Notice

Date: 17 January 2020

It is hereby informed to the students of M.Sc. – I and II, that Second Term Internal Evaluation Examination is scheduled between 30th to 31th February 2020 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 afterword's in any case.

Sr. No.	Date	Class	Name of the Paper	Time
01	30/01/2020	M. Sc. – I	Quantum mechanics- II	11am – 12 noon
			Statistical mechanics	12 noon – 01 pm
02	30/01/2020	M. Sc. – II	Experimental techniques	11am – 12 noon
			Electronic devices and applications	12 noon – 01 pm
03	31/01/2020	M. Sc. – I	Electrodynamics	11am – 12 noon
			Atomic and Molecular Physics	12 noon – 01 pm
04	31/01/2020	M. Sc. – II	Solid State Physics- III	11am – 12 noon
			Solid State Physics- IV	12 noon – 01 pm

HOD, Physics

Head of the Department of Physics Vivekanand College, Kolhapur.

VIVEKANAND COLLEGE ESTD JUNE 1964 KOLHAPUR - 416003

Vivekanand College, Kolhapur (Autonomous)
M. Sc. Part-II (Semester- IV) Internal Examination
Subject: Physics
Title of the Paper: EXPERIMENTAL TECHNIQUES
Paper Code: CP-1118D

Time - 11 am - 12 pm **Total Marks: 20**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw the neat labeled diagram whenever necessary

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

i. The order of high vacuum is from .....torr.
A) 760 to 25 B) 25 to 10^{-3} C) 10^{-3} to 10^{-6} D) 10^{-6} to 10^{-9}

ii. In mechanical oil sealed pumps the oils used has.....vapor pressure.
A) low B) high C) medium D) infinite

iii. The ultimate pressure obtained with the diffusion pump is.....torr.
A) 10^{-2}B) 10^{-3}C) 10^{-4}D)10^{-7}

iv. Mcleod Gauges works on the principles of.....law.
A) Newton's B) Boyle's C) Krichoff's D) Poisson's.

v. Thermal conductivity in molecular flow region is inversely proportional to .....of molar mass of gas.
A) square B) square root C) cube root D) fifth root

Q. 2 Attempt any one **(10)**

i) What are the different types of gauges? Discuss the Mcleod gauge for the measuring the vacuum.

ii) With suitable diagrams explain the construction and working of diffusion pump. What are the advantages and drawbacks of the pump.

Q.3 Attempt any one **(5)**

i. Discuss the mechanism of rotary pump.

ii. Write note on thermocouple gauge.

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Shri Swami Vivekanand Shikshan Sanstha's
Vivekanand College (Autonomous) Kolhapur
Department of PhysicsM.Sc. II
2019-20
Attendance Sheet
Paper: Experimental Technique
Date:30/01/2020

Roll. No.	Name of Candidate	Sign
1	Mr. Bote Sushant Suresh	
2	Miss. Deshmukhe Aishwarya D.	
3	Mr. Deshmukh Mahesh Bhauso	
4	Mr. Jadhav Amit Ashok	
5	Mr. Jadhav Shivprasad Krishnarao	
6	Miss. Kadam Ketaki Vasnat	
7	Miss Patil Manisha Nanaso	
8	Miss Kamble Susmita Chandar	
9	Miss Mandavkar Ruchita R.	
10	Miss Nirmale Pooja Ashok	
11	Mr. Patil Ashutosh Madukar	
12	Miss Patil Asmita Anandrao	
13	Mr. Patil Pranit Mohanrao	
14	Miss Patil Swati Dinkar	
15	Miss Patole Anuradha L.	
16	Miss Phadatare Dhanashri Rajesh	
17	Mr. Sherala Dinesh Naresh	S. D. N
18	Miss Shinde Amruta Anandrao	
19	Miss Tamke Vaishanavi Namdeo	
20	Mr. Tamboli Asif Jahangir	

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27840

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's

VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Signature of Supervisor

Suppliment No. :

Roll No. : 1341

Class : MSc-II

Subject : Experimental techniques

Test / Tutorial No. : Internal exam.

Div. :

Q.1

1] → b] positive displacement.

2] → c] both (a) & (b)

