

2024-2020

GSI Prelims PYQ

Mineralogy



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2020

1. The space lattice of a mineral is:
 - a. An assemblage of atoms that is constantly repeated to form a mineral.
 - b. A glide plane parallel to which there are number of additional planes along which gliding takes place
 - c. A position of mineral in terms of their resistance towards failure
 - d. A position of mineral before plastic deformation and recrystallization
2. A tetragonal unit is a right square prism with a and b edge lengths equal and c different with two space lattices:
 - a. Primitive and body centered
 - b. Primitive and face centered
 - c. Primitive only
 - d. Body centered and face centered
3. In feldspar group of minerals, while cooling, unmixing of potash feldspars and soda feldspars takes place. The larger component occurs as ground mass and the minor one oriented parallel lamellae within the groundmass. This process of unmixing of two minerals is:
 - a. Exsolution
 - b. Isomorphism
 - c. Polymorphism
 - d. Magmatic segregation
4. Polymorphism is the phenomenon when a mineral exhibits:
 - a. Distinctly different physical or optical properties in spite of possessing the same chemical composition
 - b. Identical physical or optical properties in spite of possessing the same chemical composition
 - c. Identical physical or chemical properties in spite of possessing the different crystal lattice
 - d. Distinctly different physical or chemical properties in spite of possessing the same crystal lattice
5. The characteristic feature of a inosilicates group is:
 - a. 3.5 oxygens are shared between adjacent tetrahedra
 - b. 2 oxygen atoms link together to form a ring of composition
 - c. 2 tetrahedra sharing common oxygen
 - d. 2.5 oxygens are shared by adjacent tetrahedra
6. The characteristic feature of an opal is:
 - a. It is contaminated form of silica with varying amount of Fe and Mg in its structure
 - b. It contains a variable quantity of water molecules in its structures
 - c. It contains large numbers of micro-cavity in its structure
 - d. It contains traces of colloidal carbon and iron in its structure
7. The fibrous variety of anthophyllite is called:
 - a. Glaucophane
 - b. Jadeite
 - c. Enstatite
 - d. Amosite
8. Piezoelectricity is the simultaneous development of:
 - a. Positive and negative charges of electricity when its temperature is suitably changed
 - b. Positive and negative charges of electricity on different parts of same crystal when its pressure is suitably changed
 - c. Magnetic charge when its pressure and temperature is suitably changed
 - d. Electrical charges on different parts of same crystal when its pressure is suitably changed

9. Idiochromatic minerals are those which have:
- An uniform white streak though the colour is variable
 - A different colour based on chemical composition
 - A characteristic and constant colour
 - The same physical appearance in spite of having different chemical composition

2021

10. If the indices of any crystal face are rational numbers and are determined by dividing the intercepts of any face into the intercepts of the parametrial plane and clearing fraction, that with intercepts a, b and c. The indices will be:
- (101)
 - (111)
 - (001)
 - (100)
11. Opal is a mineral that displays iridescence or play of colours when rotated or observed from different direction because of:
- Interference of the ray of light by minute globules of water trapped in the outer layer of crystal lattice
 - Interference of the ray of light by the distortions in crystal lattice
 - On account of mineral inclusions
 - Interference of light reflected from thin plates of other minerals enclosed or exsolved in parallel planes within the crystal
12. "Pleochroism" representing change of colors upon rotation of microscope stage under plane polarized light in some minerals is characterized by:
- Two extremes of colour seen twice during a complete 360° rotation
 - Four extremes of colour seen twice during a complete 360° rotation
 - Two extremes of colour seen twice during a 90° rotation
 - Four extremes of colour seen twice during a 90° rotation
13. In alkali feldspar a 'coupled substitution' occurs when:
- Addition of one silicon ion in the framework structure to make a covalent bond in alkali feldspar
 - One aluminium ion plus one sodium ion enters the framework structure and replace one silicon ion and, in addition, fill a vacant site
 - One silicon ion is replaced by the one sodium ion to balance one ion of oxygen
 - One oxygen ion in addition enter in the framework structure to balance the charge of silicon and alumina
14. Garnet in-situ deposits are generally associated with:
- Sedimentary rocks only
 - Igneous rocks only
 - Metamorphic rocks
 - Sedimentary and igneous rocks
15. Variation in the refractive index in Al_2SiO_5 polymorphs is due to:
- Polarization of some light in the form of interference colour
 - Ferric iron and manganese entering structure
 - Thickness of thin section that retard velocity of light
 - Transmission of light with equal velocity in all direction

