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Q.1 In general alloying of steels will always increases the hardenability, but the addition of which element decrease the hardenability?

A. Cobalt

B. Nickel

C. Chromium

D. magnesium

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SC = 6, BCC = 8, FCC = 12

Q.2 The correct sequence in decreasing order number of the coordination number for the material structure is

FCC > BCC > SC

A. SC > BCC > FCC

B. FCC > BCC > SC

C. SC > FCC > BCC

D. BCC > FCC > SC

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Q.3 The average flow stress in flow curve equation is depends upon

A. True strain

B. True strain rate

C. Microstructure of material

D. All of above

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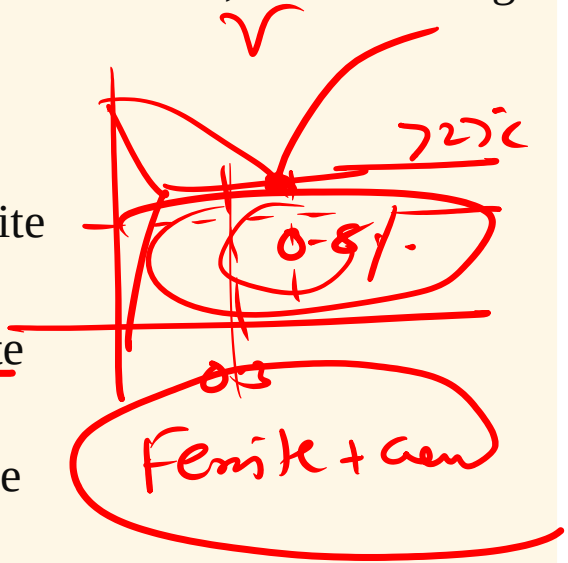
Q.4 When 0.3 % plane carbon steel is slowly cooled from the molten state to 710°C, the resulting structure will contain.

A. Pearlite and cementite

B. Ferrite and cementite

C. Austenite and Ferrite

D. Austenite and cementite



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$n = \varepsilon = 0.3$

Q.5 True stress strain of the material can be expressed as $\sigma = 1000\,\varepsilon^{0.3}$, stress in MPa. The true stress at maximum load and UTS of material are

0.3

$\sigma_T = 1000 \times 0.3$

A. 155 and 698 MPa respectively

B. 516 and 698 MPa respectively

$\sigma_T = 696.8$ MPa

C. 316 and 516.3 MPa respectively

D. 697 and 516.3 MPa respectively

$$\sigma_T = \sigma_N (1+e)$$

$$\sigma_N = \frac{\sigma_T}{1+e}$$

$$\varepsilon = 0.3 = \ln(1+e)$$

$$1+e = e^{0.3}$$

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$$\sigma_N = \frac{697}{1+e}$$

$$= \frac{697}{e^{0.3}}$$

$$\boxed{\sigma_N = 516.3\ MPa}$$

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Q. 6 During heat treatment of steel which one of the following will have minimum yield strength?

A. Martensite

B. Fine Pearlite

C. Very fine Pearlite

D. Coarse pearlite

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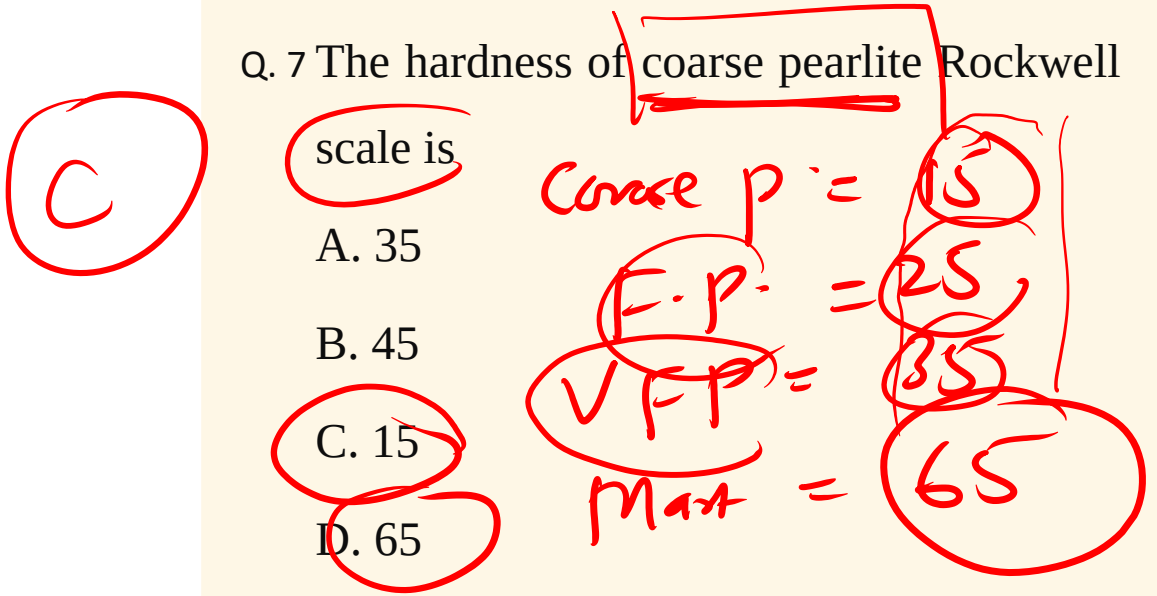
Q. 7 The hardness of coarse pearlite Rockwell scale is

