Shri Swami Vivekanand Shikshan Sanstha Kolhapur's

Vivekanand College, Kolhapur (Empowered Autonomous)

Department of Physics

Notice

Date: Tuesday, 10th October 2023

It is hereby informed to the students of M.Sc. – I and II, that First Term Internal Evaluation Examination is scheduled between 25th to 26th October 2023 in the Department of Physics.

Instructions:

1) Nature of question paper for M.Sc. – I: 05 MCQ's (05 Marks), 01 Short Answer Questions (05 Marks), 01 Long Answer Questions (10 Marks)
2) Nature of question paper for M.Sc. – II: 05 MCQ's (05 Marks), 01 Short Answer Questions (05 Marks), 01 Long Answer Questions (10 Marks)
3) Students should present before 15 minutes of the examination.
4) Answer sheets will be provided by the Department.
5) Strictly mention the Full Name and Roll number on Answer Sheet correctly.
6) All students should remain present for the Internal Examination as the examination will not be conducted afterwords in any case.

Sr. No.	Date	Class	Name of the Paper	Time
01	25/10/2023	M. Sc. – I	(01) Mathematical Physics	12 – 01 PM
			(02) Classical Mechanics	02 – 03 PM
02	25/10/2023	M. Sc. – II	(01) Nuclear and Particle Physics	12 – 01 PM
			(02) Thin Film Deposition and other Techniques	02 – 03 PM
03	26/10/2023	M. Sc. – I	(01) Research Methodology	12 – 01 PM
			(02) Solid State Physics – I	02 – 03 PM
04	26/10/2023	M. Sc. – II	(01) Solid State Physics – I	12 – 01 PM
			(02) Solid State Physics – II	02 – 03 PM

Head

Head of the
Department of Physics
Vivekanand College, Kolhapur

(M.Sc. Co-ordinator)

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Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

Vivekanand College, Kolhapur (Empowered Autonomous)

Department of Physics

M.Sc. Part-II SEM III Internal Examination (2023-24)
Nuclear and Particle Physics
Paper code: CP-1112C

Date: - 25/10/2023 | Total Marks: 20
Day: - Wednesday | Time :- 12.00 pm - 1.00 pm

Instructions:- 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculator is allowed.

Q.1 Select Correct Alternative: (5)

1) The particle carrying the strong force are the _____.

(a) Photons (b) Gluons

(c) Z or W- bosons (d) None of above

2) Which of these is not made from quarks?

(a) Proton (b) Neutron

(c) Lepton (d) Meson

3) The strangeness of Ω^- is_____.

(a) 0 (b) -1

(c) -2 (d) -3

4) The Proton is in the quark model composed of _____.

(a) udd (b) ddd

(c) uuu (d) udd

5) Hyper charge is defined as Y= _____.

(a) B+S (b) Q+B+I

(c) $I+I_3$ (d) $I+I_3+S+B$

Q.2 Attempt any one (10)

1) Explain classification of elementary particles.

2) Note on quark model with strangeness of elementary particle.

Q.3 Attempt any one (5)

1) Write a short note on Strong interaction.

2) Explain with diagram Meson octet.

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M.Sc. II

Date :- 25-10-23

Internal Examination

Nuclear & Particle Physics

Roll No	Name	Sign
1601	Snehal Nitin Ahiwale	Snehal
1602		
1603	Anand Nagappa Biradar	[illegible]
1604		
1605	Smit Kallappa Jamboli	[illegible]
1606		
1607		
1608	Shweta Sardar Mithari	S Mithari
1609		
1610	Rajshree mahesh Randive.	Rajshree
1611	Shivani Dattaray Sagar	[illegible]
1612	Pranali Pradeep Shirke	[illegible]
1613		
1614	Dnyaneshwari pandit Todkar	Dnyaneshwari
	Abhishek Ashok Davana.	[illegible]

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Shri Swami Vivekanand Shikshan Sanstha Kolhapur's
VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

Name: Snehal Nitin Ahiwale

SUPPLIMENT

Signature of Supervisor	

Suppliment No. :
Roll No. : 1601
Class : MSc - II

Subject : Nuclear and Particle Physis
Test / Tutorial No. :
Div. :

12/20

Q1) Quark Model with strangeness of elementary particle

1) The quark model are thought to be elementary as same as lapton. They are point particle with no internal structure.

2) The quark particle suppose to ~~hav~~ posses electric charge.
There are six quark particle named as up (u), down (d), charm (c), strange (s), top (t) & bottom (b).
Six anti-quark are labbled as anti-up ($\bar{u}$), anti-down ($\bar{d}$), ~~cho~~ anti-charm ($\bar{c}$), anti-strange ($\bar{s}$), anti-top ($\bar{t}$), anti-bottom ($\bar{b}$).

The twelve quarks and anti-quarks are given below with there electric charge

$Q = +\frac{2}{3}e$	u	d	$Q = -\frac{1}{3}e$	$\bar{u}$	d	$Q = -\frac{2}{3}e$	$Q = \frac{1}{3}e$
	c	s		$\bar{c}$	s		
	t	b		$\bar{t}$	b		

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3) Each quark has baryon number $b = 1/3$ and anti quark has baryon number $b = -1/3$.

4) Each ~~quark~~ baryon has three quarks and and three anti-quarks.

5) The quarks and anti-quarks are fermion with spin $s = 1/2$ is explained by pauli Exclusive principle.

6) The mesons are made up of one quark and one anti-quark.

7) There are three colours of quark that are red, green, blue and three colours of anti-quark anti-red (cyan), anti-green (Megenta) and anti blue (yellow).

~~The~~

The mesons are of ~~two colo~~ one colour and one anti-colour so, they are colour less.

8) The baryons are of three colours and anti-baryons are of three anti-colours.

9) There is strong interaction between hadron because of interaction between quarks with each other.

The exchange of particle during interaction between quark with each other called Gluons.

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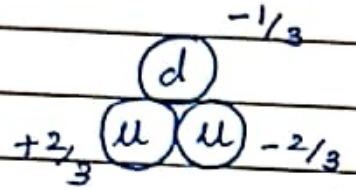
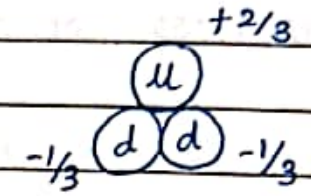
10) The gluons are massless and move with the speed of light

11) The interaction between two quark with each other is called quantum chromodynamic

12)



= proton



= neutron.

13) The quarks are not isolated ~~du~~ in the experiment.

14) The strangeness of quark is $s = 1/2$, and strangeness of anti-quark is $s = -1/2$ and other quark is $s = 0$

15) They exist independent entity.

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1) The particle carrying the strong force are the π or W - bosons

2) Which of these is not made from quarks?
→ lepton.

3) The strangeness of Ω^{-1} is -1

4) The Proton is in the quark model composed of uud.

5) Hyper charge is defined as $Y = Q + B + I$

2

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27760

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's

VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Miss. Shruti Harish Bam.

Suppliment No. :

Roll No. : 1602

Class : MSc II

Signature of Supervisor

Subject : Particle Physics

Test / Tutorial No. : Internal Exam.

