

# Andhra Pradesh State Council of Higher Education

## Notations :

- 1.Options shown in green color and with ✓ icon are correct.
- 2.Options shown in red color and with ✗ icon are incorrect.

<b>Question Paper Name :</b>	Metallurgy 31st May 2024 Shift 1
<b>Duration :</b>	120
<b>Total Marks :</b>	120
<b>Display Marks:</b>	No
<b>Share Answer Key With Delivery Engine :</b>	Yes
<b>Calculator :</b>	None
<b>Magnifying Glass Required? :</b>	No
<b>Ruler Required? :</b>	No
<b>Eraser Required? :</b>	No
<b>Scratch Pad Required? :</b>	No
<b>Rough Sketch/Notepad Required? :</b>	No
<b>Protractor Required? :</b>	No
<b>Show Watermark on Console? :</b>	Yes
<b>Highlighter :</b>	No
<b>Auto Save on Console?</b>	Yes
<b>Change Font Color :</b>	No
<b>Change Background Color :</b>	No
<b>Change Theme :</b>	No
<b>Help Button :</b>	No
<b>Show Reports :</b>	No

Show Progress Bar :	No
Is this Group for Examiner? :	No
Examiner permission :	Cant View
Show Progress Bar? :	No

## Metallurgy

Section Id :	33300855
Section Number :	1
Mandatory or Optional :	Mandatory
Number of Questions :	120
Section Marks :	120
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Is Section Default? :	null

Question Number : 1 Question Id : 3330086481 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following does not have FCC crystal structure?

Options :

1. ✘ Copper

2. ✔ Sodium

3. ✘ Lead

4.

## ✖ Aluminium

Question Number : 2 Question Id : 3330086482 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Froth flotation is most suitable for treating

Options :

1. ✖ Iron ores
2. ✖ Quartzite
3. ✔ Sulphide ores
4. ✖ Carbonates

Question Number : 3 Question Id : 3330086483 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is a line defect found in metal crystal?

Options :

1. ✖ Vacancies
2. ✖ Grain boundaries

3. ✘ Stacking faults

4. ✔ Dislocations

Question Number : 4 Question Id : 3330086484 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Softest phase in Fe-Fe<sub>3</sub>C phase diagram is

Options :

1. ✘ Austenite

2. ✘ Cementite

3. ✔  $\alpha$  ferrite

4. ✘ Martensite

Question Number : 5 Question Id : 3330086485 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

At room temperature, Iron is \_\_\_\_\_ in lattice arrangement

Options :

1. ✘ HCP

2. ✓ BCC

3. ✘ Tetragonal

4. ✘ FCC

Question Number : 6 Question Id : 3330086486 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The term Ledeburite in steels refer to

Options :

1. ✘ An inter metallic compound

2. ✘ A solid solution

3. ✘ An inclusion

4. ✓ A mixture of two phases

Question Number : 7 Question Id : 3330086487 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The eutectoid reaction in steel occurs at

Options :

1. ✓  $723^{\circ}\text{C}$

2. ✗  $1146^{\circ}\text{C}$

3. ✗  $1495^{\circ}\text{C}$

4. ✗  $910^{\circ}\text{C}$

Question Number : 8 Question Id : 3330086488 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Peritectic reaction among the following is

Options :

1. ✓  $\alpha + \text{L} \xrightarrow{\text{Cooling}} \beta$

2. ✗  $\text{L} \xrightarrow{\text{Cooling}} \beta$

3. ✗  $\alpha \xrightarrow{\text{Cooling}} \beta$

4. ✗  $\text{L} \xrightarrow{\text{Cooling}} \beta + \text{S}$

Question Number : 9 Question Id : 3330086489 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Carbon content in hypo eutectic cast iron is

Options :

1. ✘ 0.08-0.8%

2. ✘ 4.3-6.67%

3. ✔ 2.0-4.3%

4. ✘ 0.8-2.0%

Question Number : 10 Question Id : 3330086490 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Etching solution used for Copper is

Options :

1. ✘ Nital

2. ✔ 50%  $\text{NH}_4\text{OH}$

3. ✘ Picral

4. ✘ 1% HF in water

Question Number : 11 Question Id : 3330086491 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Toughness of a material implies

Options :

1. ✔ Impact strength

2. ✘ Creep resistance

3. ✘ Stress relieving

4. ✘ Machinability

Question Number : 12 Question Id : 3330086492 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Martensite transformation occurs by

Options :

1. ✘ Nucleation-and-growth phenomenon



2. ✓ Diffusionless transformation

3. ✘ Lattice diffusion

4. ✘ Spinodal decomposition

**Question Number : 13 Question Id : 3330086493 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

The fine austenite grain size in steel increases

**Options :**

1. ✘ Corrosion resistance

2. ✘ Hardenability

3. ✘ Creep strength

4. ✓ Impact toughness

**Question Number : 14 Question Id : 3330086494 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which mode of size reduction is used by Jaw crushers?

