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-Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College (Autonomous), Kolhapur

Department of Physics

Notice (M.Sc.II) **Date : 13/05/2022**

All the students of M.Sc. II Physics are hereby informed that, their internal examination will be held from **25/05/2022 to 28/05/2022.** The time table is given below.

Sr. No.	Course Code	Name of the Course	Date	Time	Marks
1	CP-1118D	Experimental Techniques	25/05/2022	11am to 12.00 noon	20
2	CBP-1119D	Electronic devices and applications	26/05/2022	11am to 12.00 noon	20
3	CP-1120D	SSP-III: Physical properties of solids	27/05/2022	11am to 12.00 noon	20
4	CP-1121D	SSP-IV: Energy Conversion and Storage devices	28/05/2022	11am to 12.00 noon	20

Shri. C. J. Kamble
Coordinator

Dr.M. M. Karanjkar
Head of the
Department of Physics
Vivekanand College, Kolhapur

Dr. G. J. Navathe
Controller of
Examination
Vivekanand Autonomous
College, Kolhapur.

Dr.R .R. Kumbhar
PRINCIPAL
Vivekanand College
Kolhapur

VIVEKANAND COLLEGE ESTD JUNE 1964 KOLHAPUR - 416003

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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 (2021-22)

Experimental techniques

Time - 11:00 am - 12:00 pm Total Marks: 20

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

Q.1Choose the correct alternative and rewrite. **(05)**

1. In ultrahigh vacuum, the chief constituent of gas is _____ .
   a) N_2 b) O_2 c) C d) H_2
2. The rotary pumpswork on the principle of _____.
   a)drag by viscosity effect b) drag by diffusion effect
   c) Compression and expansion of gas d) Ionization effects
3. The vapor pumps work on the principle of _____.
   a) drag by viscosity effect b) drag by diffusion effect
   c) Compression and expansion of gas d) Ionization effects
4. In gases, the magnitude of ionization current depends on _____ of the gas.
   a) Pressure b) volume c) temperature d) kinetic energy
5. In _____ gauge, the resistance of wire with temperature and pressure is measured by Wheat stone bridge consequently.
   a) Pirani b)McLeod c) Penning d) all of these

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

i) Write the criteria for selection of pump. Hence discussion the construction and working of rotary pump.

ii)Discuss the construction and action of vapor pump with reference to three stage oil diffusion pump.

iii) Discuss the basic construction and advantages of ion pumps. Hence elaborate construction, action characteristics of cold cathode getter ion pump in detail.

Q.3 Attempt any one. **(05)**

i)Discuss construction and working of penning gauge.

ii)Write note on thermal conductivity gauges with reference to Pirani gauge.

iii) Write note on Leak detection.

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Vivekanand College (Autonomous), Kolhapur

Department of Physics

Date: 25/05/2022

M.Sc. II

2021-22

Attendance Sheet

Internal Exam-2021-22: Sem-IV

Paper: Experimental Techniques

Roll. No.	Name of Candidate	Sign	Marks
1	Komal Jotiram Bhosale		14
2	Priyarani Ravindra Burud		08
3	Pratiskha Pandit Chogale		09
4	Sunil Ratnakar Chougae		08
5	Rishikesh Tukaram Devtale		12
6	Pranav Shankar Ghosalkar		11
7	Gouri Govind Jadhav		15
8	Manasi Khanderao Jagadale		14
9	Prasad Vilas Kamble		13
10	Snehal Narayan Mane		10
11	Priyanka Sanjay Patil		08
12	Shweta Shital .Patil		16
13	Sujata Anandrao Patil		15
14	Bhagyashri Mahadev Pednekar		16
15	Prajyot Sunilkumar Pradnyasagar		12
16	Manisha Shivram Sawant		09
17	Sadiya Mustafa Shaikh		14
18	Rutuja Subhash Shetti		10
19	Swapnil Sakharam Shinde		14
20	Neha Sunil Thorat		11
21	Yogita Vishnu Zirange		12
22	Girish Suresh Adake		09

Teacher Incharge ....

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Signature of Supervisor

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

Class M.Sc II Div (Physics) 16/20 Roll No. 1628

Suppliment No. Subject (Physics)

Test / Tutorial No.