Div. :

15/20

Q.1

0 1) The particle carrying the strong force are the None of the above

1 2) Lepton

0 3) Strangeness of Ω^- is -1

0 4) The proton is in the quark model composed of udd

0 5) Hyper charge is defined as $Q+B+I$

0

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Note on quark model with strangeness of elementry particle.

i) Quarks are thought to be in elementry same as leptons. They are point particles with no internal structure.

ii) Quarks are supposed to be in fictional electric charges. There are six quarks given as up (u), down (d), charm (c), strange (s), top (t), bottom and there are six anti-quarks like anti-up ($\bar{u}$) ~~and~~ anti-down ($\bar{d}$), anti-charm ($\bar{c}$), anti-strange ($\bar{s}$), anti top ($\bar{t}$), anti-bottom ($\bar{b}$). These twelve quarks & anti quarks along with their electric charges are given below:

$$Q = \pm\frac{2}{3}e \left\{\begin{matrix} u & d \\ c & s \\ t & b \end{matrix}\right\} \quad Q = -\frac{1}{3}e \left\{\begin{matrix} \bar{u} & \bar{d} \\ \bar{c} & \bar{s} \\ \bar{t} & \bar{b} \end{matrix}\right\} \quad Q = \pm\frac{1}{3}e$$

iii) Each quark has baryon number $B = +1/3$ and anti-quark has anti-baryon number $B = -1/3$.

iv) Each baryon is made up of three quarks and anti-baryon is made up of three anti-quarks.

v) Meson is made up of one quark and one anti-quark.

vi) Quark has three colours i.e red, green, blue. Anti-quark has three anti colours i.e. anti-red (cyan), anti-green (magenta) and anti-blue (yellow). In baryon each quark has different colours.

vii) Meson has one ~~que~~ colour quark & one anti-colour quark so meson is always colourless.

Meson obeys pauli's exclusive principle.

viii) Strong interaction between baryon is because of interaction between quarks. Exchage of quarks during the interaction are called as gluons. ~~gt~~ Gluons are massless and ~~has speed~~ move with the speed of light.

ix) This process is known as chromodynamics.

x) $\frac{+2}{3}$ (u) (u) $\frac{+2}{3}$ (d) $-1/3$ – protons

$-1/3$ (d) (d) $-1/3$ (u) $+\frac{2}{3}$ – neutrons.

xi) No quark are isolated in an experiment.

xii) Strong quark has spin $s = 1/2$

xiii) Quark are said to be independent entity.

10

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Strong interaction:-

i) Strong interaction has short range i.e 2×10^{-13} m.

ii) Strong interaction does not obey inverse squ law

iii) Strong interaction is independent relativistic orientation of molecules.

iv) Charge carriers are pion, kaon and lepton.

v) Characteristic time is 10^{-23}

vi) Relative magnitude is 1.

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27763

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's

VEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Signature of Supervisor

ıradar Anand Nagappa

pliment No. :

No. : 1603

s : Msc-II (Physics)

Subject : Nuclear and particle physics

Test / Tutorial No. :

Div. :

09/20

1 The particle carrying the strong force are the photons.

2 Which of these is not made from quarks?
→ Lepton

3 The strangeness of Ω^- is -1

4 The proton is inthe quark model composed of uud

5 Hyper charge is defined as $Y = Q + B + I$

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Q 2 Quark model :-

Quarks are the Barion no (B) strangeness number (s) and third component of isospin (I_3) of the particles and photo with charge (q)

Photons are made up of quarks having the colours Red, yellow, and Green. resp.

4p Photons are made of quarks and anti quarks the colours of antiquarks are anti Red. anti green. and anti yellow. The pairs of quarks and antiquarks are present in the photons

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Q3 strong interaction

strong interaction it is a short range interaction of 10^{-16} m The interaction betn two particles is very strong.

The repulsive and attractive force applied

The photons carrying a strong interaction force. with the help of quarks.

strong interaction does not obey square law

3

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Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

Vivekanand College, Kolhapur (Empowered Autonomous)

Department of Physics

M.Sc. Part-II SEM III Internal Examination (2023-24)

Thin Film and Other Deposition Techniques

Paper code:CBP1113C

Date: - 25/10/2023 Time :- 2.00 pm- 3.00 pm Total Marks: 20

Day: - Wenesday

Instructions:-

1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculator is allowed.

Q.1 Select Correct Alternative: (5)

i) In CVD oxidation reaction silicon dioxide thin film prepared from oxidation of _____

(a) hydrogen gas (b) propane gas (c) silane gas (d) none of these

ii) In chemical bath deposition technique ionic product in solution must be ..... than solubility product.

(a) less (b) greater (c) equal (d) none of these

iii) The equation of second low of Faraday in electrodeposition is given as _____

(a) $\Delta m = Cej^{+}$ (b) $\Delta m = Cej^{-}$

(c) $\Delta m = Ce$ (d) $\Delta m = j^{+}$

iv) In spin coating deposition process solution is spread evenly over a surface using _____

(a) centripetal force (b) centrifugal force

(c) Gravitational force (d) none of these

v) In spray pyrolysis techniques pyrolytic decomposition takes place by _____.

(a) thermal energy (b) wind energy (c) electrochemical energy (d) kinetic energy

Q.2 Attempt any one (10)

i) Explain the chemical vapor deposition technique in detail.

ii) Explain the basics and working of spray pyrolysis technique in detail.

Q.3 Attempt any one (5)

i) What is SILAR. Explain the mechanism of it in detail.

ii) Explain the working mechanism of spin coating deposition technique in detail.

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M. Sc - II

Date: 25/10/2023

Internal Exam - 2023

Paper : TFDOT : Thin Film Deposition

1) Name	Roll No.	Marks	Sign
Abhishek A. Dayama.	—	12	Adayama
Smit K. Jankoli	1605	14	
3) Dnyaneshwari P. Todkar	1614	17	Dnyaneshwari.
4) Pranali P. Shirke	1612	16	PShirke
5) Snehal Ahiwale	1601	15	Snehal
6) Shivani D. Sagar	1611	15	Sagar
7) Rajshree M. Randive	1610	11	RM.Randive
8) Shweta S. Mithari	1608	17	S Mithari
9) Anand N. Biradar	1603	17	Anand
10) Shruti H. Bam	1602	14	Shruti

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VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

Snehal Nitin Ahiwale

SUPPLIMENT

Signature of Supervisor	15/20 21.11.2025

Suppliment No. :

Roll No. : 1601

Class : MSc II

Subject :

Test / Tutorial No. :

Div. :

The chemical vapour deposition technique

a) The CVD is an important and popular method for thin film deposition for variety of materials, elements and compound on substrate.

b) There are many advantages over other by other method of thin film deposition.

c) Example: The film has higer degree of purity with accuratly controable stichometry composition and doping an be prepared.

d) Because of good power throw is attainable by CVD coating and complex ~~ca~~ ~~spap~~ shapes are possible

e) ~~Ih~~ In CVD the reaction are performed at atmospheric temperature and pressure since the high ~~equivalence~~ pressure ~~vaccump~~ vaccum measuring equipments can be avoided.

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f) Higher the temperature of Reaction, leads to perfect internal structure.

g) The decomposition of melting and evaporating can be prepare of the film.

Common CVD methods

a) In CVD vapour or vapour mixture enters to the chamber, that contain substrat to it. Which has suitable temperature, reats to form solid film on substrate.

b) This is very important charateristic of CVD.