**Options :**

1. ✘ Impact
2. ✔ Compression
3. ✘ Cutting
4. ✘ Attrition

**Question Number : 15 Question Id : 3330086495 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which of the following is a metal refining process?

**Options :**

1. ✘ Roasting
2. ✘ Smelting
3. ✔ Vacuum arc remelting
4. ✘ Calcination

**Question Number : 16 Question Id : 3330086496 Display Question Number : Yes**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Kick's law relates to

**Options :**

1. ✘ Final particle size
2. ✘ feed size
3. ✘ Ore size
4. ✔ Energy consumption

**Question Number : 17 Question Id : 3330086497 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Pine oil used in froth flotation technique to acts as a

**Options :**

1. ✔ Frother
2. ✘ Collector
3. ✘ Crusher
4. ✘ Modifier

Question Number : 18 Question Id : 3330086498 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Leaching of ore is done in \_\_\_\_\_ method of metal extraction process

Options :

1. ✘ Smelting
2. ✘ Pyro metallurgical
3. ✔ Hydro metallurgical
4. ✘ Electro metallurgical

Question Number : 19 Question Id : 3330086499 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is not a function of coke in the blast furnace?

Options :

1. ✘ Produce heat
2. ✘ Generate reducing gases
3. ✘ Act as spacer

4. ✓ Act as a Flux

Question Number : 20 Question Id : 3330086500 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The size of blast furnace coke is about

Options :

1. ✗ 10-30 mm

2. ✓ 25-80 mm

3. ✗ 80- 100 mm

4. ✗ 25-40 mm

Question Number : 21 Question Id : 3330086501 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which is an acidic refractory?

Options :

1. ✗ Magnesite

2. ✗ Dolomite

3. ✓ Fireclay

4. ✗ Chrome magnesite

**Question Number : 22 Question Id : 3330086502 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which is the hardest structure that appears on Fe-C equilibrium diagram?

**Options :**

1. ✗ Ferrite

2. ✗ Pearlite

3. ✗ Austenite

4. ✓ Cementite

**Question Number : 23 Question Id : 3330086503 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which of the following statement is wrong in Hume Rothery rules?

**Options :**

1. ✗ Solute and solvent atoms possess almost equal diameters

2. ✘ The crystal structure of two metals is same
3. ✔ The chemical affinity of the two metals is high
4. ✘ Lower chemical valance metals will dissolve more in higher valance than vice versa

**Question Number : 24 Question Id : 3330086504 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Segar cones are used for the determination of

**Options :**

1. ✘ Electrical conductivity
2. ✔ Softening temperature of refractories
3. ✘ Spalling resistance
4. ✘ Resistance to slag attack

**Question Number : 25 Question Id : 3330086505 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Sillimanite is a

**Options :**

1. ✘ Basic refractory
2. ✘ Insulating refractory
3. ✘ Neutral refractory
4. ✔ High alumina refractory

**Question Number : 26 Question Id : 3330086506 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

The structure produced by martempering of steel is \_\_\_\_\_

**Options :**

1. ✘ Pearlite
2. ✘ Austenite
3. ✔ Martensite
4. ✘ Bainite

**Question Number : 27 Question Id : 3330086507 Display Question Number : Yes Is Question**



**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which of the following treatment is used for imparting ductility in the metals?

**Options :**

1. ✓ Annealing
2. ✗ Normalizing
3. ✗ Hardening
4. ✗ Tempering

**Question Number : 28 Question Id : 3330086508 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Sub-zero treatment is used for

**Options :**

1. ✗ Bainite transformation
2. ✗ Pearlite transformation
3. ✗ Austenite transformation
4. ✓ Retained Austenite transformation

Question Number : 29 Question Id : 3330086509 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Hardenability of a Steel is measured in terms of

Options :

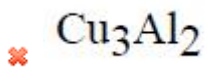
1. ✘ Its Iron content
2. ✘ Its carbon content
3. ✔ The depth martensite from the surface
4. ✘ The depth of Austenite from the surface

Question Number : 30 Question Id : 3330086510 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Compound formed during precipitation hardening of Al-Cu alloys is

Options :

1. ✘ CuAl
2. ✔ CuAl<sub>2</sub>
3. ✘ Cu<sub>2</sub>Al<sub>3</sub>
- 4.



