

**MASTER OF SCIENCE EXAMINATION, 2019**

**(1st Year, 1st Semester)**

**APPLIED GEOLOGY**

**Mineralogy**

**Paper : - I**

Time : Two hours

Full Marks : 50

Use a separate answer script for each group.

**GROUP - A (25 marks)**

Answer *Q.no. 1* and any *two* from the rest.

1. What is “Numerical Aperture” of a lens and how does it related to (a) ‘Working distance’ and (b) ‘Resolution’ of the Scanning Electron Microscope? What are the different polymorphs of olivine? Why are in natural rocks, the olivine compositions between  $Fe_{40}-Fe_{10}$  rare? Why in some granitic rocks fayalite occurs with quartz? Describe in brief as to how can metamorphism of siliceous dolomite develop olivine. 13
2. What is ‘Sphinfex texture paradox’? State a mechanism that can resolve this paradox. 6

(Turn over)

( 2 )

3. What are pigeonite and inverted pigeonite ? Which factors control the formation of pigeonite in mafic rocks? 6
4. Write short notes on : 6
- (a) Serpentinization and generation of abiogenic methane.
- (b) Gabbro-eclogite transition.

**GROUP - B (25 marks)**

5. Answer any *five* questions. 5x5=25
- (a) What is 'oxidation-exsolution' ? How is it related to the stability of spinels containing Fe and Ti ? Comment on the stability of maghemite and titanomaghemite with respect to temperature (T) and  $fO_2$ .
- (b) What are the major minerals in polymetallic nodules formed on ocean floor? How do you account for the presence of bivalent Fe, Cu, Ni and Co in these nodules ?

( 3 )

- (c) Why natural manganese carbonate deposits usually contain relicts of higher oxides of manganese? Write a note on solid solution between  $CaCO_3$  and  $MnCO_3$ .
- (d) Why  $743^\circ C$  is critical in the Fe-S system ? Discuss the stability of pyrite with temperature in sulfur-excess or sulfur-deficient conditions.
- (e) Why marcasite is considered as sulfur-deficient mineral ? Justify your answer. Under what condition is marcasite coexistent with its polymorphic form ?
- (f) What is the stability range of digenite ? Is there any relation of temperature and iron-content in digenite ? Discuss briefly about the inverted forms of digenite at higher temperature.
- (g) Why mooihoekite is not common in nature though similar in structure with chalcopyrite ? Discuss briefly about the different phases in intermediate solid solution of Cu-Fe-S system at  $600^\circ C$ .
- (h) Write notes on :
- (i) Mn-pyroxenoids
- (ii) Troilite.

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