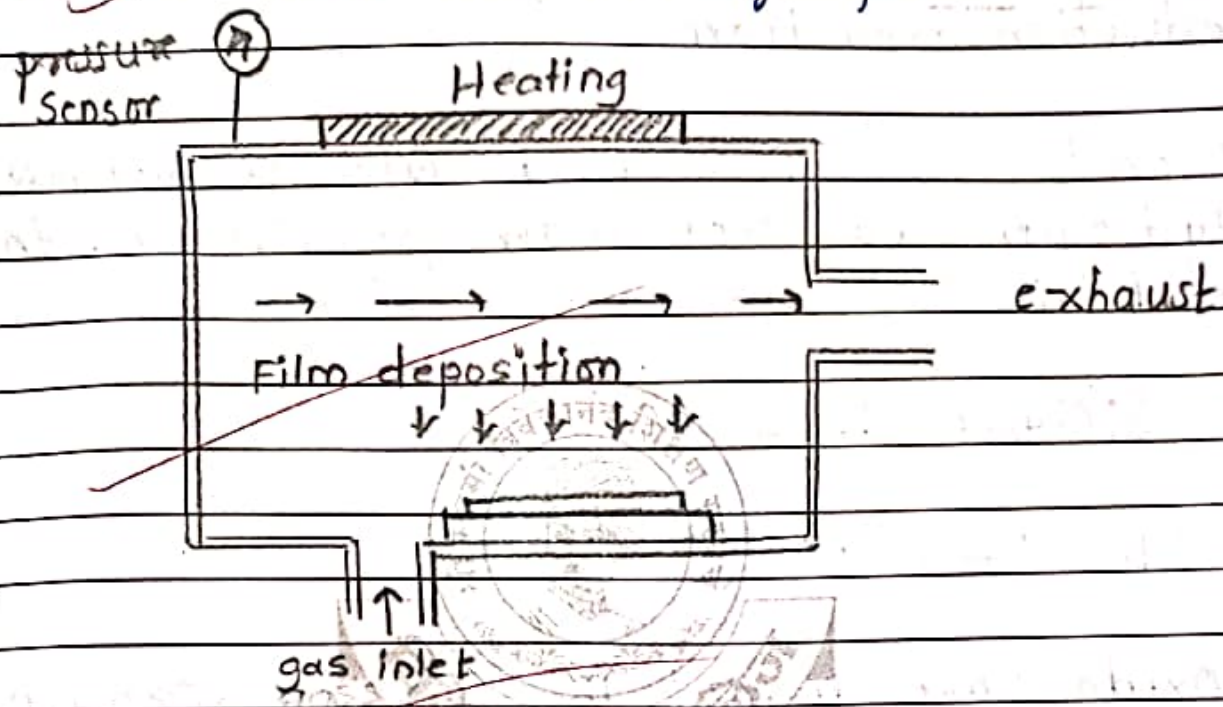
c) In CVD system rate of deposition can be measured by following like flow of rate, gas composition, deposition of temperature, pressure, geometry of chember.

d) In CVD deposition system has three fundamental process
1) Transfer of reactant.
2) Supply heat to reaction site.
3) Removal of reaction for byproduct.

e) There are two types of reactor deposition for thin film are ① Atmospheric pressure
② Low pressure.

In Atmospheric pressure there is large ~~number~~ Stream of gas carriers, large size of aparatus and

In lower pressure there is Removal of gas carriers and small amount of Gas is used.



Thermal Gas reactor
To prepare silicon metal we use thermal Silane gas.
Here silane gas is Heated at suitable temperature.

$$SiH_{2(g)} \longrightarrow Si_{(s)} + H_{2(g)}$$

$$TiI_{2(g)} \longrightarrow Ti_{(s)} + I_{2(g)}$$

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Reduction reaction → gain of electrons
Oxidation reaction → loss of electrons

electronegative ions → attract electrons
electropositive ions → donate electrons

2) Reduction reaction

Chlorids are commonly used as halides. Hydrogen are not more reactive in this reaction.

$$SiCl_{4(g)} + 2H_{2(g)} \rightarrow Si_{(s)} + 4HCl_{(g)}$$

3) Oxide Formation

Oxide are formed by heating oxygen gase and silane gase

~~$SiO_{2(g)} + H_{2(g)} \rightarrow Si$~~

$$SiH_{4(g)} + O_2 \rightarrow SiO_{2(s)} + H_{2(g)}$$

Q1) 1) Silane gas

2) greater

3) $\Delta m = Cej^+$

4) Centripetal force

5) thermal energy.

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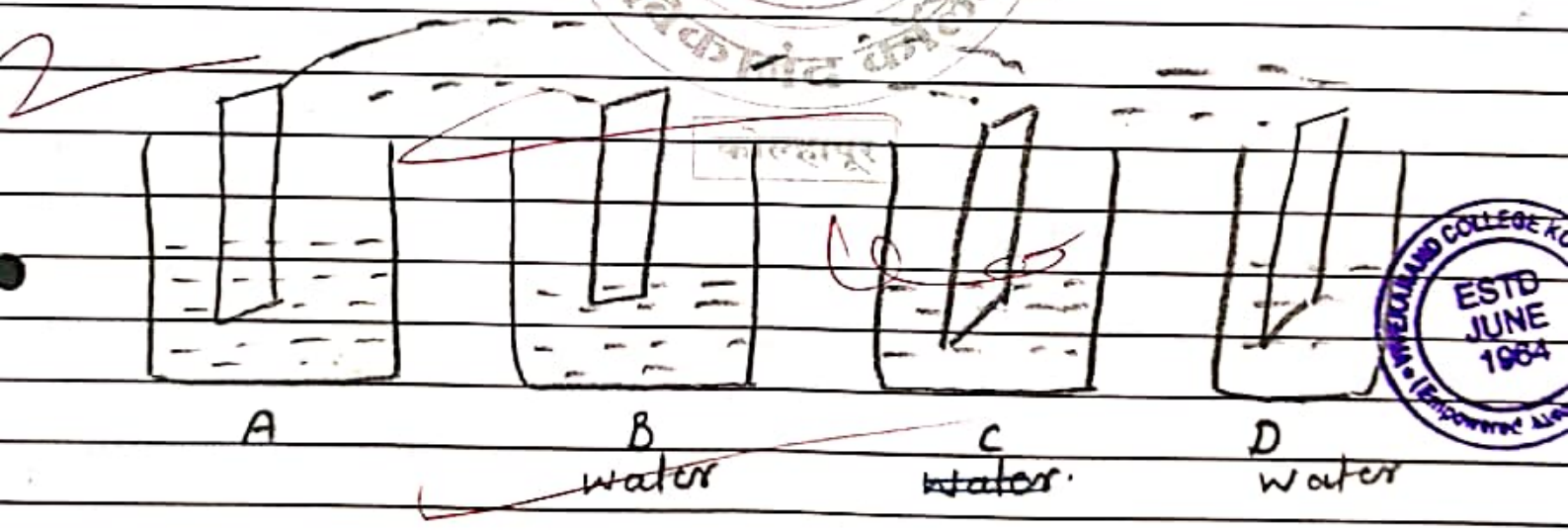
SUPPLIMENT

Signature of Supervisor	

Suppliment No. :
Roll No. :
Class :

Subject :
Test / Tutorial No. :
Div. :

3) In SILAR we use 4 beaker to perfor the reaction that are two anions and cation respectively.
With two beaker of water (disstilled) for ~~rins~~ rinesing.



Here first substrate is immersed in ~~substrate~~ beaker A anion and after that ~~substrate~~ beaker B water for ~~si~~ twice rines.
Thatn at beaker C cation and for rienss and agin at beaker A.

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Shri Swami Vivekanand Shikshan Sanstha Kolhapur's

VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Signature of Supervisor: 15/20

Miss. Shruti Harish Bam.