Q.1

1) When x-ray interact with matter, scattering without loss of energy is called as Rayleigh scattering

2) c) to eliminate background profile

3) b) More

4) a) one

5) b) Secondary Target

Q.2 1. There are ~~four~~ types of detector were used in EDXRF and WDXRF

~~1) XRT detector~~

EDXRF :- Energy dispersive x-Ray fluroscence can be detected by 2D optics detector and also by 3D optics detector. detector detects energy of outcoming photon.

WDXRF :- In WDXRF wavelength is detected by detector. That is wavelength dispersive x-Ray fluroscence. Here 3D optics detectors are used.

4)

5)

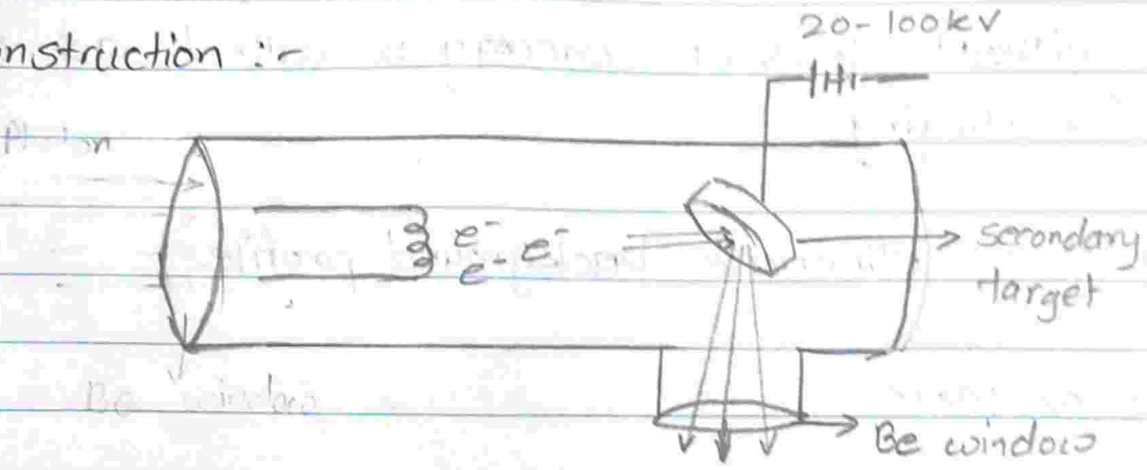
6)

There are ~~four~~ types of detectors

1) XRT ~~detector~~
2) Solid state detector
3) Gas filled detector
4) scintillation detector.

1) XRT ~~detector :-~~

construction :-



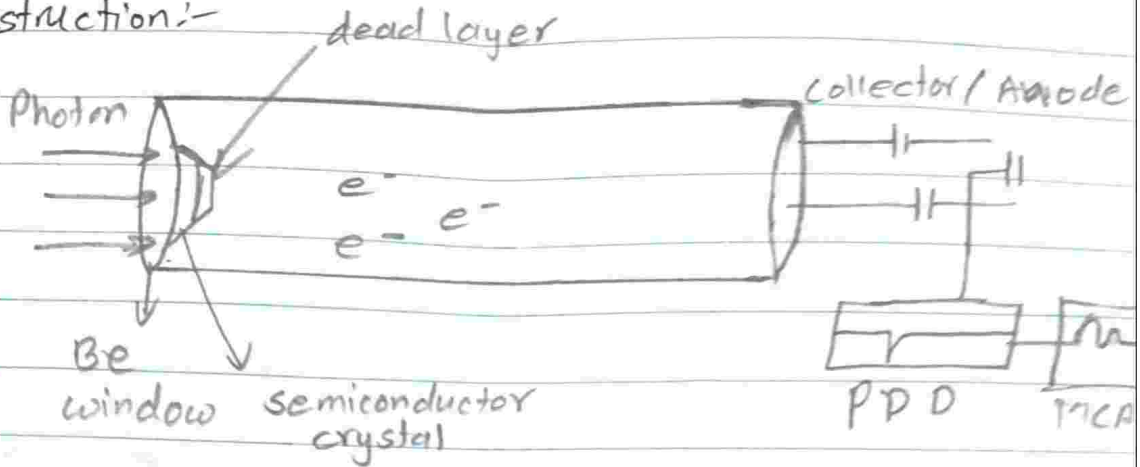
Tungsten filament is placed and secondary target is placed in glass evacuated chameber. and filament is work as cathod and secondary target is work as anode. Berilium windoco is on side to absorb the lower energy radiations.

working principle:-

When filament is heated at very high temperature electrons emitt electrons and due to the high +ve potential at anode electrons are attracted towards it and charcteristic radiation passes through the Berilium windoco.