A. 35

B. 45

C. 15

D. 65



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Q.8 The main purpose of spheroidizing treatment is to improve

A. hardenability of law carbon steek

B. Machin ability of law carbon steels

C. Hardenability of high carbon steels

D. Machinability of high carbon steels

M-C-S
or HCS

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A = 63.54 gm/mole

Q.9 The following data is given for the coper:

Atomic weight of copper = 63.54 gm/mole

Radius of copper = 1.278 A°

The theoretical density of the copper (in gm/cc) will be…….

A. 7.93

B. 8.23

C. 8.46

D. 8.94

$N = 6.02 \times 10^{23}$ atoms/mole

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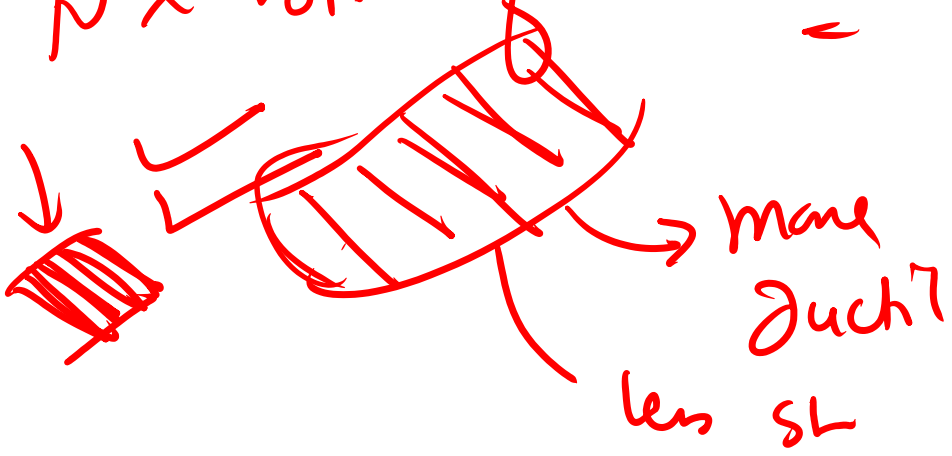
$$\rho_{th} = \frac{\text{Avg no of atom per Unit cell} \times \text{Atomic weight}}{N \times \text{Vol.}^{m} \text{ of Unit cell}}$$



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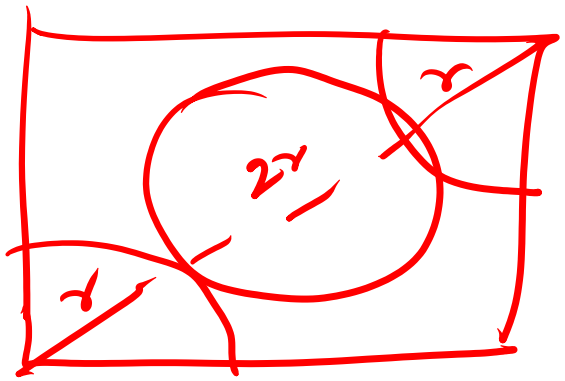
FCC