Question Number : 31 Question Id : 3330086511 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The structure produced by Austempering of steel is

Options :

1. ✘ Austenite

2. ✘ Pearlite

3. ✓ Bainite

4. ✘ Martensite

Question Number : 32 Question Id : 3330086512 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Sorbite is a mixture

Options :

1. ✓ Ferrite and cementite

2. ✘ Austenite and Ferrite

3. ✘ Ferrite and pearlite

4. ✘ Ferrite and martensite

Question Number : 33 Question Id : 3330086513 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Major alloying addition in spring steels is

Options :

1. ✘ Aluminium

2. ✔ Silicon

3. ✘ Titanium

4. ✘ Nickel

Question Number : 34 Question Id : 3330086514 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is not a mixture of ferrite and cementite?

Options :

1. ✘ Troostite

2. ✘ Pearlite
3. ✘ Ledeburite
4. ✔ Martensite

**Question Number : 35 Question Id : 3330086515 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Malleable cast irons is obtained by controlled heat treatment of -----

**Options :**

1. ✘ Grey cast iron
2. ✘ Nodular cast iron
3. ✔ White cast iron
4. ✘ Flake graphite cast iron

**Question Number : 36 Question Id : 3330086516 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

The diffusion inequality of components in a binary solution of alloys is given by

**Options :**

1. ✘ Cottrell effect
2. ✘ Graham's law
3. ✘ Fick's law
4. ✔ Kirkendall effect

**Question Number : 37 Question Id : 3330086517 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Stress causing a deformation of \_\_\_\_\_% is called yield strength

**Options :**

1. ✘ 1.0
2. ✘ 0.01
3. ✔ 0.2
4. ✘ 3.3

**Question Number : 38 Question Id : 3330086518 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

The diameter of ball in BHN test for steel and other hard materials is

**Options :**

1. ✘ 5 mm
2. ✔ 10 mm
3. ✘ 25 mm
4. ✘ 50 mm

**Question Number : 39 Question Id : 3330086519 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

In which of the following hardness test Brale indenter is used for indentation?

**Options :**

1. ✘ Vickers test
2. ✘ Shore test
3. ✘ Brinell test
4. ✔ Rockwell test

**Question Number : 40 Question Id : 3330086520 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

The ability of a material to withstand suddenly applied loads is called

**Options :**

1. ✘ Creep strength
2. ✘ Hardness
3. ✔ Impact strength
4. ✘ Fatigue strength

**Question Number : 41 Question Id : 3330086521 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

The fatigue limit of metals is decreased by

**Options :**

1. ✘ Carburizing
2. ✘ Nitriding
3. ✘ Carbonitriding
4. ✔ Decarburizing



Question Number : 42 Question Id : 3330086522 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Plastic deformation of metal below its recrystallization temperature is called

Options :

1. ✓ Cold working
2. ✗ Hot working
3. ✗ Deep drawing
4. ✗ Tempering

Question Number : 43 Question Id : 3330086523 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

At what temperature grains and grain boundaries will have equal strength?

Options :

1. ✗ Recrystallization temperature
2. ✗ Curie temperature
3. ✗ Absolute zero temperaure
4. ✓ Equi cohesive temperature

**Question Number : 44 Question Id : 3330086524 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which method is not used to measure the Residual stress of a given materials ?

**Options :**

1. ✘ Magnetic particle method
2. ✘ Radiography
3. ✔ Dye-penetrant method
4. ✘ Ultrasonic testing

**Question Number : 45 Question Id : 3330086525 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which of the following is not used for manufacture of bearing materials?

**Options :**

1. ✘ Steel
2. ✘ Copper
3. ✘ Babbit materials

4. ✓ Pig iron

Question Number : 46 Question Id : 3330086526 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Hooke's law holds good up to

Options :

1. ✗ Plastic limit

2. ✓ Proportional limit

3. ✗ Yield point

4. ✗ Ultimate tensile strength

Question Number : 47 Question Id : 3330086527 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In  $CO_2$  moulding process \_\_\_\_\_ is used as binder

Options :

1. ✗ Water

2. ✗ Dextrine

3. ✓ Sodium silicate

4. ✗ Bentonite

Question Number : 48 Question Id : 3330086528 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is a powder production method?

