

M. SC. APPLIED GEOLOGY EXAMINATION, 2022

(2nd Year, 1st Semester)

ORE GEOLOGY

PAPER – CORE/TH/09

Time : Two hours

Full Marks : 40

(Use a separate Answer script for each Part)

PART – I (20 Marks)

Answer any 4 (*four*) questions

- 1 Write about PGE geochemistry of the base metal sulfides that are commonly present in the mantle xenoliths. What would be the expected differences in PGE geochemical characters of magmas generated by a lower degree (5-7%) of partial melting of a sulfide saturated mantle and a higher degree (>30%) of partial melting of a sulfide saturated mantle? 2+3 = 5

- 2 Why are critical minerals important for a low-carbon future of the Earth? Do you consider that the Singhbhum Craton is a Metallogenic Province? Why? How do you use the combined lithophile and chalcophile elements geochemistry to explore the Ni-Cu sulfide ore deposits in the Deccan Traps? 1+2+2 = 5

- 3 "Major chromite deposits are genetically related to ultramafic-mafic magmatism that are restricted to specific periods of time and have specific tectonic settings" – Explain with examples. How do you explain the bimodal distribution of Cr-ratios in tectonite hosted chromitites from the ophiolitic complexes? 3+2 = 5

- 4 How does change in oxygen fugacity influence the Cr and S solubilities of the komatiitic magma? Explain the most effective mechanism for sulfide liquid immiscibility in the ultramafic-mafic magmas. 3+2 = 5

- 5 Write the expression for equilibrium partitioning of Ni among three co-existing phases (i) silicate liquid (sil), (ii) olivine (ol), (iii) immiscible $Fe_{1-x}-Ni_{1-x}$ monosulfide liquid (sulf) from a mafic silicate magma saturated with S and crystallizing olivine as a liquidus phase. How do you explain the wide ranges of partitioning values of Ni in sulfide-olivine natural assemblages? 3+2 = 5

[Turn over

PART – II (20 Marks)

Answer any 4 (*four*) questions

(4×5)

1. “The composition of magma, depth of magma emplacement and nature and timing of fluid saturation (first boiling vs. second boiling) play very important role in controlling porphyry Cu- (Mo) and porphyry W- (Mo) deposits”-accept or reject the statement with reasons.
5
2. What are VMS deposits? Discuss how does the alkaline, Mg-rich, and SO_4^{2-} dominated seawater become acidic, Mg-poor and H_2S -rich as it percolates down the oceanic.
1+4
3. Describe the different zones formed in a well-developed profile of supergene enrichment. Using suitable reactions discuss how metals are dissolved from the gossan and leached zone and deposited in the supergene enriched zone.
 $2\frac{1}{2}+2\frac{1}{2}$
4. “During hydrothermal mineralization Au is efficiently trapped from AuCl_2^- complexes through acid neutralization or reduction whereas it..is efficiently trapped from AuHS_2^- complexes through acidification and oxidation”- accept or reject the statement with reasons. Use necessary sketch for your explanation. Why metal ions are more efficiently adsorbed onto mineral surfaces in alkaline environment than in acidic environment?
4+1
5. “The timing and changing style of major uranium deposit types through geological time can be explained by the evolution of lithosphere, atmosphere and biosphere”- accept or reject the statement with reasons.
5
6. Write short notes on a) Fe oxide Cu-Au (IOCG)-type deposits and b) Indian beach placer deposits
 $2\frac{1}{2}+2\frac{1}{2}$