

CG-11-2020

WINTER EXAM 2020

Subject Name : RB-36\_PHYSICS - Solid State Physics – XIII (CBCS) OR\_V\_19-03-2021

Date : 19/03/2021

Duration : 60 min. |

Instruction / सूचना / :-

\* Follow the detail instructions given on OMR Sheet

\* ओ एम आर वरील सर्व सूचनांचे पालन करावे.

Q.1 Regular arrangement of atoms in the solid is called as

- A. Crystal
- B. Amorphous
- C. Both A & B
- D. None of the above

Q.2 All the lattice points lie at its corners only is called as \_\_\_\_\_ unit cell

- A. Single
- B. Multiple
- C. Non primitive
- D. Primitive

Q.3 The \_\_\_\_\_ operation applies to lattices only

- A. Reflection
- B. Rotation
- C. Translation
- D. Inversion

Q.4 \_\_\_\_\_ no of atoms present in body center cubic structure

- A. 4
- B. 1
- C. 2
- D. 8

Q.5 The lattice which divides it into two identical halves which are mirror images of each other is called as

- A. Rotation
- B. Reflection
- C. Inversion
- D. Translation

Q.6

Lattice parameters of the orthorhombic structure is

- A.  $a \neq b \neq c, \alpha = \beta = \gamma = 90$  degree
- B.  $a = b \neq c, \alpha = \beta = \gamma = 90$  degree
- C.  $a = b = c, \alpha = \beta = \gamma = 90$  degree
- D.  $a \neq b \neq c, \alpha \neq \beta \neq \gamma \neq 90$  degree

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Q.7

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A lattice combined with a basis generates the \_\_\_\_ structure

- A. Lattice
- B. Crystal
- C. Basis
- D. All of these

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Q.8

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Packing Fraction of the FCC structure is \_\_\_\_\_

- A. 52%
- B. 74%
- C. 64%
- D. None of the above

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Q.9

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The number of space lattices possible is only \_\_\_\_ in 3dimensional. The Group of rotations.

- A. Ten
- B. Fourteen
- C. Six
- D. Eight

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Q.10

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Inversion and reflection symmetry operations Collectively known as

- A. Point symmetry operations
- B. Space symmetry operations
- C. Single group
- D. Multiple symmetry operations

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Q.11

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The atoms and molecules in a solid are held (bind) together due to the \_\_\_\_ forces between them

- A. Repulsive
- B. Interatomic
- C. Lorent' s
- D. None of the above

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Q.12

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A bond is formed by the actual transfer of valence electrons from one atom to the other atom so that each atom acquires a stable electronic configuration is called as

- A. Covalent bond
- B. Hydrogen
- C. Ionic bond
- D. Metallic

Q.13

The Laue's X-ray diffraction is one of the methods used to determine the

structure of the solids in which

- A. Keeping glancing angle  $\theta$  fixed & varies with the wavelength  $\lambda$
- B. Keeping glancing angle
- C. Keeping both the wavelength  $\lambda$  & glancing angle
- D. Varies both the wavelength  $\lambda$  & glancing angle

Q.14

Bending of X-rays around of obstacle is called as

- A. X-rays penetration
- B. Emergent of X-rays
- C. X-rays diffraction
- D. X-rays coherent

Q.15

Bragg's law is expressed as

- A.  $2d\sin\theta = n\lambda$
- B.  $2d\sin\theta = n$
- C.  $d\sin\theta = n\lambda$
- D.  $4d\sin\theta = n\lambda$

Q.16

\_\_\_\_\_ bonds are called secondary bonds.

- A. Hydrogen
- B. Vander Waal's
- C. A and B. Of the above
- D. None of the above

Q.17

A \_\_\_\_\_ bond is formed by an equal sharing of electrons between two neighbouring atoms each having incomplete outermost shell.

- A. Ionic
- B. Covalent
- C. Metallic
- D. Hydrogen

Q.18

Vander waal's force of attraction present in \_\_\_\_\_ bonds

- A. Ionic
- B. Covalent
- C. Metallic
- D. Molecular

Q.19 H<sub>2</sub>O (water) is an example of

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- A. Hydrogen bond
- B. Covalent bond
- C. Ionic bond
- D. Molecular bond

Q.20

Binding energy of the metallic bonds ranges from ---to ----eV

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- A. 5,20
- B. 1,5
- C. 8,9
- D. 10,20

Q.21

Einstein's Specific heat formula for solids is

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- A.  $3N k_B \left( \frac{\theta_E}{T} \right)^2 \frac{e^{\theta_E/T}}{(e^{\theta_E/T} - 1)^2}$
- B.  $3R \left( \frac{\theta_D}{T} \right) F_D$
- C. 3NKB
- D. None of the above

Q.22

The specific of heat substance is expressed as

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- A.  $\frac{dQ}{dT}$
- B.  $\frac{dT}{dQ}$
- C.  $\frac{1}{2} \frac{dQ}{dT}$
- D.  $\frac{3}{2} \frac{dQ}{dT}$

Q.23

The einstein temprature defind by equation .