Options :

1. ✗ Rolling

2. ✗ Tapping

3. ✗ Forging

4. ✓ Atomization

Question Number : 49 Question Id : 3330086529 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Copper materials exhibit \_\_\_\_\_ fracture

Options :

1. ✗ Flat

2. ✘ Combined

3. ✔ Cup and cone

4. ✘ Helical

Question Number : 50 Question Id : 3330086530 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is a ore of Titanium?

Options :

1. ✘ Bauxite

2. ✔ Ilmenite

3. ✘ Chacopyrite

4. ✘ Limonite

Question Number : 51 Question Id : 3330086531 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Cementite ( $\text{Fe}_3\text{C}$ ) crystal structure is

Options :

1. ✔

Orthorhombic

2. ✘ BCT

3. ✘ HCP

4. ✘ FCC

Question Number : 52 Question Id : 3330086532 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Most closely packed planes in face-centered cubic lattice are

Options :

1. ✘ (1 1 0)

2. ✘ (1 1 2)

3. ✘ (1 0 0)

4. ✔ (1 1 1)

Question Number : 53 Question Id : 3330086533 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Stacking faults are \_\_\_\_\_ imperfections

Options :

1. ✘ Point
2. ✘ Line
3. ✔ Surface
4. ✘ Volume

Question Number : 54 Question Id : 3330086534 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following alloy can be strengthened by Age-hardening?

Options :

1. ✘ Cu - Sn
2. ✘ Cu - Zn
3. ✘ Cu - Ni
4. ✔ Al - Cu

Question Number : 55 Question Id : 3330086535 Display Question Number : Yes

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Surgical instruments are made of

**Options :**

1. ✘ Plain carbon steels
2. ✘ Titanium alloys
3. ✔ Stainless steels
4. ✘ Copper alloys

**Question Number : 56 Question Id : 3330086536 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Razor blades are made with \_\_\_\_\_% of carbon steel

**Options :**

1. ✘ Low carbon steel
2. ✘ Medium carbon steel
3. ✘ Mild steel
4. ✔ High carbon steel



Question Number : 57 Question Id : 3330086537 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Zirconium alloys are used in nuclear reactors as \_\_\_\_\_

Options :

1. ✓ Cladding material
2. ✗ Catalyst
3. ✗ Moderator
4. ✗ Fuel

Question Number : 58 Question Id : 3330086538 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

To obtain high corrosion resistance of the steel which of the following elements are added

Options :

1. ✗ Carbon, Silicon
2. ✓ Chromium, Nickel
3. ✗ Carbon, Tungsten

4. ✘ Copper, Titanium

Question Number : 59 Question Id : 3330086539 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Dephosphorization is favourable in following conditions of steel making process

Options :

1. ✘ Acid slag and oxidizing atmosphere
2. ✘ Acid slag and reducing atmosphere
3. ✔ Basic slag and oxidizing atmosphere
4. ✘ Basic slag and reducing atmosphere

Question Number : 60 Question Id : 3330086540 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Finest particles in blast furnace gas is removed by

Options :

1. ✘ Dust catcher
2. ✔ Electrostatic precipitator

3. ✘ Wet scrubber

4. ✘ Blast furnace stoves

**Question Number : 61 Question Id : 3330086541 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which of the following is not an iron ore ?

**Options :**

1. ✘ Banded Hematite Quartzite (BHQ)

2. ✘ Hematite

3. ✘ Goethite

4. ✔ Chalcopyrite

**Question Number : 62 Question Id : 3330086542 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which of the following is a chief source of sulphur entry in the blast furnace?

**Options :**

1. ✘ Iron ore

2. ✓ Coke

3. ✗ Sinter

4. ✗ Flux

Question Number : 63 Question Id : 3330086543 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The favourable conditions for desulphurization of iron

Options :

1. ✓ Both slag basicity and temperature should be high

2. ✗ Atmosphere should be oxidizing

3. ✗ Slag basicity should be low and temperature should be high

4. ✗ Slag should be viscous

Question Number : 64 Question Id : 3330086544 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Blue dust is

Options :

1. ✘ Generated during iron making
2. ✘ Generated during steel making
3. ✔ Generated during mining
4. ✘ Dust collected from exhaust gases

Question Number : 65 Question Id : 3330086545 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Iron ore sintering employs the principle of \_\_\_\_\_