Suppliment No. : 1

Roll No. : 1602

Class : MSc-II

Subject : Thin film deposition

Test / Tutorial No. : Internal Exam

Div. :

1.

i) In CVD oxidation reaction silicon dioxide thin film prepared from oxidation of silane gas.

ii) In chemical bath deposition technique ionic product in solution must be greater than solubility product

iii) The equation of second law of faraday in electro-deposition is given as $\Delta m = J t$

iv) In spin coating deposition process solution is spread evenly over a surface using centripetal force

v) In spray pyrolysis techniques pyrolytic decomposition takes place by kinetic energy

3

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Chemical Vapor deposition: (CVD)

1) CVD is very important and popular technique of thin film deposition. It has wide var of materials, elements as well as compound ~~in~~ of various substrate.
2) CVD offers many advantages over other meth of thin film deposition.
3) Eg: Films are high purity and good quality of accurately controllable sticheometry composition and doping can be prepared.
4) Because of good throw power attainable by CVD, coating of complex shapes are possible.
5) Many reactions can be accomplished by CVD hence, need for expensive thermal vaccum ~~are~~ can be avoided.

Common CVD reaction:

1) In this the vapor or the vapor mixture is inserted in the chamber which contains a substrate with suitable temp. to form a solid thin film on the surface of the substrate.
2) Reaction which occurs in CVD is a very important characteristics.
3) In CVD, the rate of deposition is controlled by various parameters like flow rate, gas composition, deposition temp, pressure & geometry of chamber.
4) There are three fundamental processes in CVD:
   a) The transfer of reactant.
   b) Supply of the temp. to reaction site.
   c) Removal of reaction by product.

5) There are two types of ~~re~~ pressure as follows:
a) Atmospheric pressure
b) Low pressure..
In atmospheric pressure, there is large carrier gas, ~~too~~ large apparatus size & high temp contamination occurs.
But in low pressure, there is removal of carrier gas & very small amount of relative gas hence limitation of temp.

6) There ~~is~~ are two types of reactors present - Hot wall reactor and cold wall reactor. Hot wall reactor provides temp to the whole reactor. And cold wall reactor provides temp. only to the substrate hence temp is limited.

7) Following are the common reaction:
a) Thermal deposition ~~of~~ or metal films:
To get thin film on silicon we use oxidation of silane gas.

$$SiH_{4(g)} \xrightarrow{\Delta} Si_{(s)} + 2H_{2(g)}$$

$$TiI_{2(g)} \longrightarrow Ti_{(s)} + I_{2(g)}$$

Reduction reaction - gain of electron
Oxidation reaction - loss of electron.
Electronegative ion - Attraction of electron.
Electropositive ion - Electron donation.

b) Reduction reaction:
chloride are commonly used as hallides -

$$SiCl_{4(g)} + 2H_{2(g)} \longrightarrow Si_{(g)} + 4HCl_{(g)}$$

$$2BCl_{3(g)} + 2H_{2(g)} \longrightarrow 2B_{(g)} + 6HCl$$

c) Oxide formation: ~~To form oxide ox~~

In this type of reaction oxide formation ~~Sitta~~ takes place.

$SiH_{4(g)} + O_{2(g)} \longrightarrow SiO_{2(g)} + 2H_{2(g)}$

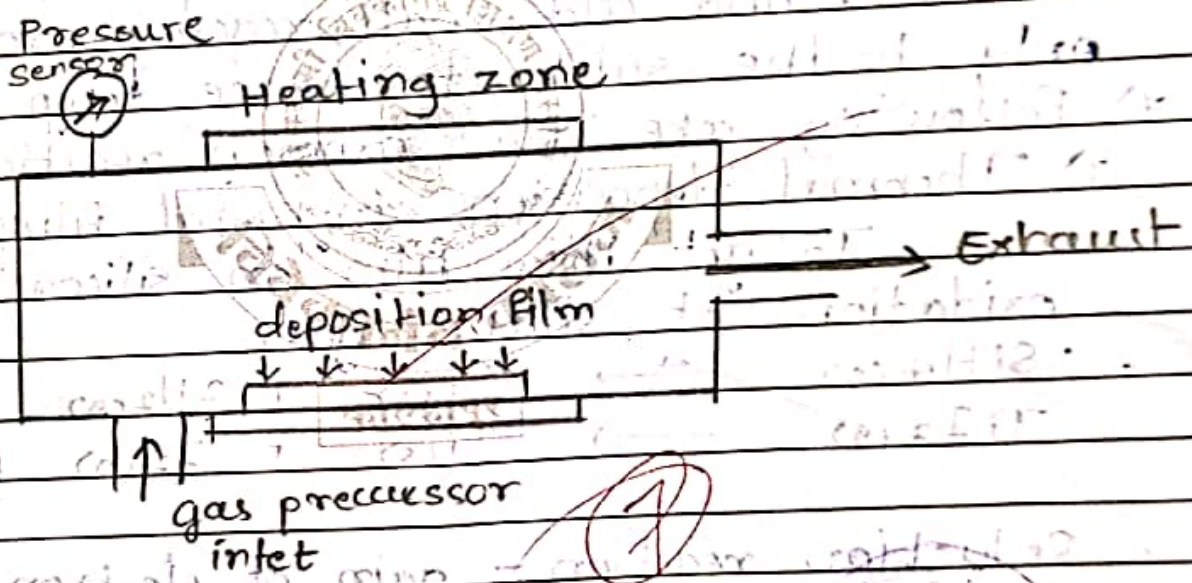
$SiCl_{4(g)} + O_{2(g)} \longrightarrow SiO_{2(g)} + 2Cl_{2(g)}$

d) ~~#~~ Carbide and nitrite formation:

In this type of reaction carbide & nitrite can be formed.

$BCl_{3(g)} + NH_{3(g)} \longrightarrow BN_{(g)} + 3HCl_{(g)}$

$TiCl_{4(g)} + CH_{4(g)} \longrightarrow TiC_{(g)} + 4HCl_{(g)}$



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Shri Swami Vivekanand Shikshan Sanstha Kolhapur's

VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Signature of Supervisor

Suppliment No. : 2

Roll No. : 1602

Class :

Subject :

Test / Tutorial No. :

Div. :

Q.

i) SILAR:

1) Successive Ionic layer Adsorption and Reactio is a modified technique of CBD.

2) In this modification substrate immerse in a cationic and anionic solution. Between every ~~em~~ immersion there is rinsing in ion-exchanged water.

3) There are at least four steps of SILAR.

i) Adsorption.

ii) First rinsing.

iii) Reaction

iv) Second Rinsing

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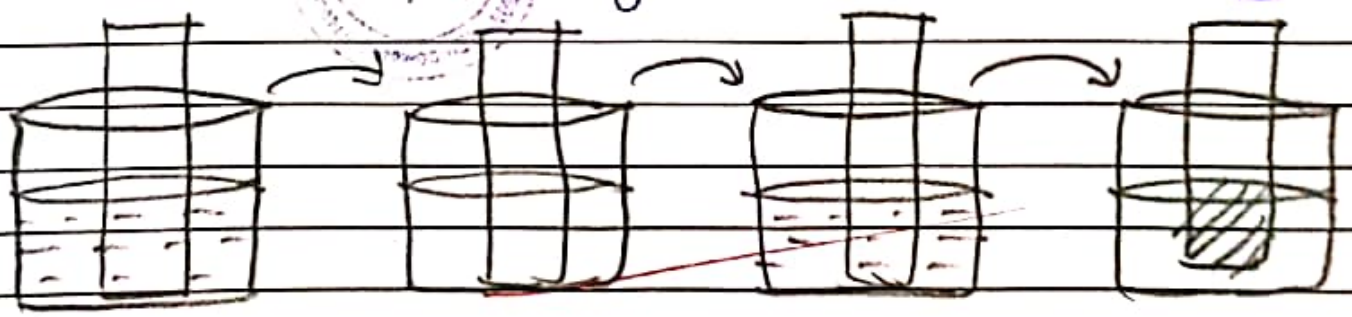

Adsorption First Rinsing Reaction Second Rinsing.

i) Adsorption :

In this step of SILAR cations are placed on the substrate to form thin film.

ii) First rinsing :

In this step loosely adsorbed ions dissolved in the water.

iii) Reaction :

In this step cations get connected to the anions, i.e. cation & anions get reacted & for a thin film.

iv) Second rinsing :

In this last step of a cycle, unreacted species get removed.