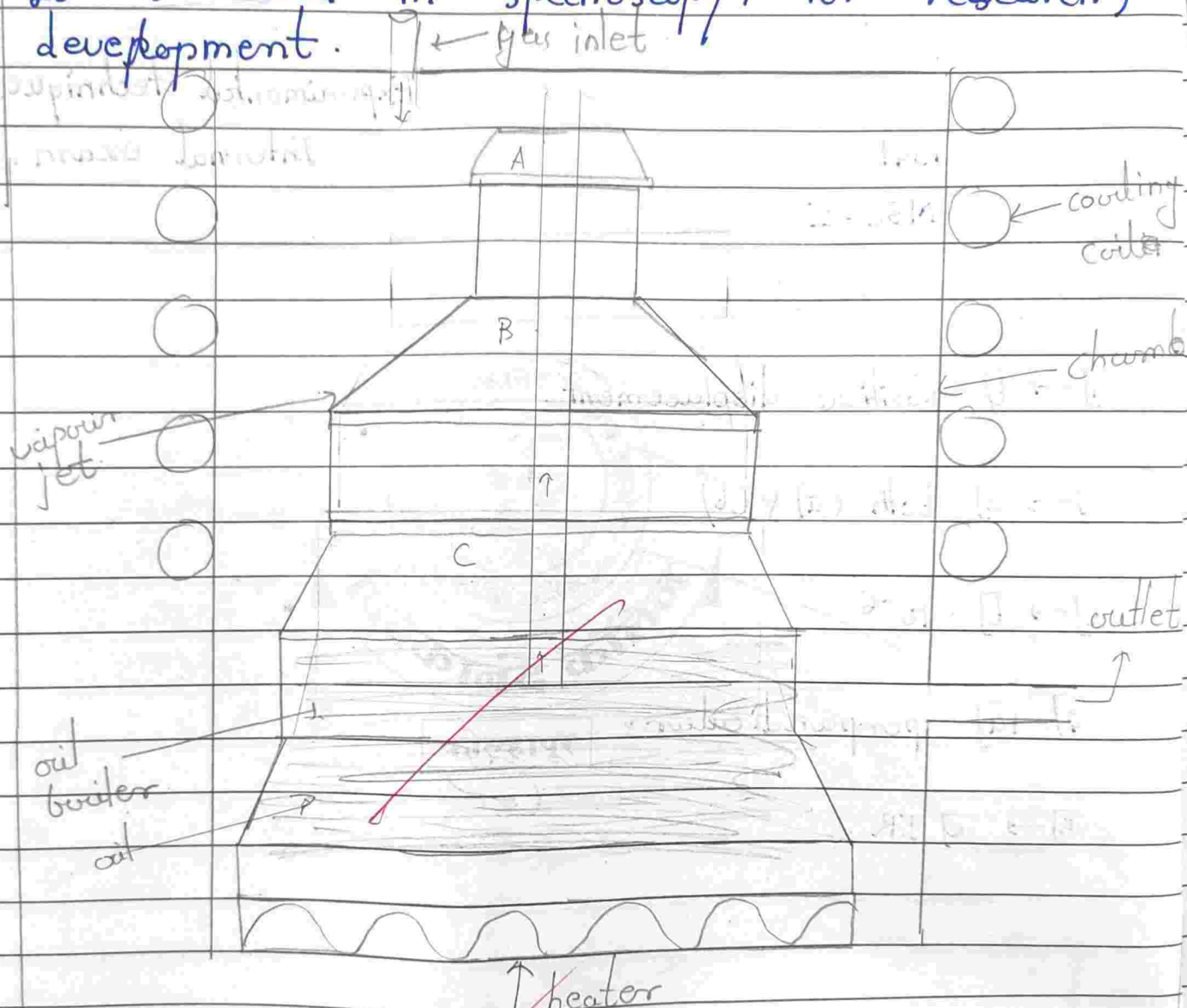
3] → b] 10^{-6}

4] → a] perpandicular.

5] → c] IR.

ii) (a) Diffusion pump.

- Diffusion pump creats high vaccum & so it use ~~for~~ as industrial purpose. at large scale.
- It is used in spechroscopy. for research & development.



- Diffusion pumpp consist heater, oil, boiler, cone sheped vapour jet, cooling coil & reaction chamber.
- Fist ~~we~~ boil the the oil in oil boiler with the help of heater. until the oil reaches at guseous state.
- This gas goes upword direction through

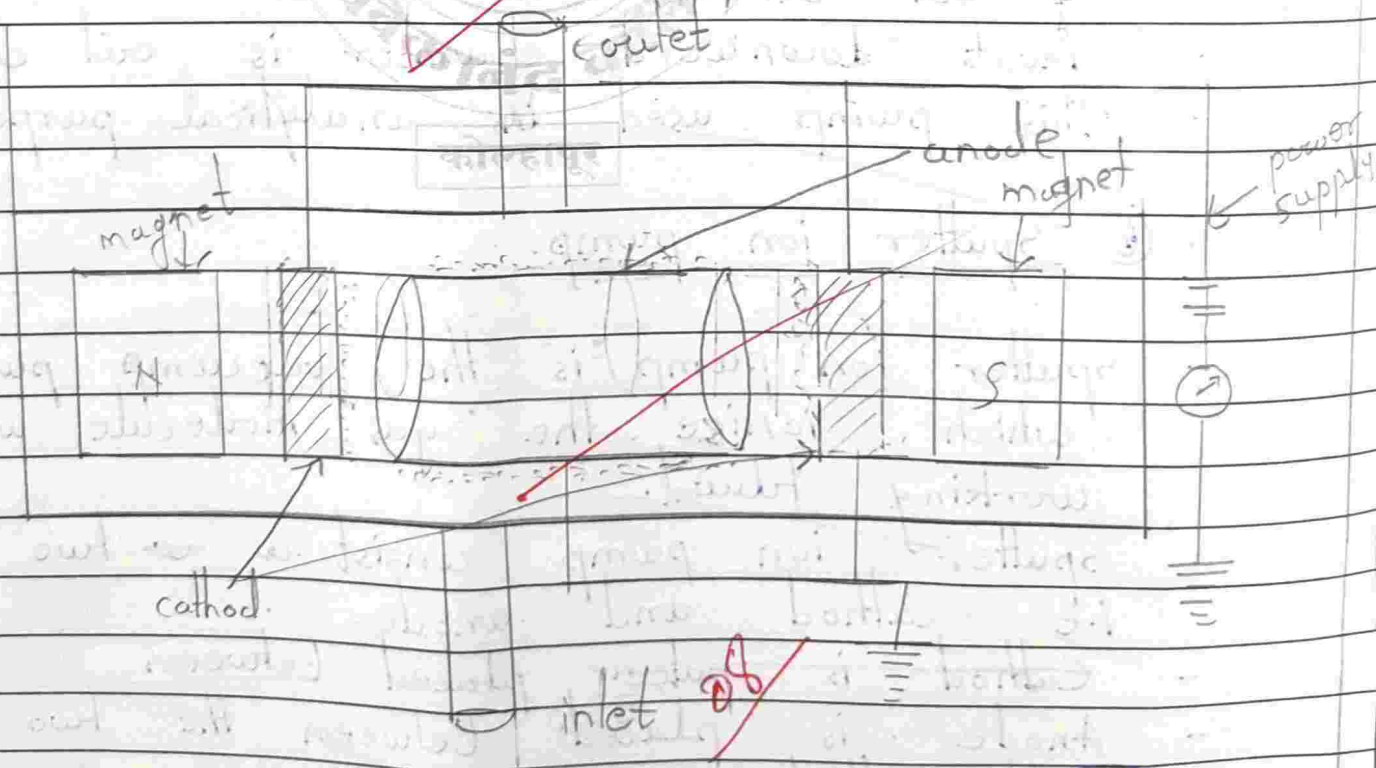
the ~~cont~~ cone shaped vapour jet. These vapour jets are decrese in size as we goes in upword direction.

- Upper most cone shaped vapour jet act as cooling chamber.
- When gas goes in upword direction it realise from nozzle of vapour jet and reacts with air molecule and trap them.
- These is gas move with excellent speed. and as gas approches the wall of chamber then cooling coils are cooles this gas and gas molecule realized the traped molecule and then ~~pres~~ create a vaccum and generate a pressure.
- ~~Theseis p~~ This pressure outer ~~of~~ from outlet.
- And cooling oil is come again in oil chamber.
- most downword chamber is oil chamber.
- This pump used ~~as~~ analytical purpose.

⑥ Sputter ion pump.

- Sputter ion pump is the vaccump pump which ionize the gas molecule without working fluid.
- Sputter ion pump consist a ~~co~~ two electrodes i.e cathod and anode.
- ~~Cathod is pace~~ placed between
- Anode is placed between the two magnets and cathode.
- Anode is the cylindrical tube which is made up of stainless steel

- Cathod placed both sides of the anode which is mainly made up of titanium
- As we apply the constant current to the cathode. cathod reduced electrons.
- These electrons are react with the gas which is placed in ~~vaccum~~ chamber.
- Due to magnetic field electrons moves around the anode with helix trajectory path.
- After reacting with gas molecule it produced positive and negative charge
- positive charge attracted by anode & negative charge is attracted by anode.
- ~~Du~~ so charge get seperated.
- Due to charge seperation we measure the ~~pre~~ value of proved pressure.