Options :

1. ✔ Down draught sintering
2. ✘ Up draught sintering
3. ✘ Smelting
4. ✘ Roasting

Question Number : 66 Question Id : 3330086546 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

**Time : 0**

High alumina content in the blast furnace slag \_\_\_\_\_

**Options :**

1. ✘ Increases its melting point, but decreases its viscosity
2. ✘ Does not affect its melting point but increases its viscosity
3. ✘ Decreases both its melting point but increases its viscosity
4. ✔ Increases both its melting point and viscosity

**Question Number : 67 Question Id : 3330086547 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Lever rule is used to evaluate the \_\_\_\_\_

**Options :**

1. ✔ Relative amounts of two phases in equilibrium at any specified temperature
2. ✘ Chemical composition of the phases of an alloy in equilibrium at any specified temperature
3. ✘ Residual stresses in a given alloy
4. ✘ Number of phases present in a given alloy

Question Number : 68 Question Id : 3330086548 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Catch carbon technique is employed in LD steel making process to produce

Options :

1. ✘ Low carbon steel
2. ✘ High alloy steel
3. ✔ High carbon steel
4. ✘ Killed steel

Question Number : 69 Question Id : 3330086549 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Composites strength is evaluated by -----

Options :

1. ✘ Hooke's law
2. ✘ Power law
3. ✘ Fick's law
4. ✔

✓ Rule of mixture

Question Number : 70 Question Id : 3330086550 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Salamander tapping in blast furnace is done after

Options :

1. ✓ Blowing out
2. ✗ Banking
3. ✗ Back draughting
4. ✗ Blowing in

Question Number : 71 Question Id : 3330086551 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is a creep deformation mechanism?

Options :

1. ✗ Grain sliding
2. ✓ Grain boundary sliding



3. ✘ Dislocations pile up

4. ✘ Strain hardening

**Question Number : 72 Question Id : 3330086552 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which of the following is not a metal matrix composites fabrication technique

**Options :**

1. ✘ Vortex method

2. ✘ Squeeze casting

3. ✔ Pultrusion

4. ✘ Duralcan process

**Question Number : 73 Question Id : 3330086553 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Critical fibre length of a composite is expressed by the following equation

**Options :**

1. ✔  $L_c = [\sigma \times d] / [2 \tau_c]$

2. ✘  $L_c = [\sigma + d] / [2 \tau_c]$

3. ✘  $L_c = [2 \tau_c] / [\sigma \times d]$

4. ✘  $L_c = [\sigma - d] / [2 \tau_c]$

**Question Number : 74 Question Id : 3330086554 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which of the following employs a bottom blowing operation?

**Options :**

1. ✘ L.D. converter

2. ✘ Rotor

3. ✔ OBM

4. ✘ Kaldo furnace

**Question Number : 75 Question Id : 3330086555 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

In Basic steel making process \_\_\_\_ slag is prepared to remove the impurities

**Options :**

1.

- ✘ Dry slag
- 2. ✔ Wet slag
- 3. ✘ Neutral slag
- 4. ✘ Reducing slag

**Question Number : 76 Question Id : 3330086556 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Killing of the steel bath is aimed to remove \_\_\_\_\_

**Options :**

- 1. ✘ Carbon
- 2. ✘ Sulphur
- 3. ✘ Phosphorous
- 4. ✔ Oxygen

**Question Number : 77 Question Id : 3330086557 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Glass ceramics possess \_\_\_\_\_

Options :

1. ✓ Fine grain structure
2. ✗ Non-crystalline structure
3. ✗ Hard and Brittle
4. ✗ Low impact strength

Question Number : 78 Question Id : 3330086558 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is an oxide ore of copper

Options :

1. ✗ Chalcocite
2. ✗ Chalcopyrite
3. ✓ Malachite
4. ✗ Bornite

Question Number : 79 Question Id : 3330086559 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

**Time : 0**

In Parkes process, desilverising of molten lead is affected by the addition of \_\_\_\_\_

**Options :**

1. ✘ Carbon
2. ✘ Copper
3. ✘ Aluminum
4. ✔ Zinc

**Question Number : 80 Question Id : 3330086560 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

The use of Bacterial leaching is \_\_\_\_\_

**Options :**

1. ✘ Refining of metals
2. ✘ Fast recovery of metal values
3. ✔ In situ-leaching low-grade ores
4. ✘ Leaching of enriched ores

Question Number : 81 Question Id : 3330086561 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Lead free solders are made with \_\_\_\_\_

Options :

1. ✘ Iron based alloys
2. ✔ Tin based alloys
3. ✘ Magnesium based alloys
4. ✘ Aluminium based alloys

Question Number : 82 Question Id : 3330086562 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which is the most weldable of all metals?