2) Solid state detector :-

construction :-



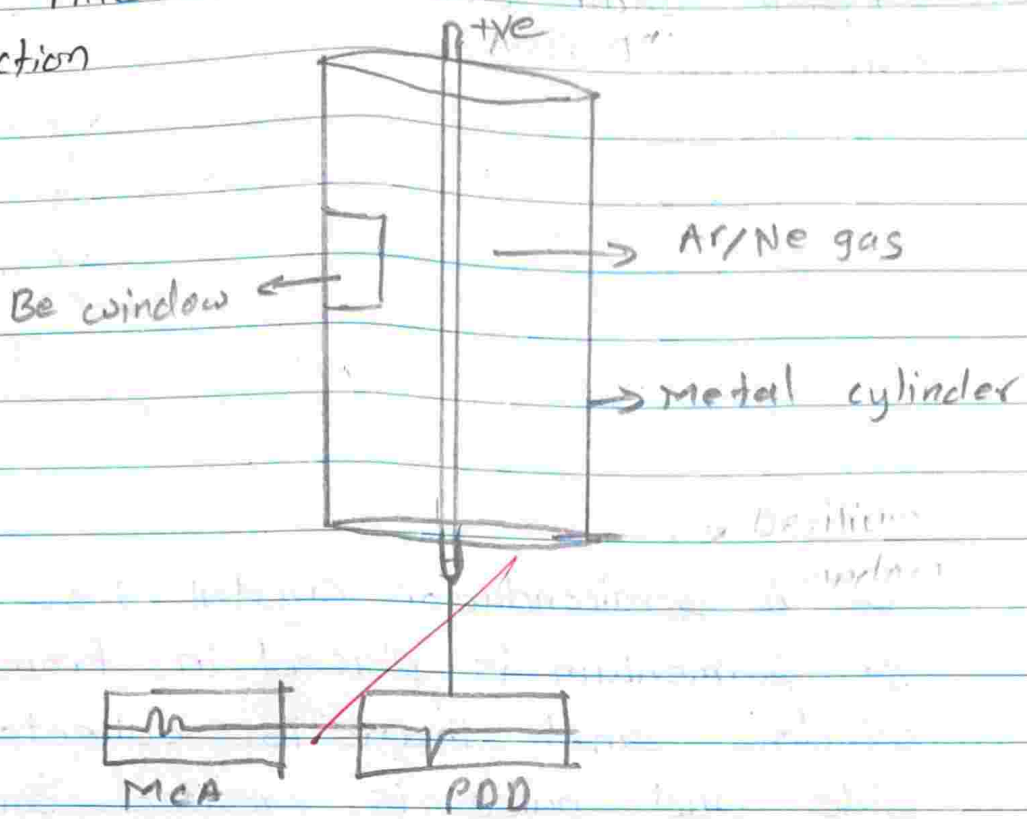
A semiconductor crystal i.e. Silicon or or Germenium is placed in front of Berilium window and there is collector on back side and pulse is created and analyzied by Muti channel analyzer.

working :-

when photon incident on Berilium window it will absorb lower energy radiction and it hit passes characterstic radiations. characterstic radiations hits on semiconductor crystal it will produce electron hole pairs and and due to higher potential (positive) and collector electrons attracted towards collector plate and collector's potential drops and pulse is created and MCA is connected to pulse depth analyzer it analyzes the pulse. pulse depth is directly proportional to the electrons generated and no. of electrons generated is directly proportional to the energies of incoming photons.

3) Gas filled detector :-

Construction



~~working :-~~ Berilium window to absorb lower energy radiation and cylinder is filled with Ar/Ne gas and tungstun wire is Anode.

working :-

when characterstic radiation passes through Be window it will gives energy to electrons and emitted electrons from Ar/Ne gas will attracted towards the tungsten filament due to positive potential. Due to the electron cloud is on tungstun wire potential drops and pulse is created and it will anglyzed by MCA. pulse depth is directly proportional to electrons generated and no. of electrons generated is directly proportional to the energic of incident photon.