$\therefore a = \sqrt{4x2} - r$

$a = 2\sqrt{2}r$

a

$(4r)^2 = a^2 + a^2$

$16r^2 = 2a^2$

$\therefore a^2 = 8r^2$

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$$a = 2\sqrt{2} \times 1.278$$

$$a = 3.61\ A^{\circ} = 3.61 \times 10^{-8}\ cm$$

FCC = 4

$$\rho = \frac{4 \times 63.54}{6.02 \times 10^{23} \times a^3}$$

$$\rho = \frac{4 \times 63.54}{6.02 \times 10^{23} \times (3.61 \times 10^{-8})^3}$$

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$\rho = 8.94 \ g/cc$

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D

Q.10 The material property which depends only on the basic crystal structure is

A. Fracture strength

B. Fatigue strength

C. Creep

D. Modulus of elasticity

Imperfect
defect

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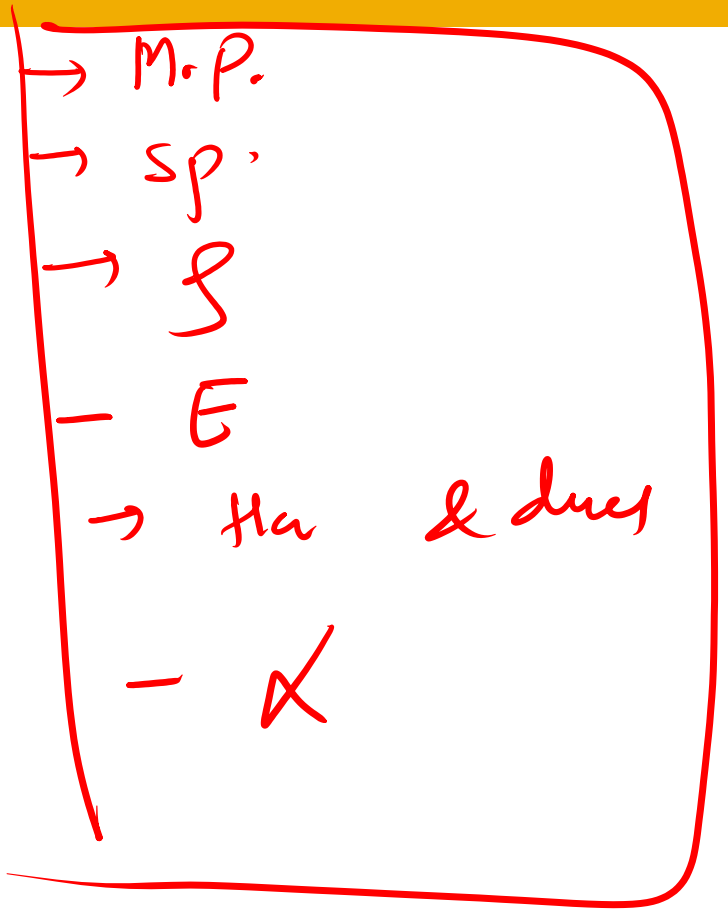

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Q.11 Consider the following statements related to the Eutectic point in the phase diagram:

A. It is the point corresponds to the Melting point of an alloy system

B. It is the point associated with a lowest melting temperature of that alloy system

C. It helps in controlling the thermal damage to the part during joining, as is done in soldering

D. It has different types of microstructures

Which of the above statement/s are correct?