By repeating these cycles we get thin film.

ESTD JUNE 1984

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Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

Vivekanand College, Kolhapur (Autonomous)

Department of Physics

M.Sc. Part-II SEM III
Internal Examination
Solid State Physics I
Paper code:CC-1100A

Date: - 26/10/2023
Day: - Thursday

Total Marks: 20
Time :- 12 noon- 1 pm

Instructions:-

1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculator is allowed.

Q. 1) Select most correct alternative. **(05)**

1. Aluminum, gold and other metals are heated to the point of....., and then evaporate to form to a thin film covering the surface of the substrate.

   a) heating b) boiling c) vaporization d) condensation

2. A hot detergent solution may produce .....etching of soda-lime glasses

   a) uniform b) non-uniform c) hollow d) dimpling

3. The simplest sources in resistive heating are in the form of .....

   a) wire b) foil c) both a and b d) None of the above

4. The pipe-shaped glass tube made of Corning glass in flash evaporator serves to drop the powdered material onto a heated ..... boat.

   a) Molybdenum b) Tantalum c) Tungsten d) None of the above

5. In electron beam evaporation, a stream of electrons is accelerated through fields of typically ..... and focused onto the surface material for evaporation.

   a) 410kV b) 510 k V c) 502kV d) 740kV

Q.2) Answer the following long answer question **(10)**

Explain the principle and working mechanism of flash evaporator with neat suitable diagram.

Q.3)Answer the following short answer question **(05)**

Discuss the mechanism of Arc evaporator

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Pranali P. Shirke.

5+8+04 = 17/20

॥ ज्ञान, विज्ञान आणि सुसंस्कार यांसाठी शिक्षण प्रसार ॥

– शिक्षणमहर्षी डॉ. बापूजी साळुंखे

34627

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's

VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Signature of Supervisor	

Suppliment No. : –

Roll No. : 1612

Class : M.Sc-II Physics

Subject : Solid State Physics -I

Test / Tutorial No. : Internal exam

Div. : –

Q.1.

1) – C] Vaporization

2) – B] non-uniform

3) – C] both a & b

4) – A] Molybdenum

5) – B] 510 KV

05

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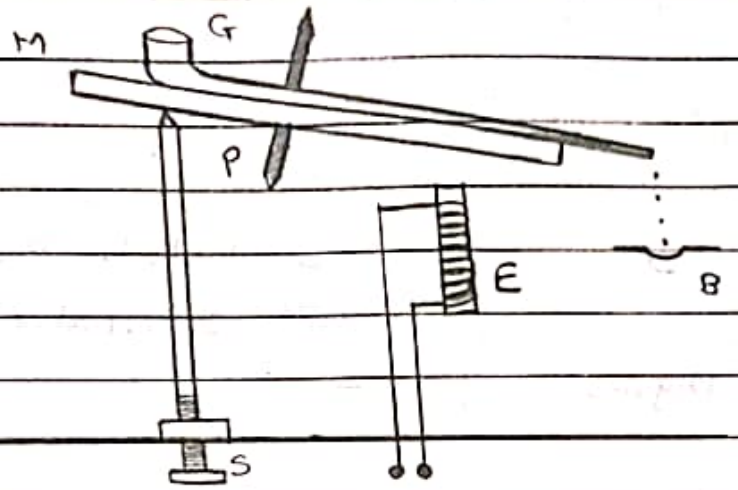
Flash evaporation :

I. Diagram:



M - mild steel plate
G - pipe-shaped glass
E - electromagnet
B - Heated Mo boat
S - Screw
P - pivot

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Chemical composition of thin films of multi~~compact~~ component alloys or compounds that are tend to distill fractionally deviates from that of the evaporants. This difficulty is overcome in flash evaporation.

II. Working:

① Small quantities of material is dropped in powder form onto the boat hot enough to evaporate it instantly. The temperature of the boat must be high enough to evaporate even less ~~well~~ volatile material.

② The component of higher vapour pressure evaporate first, followed by the component of lower vapour pressure.

③ ~~The~~ ~~For~~ In instantaneous evaporation, less volatile material evaporates first.

④ Due to continuous feed of material and high temperature of the boat, the vapour & source have same chemical composition.

⑤ This way we can get required film of the desired material. The whole set up is kept in a chamber in vacuum.

⑥ Electromagnet is used to heat up the boat at a certain temperature.

⑦ To adjust the height and alignment of the pipe-shaped glass, screw & pivot are used.

III. Advantages:

① Flash evaporation is widely used for the preparation of cermet films which are the mixture of metals & dielectrics.

② The resistivity of film increases with dielectric content & varries over wide range.

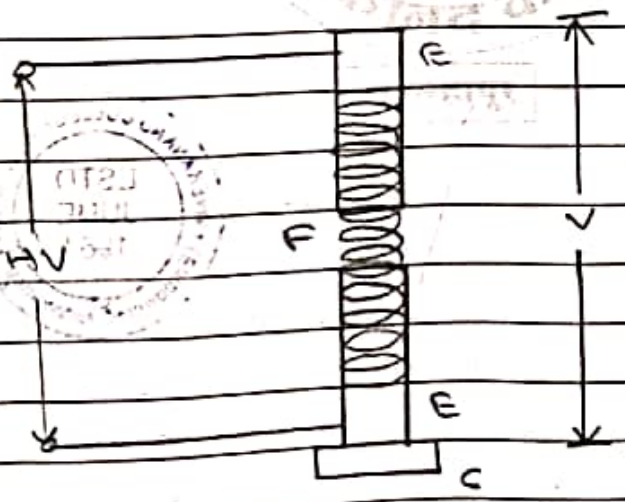
③ They have great stability at high temperature.

IV. Drawbacks:

① It's a very time consuming technique.

② Large amount of gases may realeased during flash evaporation.

Q. 3. Arc evaporation:



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E - electrodes

F - Filament

C - Gap controlling device

HV - High voltage across the electrodes

mechanism:

① To obtain the thin refractory metal film, 2 elect are used in the form of rods, ~~fi~~ facing each oth and alligned ~~at~~ in the direction of axis of helical filament.

② The electrodes are evaporated at high pressur (around 10^{-5} torr) in the chamber.

③ In the chamber, voltage of several 100 volts is applied in between cathode & anode which generate an arc, hence arc evaporation.

④ One eletrode is fixed and other is movable, wher movable electrode is brought in contact with the fixed one & held until hot spot appears & deposited on the substrate. This shows an arc position.

⑤ The helical filament is heated with the ~~higher voltage~~ electron bombardment which ~~give~~ evaporates the material.

06

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Dnyaneshwari Pandit Todkar.