SUPPLIMENT

Signature of Supervisor

Suppliment No. :

Roll No. : 1341

Class : MSc-II

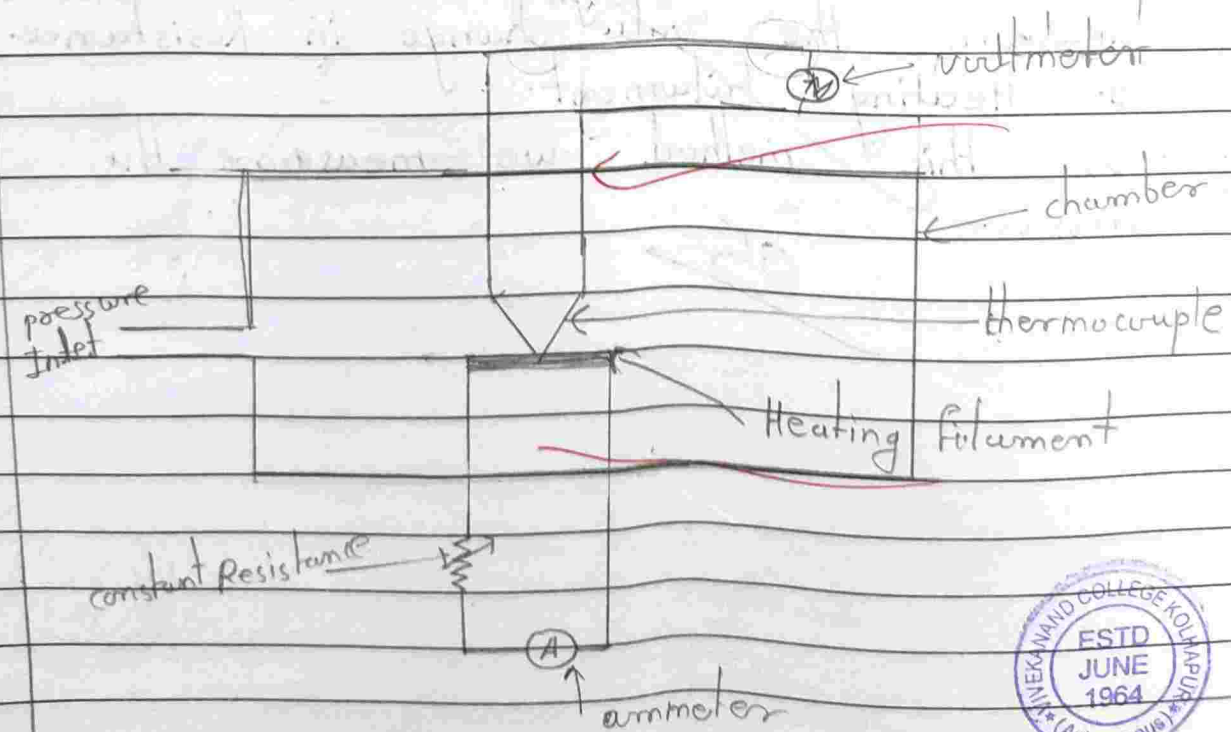
Subject :

Test / Tutorial No. :

Div. :

Q.3 i) Thermocouple gauge.

Principle - Thermocouple gauge works on the principle of thermodynamics which states that as increase the pressure ~~on~~ thermal conductivity decreases.



Construction.

- Thermocouple gauge consist heating filament and thermocouple.
- Thermocouple is welded ~~at~~ on the heating filament.
- Heating filament is made of ~~platinum~~ tungston.
- Heating filament and thermocouple is inside the chamber.

- Working

- Heating filament is heated ~~by~~ with ~~con~~ applying constant current through it.
- Thermocouple which is placed on the filament ~~to~~ measures the Heating value.
- As we inter the pressure in the chamber. then Heating filament changes its value.
- This changed value is measured by thermocouple. ~~which is~~ ~~atta~~ which consist voltmeter ~~or~~ ~~moving~~ ~~whic~~ ~~which~~ that measure the ~~valu~~ change in Resistance of Heating filament.
- So this method we measure the pressure.

05

18/20

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SUPPLIMENT

Signature of Supervisor	

Suppliment No. : 1

Roll No. : 1342

Class : Msc-II

Subject : Experimental Techniques

Test / Tutorial No. :

Div. :

1.

i) b) Positive displacement

ii) c) both (a) and (b)

iii) b) 10^{-6} torr

iv) a) perpendicular

v) c) IB.

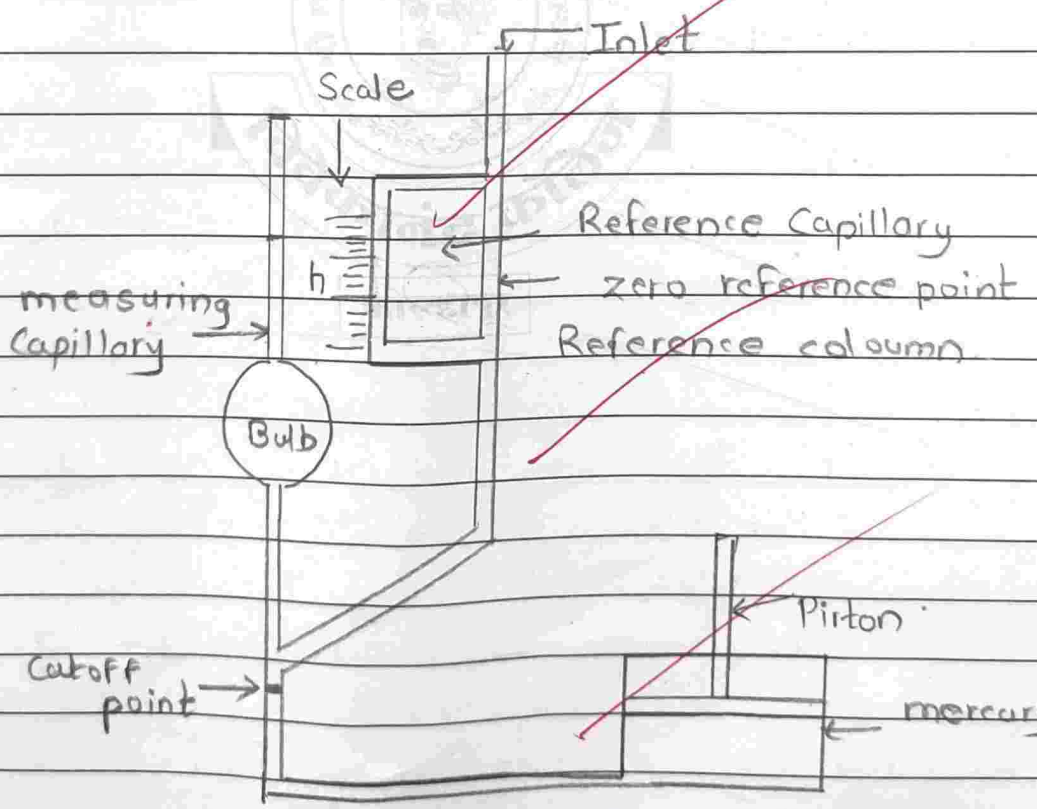
05

VIVEKANAND COLLEGE KOLHAPUR (Autonomous) ESTD JUNE 1964

Mcleod Gauge

① This guage is used to measure pressure at a very lower range upto 10^{-6} torr.
② It is also used to measure vaccum pressure
③ Mcleod guage is also known as compression guage
④ In this guage known volume of gas is compressed at a constant temperature and unknown pressure of gas is calculated.

Working principle.-
It mainly works on the principle of Bogle's law.



Construction -

① Working Fluid -
Here we used mercury as an working fluid is maintained below cutoff initially.

② Mercury Reservoir -
The purpose of mercury reservoir is to zero the mercury it consists of prism which pushes mercury into the reference coloumn bulb and the bulb.

③ Reference coloumn -
One end of the reference coloumn is attended to the cut off point and another end for entering of gas.

④ Reference Capillary -
Both ends of reference capillary are connected to the reference coloumn.

⑤ Bulb -
The bulb is connected to the reference coloumn at cut off point and another end is connected to measuring capillary.

Working -

① First remove the mercury inbulb and reference coloumn below cut off point so that gas can enter into the bulb.

② Connect the reference coloumn to the source of gas or vaccum whose pressure is to the measure.

③ After filling of gas in bulb & in capillary starts to the filling of mercury into the bulb and reference coloumn by moving prism downword.

④ By knowing this height h we calculate volume of gas

⑤ By using Boyel's law we can find unknown pressure of gas.

Mclead gugge derivation -

Let us consider P_1V_1 be the initial & P_2V_2 be the final volume

$$\boxed{P_1V_1 = P_2V_2} \quad -(1)$$

lets V be the volume, a be area of cross section of measuring capillary, hc be the height of measuring capillary.

∴ Initial volume of gas entropped in the bulb plus measuring capillary tube $V_1 = V + ahc$ -(2)

∴ final volume of gas $= V_2 + ah$ -(3)

so, $P_2 = P_1 + h$ -(4)

$P_1V_1 = P_2V_2$

$\therefore P_1V_1 = (P_1+h)\cdot(V_2+ah)$

$= (P_1+h)V_2 + (P_1+h)\cdot ah$

$\therefore P_1V_1 = (P_1+h)\cdot ah$

$\therefore P_1V_1 = P_1ah + ah^2$

$\therefore P_1V_1 - P_1ah = ah^2$

$$\therefore \boxed{P_1 = \frac{ah^2}{(V_1 - ah)}}$$

Since ah is very small as compared to V_1 so, $V_1 - ah = V_1$.

$$\therefore \boxed{P_1 = \frac{ah^2}{V_1}}$$

So. applied pressure is measured by Mcleod Guage.

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SUPPLIMENT

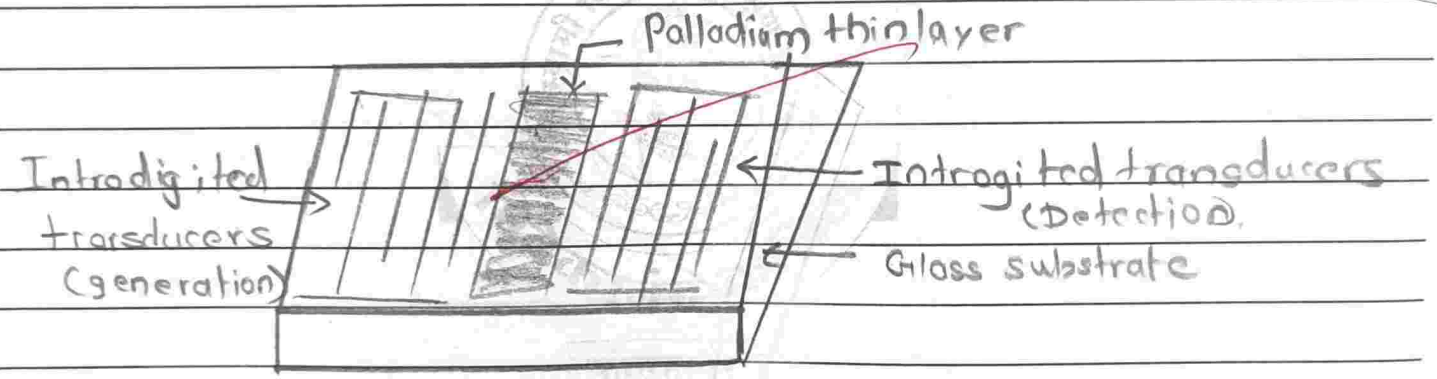
Signature of Supervisor

Suppliment No. : (2)
Roll No. : 1342
Class : Msc-II

Subject : Experimental techniques
Test / Tutorial No. :
Div. :

Q.3

ii) Palladium barrier detector.-



Construction.-

① It mainly consists of glass sepstrate on which thin layer of sensitive palladium is deposited at the centre.

② Integrated transducers fitted on both sides of this palladium layer one acts as surface.

Working -

① Before passing of hydrogen gas on the thin film of palladium surface wave generated by IDT.

② As Pd is very sensitive to the hydrogen gas after interaction with H_2, it produces palladium hydrate molecules.

③ So when we pass H_2 gas on Pd thin layer molecules of palladium hydrate created on thin layer.

④ So we get resultant phase diff in acoustic wave due to these palladium hydrate molecules.

Applications -

① Fuel cell technology
② Power stations
③ Chemical industries.

03

Seat No. | O.P. Code

Vivekanand College, Kolhapur (Autonomous).

M. Sc. Part-II (Semester- III) Internal Examination May.2020

Subject: Physics

Title of the Paper: Electronics Devices and application

Subject Code: CP-1121D

Time - 12 noon - 01 pm **Total Marks: 20**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of Scientific calculator or Log table is allowed.
4) Draw the neat labeled diagram whenever necessary

Q. 1 Select most correct alternative (5)

i. In p - type semiconductor, silicon is doped in _____ impurities.
A) pentavalent B) trivalent C) tetravalent D) divalent.

ii. The $p^+ - n - p$ BJT the emitter is _____doped
A) lightly B) heavily C) moderately D) none of these.

iii. A bipolar junction transistor is a current controlled device i.e. output characteristics of device are controlled by_____
A) base current B) base voltage C) emitter voltage D) none of these.

iv. In junction field effect transistor(JFET) output characteristics are controlled by input __
A) voltage B) current C) resistance D) none of these.

v. In n type JFET current conduction by_____.
A) hole B) electron C) both electron hole D) none of these

Q. 2 Attempt any one (10)

i) Explain principle, construction and working of bipolar junction transistor (BJT) with energy level diagram.

ii) Discuss frequency response and switching of bipolar junction transistor (BJT).

Q.3 Attempt any one (5)

i. Discuss n- type and p- type semiconductor.

ii. Explain principle, construction and working of junction field effect transistor (JFET).

