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P.P Code: 00056614

NB: Draw neat Diagrams wherever necessary. Max.Marks 100 Duration 3 Hours

Q1A Fill in the blanks.

10\*1 = 10

- i) Mineral calcite and aragonite are **POLYMORPHS** of each other.
- ii) Various trace and minute impurities within minerals give them various **COLOURS**.
- iii) **BLADED**- form is the characteristic of mineral kyanite.
- iv) Diamond mineral crystallizes in **ISOMETRIC/CUBIC** system.
- v) Orthorhombic system-normal class has **THREE** planes of symmetry.
- vi) Mica group of minerals are **SHEET-/PHYLLO**-silicates.
- vii) Only centre of symmetry is present in normal class of **TRICLINIC** system.
- viii) Hexagonal system exhibits **SEVEN (7)** planes of symmetry.
- ix) Mineral apatite shows hardness of **FIVE (5)** on Mohs scale of relative hardness.
- x) Pyroxenes and amphiboles mineral groups are **INO**-silicates.

Q1B Define the following.

10\*1 = 10

- i) Cleavage and specific gravity  
- **A plane of weakness along which minerals break easily.**  
- **The ratio between the weight of a volume of the mineral and the weight of an equal volume of water at 4°C**
- ii) Solid angle and interfacial angle.  
**angle between the two or more intersection of crystal faces is known as solid angle.**  
**Interfacial: angle between two adjacent faces.**
- iii) Streak and opalescence.  
**Streak: colour of mineral powder.**  
**Opalescence: mineral shows milky appearance.**
- iv) Goniometer and miller indices.  
**Ans: Goniometer: used for determining interfacial angle.**  
**Miller indices: miller indices: consist of a series of whole no. that have been derived from the intercepts by inverting and if necessary, the subsequent clearing of fraction.**
- v) Interference colour of hypersthene and hornblende.  
**Ans: hypersthene: 2<sup>nd</sup> order, hornblende: 3<sup>rd</sup> order.**

Q2 Answer any two of the following :

2\*10 = 20

- a) Define diaphaneity. Write a short note on different types of diaphaneity shown by minerals.  
**Ans: the amount of light transmitted by a mineral is known as**

diaphaneity.

**Types: transparent, translucent, opaque.**

b) Define luster. Write a short note on different types of luster seen in minerals.

**Ans: general appearance of a mineral surface in reflected light. Eg. Metallic luster.**

**Types: metallic and non-metallic. Non-metallic: adamantine, vitreous, resinous, pearly, greasy, silky and earthy.**

c) Describe the magnetic properties shown by minerals.

**Ans: paramagnetic, diamagnetic,**

d) Differentiate between isomorphism and polymorphism. Write a short note on mechanism of polymorphism.

**Ans: isomorphism: same structure, different composition.**

**Polymorphism: different structure, same composition.**

**Types of polymorphism: reconstructive transformation, displacive transformation, order-disorder transformation.**

**Q3 Answer any two of the following :**

**2\*10 = 20**

a) Name the class and crystal system in which Gold mineral crystallizes. Describe its symmetry element.

**Ans: isometric, hexaoctahedral class, axis: 13, plane:9 and centre is present.**

b) Describe elements of symmetry seen in crystal.

**Ans: plane, axis, and centre of symmetry.**

c) Write a short note on crystallographic zone.

**Ans: A zone is defined as a group of crystal faces that intersect in parallel edges. Since the edges will all be parallel to a line, we can define that the direction of the line using a notation similar to Miller Indices.**

d) Define form. Describe with neat sketch forms like pedion, pinacoid, cube and trisoctahedron.

**Ans: A crystal form is a set of crystal faces that are related to each other by symmetry.**

**Pedion: single face, open form. Cube: closed six faces, trisoctahedron: closed, 24 faces.**

**Q4**

**Answer any two of the following :**

**2\*10 = 20**

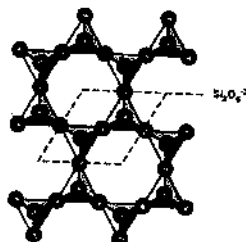
a) Define Si:O ratio of enstatite and which mineral group it belongs to and describe its physical properties.

**Ans: 1:3, pyroxene mineral group. properties: cleavage : 2 set, hardness: 5-6, sp. Gravity: 3.2 to 3.6, luster: vitreous, colour: grayish to greenish black.**

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b) Describe phyllosilicate structure drawing a neat sketch.



Ans:  $\text{Si}:\text{O}$ ,

c) Define Si:O ratio of olivine mineral and give its physical properties.

Ans: 1:4, physical properties of olivine: fracture: uneven to conchoidal, hardness : 6-7, colour: olive green, luster: vireous to sub-vitreous.

d) Describe physical properties for Biotite and muscovite mineral.

Ans: muscovite: phyllosilicate, colour: pale silvery, form: lamellar, hardness: 2-2.5, sp.gr: low, cleavage: 1set. Luster: pearly/silky.

Biotite: , colour: pale silvery brown, form: lamellar, hardness: 2.5-3, sp.gr: low, cleavage: 1set. Luster: pearly/silky.

Q5 Write short note on ANY FOUR of the following:

a) Pseudomorphism.

4\*5=20

Ans: **Pseudomorphism** is the existence of a mineral that has the appearance of another mineral. Pseudomorph means false form. Mechanism: substitution, encrustation, alteration.

b) Fracture in minerals.

Ans: Breakage of crystal when they do not break along cleavage or parting. Types conchoidal, fibrous, uneven, hackly.

c) Normal class of tetragonal system.

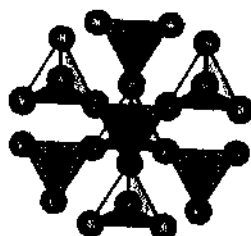
Ans:  $a_1=a_2 \neq c$ ,  $\alpha=\gamma=\beta=90^\circ$ , symmetry element: axis: 5, plane: 5 and center of symmetry is present.

d) Normal class of hexagonal system.

Ans:  $a_1=a_2=a_3 \neq c$ ,  $a_1 \wedge a_2 \wedge a_3 = 120^\circ$  and all three horizontal axes are perpendicular to c-axes.

Axis of symmetry: 7, plane of symmetry: 7, center of symmetry is present.

e) Tectosilicate structure.



Ans:  $\text{Si}:\text{O}=1:2$

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- f) Double chain Inosilicate structure.  
Ans:

