

National Testing Agency

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X-RAY CRYSTALLOGRAPHY

Group Number : 1
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X-RAY CRYSTALLOGRAPHY

Section Id : 28860741
Section Number : 1
Section type : Online
Mandatory or Optional: Mandatory
Number of Questions: 50
Number of Questions to be attempted: 50
Section Marks: 100

Sub-Section Number: 1
Sub-Section Id: 28860744
Question Shuffling Allowed : Yes

Question Number : 1 Question Id : 2886073445 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

In Bragg's law the phenomenon applied is

- Reflection
- Refraction
- Interference
- Polarization

Options :

28860713753. 1

28860713754. 2

28860713755. 3

28860713756. 4

Question Number : 2 Question Id : 2886073446 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

For the constructive wave front in diffraction to occur the path difference between the two parallel rays should be

- a. Path difference should be shorter than wavelength
- b. Path difference should be comparable with wavelength
- c. Path difference should be higher than that of wavelength.
- d. Integral multiple of wavelength

Options :

28860713757. 1

28860713758. 2

28860713759. 3

28860713760. 4

Question Number : 3 Question Id : 2886073447 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

The diffraction phenomena is explained with

- a. Newton's Corpuscular theory
- b. Electromagnetic theory
- c. Huygens wave theory
- d. Heisenberg principle

Options :

28860713761. 1

28860713762. 2

28860713763. 3

28860713764. 4

Question Number : 4 Question Id : 2886073448 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

In Neutron diffraction, the diffraction occurs from

- a. X-rays
- b. Electrons
- c. Nucleus
- d. Neutrons

Options :

28860713765. 1

28860713766. 2

28860713767. 3

28860713768. 4

Question Number : 5 Question Id : 2886073449 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

What is the radius of limiting sphere with a source of wavelength λ .

- a. $1/\lambda$
- b. $2/\lambda$
- c. λ
- d. $\lambda/2$

Options :

28860713769. 1

28860713770. 2

28860713771. 3

28860713772. 4

Question Number : 6 Question Id : 2886073450 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

X-rays are having wavelength in the range

- a. $< 0.1 \text{ \AA}$
- b. $10 - 100 \text{ \AA}$
- c. $0.1 - 10 \text{ \AA}$
- d. Micro wave

Options :

28860713773. 1

28860713774. 2

28860713775. 3

28860713776. 4

Question Number : 7 Question Id : 2886073451 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

. In electromagnetic spectrum wave length and energy are

- a. Directly proportional
- b. Inversely proportional
- c. The intensity is same as that of the λ
- d. The wavelength is square of the energy

Options :

28860713777. 1

28860713778. 2

28860713779. 3

28860713780. 4

Question Number : 8 Question Id : 2886073452 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

In a given triclinic unit cell, if the cell become $a=b=c$ and $\alpha=\beta=\gamma\neq 90$ then the crystal system is

- a. Cubic
- b. Trigonal
- c. Orthorhombic
- d. Triclinic

Options :

28860713781. 1

28860713782. 2

28860713783. 3

28860713784. 4

Question Number : 9 Question Id : 2886073453 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

The most commonly used material in routine X-ray diffraction studies is

- a. Gel
- b. Amorphous
- c. Crystalline
- d. solution

Options :

28860713785. 1

28860713786. 2

28860713787. 3

28860713788. 4

Question Number : 10 Question Id : 2886073454 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

How many point groups are there in a trigonal crystal system.

- a. 7
- b. 6
- c. 5
- d. 3

Options :

28860713789. 1

28860713790. 2

28860713791. 3

28860713792. 4

Question Number : 11 Question Id : 2886073455 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

What is the highest symmetry possible in a triclinic system.

- a. Two fold rotation
- b. Two fold followed by reflection
- c. Reflection
- d. Inversion

Options :

28860713793. 1

28860713794. 2

28860713795. 3

28860713796. 4

Question Number : 12 Question Id : 2886073456 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

What are the allowed rotational symmetries in a crystal.

- a. 2,3,4,5,6,8
- b. 2,5,8
- c. 2,3,4,6
- d. 2,3,6

Options :

28860713797. 1

28860713798. 2

28860713799. 3

28860713800. 4

Question Number : 13 Question Id : 2886073457 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

What is the alternate way of explaining the Tetragonal system.

- a. Compressed Orthorhombic
- b. Stretched Cubic in one direction
- c. Elongated Hexagonal
- d. Stretched Triclinic

Options :

28860713801. 1

28860713802. 2

28860713803. 3

28860713804. 4

Question Number : 14 Question Id : 2886073458 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

Identify the Bravais types possible in Orthorhombic system.