Options :

1. ✔ Plain carbon steels
2. ✘ Stainless steels
3. ✘ Aluminium

4. ✘ Brass

Question Number : 83 Question Id : 3330086563 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The formation of corrosion retarding films on metal surfaces is known as

Options :

1. ✘ Polarization

2. ✔ Passivation

3. ✘ Cavitation

4. ✘ Pitting

Question Number : 84 Question Id : 3330086564 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Example of a sacrificial anode which is used in the protection of underground pipelines is

Options :

1. ✘ Steel

2. ✘ Platinum

3. ✘ Graphite

4. ✔ Magnesium

Question Number : 85 Question Id : 3330086565 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Enthalpy 'H' defined as

Options :

1. ✘  $H = E - PV$

2. ✔  $H = E + PV$

3. ✘  $H = F - TS$

4. ✘  $H = F + PV$

Question Number : 86 Question Id : 3330086566 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The main cause to exist congruent melting alloys in a given isomorphous system is

Options :

1. ✔ Large atomic size difference between solvent and solute



2. ✖ Variation in crystal structures of solvent and solute
3. ✖ Variation in chemical valance factor of solvent and solute
4. ✖ Variation in chemical composition of solvent and solute

**Question Number : 87 Question Id : 3330086567 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Degrees of freedom at triple point will be

**Options :**

1. ✔ 0
2. ✖ 1
3. ✖ 2
4. ✖ 3

**Question Number : 88 Question Id : 3330086568 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

The free energy changes at equilibrium is \_\_\_\_\_

Options :

1. ✘ Positive
2. ✘ Negative
3. ✘ Intermediate
4. ✔ Zero

Question Number : 89 Question Id : 3330086569 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

For a spontaneous process \_\_\_\_\_

Options :

1. ✘ Both Free energy and entropy decreases
2. ✘ Free energy increases
3. ✔ Free energy decreases whereas the entropy increases
4. ✘ Free energy is zero

Question Number : 90 Question Id : 3330086570 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Entropy is a measure of

Options :

1. ✓ Disorder of a system
2. ✗ Orderly behaviour of a system
3. ✗ Only temperature changes of the system
4. ✗ Equilibrium of system

Question Number : 91 Question Id : 3330086571 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Ellingham diagrams for  $M - MO_x$  reactions is a plot of \_\_\_\_\_

Options :

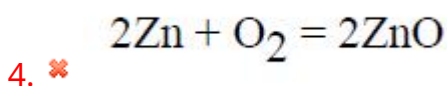
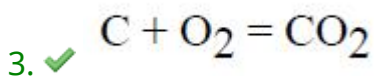
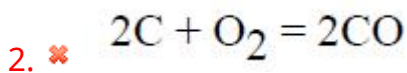
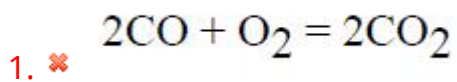
1. ✗  $\Delta G$  vs T
2. ✓  $\Delta G^0$  vs T
3. ✗  $\Delta G$  vs  $1/T$

4. ✘  $\Delta G^0$  vs  $1/T$

Question Number : 92 Question Id : 3330086572 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In Ellingham diagrams \_\_\_\_\_ reaction that is parallel to the temperature axis

Options :



Question Number : 93 Question Id : 3330086573 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Dental alloys are casted by \_\_\_\_\_ process

Options :

1. ✘ True centrifugal

2. ✘ Shell moulding

3. ✘ CO<sub>2</sub> moulding process

4. ✔ Investment casting

**Question Number : 94 Question Id : 3330086574 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

The ideal theoretical shape of a Riser is \_\_\_\_\_

**Options :**

1. ✘ Conical

2. ✘ Rectangular

3. ✔ Cylindrical

4. ✘ Cubic

**Question Number : 95 Question Id : 3330086575 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Plastic goods are usually produced by

**Options :**

1. ✘ Shell moulding
2. ✔ Injection moulding
3. ✘ Wet sand moulding
4. ✘ Dry sand moulding

**Question Number : 96 Question Id : 3330086576 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Blow holes are casting defects caused by\_\_\_\_\_