5+7+02 = 14/20

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– शिक्षणमहर्षी डॉ. बापूजी साळुंखे

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VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Signature of Supervisor	

Suppliment No. :

Roll No. : 1614

Class : M.Sc. II

Subject : Solid state physics-I

Test / Tutorial No. :

Div. :

Q.1) Aluminium, gold and other metals are heated to the point of
1. and then evaporate to form to a thin film covering the surface of the substrate.

Ans:- c) vapourisation

2. A hot detergent solution may produce ..... etching of soda lime-glasses.

Ans:- b) Non - uniform

3.

Ans: c) both a) & b)

4.

Ans: a) Molybdenum

5.

Ans:- b) 510 kV

05

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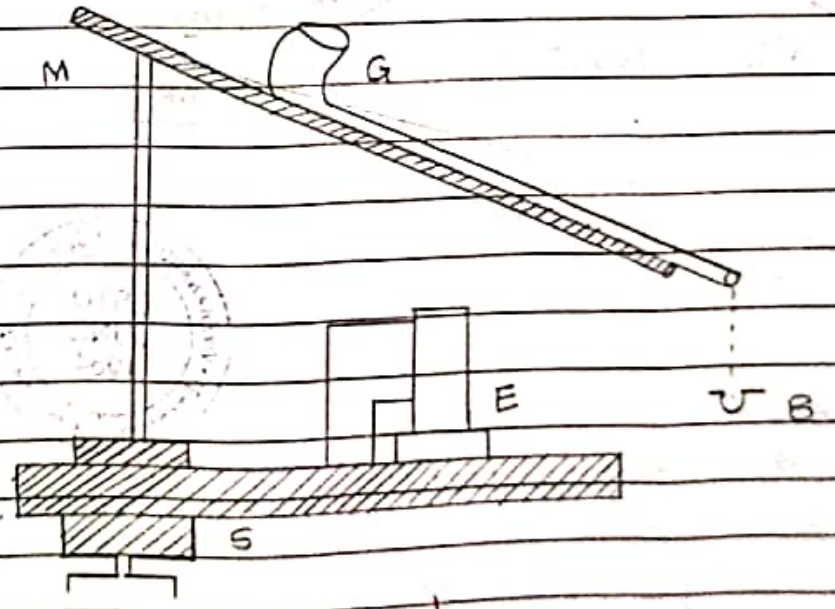
i) Thin film of multicomponent alloys and compounds that tends to distill fractionally that the chemical composition of the thin film obtained deviates from that the evaporant. difficulty is the best overcome in flash evaporation.

4) Hence the small quantity of the material to be evaporated dropped in the powder form onto a boat hot enough to ensure that the evaporation takes places instantaneously.

- The temperature of the boat is should be high enough to evaporate the less volatile material fast.
- Due to feed of the material and high temperature of the boat the vapour and the source material has same chemical composition.
- Hence we get required Film.



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07

The steel plate is arranged by screw pivot attached by electron magnet which helps to vibrate elect steel plate with the desired frequency.

The pipe shaped glass tube serves a drops of material on heated boat.

The whole system is enclosed in an aluminium core.

The power of electromagnet was provided by astable Multibibrator with frequency 2 Hz.

s.

ns: i) To obtain thin refractor metal thin film.

ii) The electron arc are evaporated in chamber and high pressure.

iii) In the chamber voltage of several 100 volts. is applied in between the electrodes. Which generates at arc, an arc ~~iv)~~ evaporation.

iv) one electrode is fixed and second is movable. where movable electrode is brought in contact with fixed. and held until hotspot appears. and deposited on the substrait these shows an arc position.

02

YMCA JAIN COLLEGE KOLHAPUR (Temporarily Unaided) ESTD JUNE 1984

Name:- Smit Kallappa Jankoli

4+6+4 = 14/20

॥ ज्ञान, विज्ञान आणि सुसंस्कार यांसाठी शिक्षण प्रसार ॥

– शिक्षणमहर्षी डॉ. बापूजी साळुंखे

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Shri Swami Vivekanand Shikshan Sanstha Kolhapur's

VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Signature of Supervisor

Suppliment No. :

Roll No. : 1605

Class : MSc II Sem III

Subject : Solid physics I

Test / Tutorial No. : Internal examination

Div. : ——

Q. 1

(1) Aluminum, gold and other metals are heated to the point of vaporization and then evaporate to form to a thin film covering the surface of the substrat

(2) A hot detergent solution may produce hollow etching of soda lime glasses.

(3) the simplest sources in resistive heating are in the form of both a and b

(4) the pipe shaped glass tube made of corning glass in flash evaporator serves to drop the powdered material onto a heated molybdenum boat.

(5) In electron beam evaporation, a stream of electron is accerelated through field of typically 510 kV and focused onto the surface material for evaporation

04

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2.2

(1) the principle and working mechanism of Fl evaporator with neat diagram

the flash evaporator is a example of thermal evaporation technique or method Fl evaporation is a compound of multicomponent alloy formation and chemical mixture the flas evaporation technique is good technique for thin film preparing with metal powdered techn method, the flash evaporator is simple and widely used large technique the flash evaporatio technique mechanism is very simple but this flash evaporation technique or method very high quality high deposition film preparing technique in this flash evaporation technique or method the ~~final~~ material or is liquid to vaporized converted and only form vapours plume then this vapours one vapor chamber through deposited in thin film and preparing start thin film using w, mo, mo, and many other multicomponent particles precursor then the very easy and smooth technique this flash evaporation technique or method using high quality film prepared good quality deposition and very good ~~transport~~ material or final product ready. In this flash evaporation technique is thermal evaporation technique or method evaporation means the the liquid form of material converted into the vapor material and this technique vapors used and final product is ready the flash evaporation is very heating process and this temperature and

ESTD JUNE 1964

boiling point based technique main part of this technique or method is liquid material converted into the vapour or gas particles to electric supply thermally powdered using that type of final product or final thin film making or preparing and this technique after converted liquid to vapour or gas. the pipe shaped glass tube made cooling glass in flash evaporator serves to drop the powered material onto a heated molybdenum boat, the flash evaporator is dropped in powdered material, the flash evaporator steps in follows for thin film preparing :