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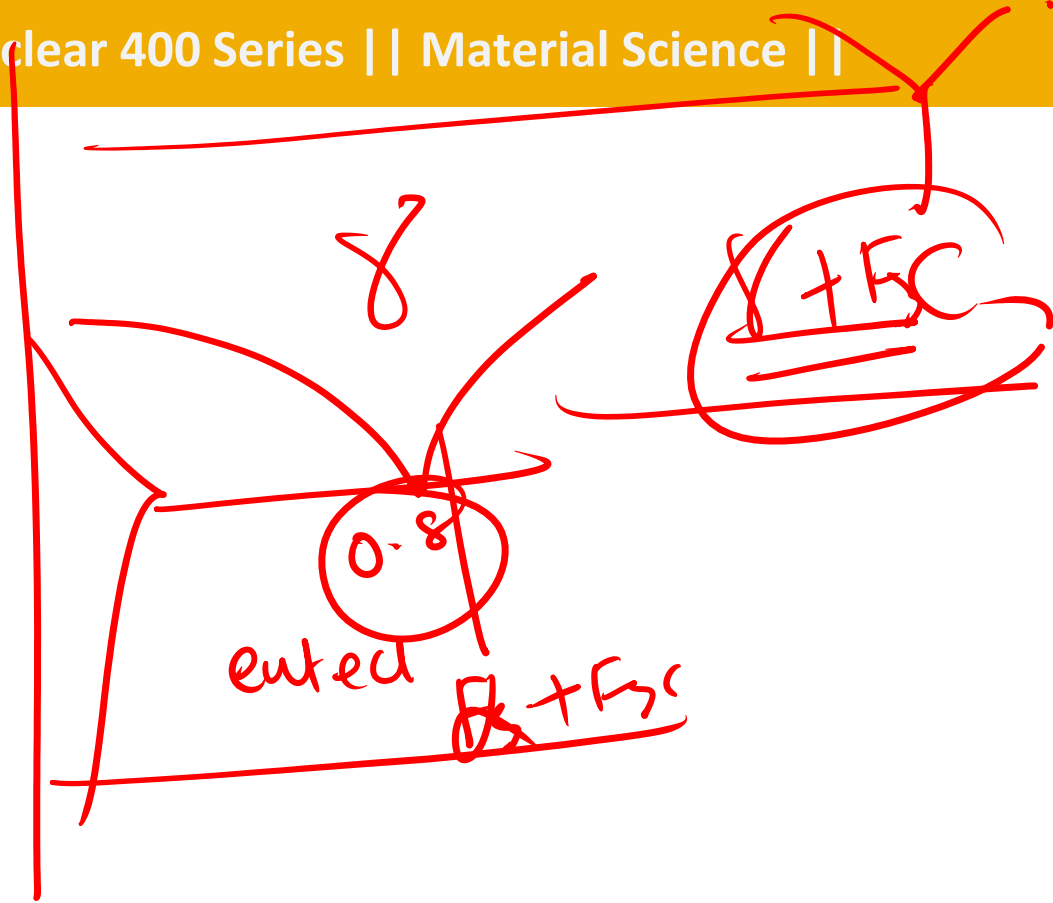

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Q.12 The process of providing the self lubrication property to powder metal parts called as…..

Q. Coining

R. Infiltration

S. Impregnation

T. None of these

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$\sigma_y = \sigma_i + K \cdot d^{1/2}$

$\sigma_i = 50\ MN/m^2$

$K = 0.63\ MN\,m^{-3/2}$

$d = 0.1\ mm$

Q.13 What is the yield stress for the polycrystalline alloy, when the grain size is 0.1 mm

Assume : yield stress for the crystal having no grain boundaries $\sigma_i = 50\ MNm^{-2}$

Hall itch constant $K = 0.63\ MNm^{-3/2}$

A. $1143\ MNm^{-2}$

B. $1113\ MNm^{-2}$

C. $113.00\ MNm^{-2}$

D. $2.143\ MNm^{-2}$

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$$\sigma_y = 50 + \frac{0.63}{\sqrt{0.1 \times 10^{-3}}}$$

113

$$= 50 + 63$$

$$= 113 \text{ MN/m}^2$$

$$\boxed{\sigma_y = \sigma_{y_i} + \frac{k}{\sqrt{d}}}$$

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Q.14 The melting temperature of the pure iron is…

A. 1539 °C

B. 1550 °C

C. 1130 °C

D. 1339 °C

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Q.15 The creep is specialty taken care while designing of the

A. Turbine rotor and casing

B. Drilling machines

C. Shapers

D. refrigerators

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Q.16 Muntz metal is an alloy of

A. Zinc and lead

B. Copper and zinc

C. Lead and white metal

D. Tin and zinc

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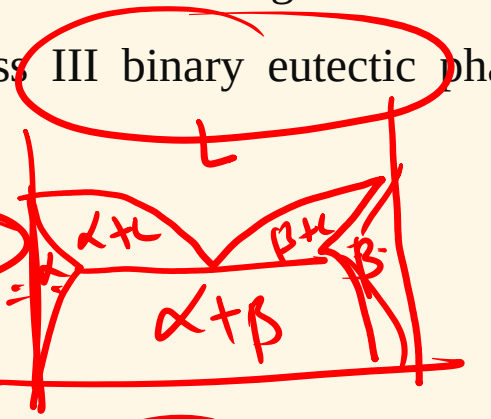
Q.17 Which one of the following is a classic example of class III binary eutectic phase diagram?