**Options :**

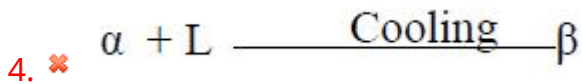
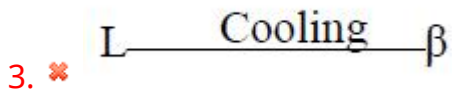
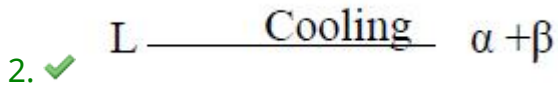
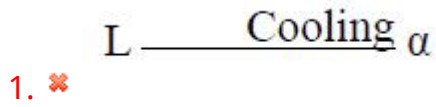
1. ✔ Excessive gaseous substances not able to escape
2. ✘ Discontinuity is metal casting resulting from hindered contraction
3. ✘ Two streams of metals that are too cold to figure properly
4. ✘ Some sand shearing from the cope surface

**Question Number : 97 Question Id : 3330086577 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

Time : 0

Which of the following is a eutectic reaction ?

Options :



Question Number : 98 Question Id : 3330086578 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

Which is the top down approach method for synthesis of Nano materials?

Options :

1. ✘ Chemical vapour deposition

2. ✘ Sol-Gel technique

3. ✔ High energy ball milling

4.

✘ Chemical precipitation method

Question Number : 99 Question Id : 3330086579 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

TIG is especially useful in welding for the following alloys

Options :

1. ✘ Stainless steels
2. ✔ Aluminium and its alloys
3. ✘ Titanium and its alloys
4. ✘ Cast Irons

Question Number : 100 Question Id : 3330086580 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Electrode is consumed in \_\_\_\_\_ welding process

Options :

1. ✘ Gas
2. ✘ TIG



3. ✘ Thermit

4. ✔ Arc

Question Number : 101 Question Id : 3330086581 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Cold working of metal reduces its

Options :

1. ✔ Ductility

2. ✘ Hardness

3. ✘ Ultimate tensile strength

4. ✘ Electrical resistance

Question Number : 102 Question Id : 3330086582 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The collapsible toothpaste tube is produced by \_\_\_\_ extrusion

Options :

1. ✘ Direct

2. ✓ Impact

3. ✗ Tube

4. ✗ Indirect

Question Number : 103 Question Id : 3330086583 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Dislocation tangles are the regions of \_\_\_\_

Options :

1. ✗ Defect free areas

2. ✗ Dislocation free areas

3. ✗ Low dislocation density areas

4. ✓ High Dislocation density areas

Question Number : 104 Question Id : 3330086584 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Critical resolved shear stress is expressed by the following equation

Options :

1. ✘  $\tau_R = (P/A) \cos \phi \sin \lambda$

2. ✘  $\tau_R = (P/A) \sin \phi \cos \lambda$

3. ✔  $\tau_R = (P/A) \cos \phi \cos \lambda$

4. ✘  $\tau_R = (P/A) \sin \phi \sin \lambda$

Question Number : 105 Question Id : 3330086585 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Anti-Phase Boundaries (APB) are existing in \_\_\_\_\_ strengthening mechanism

Options :

1. ✘ Grain boundary strengthening mechanism

2. ✔ Solid solution strengthening mechanism

3. ✘ Precipitation hardening strengthening mechanism

4. ✘ Strain hardening strengthening mechanism

**Question Number : 106 Question Id : 3330086586 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Which alloying element does not shift TTT diagram or does not retard the transformation of austenite to pearlite or bainite?

**Options :**

1. ✓ Cobalt

2. ✗ Nickel

3. ✗ Copper

4. ✗ Aluminium

**Question Number : 107 Question Id : 3330086587 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

When two different metal placed in contact, when one end is heated, an EMF is generated. This effect is called as

**Options :**

1. ✗ Thomson effect

2. ✗ Temperature effect

3. ✓ Seebeck effect

4. ✗ Junction-diode effect

**Question Number : 108 Question Id : 3330086588 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Calculate the Pilling-Bedworth ratio when Fe oxides to FeO. The atomic weight of Fe is 55.8gm, the atomic weight of Oxygen is 16 gm, density of Fe is 7.87 gm/cc and density of FeO is 5.70 gm/cc