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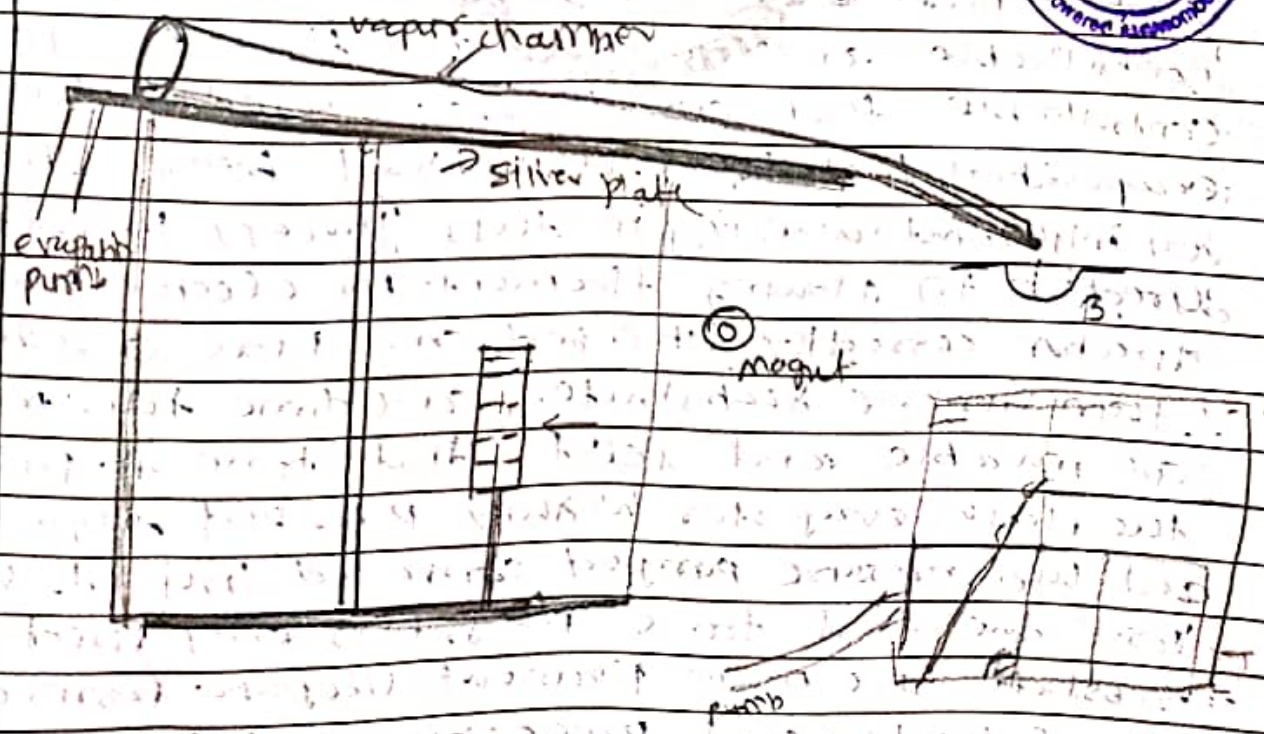

fig. flash evaporator setup

(b) Flash evaporator is simple and very good setup:

this flash evaporation firstly the contain chamber liquid material in the present and the pumped very highly then this flash evaporation chamber high pressure created evaporation time that multi component material converted into the vaporization vapor or gaseous form but in this flash evaporation process time few liquid material not converted in vapor form that time this liquid seperated by other flash evaporator section is called as a seperator. in this flash evaporator setup process the pipe shaped glass tube made of corning glass in flash evaporator. the river plate used upper side and this slid attached slid or base attached in sand and this state is controllable and resizable any time easily or simply controllable then one magnet is used in this flash evaporation technique or method because magnet very important working in this process magnet correct direction in flowing filament for electric flaws and direction correctly charged and flow directly thray thin film or substrate and time this magnets are movable and set to that time of process. the flash evaporator highly pumped liquid material and high pressure pumped converted liquid to vapor. from the that time magnet is only direction for substrate all main filament vapor form detached the substrate and process is smoothly started this technique good for high quality film and highly deposited good quality of film. this is the flash evaporator.

COLLEGE OF ESTD JUNE 1954

Name :- Shri Kallappa Jamboli

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Shri Swami Vivekanand Shikshan Sanstha Kolhapur's

VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Signature of Supervisor	

Suppliment No. : 01
Roll No. : 1605
Class : msc II sem III

Subject : solid state physics I
Test / Tutorial No. : Internal exam
Div. : —

Q.3

(1) the mechanism of Arc evaporator :

the Arc evaporator is a physical vapour deposition technique or method the arc evaporation technique is thermal evaporation technique in this evaporation technique or method in this arc is used any process of evaporation in this arc evaporation technique or method electric heating used in this evaporation and in this Arc evaporation technique is very useful and very quick result technique but in this technique very carefully handling that time of arc evaporation using the preparing the film in this mechanism of arc evaporator coils and fills are used and rods used and arc evaporation process.

04

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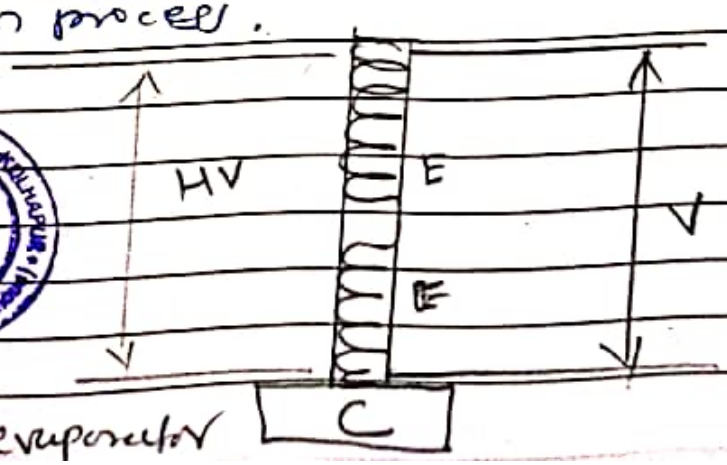

Dia: Arc evaporator

Arc evaporation technique is very simple and electically formed technique in this Arc evaporation technique or method process is very simple the this evaporator. cathode and anode are two rods present and wire and foils is wounded in the rods and that side attached the substrate of different material Metal substrate this evaporation process very carefully the electric current is connected in high temperature heating. and cathod are heated the first and second are two metal rods one rods is movable moveable and second rod is fitted the electric beam bombarded in the electric high current supply temperature is highly increased then the movable or moveable rod is sided the fixed rod and that time electric charges bombard in material and highly vapor are attached in filament substrate and prepare the final product or this film.

this is the mechanism of Arc evaporator.

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Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College (Autonomous), Kolhapur.

Department of Physics

M.Sc. II Internal Examination Oct-2023

Solid State Physics-I

Day and Date: Thursday, 26/10/2023 **Time:** 12-1pm

Roll No	Name of Students	Sign	Marks
1601	Ahivale Snehal Nitin	Snehal.	12
1602	Bam Shruti Harish	Shruti.	12
1603	Birajdar Anand Nagappa	[illegible]	(8) 12
1604	Chauhan Aditi Brijesh	Aditi	(9) 11
1605	Smith Kallappa Jarkoli	[illegible]	14
1606	Kavatagi Shivraj Chandrakant		10
1608	Mithari Shweta Sarday	Mithari	13
1610	Randive Rajshree Mahesh	R.M. Randive.	(8) 12
1611	Sagar Shivani Dattatray	[illegible]	(7) 14
1612	Shirke Pranali Pradip	[illegible]	17
1614	Todkar Dnyneshwari Pandit	Dnyaneshwari	14
1615	Dayama Abhishek Ashok	Dayama	10

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Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

Vivekanand College, Kolhapur (Empowered Autonomous)

Department of Physics

M.Sc. Part-II SEM III Internal Examination (2023-24)

Solid State Physics - II

Paper code:CBP1113C

Date: - 26/10/2023 Time :- 2.00 pm- 3.00 pm Total Marks: 20

Day: - Wenesday

Instructions:-

1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculator is allowed.

Q.1) Select correct alternative **(5)**

i) Barrier potential for silicon is -----

a) 0.7 b)0.3 c)0.8 e) 0.9

ii)) Barrier potential for germanium is -----

a) 0.7 b)0.3 c)0.8 e) 0.9

iii) In p-type majority carriers are .....

a) electrons b)holes c)protons e) neutrons

iv) In n-type majority carriers are .....

a) electrons b)holes c)protons e) neutrons

v) In intrinsic semiconductor Fermi energy level is at ..... of valence and conduction band.

a) centre b) upper site c)away e) lower site

Q.2) Attempt any one **(5)**

i) Explain the difference between direct and indirect band gap.

ii) Explain the n-type semiconductor.

Q.3) Attempt any one **(10)**

i) Explain the concept of Valence band and Conduction band.

ii) Describe the variation of energy bands with alloy composition.