A. Pb – Sn

B. Nb – Si

C. H2O - NaCl

D. Al – Si



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Q.18 In white cast iron the carbon is resent as

A. Graphite flakes

B. Graphite nodules

C. Combined cementite

D. Carbon does not exists

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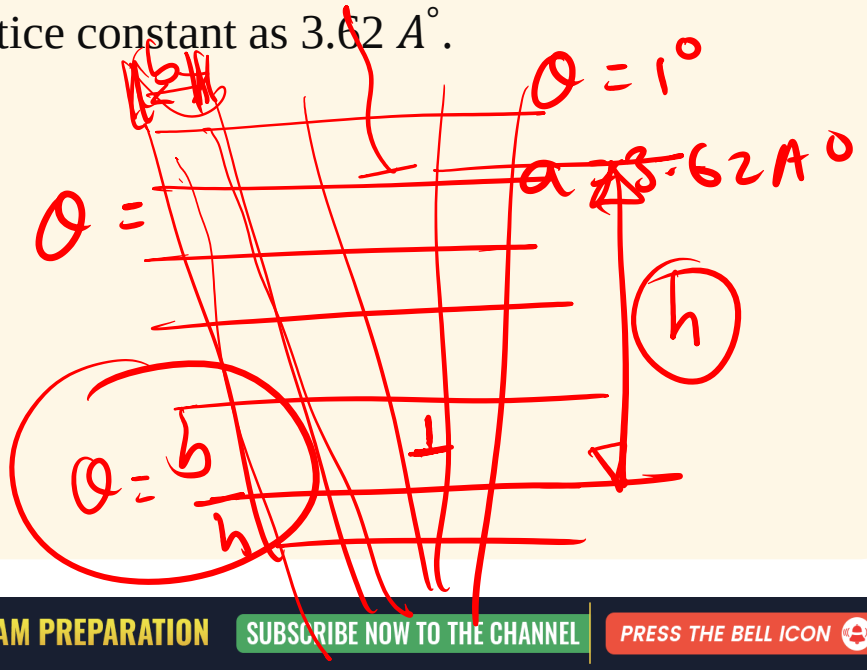
Q.19 The small angle boundaries in a variety of copper consists of align edge dislocation due to (110) planes of atoms. The spacings of dislocations if the angle of tilt is 1 degree? Take lattice constant as 3.62 A°.

A. 2.56 A°

B. 3.62 A°

C. 146.70 A°

D. 212.53 A°



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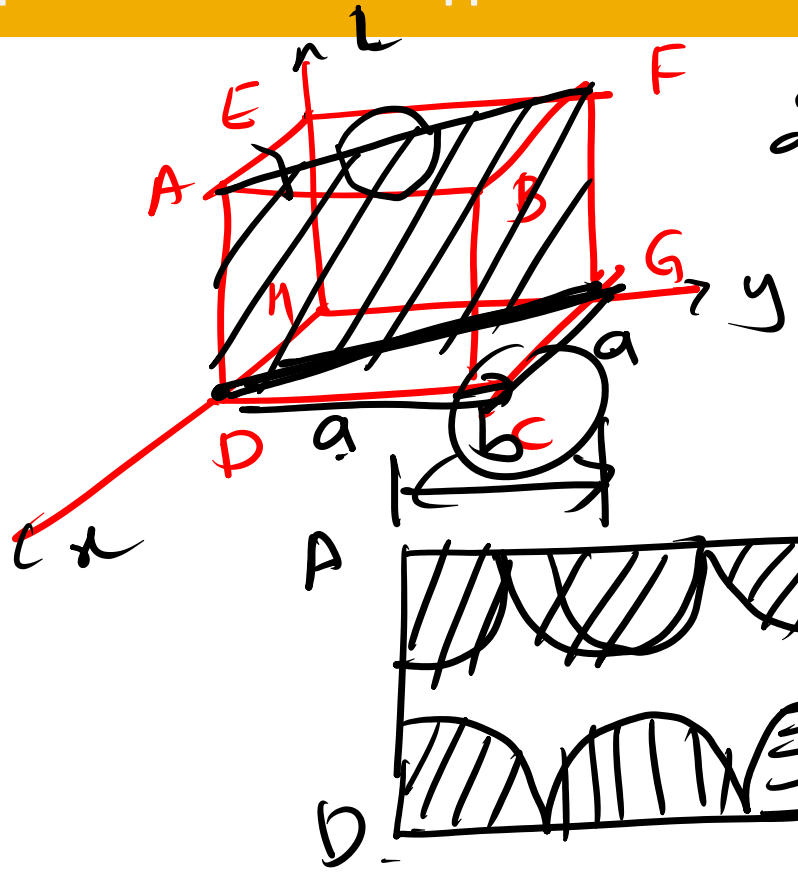
$\vec{B} \cdot \vec{V} = \frac{DG}{2} = \vec{b}$