**Options :**

1. ✗ 0.777

2. ✗ 3.777

3. ✗ 2.777

4. ✓ 1.777

**Question Number : 109 Question Id : 3330086589 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Solution of system of equations  $3x + y + 2z = 3, 2x - 3y - z = -3, x + 2y + z = 4$

**Options :**

1. ✘ (1, 2, 1)

2. ✔ (1, 2, - 1)

3. ✘ (2, 3, 1)

4. ✘ (4, 3, 2)

**Question Number : 110 Question Id : 3330086590 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

If  $f(x) = (x^2 - 16)^2$ , where  $x$  is real,  $f(x)$  has

**Options :**

Two maxima and one minimum

1. ✘

One maxima and 2 minima

2. ✔

Three minima

3. ✘

Three maxima

4. ✘

Question Number : 111 Question Id : 3330086591 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If  $A$  is an orthogonal matrix, then  $A^{-1}$  is

Options :

1. ✘ Symmetric
2. ✘ Skew- symmetric
3. ✔ Orthogonal
4. ✘ Hermitian

Question Number : 112 Question Id : 3330086592 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If  $\vec{f} = f_1(y, z)\vec{i} + f_2(z, x)\vec{j} + f_3(x, y)\vec{k}$  then  $\vec{f}$  is

Options :

1. ✘ Irrotational
2. ✔ Solenoidal
3. ✘ Both Irrotational & Solenoidal

## Gradient

4. ✖

**Question Number : 113 Question Id : 3330086593 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

The work done in displacing a particle from  $t=0$  to  $t=1$  in a curve  $x = t, y = t^2 + 1$  and  $z = 2t^2$  in a force field  $\vec{F} = (2xy, -3x, -5z)$  is

**Options :**

1. ✖  $-19/2$

2. ✖  $-14/3$

3. ✔  $-21/2$

4. ✖  $5$

**Question Number : 114 Question Id : 3330086594 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

If  $\vec{a}$  is a constant vector then  $\text{div}\{\vec{a} \times (\vec{r} \times \vec{a})\} =$

**Options :**

1. ✔  $2a^2$



2. ✘  $3a^2$

3. ✘  $6a$

4. ✘  $4a$

**Question Number : 115 Question Id : 3330086595 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

If  $F = ax\mathbf{i} + by\mathbf{j} + cz\mathbf{k}$ , where  $a, b, c$  are constants then  $\iint_S \mathbf{F} \cdot \mathbf{N} \, ds$  Where  $s$  is the surface of the unit sphere

**Options :**

1. ✘  $0$

2. ✘  $\frac{4}{3}\pi(a + b + c)^2$

3. ✔  $\frac{4}{3}\pi(a + b + c)$

4. ✘  $1$

**Question Number : 116 Question Id : 3330086596 Display Question Number : Yes Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

Solution of the differential equation  $xy \frac{dy}{dx} = 1 + x + y + xy$  is \_\_\_

**Options :**

1. ✘  $\log(x(1+y)) = c$

2. ✔  $(y-x) - \log(x(1+y)) = c$

3. ✘  $(y-x) - \log(y(1+x)) = c$

4. ✘  $(y+x) - \log(x) = c$

**Question Number : 117 Question Id : 3330086597 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

What is the correct formula for Runge-Kutta 3<sup>rd</sup> order method ?

**Options :**

1. ✘  $y = y_0 + \frac{1}{6}(k_1 + 2k_2 + 3k_3)$

2. ✘  $y = y_0 + \frac{1}{3}(k_1 + 4k_2 + k_3)$

3. ✓  $y = y_0 + \frac{1}{6}(k_1 + 4k_2 + k_3)$

4. ✗  $y = y_0 + \frac{1}{6}(k_1 + k_2)$

**Question Number : 118 Question Id : 3330086598 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

One of the two events must occur the chance of one is  $\frac{2}{3}$  of the other, then odd in favour of the other are

**Options :**

1. ✓ 3:2

2. ✗ 1:3

3. ✗ 3:1

4. ✗ 2:3

**Question Number : 119 Question Id : 3330086599 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

The Coefficient of correlation is independent of

Options :

1. ✘ Change of scale only
2. ✘ Change of origin only
3. ✔ Both change of scale & origin
4. ✘ No change

Question Number : 120 Question Id : 3330086600 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If  $x^3 - x - 4 = 0$  by bisection method first two approximations  $x_0$  and  $x_1$  are 1 and 2 then  $x_2$  is

Options :

1. ✘ 1.2
2. ✘ 1.3
3. ✘ 1.4
4. ✔ 1.5