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Snehal Ahiwale class-M.Sc-II 25.10.2

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– शिक्षणमहर्षी डॉ. बापूजी साळुंखे

19/20

(अधिकारप्रदत्त स्वायत्त)
कोल्हापूर

VIVEKANAND COLLEGE, KOLHAPUR.

(Empowered Autonomous)

SUPPLIMENT

Solid State Physics-II

Jr. Supervisor's Sign. :	
Students Sign. :	Snehal
Seat No. :	1601
Seat No. in words :	
Suppliment No. :	
	47254
Centre	Va

प्र. क्र.
Q. No.

Q.1) Select Correct alternatives

i) 0.7

ii) 0.3

iii) holes

iv) electrons

v) Centre,

05

(अधिकारप्रदत्त स्वायत्त)
कोल्हापूर

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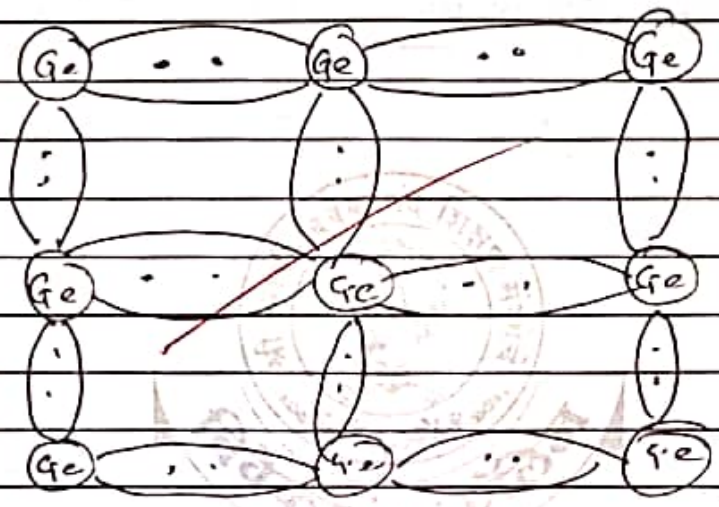
Section	Q. No.													
	Marks													

Q.3)

• n- type Semiconductor •



MEKAMAND COLLEGE KOLHAPUR ESTD JUNE 1964

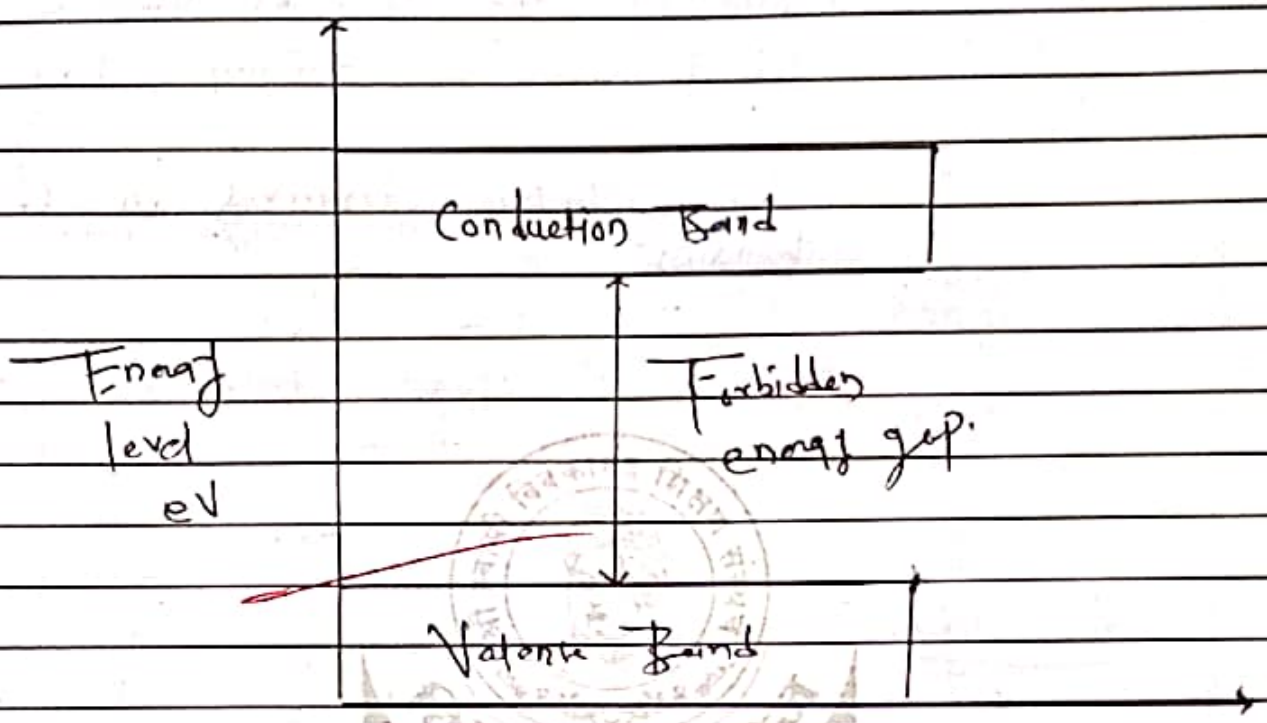
Q5

An n type semiconductor material is generally doped with impurities to increase the number of free electrons to make it more conductive. These impurities called dopants, are elements with five valence electrons e.g. phosphorous which donates extra electrons to the semi conducting material.

Examples : Common examples of n-type semiconductor are Silicon, Germanium.

• Applications : Transistors & diodes → modern electronics

Q.3. Valence & Conduction band



In the context of SSP. the valence band refers to the range of energy levels that are occupied by valence electrons which are outermost electrons of the atom and involved in chemical bonding.

While conduction band is range of energy levels that are unoccupied by electrons at absolute zero temperature but can be occupied by electrons when they gain sufficient energy to transition from valence band.

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Section	Q. No.												
	Marks												

प्र. क्र.
Q. No.

a) Valence Band:

- represent the E.L. of valence electrons which are in outermost shell of atom

These electrons involved in chemical bonding

- It is usually filled or partially filled with electrons.

b) Conduction Band:

- represent E.L. which are above Valence band.

- Electrons in it are free to move & carry as electrical current

- It is typically empty & partially filled.

c) Forbidden Energy Gap:

- Gap betn CB & V.B.

- which determines whether material is conductor, insulator or semiconductor

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Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

Vivekanand College, Kolhapur (Empowered Autonomous)

Department of Physics

M.Sc. Part-II SEM-III Internal Examination (2023-24)

Paper- Solid State Physics-II

Day: - Wenesday

Date: 26/10/2023

Time: - 2.00 pm- 03.00 pm

Total Marks:20

Attendance

Sr. No.	Name of the students	Sign
1	Ahivale Snehal Nitin	Snehal
2	Bam Shruti Harish	[illegible]
3	Biradar Anand Naggappa	[illegible]
4	chauhan Aditi Birjesh	Aditi
5	Smith Kallappa Jarkali	[illegible]
6	mitturi Shewta Sardar	Shritani
7	Ranline Rajshree mahesh	Rim. Ranline
8	Sagar Shivani Dattatrey	[illegible]
9	Shika Pranali Pradip	Pratik
10	Todakar Dnyneshwari Pandit	Dnjaneshwari
11	Dajama Abhishek Ashok	[illegible]
12		
13		
14		
15		

VIVEKANAND COLLEGE KOLHAPUR (Empowered Autonomous) ESTD JUNE 1964