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Vivekanand College (Autonomous) Kolhapur

Department of PhysicsM.Sc. II

2019-20

Attendance Sheet

Paper: Electronic Devices and Application

Date:30/01/2020

Roll. No.	Name of Candidate	Sign
1	Mr. Bote Sushant Suresh	
2	Miss. Deshmukhe Aishwarya D.	
3	Mr. Deshmukh Mahesh Bhauso	
4	Mr. Jadhav Amit Ashok	
5	Mr. Jadhav Shivprasad Krishnarao	
6	Miss. Kadam Ketaki Vasnat	
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20	Mr. Tamboli Asif Jahangir	

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ESTD JUNE 1964
(Autonomous)

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– शिक्षणमहर्षी डॉ. बापूजी साळुंखे

07003

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's

VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Signature of Supervisor	A.V.S.

Suppliment No. : 17/20

Roll No. :

Class :

Subject : Electronic Devices & applications

Test / Tutorial No. : Internal Exam- may 2022

Div. :

Select most Correct Alternative:

Q.1>

i) Divelent

ii) Heavily

iii) Emitter voltage

iv) A) Voltage

v) Elector. 05

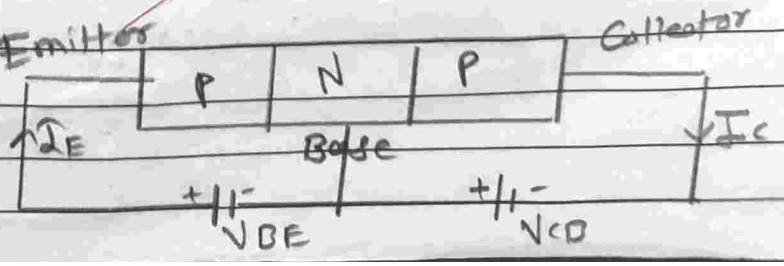
Q.2:

• Bipolar Junction Transistor – BJT •

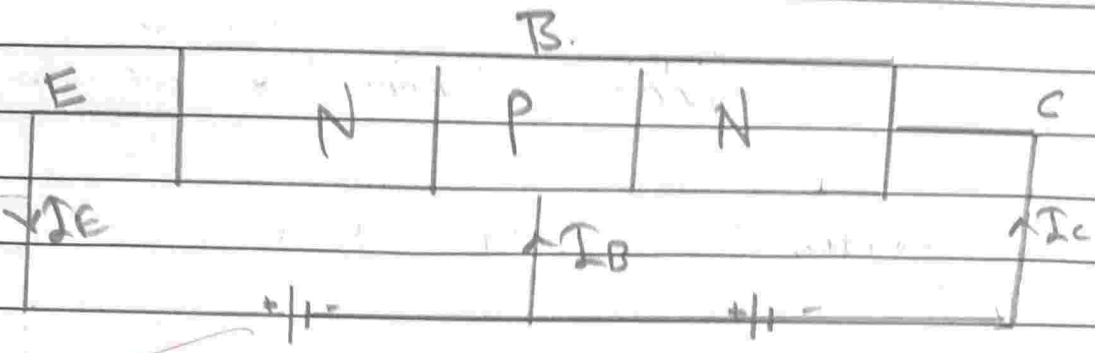
- It invented by William shockley & John Bardon
- It uses both electrons & holes as charge carriers.
- It is current controlled device.

- **Construction:**
  - formed by the combination of two back to back doped semiconductor materials.
  - Two PN junctions diodes are fabricated together to form BJT transistor
- Emitter - emitts electron majority charge carrier.
- Collector - Collect the emitted charged carrier heavily dopped.
- Base - middle portion between Collector & emitter
- Types: 1) PNP
  2) NPN

1) PNP:



2) NPN:



- Exactly opposite to PNP type
- P type sandwitched between two N-type semiconductor
- When anodes of two diodes are connected together it forms an NPN transistor
- Current will flow from the collector to emitter

Working:

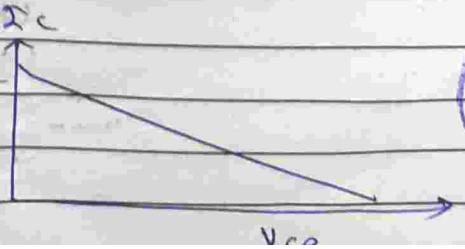
a) Active Region: $I_c = \beta \times I_b$
b) Saturation Region $= I_c = I_{sat}$
c) Cutoff region $= I_c = 0$

Working Principle:

a) Base-Emitter junction is forward biased
b) Collector emitter junction is reversed biased.

08

$I_e = I_b + I_c$



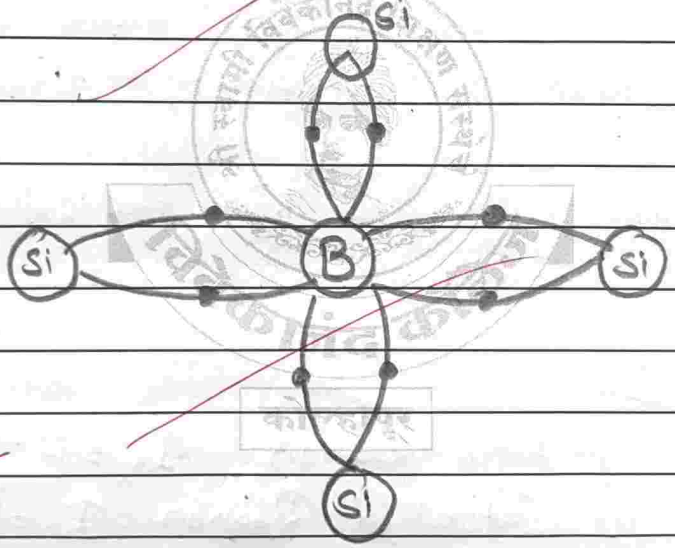
Q.5) . P- type semiconductor and N- type semiconductor

a) P- type semiconductor.

. In these, the impurity of some trivalent used.

. it accept electrons known as acceptor semiconductor

. holes are majority current carriers & electrons are minority.



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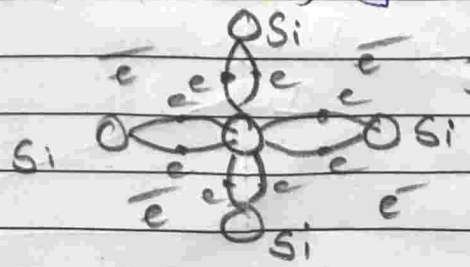
b) N- type semiconductor.

. pentavalent impurity used eg. P, As, Sb.