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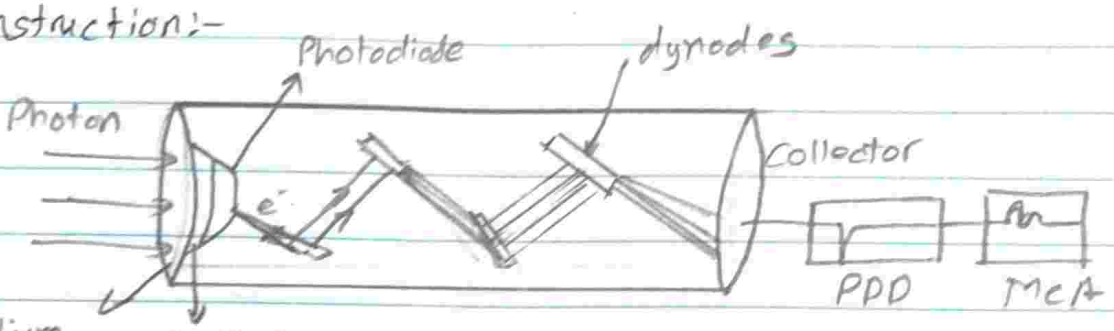
Class _____ Div _____ Roll No. _____

Suppliment No. _____ Subject _____

Test / Tutorial No. _____

b) scintillation detector :-

construction :-



scintillation crystal in front side on Berilium window and is connected to photodiode through photomultiplier and electrons are emitted and dynodes to multiply electrons no.

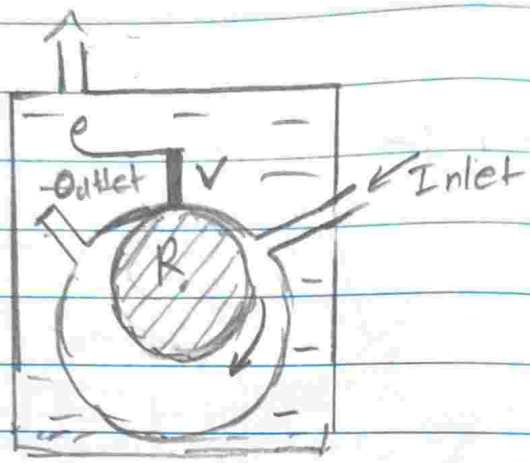
working :-

when photon is incident on Be window it will absorb lower energies radiations and characteristic x-ray radiations are passes through it. It will incident on scintillation crystal ~~and electron is ejected a very few electrons are ejected so photomultiplier~~ there is flash light that will detected by photomultiplier and electron is ejected from photodiode and very few electrons are ejected so through dynodes they are get multiplied and falls on ~~cathod~~ collector

and pulse is created. pulse idepth is directly proportional to electrons generated and no. of electrons generated is directly proportional to energies of incident photon

Q.3

1.



Rotary pump

construction:-

A hollow cylinder is placed in oil evacuated chamber. hollow cylinder is called stator. and

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VIVEKANAND COLLEGE (Autonomous), KOLHAPUR

Class M.Sc. - II Div 16/20 Roll No. 1637

Suppliment No. Subject Physics.

Test / Tutorial No. Internal Exam.

Q.1.

1) When X-ray interact with matter, scattering without loss of energy is called as Rayleigh Scattering.

2) Polarization is used to eliminate background Profile in X-ray fluorescence Spectroscopy.

3) Compton scattering in lighter element is More than Rayleigh's scattering.

4) In 2D optics the path of XRF is confined to One plane.

5) 3D optics in XRS uses Secondary Target as a Source.

Q.2.

1)

- X-ray fluorescence spectroscopy is mainly divided into two types.
  1) Energy Dispersion X-Ray fluorescence (EDXRF) spectrometer

2.) Wavelength Dispersion X-Ray Fluorescence Spectroscopy. (WDXRF)