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- A.  $\theta_E = \frac{1}{2} \frac{h\omega_{10}}{k_B}$
- B.  $\theta_E = \frac{h\omega_0}{k_B}$
- C.  $\theta_E = \frac{h\omega_1}{k_B}$
- D.  $\theta_E = \frac{5}{2} \frac{h\omega_{10}}{k_B}$

Q.24

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Debye's specific heat formula for solids is =

- A.  $3N k_B \left(\frac{\theta_D}{T}\right)^2 \frac{e^{\theta_D/T}}{(e^{\theta_D/T} - 1)^2}$
- B.  $3R \left(\frac{\theta_D}{T}\right) F_D$
- C.  $3Nk_B$
- D. None of the above

Q.25

According to the classical theory the molar heat capacity of all the solids is constant

and is independent of temperature and frequency is called as \_\_\_\_

- A. Law of kinetic energy
- B. Internal energy
- C. Dulong and petit's law
- D. None of the above

Q.26

Unit of specific heat of solids in CGS system is

- A. Cal/gm-atom/ $^{\circ}$ C
- B. Joule kg/moleccule/ $^{\circ}$ C
- C. Both of the above
- D. None of the above

Q.27

The quantity of heat energy required to raise the temperature of 1 kg mole or 1 kg -

atom of any substance by 1

- A. Einsten heat
- B. Debye's heat
- C. Specific heat
- D. None of the above

Q.28

The vibrational energy is distributed equally among all the \_\_\_\_ degrees of freedom

- A. Three
- B. One
- C. Two
- D. Four

Q.29

According to dulon- petit's law the average atomic heat of about 60 elements in solid

state are found to be....

- A. 9.80cal/gm-atom/ $^{\circ}$ C
- B. 12.80cal/gm-atom/ $^{\circ}$ C
- C. 15.7580cal/gm-atom/ $^{\circ}$ C
- D. 6.15cal/gm-atom/ $^{\circ}$ C

Q.30

According to Debye approximation (theory). At low temperature the expression for

specific heat of solids becomes

- A.  $3R \left( \frac{\theta_D}{T} \right) F_D$   
 B.  $3R$   
 C.  $\frac{12}{5} \pi^4 \left( \frac{T}{\theta_D} \right)^3$   
 D.  $3N k_B \left( \frac{\theta_D}{T} \right)^2 \frac{e^{\theta_D/T}}{(e^{\theta_D/T} - 1)^2}$

Q.31

The potential energy within the crystal or box is assumed to be .....

- A. 0  
 B. 1  
 C. 2  
 D. 3

Q.32

The electronic specific heat is given by

- A.  $C_p = \frac{3}{2} N K_B$   
 B.  $C_v = \frac{5}{2} K_B T$   
 C.  $C_v = \frac{3}{2} N K_B$   
 D.  $C_p = \frac{5}{2} N K_B$

Q.33

The process of emission of electrons from the hot metal surface is called .....

- A. Plastic emission  
 B. Static emission  
 C. Thermionic emission  
 D. Current emission

Q.34

The average kinetic energy of a free electron as given by the classical statistical

mechanics is

- A.  $E_0 = K_B T$   
 B.  $C_v = k_B T$   
 C.  $E_0 = 3/2 K_B T$   
 D. None of the above

Q.35

The ratio of thermal conductivity to electrical conductivity is called as.....

- A. Widemann law  
 B. Franz law  
 C. Widemann -franz law  
 D. All of above

Q.36

In low temperature case the vibrational energy is directly proportional to ..... Which is analogous to the stefen' s law of black body radiation.

- A.  $T_2$
- B.  $T_3$
- C.  $T_4$
- D.  $T_5$

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Q.37 The metal exhibits .....electrical and thermal conductivity . 114 114

- A. Low
- B. Minimum
- C. High
- D. None of the above

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Q.38 The electrone is prevented from leaving the crystal by the presence of a large 114 114  
...barrier at its surface

- A. Kinetic energy
- B. Potential energy
- C. Total energy
- D. All of the above

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Q.39 Sommerfeld treated a problem quantum mechanically using the .....statistics. 114 114

- A. Maxwell boltzmann
- B. Bose Einstein
- C. Fermi dirac
- D. All of the above

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Q.40 Relation of electrical conductivity related to ohm ' s law can be obtained as  $\sigma$  114 114

- A.  $ne^2 T/m_e$
- B.  $Ne^2 /m_e T$
- C.  $n/e^2 m_e T$
- D. None of the above