16. The ray velocity surface of an anisotropic crystal is an ellipsoid because anisotropic crystals:
- Transmit light with same velocities in different directions
 - Transmit light with different velocities in different directions
 - Absorb all the transmitted light
 - Have lower refractive index than air
17. Mineral Quartz shows twinning according to Brazil law (twin plane $11\bar{2}0$) and Dauphiné law (twin axis is c-axis) but this twinning is not detectable under the microscope because:
- Twin plane ($11\bar{2}0$) is always perpendicular to the twin axis (c-axis)
 - Both $11\bar{2}0$ and c-axis are in extinction position in twin plane direction
 - Optic orientation in both twin parts is identical in both types of twins
 - Optic orientation in both twin parts is not identical in both types of twins

2022

18. Consider the following statements:

Statement-1: Stereographic projection differs from orthographic projection in a fundamental way.

Statement-2: Orthographic projection preserves spatial relation among structures but stereographic projection displays geometries and orientation of lines and planes without regard to spatial relation.

Which one of the following is correct in respect of the above statements?

- Both Statement-1 and Statement-2 are true and Statement-2 is the correct explanation of Statement-1
 - Both Statement-1 and Statement-2 are true and Statement-2 is not the correct explanation of Statement-1
 - Statement-1 is true Statement-2 is false
 - Statement-1 is false Statement-2 is true
19. What will be the Miller indices of the crystal face having Weiss parameters $\infty a, 1b, \infty c$?
- (abc)
 - (010)
 - 011
 - (a, b, c)
20. What will be the relationship between interfacial angles of similar faces of two olivine crystals separated in space and time?
- Same
 - Different
 - No relation
 - Higher for larger crystal
21. In crystallography, how many plane lattices are possible?
- 4
 - 5
 - 6
 - 14
22. Which one among the following is a phosphate mineral?
- Apatite
 - Topaz
 - Gypsum
 - Corundum
23. How many oxygen atoms in each SiO_4 tetrahedra are shared in double-chain silicates?
- Two

- b. Three
 - c. Half of the tetrahedra share 3 and another half share 2
 - d. Four
24. Which one of the following feldspar compositions does not occur naturally?
- a. $Or_{56} An_{44}$
 - b. $An_{56} Ab_{44}$
 - c. $Or_{56} Ab_{44}$
 - d. $Or_{26} Ab_{66} An_8$
25. Which type of chemical bond is found between Si and O in tetrahedral SiO_4 ?
- a. Covalent
 - b. Ionic
 - c. 50% ionic and 50% covalent
 - d. Metallic
26. Si is in 6-fold coordination in which one of the following polymorphs of silica?
- a. Tridymite
 - b. Cristobalite
 - c. Coesite
 - d. Stishovite
27. Based on which main physical property, muscovite and biotite can be distinguished?
- a. Cleavage
 - b. Colour
 - c. Hardness
 - d. Habit
28. Match List-I with List-II and select the correct answer using the code given below the Lists:

List-I(silicate class)	List-II (Mineral)
A.Sorosilicate	1.Benitoite
B.Cyclosilicate	2.Kaolinite
C.Inosilicate	3.Epidote
D.Phyllsilicate	4.Spodumene

- a. A-2 B-4 C-1 D-3
 - b. A-3 B-1 C-4 D-2
 - c. A-2 B-1 C-4 D-3
 - d. A-3 B-4 C-1 D-2
29. Olivine does not show cleavage. Consider the following possible reasons for this:
1. Bond strength is about equal in all directions.
 2. SiO_4 tetrahedra is isolated.
 3. There is no bridging oxygen.