- a. P,A,B,C,F,I
- b. P,C,F,I
- c. P,C,A,B
- d. P,C,I

Options :

28860713805. 1

28860713806. 2

28860713807. 3

28860713808. 4

Question Number : 15 Question Id : 2886073459 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

What will be the equivalent point generated after the operation of 2_1 screw along b-axis on a given point x,y,z.

- a. $-x,-y,1/2+z$
- b. $-x,1/2+y,-z$
- c. $x,1/2+y,-z$
- d. $x,1/2+y,z$

Options :

28860713809. 1

28860713810. 2

28860713811. 3

28860713812. 4

Question Number : 16 Question Id : 2886073460 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

Identify the centro symmetric point groups in Monoclinic and Orthorhombic system.

- a. $2/m$, mmm
- b. -2 , $mm2$
- c. m , mmm
- d. 222 , $2/m$

Options :

28860713813. 1

28860713814. 2

28860713815. 3

28860713816. 4

Question Number : 17 Question Id : 2886073461 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

What is the systematic absence condition for 2_1 screw along 'a' axis.

- a. $0k0$, $k=2n+1$ absent
- b. $h00$, $h=2n+1$ absent
- c. hkl , $h=2n+1$ absent
- d. $h0l$, $h=2n+1$ absent

Options :

28860713817. 1

28860713818. 2

28860713819. 3

28860713820. 4

Question Number : 18 Question Id : 2886073462 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

Identify the systematic absent condition for the I centered lattice.

- a. $h0l$, $l=2n+1$
- b. $hk0$, $h+k=2n+1$
- c. $hk0$, $h+k=2n$
- d. $0kl$, $l=2n+1$

Options :

28860713821. 1

28860713822. 2

28860713823. 3

28860713824. 4

Question Number : 19 Question Id : 2886073463 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

Identify the point groups for the space groups P-1, P2/c, Pbc_a .

- a. -1, -2, mm2
- b. -1, 2/m, mmm
- c. -2, -1, 222
- d. m, -1, mm2

Options :

28860713825. 1

28860713826. 2

28860713827. 3

28860713828. 4

Question Number : 20 Question Id : 2886073464 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

How can we convert the Orthorhombic space group P2₁2₁2₁ to Pbc_a.

- a. Suitable reflection
- b. Suitable inversion
- c. Suitable translation
- d. Not possible

Options :

28860713829. 1

28860713830. 2

28860713831. 3

28860713832. 4

Question Number : 21 Question Id : 2886073465 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

What is the corresponding point group for the centrosymmetric space group C2/c.

- a. 2
- b. -2
- c. 2/m
- d. -1

Options :

28860713833. 1

28860713834. 2

28860713835. 3

28860713836. 4

Question Number : 22 Question Id : 2886073466 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

Which pair of points represent the unique inversion center for the space group P-1.

- a. 000, $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
- b. 000,100
- c. 100,001
- d. 010,001

Options :

28860713837. 1

28860713838. 2

28860713839. 3

28860713840. 4

Question Number : 23 Question Id : 2886073467 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

What is the third symmetry element generated after the application of two perpendicular mirrors in the orthogonal system.

- a. 2 fold
- b. Mirror
- c. 2 fold and Mirror
- d. Inversion

Options :

28860713841. 1

28860713842. 2

28860713843. 3

28860713844. 4

Question Number : 24 Question Id : 2886073468 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

. How can a 'n-glide' be defined.

- a. Rotation followed by translation
- b. Reflection followed by translation in one axis
- c. Reflection followed by translation in 2 axes
- d. Reflection followed by translation

Options :

28860713845. 1

28860713846. 2

28860713847. 3

28860713848. 4

Question Number : 25 Question Id : 2886073469 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

What is the systematic absent condition for 2_1 screw along b-axis.

- a. $0k0, k=2n+1$
- b. $hk0, k=2n+1$
- c. $0kl, k=2n+1$
- d. $hkl, k=2n+1$

Options :

28860713849. 1

28860713850. 2

28860713851. 3

28860713852. 4

Question Number : 26 Question Id : 2886073470 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

How are the reciprocal lattice vectors a^* , b^* , c^* related in Tetragonal system.