$a^2 + a^2 = DG^2$

$DG = \sqrt{2}\, a$

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$$a = 3.62\,A^{\circ}$$

$$\vec{b} = \frac{DC}{2} = \frac{\sqrt{2}\times a}{2}$$

$$\vec{b} = \frac{a\times\sqrt{2}}{\sqrt{2}\cdot\sqrt{2}} = \frac{a}{\sqrt{2}}$$

$$\vec{b} = \frac{3.62}{\sqrt{2}} =$$

$$\vec{b} = 2.56\,A^{\circ}$$

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$\theta = \frac{b}{h}$

$\theta = 1^\circ$

$= \frac{\pi}{180}$ rad

$\frac{\pi}{180} = \frac{2.56\ A^\circ}{h}$

$h = \frac{2.56 \times 180}{\pi}\ A^\circ$

$h = 146.70\ A^\circ$

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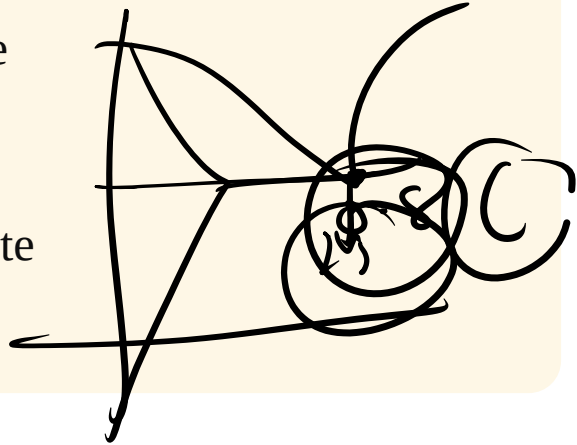
Q.20 The microstructure of the eutectoid steel at room temperature is……

A. Ferrite and pearlite

B. Pearlite

C. Ferrite and austenite

D. Cementite



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Q.21 Regarding to the recrystallization temperature (RCT) which of the following statement is not correct.

A. Higher amount of cold work, lower is the RCT

B. Higher the temperature of cold work, higher is the RCT

C. Finer the initial grain size, higher is the RCT

D. Higher the recovery, higher is the RCT

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Q.22 Which of the following technique does not required quenching to obtain final case hardness?

A. Flame hardening

B. Induction hardening

C. Nitriding

D. carburizing

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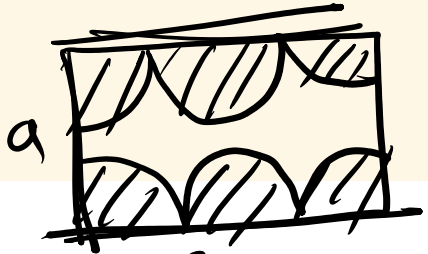
Q.23 The atomic radius of the copper (FCC) is 1.28 A°. Calculate the number of copper atoms per square meter on plane (110).....



$\frac{1}{4} \times 4 = 1$

$\frac{1}{2} \times 2 = 1$

$= 2$

$= \frac{2}{\sqrt{2} \cdot a^2}$

$= \frac{\sqrt{2}}{a^2}$

$=$

Area $= a \times \sqrt{2} \cdot a$

$= \sqrt{2} \cdot a^2$

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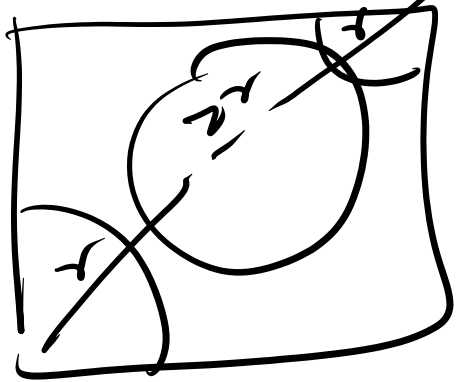
a & r



$2a^2 = (4r)^2$

$2a^2 = 16r^2$

$a^2 = 8r^2$

$a = 2\sqrt{2} \cdot r$

$a = 2\sqrt{2} \times 1.28 A^0$

$a = 6$

$a = 3.62 A^0$

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$$= \frac{\sqrt{2}}{(3.62 \times 10^{-10})^2}$$

$$= 10.79 \times 10^{18} \ \frac{\text{atoms}}{m^2}$$

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Q.24 Which one of the following are the factors of the solid solubility, in the formation of the solid solution?