Which of the above reasons is/are correct?

- a. 1 only
- b. 1 and 2 only
- c. 2 and 3 only
- d. 1, 2 and 3

30. Which mineral is distinguished from pyroxene by its two sets of cleavage at angles of approximately 56° and 124° ?
- Hornblende
 - Augite
 - Anorthite
 - Biotite

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31. Which one among the following pairs is correctly matched?

[Crystal System] [Symmetry]

- Monoclinic: $2/m\ 2/m\ 2/m$
- Orthorhombic: $6/m\ 2/m\ 2/m$
- Tetragonal: $4/m\ 2/m\ 2/m$
- Hexagonal: $2/m$

32. The mineral pyrite (FeS_2) belongs to which one of the following classes of isometric crystal system?

- Diploidal class
- Hextetrahedral class
- Hexoctahedral class
- Tetartoidal class

33. A crystal face has an intercept of $6a:4b:c$. The appropriate Miller indices for this face will be

- 230
- 100
- 110
- 321

34. The tetrahedra repeat distance in a pyroxenoid chain is

- $5.2\ \text{\AA}$
- $7.3\ \text{\AA}$
- $8-9\ \text{\AA}$
- $17-8\ \text{\AA}$

35. Lizardite [$\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$] belongs to which one of the following mineral groups?

- Serpentine
- Chlorite
- Epidote
- Illite

36. Akermanite belongs to which one of the following silicate groups?

- Tectosilicates
- Phyllosilicates
- Sorosilicates
- Inosilicates

37. Which one of the following mineral groups exhibits the peristerite, Boggild and Huttenlocher lamellar intergrowths?

- Plagioclase
- Pyroxene
- Amphibole
- Mica

38. Forsterite-Fayalite series of olivine group of minerals is an example of
- solid solution
 - polymorphism
 - paramorphism
 - pseudomorphism
39. Which one of the following pairs of minerals is not an example of polymorphism?
- Calcite and Aragonite
 - Tridymite and Cristobalite
 - Pyrite and Marcasite
 - Edenite and Enstatite
40. Some specimens of plagioclases show spectacular colours ranging from blue to green/yellow and red. This iridescence is called
- asterism
 - labradorescence
 - fluorescence
 - phosphorescence
41. Which of the following statements regarding micas is/are correct?
- Micas are silicates with a layer crystal structure in which sheets of M-(O, OH) octahedra are sandwiched between two inward pointing sheets of linked T-O tetrahedra.
 - In muscovite, two out of three octahedral sites are occupied mainly by Al and in biotite, all octahedral sites are mainly occupied by Fe and Mg.
 - Muscovite differs from phlogopite and biotite in having its optic axial plane perpendicular to (010) and usually has higher 2V than phlogopite and biotite.
- Select the correct answer using the code given below.
- 1 only
 - 1 and 2 only
 - 2 and 3 only
 - 1, 2 and 3
42. Which of the following statements regarding amphiboles is/are correct?
- The members of amphibole group of minerals occur in a wide range of P-T environments and are the common constituents of igneous and metamorphic rocks.
 - The essential feature of the structures of all amphiboles is the presence of (Si, Al)-O tetrahedra linked to form chains having composition $(\text{Si, Al})_4 \text{O}_{11}$.
 - Basal sections of amphiboles show two sets of cleavages with cleavage angle 87° to 88° .
- Select the correct answer using the code given below.
- 1 only
 - 1 and 2 only
 - 2 and 3 only
 - 1, 2 and 3