- a. Orthogonal to each other
- b. a^* and b^* are orthogonal
- c. a^* b^* are parallel and c^* is orthogonal
- d. a^* b^* c^* are coplanar

Options :

28860713853. 1

28860713854. 2

28860713855. 3

28860713856. 4

Question Number : 27 Question Id : 2886073471 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

The lattice type A,B,C can be determined from the

- a. Zonal reflection
- b. Axial reflections
- c. h0l reflections
- d. General reflections

Options :

28860713857. 1

28860713858. 2

28860713859. 3

28860713860. 4

Question Number : 28 Question Id : 2886073472 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

A 2_1 screw involves

- a. Rotation by 180 followed by $\frac{1}{2}$ unit translation
- b. 180 rotation and 1 unit translation
- c. 180 rotation
- d. Rotation by 180 followed by 2 unit translation

Options :

28860713861. 1

28860713862. 2

28860713863. 3

28860713864. 4

Question Number : 29 Question Id : 2886073473 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

The generated additional symmetry in the $C2/m$ space group is

- a. A 2_1 screw at $a/4$ along b
- b. A 2 fold rotation at $a/4$ along b
- c. A 2 fold at $b/2$ along a
- d. A mirror perpendicular to a axis

Options :

28860713865. 1

28860713866. 2

28860713867. 3

28860713868. 4

Question Number : 30 Question Id : 2886073474 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

The miller indices of 111 is

- a. Parallel to $1/a, 1/b, 1/c$
- b. Parallel to $a b c$
- c. $1/1, 1/1, 1/1$
- d. Normal at $a b c$

Options :

28860713869. 1

28860713870. 2

28860713871. 3

28860713872. 4

Question Number : 31 Question Id : 2886073475 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

In Patterson method the following is called a Harker plane

- a. $u \frac{1}{2} w$
- b. $u 0 \frac{1}{2}$
- c. $0 \frac{1}{2} w$
- d. $0 v \frac{1}{2}$

Options :

28860713873. 1

28860713874. 2

28860713875. 3

28860713876. 4

Question Number : 32 Question Id : 2886073476 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

Which of the following is correct for Monoclinic system.

- a. $hkl=h-kl$
- b. $hkl=-hkl$
- c. $hkl=hk-l$
- d. all of the above

Options :

28860713877. 1

28860713878. 2

28860713879. 3

28860713880. 4

Question Number : 33 Question Id : 2886073477 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

In direct methods the basic assumption is

- a. The atoms are considered as equal scatterers and point atoms
- b. The atoms are treated as they scatter
- c. The heavier the atom larger the scattering
- d. all of the above

Options :

28860713881. 1

28860713882. 2

28860713883. 3

28860713884. 4

Question Number : 34 Question Id : 2886073478 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

For the tetragonal system the Bragg's equation in reciprocal space is

- a. $\sqrt{(h^2 a^* + k^2 b^* + l^2 c^*)}$
- b. $\sqrt{(a^{*2}(h^2 + k^2) + l^2 c^*)}$
- c. $\sqrt{a^{*2}(h^2 + k^2 + l^2)}$
- d. None of the above

Options :

28860713885. 1

28860713886. 2

28860713887. 3

28860713888. 4

Question Number : 35 Question Id : 2886073479 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

For the hexagonal system interchanging hkl to khl the θ will

- a. Remain the same
- b. Increase
- c. Decrease
- d. Depends on λ

Options :

28860713889. 1

28860713890. 2

28860713891. 3

28860713892. 4

Question Number : 36 Question Id : 2886073480 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

In 'a' glide perpendicular to 'b' axis ($a \perp b$) the mirror plane is

- a. ac plane
- b. bc plane
- c. ab plane
- d. 1 1 1 direction

Options :

28860713893. 1

28860713894. 2

28860713895. 3

28860713896. 4

Question Number : 37 Question Id : 2886073481 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

The following pair of space groups cannot be determined uniquely

- a. C2 and Cm
- b. C2 and Cc
- c. $P2_1$ and $P2_1/c$
- d. Pm and $P2_1$

Options :

28860713897. 1

28860713898. 2

28860713899. 3

28860713900. 4

Question Number : 38 Question Id : 2886073482 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

The Friedel equivalent for the cubic system is

- a. $hkl=h0l$
- b. $hkl=0kl$
- c. $hkl=kh1$
- d. $hkl=hk0$

Options :

28860713901. 1

28860713902. 2

28860713903. 3

28860713904. 4

Question Number : 39 Question Id : 2886073483 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

In the Bragg equation in reciprocal space for the cubic system hkl & khl & lkh will have

- a. Different θ
- b. Same θ
- c. Same frequency
- d. same direction

Options :