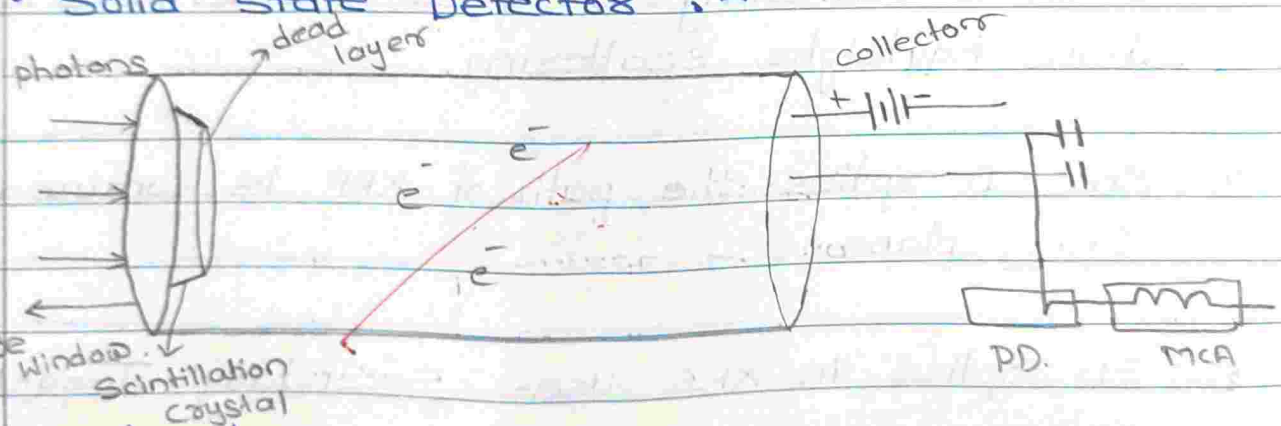
- EDXRF :

EDXRF is used to detect the energy characteristic of elements. EDXRF used in 2D as well as 3D optics. The elements used in EDXRF is Beryllium to Uranium. ~~EDXRF~~ the Solid state detector is used in EDXRF.

- WDXRF :

WDXRF is used to detect wavelength characteristics of elements. WDXRF used only in 2D optics. Gas filled detector & Scintillation detectors are used in WDXRF.

- Solid State Detector :-



Construction :-

- Solid state detector consists of metallic cylinder with very high energy.
- The metallic cylinder is enclose with evacuated glass chamber.
- Solid state detector consists of ~~Semi~~ Be Window.
- Be Window infront connected with the Scintillation detector.

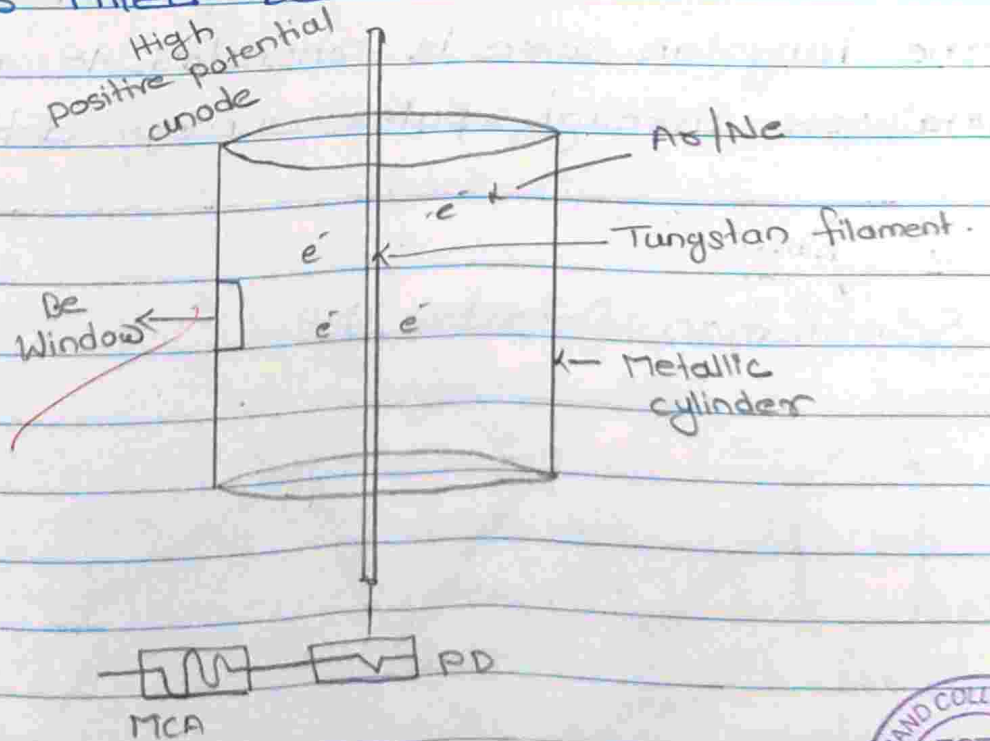
- Be window is connected front side & high positive potential collector plate is connected to Backside.
- the high positive potential plate is connected to multichannel analyser through pulse detector.