. donar of electrons - donar semiconductor

. electrons are majority chaye cariers



Vivekanand College, Kolhapur (Autonomous)
M. Sc. Part-II (Semester- IV) Internal Examination
Subject: Physics
Title of the Paper: SOLID STATE PHYSICS-III
Paper Code: 1119D

Time - 12 noon - 01 pm **Total Marks: 20**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw the neat labeled diagram whenever necessary

Q. 1 Select most correct alternative (5)

i. ..... defect occur in those ionic crystal where size of anions quite large as compared that of cations
A) Frenkel B) Schottky C) lattice D) F center

ii. ....compound mainly shows vacancy and intersteial defects.
A) Ionic B) Non-ionic C) Metals D) Covalent

iii. ..... defects occurs in those ionic crystal where difference in size between cations and anions is small
A) Frenkel B) Schottky C) lattice D) F center

iv. ..... is the time in which one vacant site jump into next atomic site
A) Dielectric relaxation time B) Atomic relaxation time
B) Dielectric jumping time D) Atomic jumping time.

v. Diffusion constant depends on temperature T as, D = ...
A) $D_0 \exp(-E/kT)$ B) $D_0 \exp(E/kT)$ C) $D_0 \exp(-kT/E)$ D) $D_0 \exp(kT/E)$

Q. 2 Attempt any one **(10)**

i) Write a note on Lattice defect.
ii) Write a note on effect of annealing on defects.

Q.3 Attempt any one **(5)**

i. Give the distinction between Schotty and Frenkel Defects
ii. State various types of defects. Explain non- stoichiometric and metal deficiency defects in details.

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Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College (Autonomous) Kolhapur

Department of PhysicsM.Sc. II

2019-20

Attendance Sheet

Paper: Solid State Physics-III

Date:31/01/2020

Roll. No.	Name of Candidate	Sign
1	Mr. Bote Sushant Suresh	
2	Miss. Deshmukhe Aishwarya D.	
3	Mr. Deshmukh Mahesh Bhauso	
4	Mr. Jadhav Amit Ashok	
5	Mr. Jadhav Shivprasad Krishnarao	
6	Miss. Kadam Ketaki Vasnat	
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9	Miss Mandavkar Ruchita R.	
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20	Mr. Tamboli Asif Jahangir	

VIVEKANAND COLLEGE KOLHAPUR ESTD JUNE 1964 (Autonomous)

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SUPPLIMENT

Signature of Supervisor

Suppliment No. :

Roll No. : 1338

Class : M.Sc II

15/20

Subject : SSP-III (physics)

Test / Tutorial No. :

Div. :

Q. 2 M.C.Q

1) ~~Zero~~

2) ~~Interstial~~

3) $F = U - TS$

4) Screw dislocation

5) ~~Line.~~

2

Q. 2

7]

Ans:-

The defect has equal or equilibrium condition at Temp at zero the equal number of positive ions and negative ions.

According to Helmholtz free energy is minimum energy is

$$F = U - TS \quad \text{—(1)}$$

U = internal energy

T = Temprature

S = entropy

The energy (E_p) is increases ~~the~~ with increasing no of ~~in~~ internal energy. 'n' is number valancy of ions

$$U = n E_p \quad \text{—(2)}$$

By Boltzman ~~Free~~ energy

$$S = k \log W. \quad \text{—(3)}$$

The number of vacancy 'N'. The 'n' is defeator or removing the ions from so material the defect is

$$W = \frac{N!}{(N-n)!\, n!} \quad \text{—(4)}$$

consider equibsum of cation and anion are squared

$$W = \left[\frac{N!}{(N-n)!\, n!}\right]^2 \quad \text{—(5)}$$

eqn ⑤ & ③ gives

$$S = K \log \left[\frac{N_i}{(N-n)!\, n!} \right]^2 \quad \text{— ⑥}$$

From eqn ①, ② & ⑥ gives

$$F = nE_p - TK \log \left[\frac{N_i}{(N-n)!\, n!} \right]^2$$

$$F = nE_p - 2TK \left[\log N_i - \log (N-n)! - \log n! \right]$$

Form rule $\log x! = x \log x - x$.

$$F = nE_p - 2TK \left[N \log N - (N-n) \log (N-n) - (N-n) - N - n \log n - n \right]$$

$$F = nE_p - 2TK \left[N \log N - (N-N) \log (N-n) - (N-n) - N - n \log n - n \right]$$

Differentiate with respect to n,

$$\frac{dF}{dn} = E_p - 2TK \log \left[\frac{N-n}{n} \right]$$

$$\frac{dF}{dn} = 0 \quad \& \quad N \gg n.$$

$$E_p = 2TK \log \left(\frac{N}{n} \right)$$

$$\frac{E_p}{2KT} = \log \frac{N}{n}$$

$$\frac{N}{n} = e^{E_p/2KT}$$

$$n = N \cdot e^{-E_p/2KT}$$

At Temp $T = 1000^0$ K.

$$\boxed{n = 2.8 \times 10^{-18} /cc}$$

Q. The increases in increases the temprature with increases the vacancy of material.

Q. 3

2.]

→ Point defect :-

The deviation of regularity of crystal formation.. and it's defect has zero dimentionality

There are Four Type

① Interstitial defect -
② Substitutional defect
③ Schotky defect
④ Frenkyl defect

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– शिक्षणमहर्षी डॉ. बापूजी साळुंखे
27054
Shri Swami Vivekanand Shikshan Sanstha Kolhapur's
VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Signature of Supervisor

Suppliment No. : 1
Roll No. : 1338
Class : M.Sc II

Subject : SSP-III (physics)
Test / Tutorial No. : 4.
Div. :

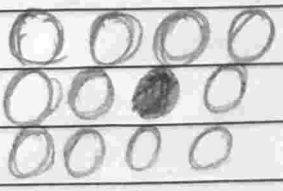
① Interstitial Defect :-

A⁺ ○ B⁻ ○ A⁺
B⁻ ○ A⁺ ○ B⁻
A⁺ ○ B⁻ A⁺

The defect is shows the small size of atom added in vacancy or interstial space called interstitial Defect.

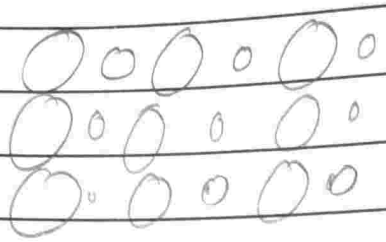
e.g Hydrogen and paladium is small size of Interstitial occupy the position in interstial space. it changes the physical and chemical properties of material

② Substitutional Defect :-



This types of defect the same size. A forgion atom added or remove parent atom and added forgin atom this defect called as substitutional Defect.

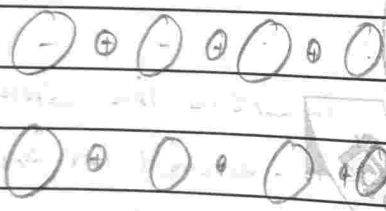
③ Schottky Defect :-



The schottky defect is a stiochomemy defect. The formation of nuetral of cation and anion with equal called schottky defect

e.g NaCl, KCl.

④ Frenkel defect :- The small size of ion remove and new atom at added like interstitial defects. Knows as frenkel defects



Frenkel defect observed in crystal having zero co-ordination numbers.

