 and 5 or 6.***

1. (a) What causes generation of magma in Mid Oceanic Ridge set up ?
- (b) ‘The basaltic magma generated in East Pacific Rise has less calcic plagioclase compared to that of in Mid-Atlantic Ridge set up’ – Why ?
- (c) Discuss how the petrographic characteristics of N-MORB can be useful in estimating the depth of magma generation.
- (d) ‘In a porphyritic andesite hornblende is only restricted as phenocryst but never found in the matrix’ – why ? $2\frac{1}{2}+4\frac{1}{2}+3\frac{1}{2}+2=12\frac{1}{2}$

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2. (a) ‘Ocean Island Basalts (OIB) have characteristically different chondrite normalized trace element plot as compared to that of N-MORB’-accept or reject the statement with reasons.
- (b) What sorts of information can be gathered can be gathered regarding depth of magma generation and composition of source rock undergoing melting to form OIB from the normalized trace element plot ?
- (c) How to differentiate magmatic textures developed through slow cooling of magma from that of a rapidly chilled one ? $5+4\frac{1}{2}+3=12\frac{1}{2}$

OR

3. (a) ‘The source rock for N-MORB and that one for Continental Flood Basalt have distinctly different geochemical characteristics’-justify the statement with the help of Sr-Nd radiogenic isotopic plot and trace element spider diagram.
- (b) ‘Seriatic texture is commonly developed in andesite but not in basalt’-Explain.

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- (c) “Ferro-basalt is a regular intermediate member in ‘Tholeiitic trend’ or magma differentiation, but not found in ‘Calc-alkaline’ suite’ in arc set up”-Why ? $5+3+4\frac{1}{2}=12\frac{1}{2}$
4. (a) Under what conditions the mantle rocks equivalent to a plagioclase Iherzolite in chemistry could generate strongly silica-undersaturated nepheline normative magma and quartz tholeiite magma ? Discuss with suitable phase diagram.
- (b) Demonstrate the suitable conditions for the generation of alkaline magma instead of a flood basalt in a continental rifting.
- (c) Why alkaline rocks are less abundant than the tholeiitic ones in Intraplate Ocean Island setting ?
- (d) Why is leucite restricted only in some volcanic rock ? $5\frac{1}{2}+3\frac{1}{2}+2+1\frac{1}{2}=12\frac{1}{2}$
5. (a) How does the melting of identical mantle peridotite differ in composition under (i) volatile-free condition; (ii) hydrous condition and (iii) CO₂-saturated condition ?