Working :-

- When photon of XRF is enter into the Be window. the Be window is used to collect low energy radiations.
- with Be Window XRF is enter into scintillation detector.
- ~~There are two types of XRF 1) One side window~~
- The high energy positive potential is enters into the collector plate which is detected into pulse ~~analyser~~ detector & multichannel analyser.

---

2) Gas filled Detector :-



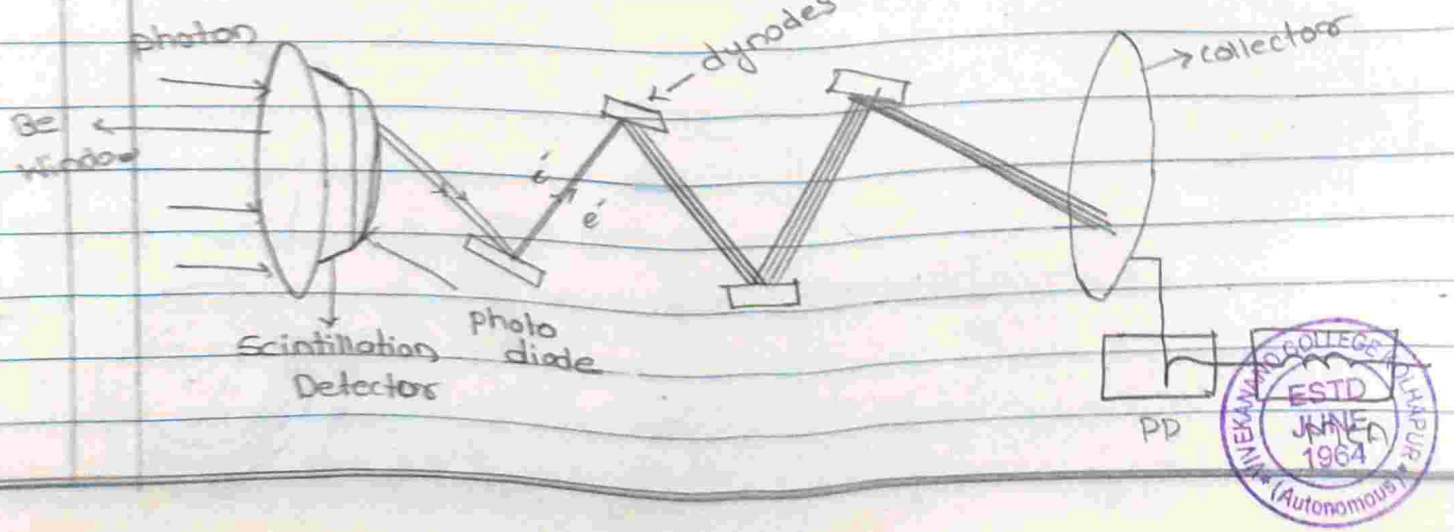
Construction :-

- Gas filled detector consists of a metallic cylinder ~~wit~~ eneclosed with the inert gas like Ar / Ne.
- A high positive potential anode metallic filament is used to detect the pulse.
- Be window is used in a metallic cylinder. Be Window allow to pass low energy radiations.
- the metallic cylinder is eneclosed with evacualated gas chamber.

Working :-

- Metallic cylinder is enclosed with evacualeted gas like Ar / Ne.
- the Be Window is allow to pass low energy radiations & gives characteristics radiations.
- the high positive potential anode is used in metallic wire.
- the tungstan wire collects the high positive potential in the from the pulse.
- the tungstan wire is connected to multichannel analyser through pulse energy detector.

3) Scintillation Detector :-



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Class M.Sc. II Div Roll No. 1637

Suppliment No. 1 Subject Physics.

Test / Tutorial No. Internal Exam.