Vivekanand College, Kolhapur (Autonomous)
M. Sc. Part-II (Semester- IV) Internal Examination
Subject: Physics
Title of the Paper: SOLID STATE PHYSICS-IV (ENERGY CONVERSION AND STORAGE DEVICES)
Paper Code: 1120D

Time - 12 noon - 01 pm Total Marks: 20

Instructions: 1) All questions are compulsory
2) Figures to the right indicate full marks.
3) Draw the neat labeled diagram whenever necessary

Q. 1 Select most correct alternative (5)

i. A capacitor is a device which is used to store……
A) mass B) charge C) electricity D) potential energy

ii. The capacity of supercapacitor is expressed in terms of …..
A) µF B) mF C) nFD) F

iii. The dielectric materials are…..type of materials
A) Conductors B) insulatorsC) semiconductorsD)plasma

iv Battery is ….device.
A) chemical B) solar C) electrochemical D) photoelectric

v. The capacitance observed due to redox reaction is called as …..capacitance
A) psedocapacitance B) double layer C) high D)supercapacitance

Q. 2 Attempt any one (10)

i) What is mean by supercapacitor ? How to find capacitance energy density and power density?Explain the different types and materialsfor it.

ii) With suitable diagrams and examples explain the formation of double layer and the mechanisum of pseudocapacitanceto store the charges.

Q.3 Attempt any one (5)

i. Give the distinction between battery and supercapacitor.

ii. Write note on the lemon battery.

"Dissemination of Education for Knowledge Science and Culture"
-Shikshanmaharshi Dr. Bapuji Salunkhe

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Vivekanand College (Autonomous) Kolhapur

Department of PhysicsM.Sc. II

2019-20

Attendance Sheet

Paper: Solid State Physics-IV

Date:31/01/2020

Roll. No.	Name of Candidate	Sign
1	Mr. Bote Sushant Suresh	
2	Miss. Deshmukhe Aishwarya D.	
3	Mr. Deshmukh Mahesh Bhauso	
4	Mr. Jadhav Amit Ashok	
5	Mr. Jadhav Shivprasad Krishnarao	
6	Miss. Kadam Ketaki Vasnat	
7	Miss Patil Manisha Nanaso	
8	Miss Kamble Susmita Chandar	
9	Miss Mandavkar Ruchita R.	
10	Miss Nirmale Pooja Ashok	
11	Mr. Patil Ashutosh Madukar	
12	Miss Patil Asmita Anandrao	
13	Mr. Patil Pranit Mohanrao	
14	Miss Patil Swati Dinkar	
15	Miss Patole Anuradha L.	
16	Miss Phadatare Dhanashri Rajesh	
17	Mr. Sherala Dinesh Naresh	
18	Miss Shinde Amruta Anandrao	
19	Miss Tamke Vaishanavi Namdeo	
20	Mr. Tamboli Asif Jahangir	

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Shri Swami Vivekanand Shikshan Sanstha Kolhapur's

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16/20

Signature of Supervisor

Suppliment No. :

Roll No. :

Class : M.Sc-II

Subject : Energy Conservation & Storage Device

Test / ~~Tutorial~~ No. : Internal Exam-202

Div. :

Q.1) Select most Correct alternative

1) B) charge

2) A) uf

3) B) Insulator

4) C) Electrochemical

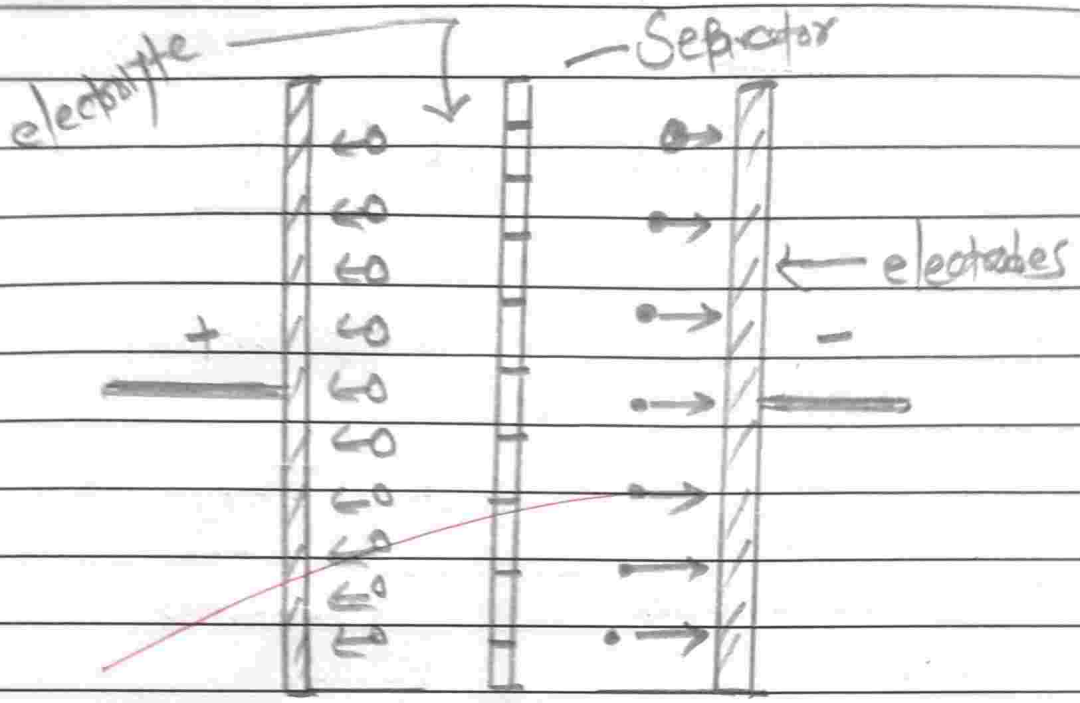
5) B) Super capacitance. 1 × 05 = 05

• Super Capacitor •

- It is an electrical device which is used to store extremely large amount of electrical charge.
- Also known as double layer capacitor
- It uses two mechanism to store electrical charge i.e. double layer capacitance & pseudocapacitance.
- Super capacitor are polar device connected in a circuit like electrolytic capacitor.
- They possess high charging & discharging time.

Construction:

- They are constructed somewhat like electrolytic capacitors.
- They have two electrodes that are made up of porous active carbon coating or carbon nanotubes.
- The coating is implemented on metal foil. ie. which serve as a current collectors.
- The current collectors are immersed in an electrolyte.
- Electrolyte can be liquid & solid.



Energy Density of Capacitor

- It is denoted by u
- It is defined as energy stored in the electric field of the capacitor per unit volume.

- Supercapacitors have a very high power density by a very low energy density.