A. Atomic size factor

B. Chemical affinity factor

C. Crystal structure factor

D. All of these

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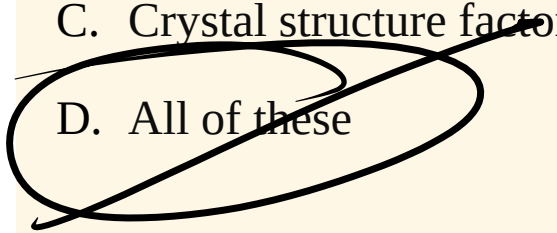
Q.25 Which one of the following are the factors of the solid solubility, in the formation of the solid solution?

A. Atomic size factor

B. Chemical affinity factor

C. Crystal structure factor

D. All of these



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Q.26 Nichrome are alloys of

A. Nickel, chromium, iron

B. Nickel, chromium, magnesium

C. Nickel, chromium, manganese

D. Nickel, manganese, silver

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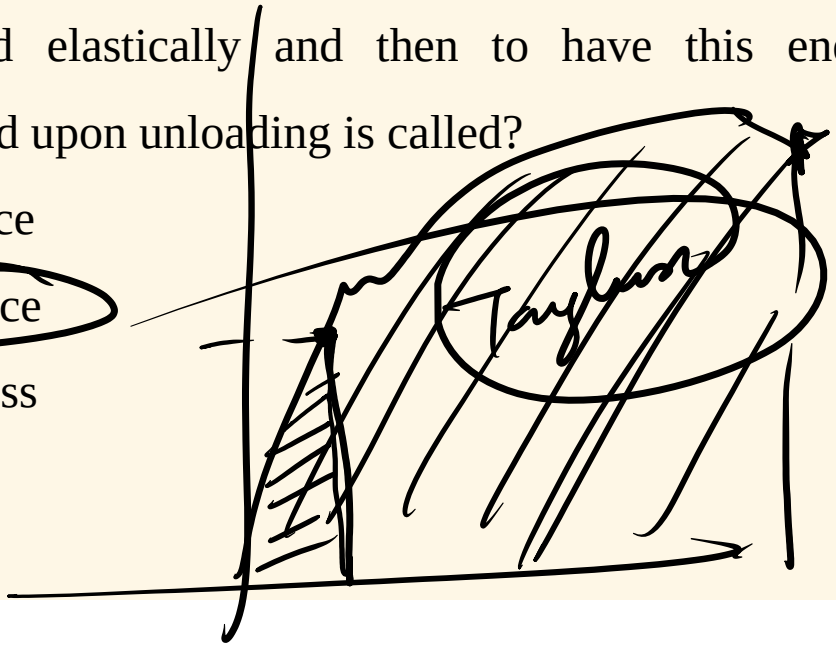
Q.27 The capacity of a material to absorb the energy when deformed elastically and then to have this energy recovered upon unloading is called?

A. Endurance

B. Resilience

C. Toughness

D. ductility



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Q.28 A carbon steel having the Brinell hardness number 100 should have the Ultimate tensile strength will be….

A. 100 MPa

B. 200 MPa

C. 350 MPa

D. 800 MPa

$\sigma_{ult} = 3.53 \text{ HB}$

$= 3.53 \times 100$

$\sigma_{ult} = 353 \text{ MPa}$

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Q.29 The capacity of a material to absorb the energy when deformed elastically and then to have this energy recovered upon unloading is called?

A. Endurance

B. Resilience

C. Toughness

D. ductility

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Q-S-

Q.30 Arrange the following processes in decreasing order of the Yield strength

P. Annealed component

Q. Quenched component

R. Powder Metallurgical component

S. Tempered component

A. P-Q-R-S

B. Q-S-R-P

C. R-Q-S-P

D. Q=R-S-P

Q > Temp > R > P

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