2024

43. If in a crystal the glide component is represented by $a/2+b/2$, $a/2+c/2$, $b/2+c/2$ or $a/2+b/2+c/2$ then the glide plane is
- a glide
 - Diagonal glide
 - Diamond glide
 - Glide

44. An open crystal form composed of 3, 4, 6, 8 or 12 faces, all of which are parallel to the same axis, is called as
- _____
- Pyramid
 - Prism
 - Pinacoid
 - Sphenoid
45. Which one among the following pairs is not correctly matched?
- Pyrope : $Mg_3Al_2Si_3O_{12}$
 - Almandine: $Fe_3Al_2Si_3O_{12}$
 - Spessartite : $Mn_3Al_2Si_3O_{12}$
 - Uvarovite : $Ca_3Al_2Si_3O_{12}$
46. Consider the following statements:
- Statement 1: The relative importance of crystal forms is proportional to the point densities or spacings of the respective lattice planes.
- Statement 2: The rate of crystal growth in any lattice direction is proportional to the point density in that direction.
- The above statements belong to which rule/law?
- Pauling's Rules
 - Bravais Law
 - Bragg's Law
 - Stokes' Law
47. Spinel group is an example of :
- Polymorphism
 - Isomorphism
 - Pseudomorphism
 - Paramorphism
48. Consider the following statements regarding polymorphism:
- Statement 1 : Polytypism is a variety of polymorphism.
- Statement 2: It involves stacking of identical layers in different sequences within a structure which have same unit cell lengths in two dimensions but commonly have a different cell length in the third dimension, which is essentially perpendicular to the layers.
- Which one of the following is correct in respect of the above statements?
- Both statement 1 and statement 2 are true and statement 2 is the correct explanation of statement 1.
 - Both statement 1 and statement 2 are true, but statement 2 is not the correct explanation of statement 1.
 - Statement 1 is true, but statement 2 is false.
 - Statement 1 is false, but statement 2 is true.
49. Regarding the structure of silicates, the type $(Si_2O_7)^{6-}$ is known as :
- Cyclosilicate
 - Sorosilicate
 - Phyllosilicate
 - Tectosilicate
50. What is the mechanism of solid solution, if Pb^{2+} substitutes for K^+ in microcline?
- Simple substitution
 - Interstitial solid solution
 - Omission solid solution
 - Coupled substitution
51. Monticellite is Ca-bearing end member of which one of the following mineral groups?
- Pyroxene Group

- b. Olivine Group
- c. Garnet Group
- d. Epidote Group

52. Which one of the following statements is not correct?

- a. The optic axial angle of olivine group minerals varies from $2V \gamma 82^\circ$ for Mg_2SiO and $134'$ for Fe_2SiO_4 .
- b. Magnesium-rich olivine is distinguished from diopside by its poor cleavage, large optic axial angle and higher birefringence.
- c. Iron-rich olivine's occur in both alkaline and acid plutonic and hypabyssal rocks.
- d. Olivine's of nearly equal Fe-Mg are common constituents of Komatiite.

53. Which one of the following minerals does not belong to pyroxene group

- a. Omphacite
- b. Kosmochlor
- c. Pigeonite
- d. Eckermannite



Year	Question no	Answer	Year	Question no	Answer
2020	1	a	2023	31	c
	2	a		32	a
	3	a		33	a
	4	a		34	b
	5	d		35	a
	6	b		36	c
	7	d		37	a
	8	b		38	a
	9	c		39	d
2021	10	b		40	b
	11	a		41	d
	12	a		42	b
	13	b	2024	43	b
	14	c		44	b
	15	b		45	d
	16	b		46	b
	17	c		47	b
2022	18	a		48	a
	19	b		49	b
	20	a		50	d
	21	a		51	b
	22	a		52	d
	23	c		53	d
	24	a			
	25	c			
	26	d			
	27	b			
	28	b			
	29	d			
	30	a			

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