08

- equation : $E = \frac{1}{2} C V^2$

So energy density is proportional to both capacitance & voltage

$$W = \frac{1}{2} C V^2$$

- E_D can be expressed by - Volumetric capacitance
  - Gravimetric capacitance

Q.3> Distinction between Battery & supercapacitor

	Supercapacitor	Battery
Operational life:	long	Long
. Cost	: low per cycle	—
. Heat build up	: low thermal energy release	combustion
. Charge protection:	No danger of overcharging	need shut-off.
. Environmental	: No corrosive chemicals	. chemical required to be disposed of
. Energy density	: store only 10-20% energy	. 10 times the capacitor.
. Power Density	: rapid discharge	steady
. max. voltage	: low	high.

Or

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SUPPLIMENT

Signature of Supervisor: Jamb.

18/20

Suppliment No. : –

Roll No. :

Class : M.Sc-II

Subject : Solid State Physics -IV

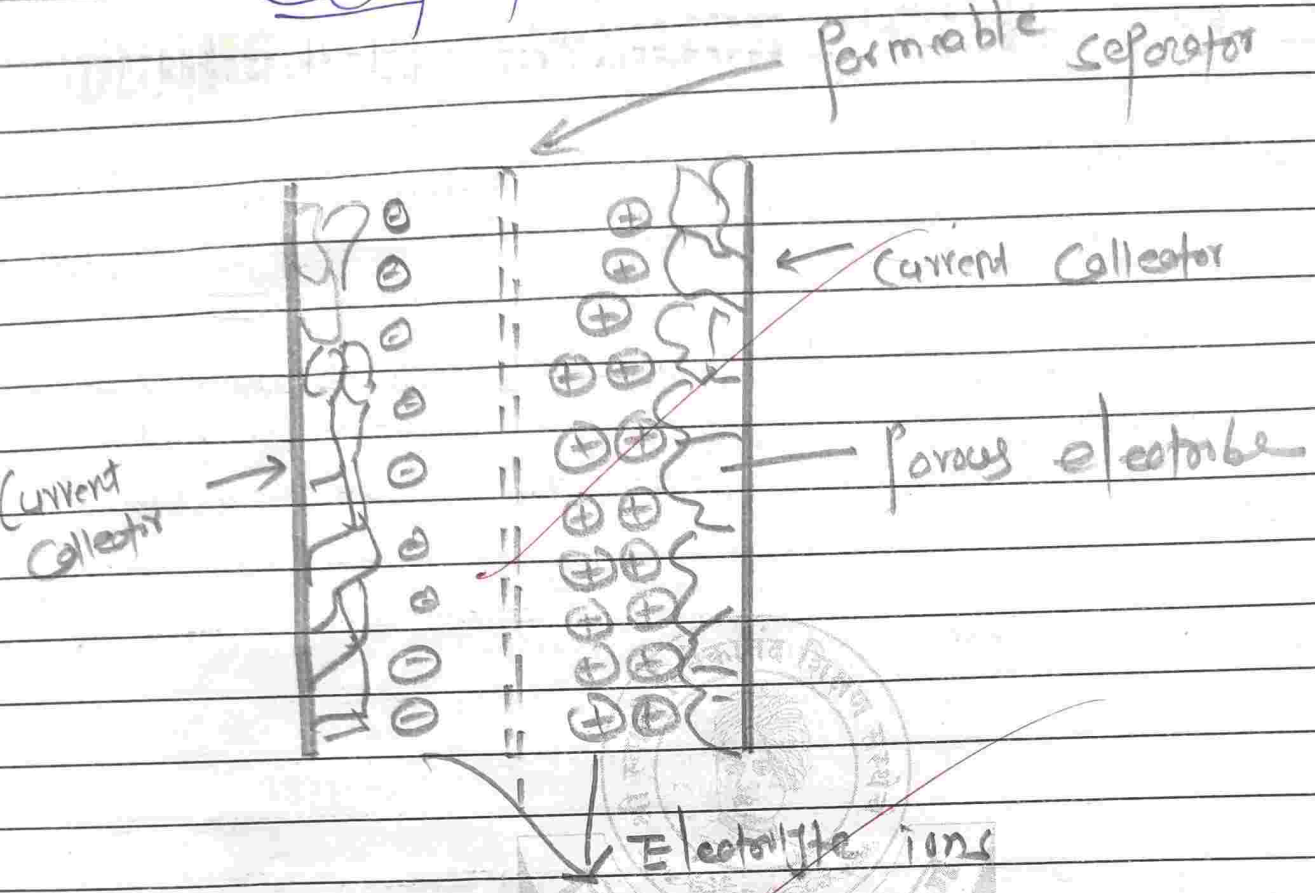
Test / ~~Tutorial No.~~ : Internal Exam- M.Sc-II

Div. : –

Q-1) MCQ's.

Q.No.	Answers.
1)	A capacitor is a device which is used to store charge
2)	Capacity of supercapacitor - ref
3)	Dielectric material : Insulating
4)	Battery electrochemical device
5)	Capacitance due to redox reaction : double layer capacitance

Super Capacitor.



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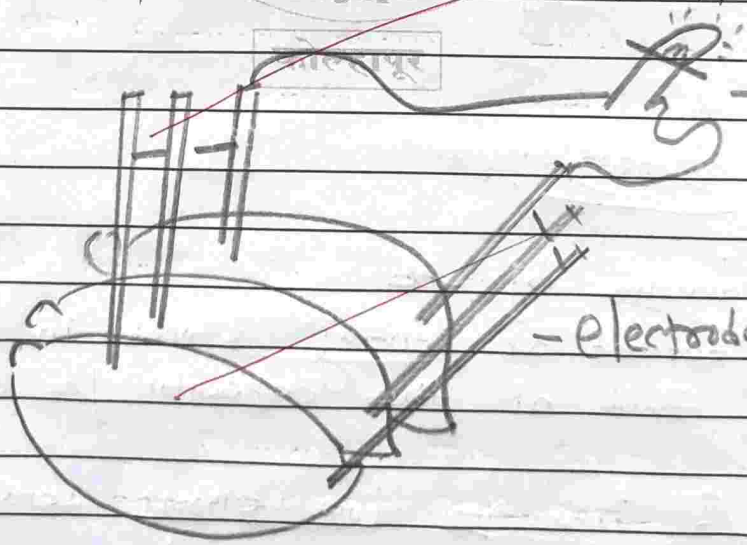
  - Coating is done on metal foil which are serves as Current Collectors.
  - current Collector are immersed in electrolyte.
  - electrolyte can be in solid or liquid form.

- Energy Density:
  - denoted by E
  - defined as energy stored in the electric field of the capacitor per unit volume
  - It has very low energy density & high Power density
  - $E = \frac{1}{2} C V^2$
  - Proportional to both capacitance & Voltage

$$W = \frac{1}{2} C V^2$$

Q.5) 2) Lemon Battery.

- It is a type of simple battery often made up the purpose of education
- Typically, a piece of zinc metal & piece of copper are inserted into the lemon & connected by wires.
- Power generated by reaction of the metals is used to power a small device such as light emitting diode
- Invented by Alessandro Volta.
- Illustrate the chemical ~~reaction~~ in electrolyte



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