28860713905. 1

28860713906. 2

28860713907. 3

28860713908. 4

Question Number : 40 Question Id : 2886073484 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The space group $Pca2_1$ belongs to the point group

- a. 222
- b. $mm2$
- c. mmm
- d. $2/m$

Options :

28860713909. 1

28860713910. 2

28860713911. 3

28860713912. 4

Question Number : 41 Question Id : 2886073485 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The generated 2_1 screw in the space group $Pbca$ is at

- a. At $b/4$ along a
- b. $a/4$ along b
- c. at 000 along b
- d. $c/4$ along a

Options :

28860713913. 1

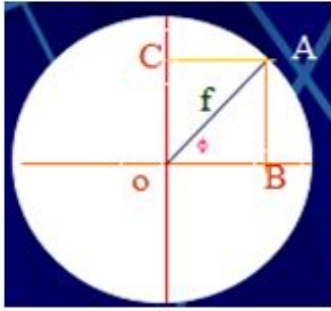
28860713914. 2

28860713915. 3

28860713916. 4

Question Number : 42 Question Id : 2886073486 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The phase angle ϕ in this fig. is



- a. $\phi = \tan^{-1} OC/OB$
- b. $\phi = f/OC$
- c. $\phi = f/OB$
- d. $\phi = OB/OC$

Options :

28860713917. 1

28860713918. 2

28860713919. 3

28860713920. 4

Question Number : 43 Question Id : 2886073487 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The space group P1 & P-1 can be uniquely determined

- a. From the systematic absences
- b. From the unit cell
- c. From the system
- d. Not possible

Options :

28860713921. 1

28860713922. 2

28860713923. 3

28860713924. 4

Question Number : 44 Question Id : 2886073488 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

When j waves with different amplitude and phases are superimposed, the resultant phase angle α_r is

- a. $\alpha_r = \tan^{-1} \frac{\sum_j f_j \sin \delta_j}{\sum_j f_j \cos \delta_j}$
- b. $\alpha_r = \tan^{-1} \frac{\sum_j f_j \cos \delta_j}{\sum_j f_j \sin \delta_j}$
- c. $\alpha_r = \tan^{-1} \left(\frac{\sum_j f_j \sin \delta_j}{\sum_j f_j \cos \delta_j} \right)^2$
- d. $\alpha_r = \tan^{-1} \left(\frac{\sum_j f_j \sin \delta_j}{\sum_j f_j \cos \delta_j} \right)$

Options :

28860713925. 1

28860713926. 2

28860713927. 3

28860713928. 4

Question Number : 45 Question Id : 2886073489 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The following pair are ambiguous space groups

- a. $Pca2_1, Pcam$
- b. $Pca2_1, Pcc2$
- c. $Pna2_1, Pna2$
- d. All the above

Options :

28860713929. 1

28860713930. 2

28860713931. 3

28860713932. 4

Question Number : 46 Question Id : 2886073490 Question Type : MCQ Option Shuffling : No
Correct Marks : 2 Wrong Marks : 0

The smaller a miller index,

- a. The more nearly perpendicular a plane is to that axis
- b. The more nearly parallel a plane is to that axis
- c. The plane is inclined to another plane
- d. None of the above

Options :

28860713933. 1

28860713934. 2

28860713935. 3

28860713936. 4

Question Number : 47 Question Id : 2886073491 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

In calculating the normalized structure factor E_{hkl} . The molecular formula plays an important role

- a. Based on the system
- b. Based on the space group
- c. True
- d. Not true

Options :

28860713937. 1

28860713938. 2

28860713939. 3

28860713940. 4

Question Number : 48 Question Id : 2886073492 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

X-rays are

- a. Transverse Electromagnetic wave with no charge
- b. Longitudinal electromagnetic wave with Charges
- c. Transverse Electromagnetic wave with negative Charges
- d. A mix of all three types

Options :

28860713941. 1

28860713942. 2

28860713943. 3

28860713944. 4

Question Number : 49 Question Id : 2886073493 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

The screw axis is determined from the

- a. zonal reflection
- b. axial reflection
- c. $h0l$ reflection
- d. hkl reflection

Options :

28860713945. 1

28860713946. 2

28860713947. 3

28860713948. 4

Question Number : 50 Question Id : 2886073494 Question Type : MCQ Option Shuffling : No

Correct Marks : 2 Wrong Marks : 0

Miller indices are constructed using

- a. The reciprocal lattice
- b. Real Lattice
- c. From Bragg angled.
- d. Oblique lattice.

Options :

28860713949. 1

28860713950. 2

28860713951. 3

28860713952. 4