Construction :-

- Scintillation detector is the detector whic Consists of Be Window infront connected in scintillation Crystal.
- Which is again connected to photodiode through photomultiplier tube (Which is not shown in fig).
- the photons of XRF intexs through Be Window.
- the high positive potential plate anodes called as dynodes axe connected Series to collect & multiply electrons.
- The collector plate is connected & through the collector plate pulse detector & MCA is connected

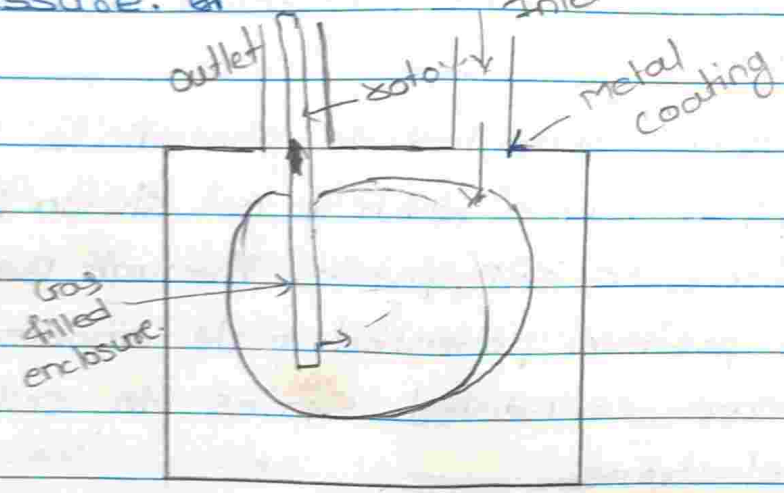
Working :-

- When photon of XRF light enters into the Be Window. the Be Window allow to low energy radiation.
- the ~~Be~~ Scintillation Crystal is connected back to Be Window. the entering light is amplified by photomultiplier tube.
- the positive potential anodes called as dynodes axe connected to collect & multiply electrons.
- the amplified ~~the~~ electrons in the form of energy is detected in pulse detector & multichannel analyser.

Q.3.

1) Rotary Pump :-

- The vaccum techinques consists of various types of pumps like rotary pump, vacuum pump etc.
- these types of pumps is used in physical methods.
- The Rotary pump is used to measure the pressure.



- The rotor is used to rotate & purify the gas.

Name- Sujata Anandrao Patil.

"ज्ञान, विज्ञान आणि सुसंस्कार यांसाठी शिक्षण प्रसार"
- शिक्षणमहर्षी डॉ. बापूजी साळुंखे

Signature of Supervisor

Shri Swami Vivekanand Shikshan Sanstha's

VIVEKANAND COLLEGE (Autonomous), KOLHAPUR

15/20

Class M.Sc -II Physics Div – Roll No. 1624

Suppliment No. 1 Subject Physics.

Test / Tutorial No. 1)

Q.1) 1) When X-ray interact with matter, scattering loss of energy is called as..... frequency.

→ Rayleigh

2) Polarization is used to ..... in X-ray fluorescence Spectroscopy.

→ To eliminate background profile.

3) compton scattering in lighter elements is..... than Rayleigh's settings.

→ More

4) In 2D optics the path of XRF is confined to ..... plane.

→ one

5) 3D optics in XRF uses as ..... source.

→ Secondary target.

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Q.2 1)

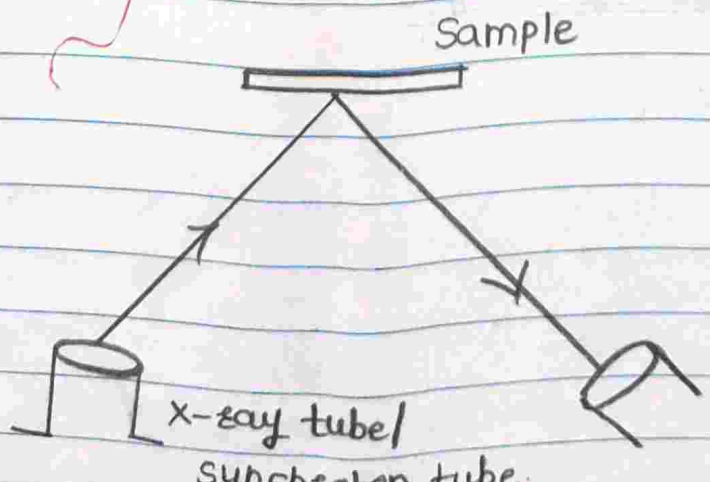
Polarization :-

Polarization is phenomenon of to remove / to ellumunate background noise in the x-ray fluresence spectroscopy. In XRF vertical & horizontal components of the vector is recorded. If the vertical components of the vector is passed through a sample, at 90° then it vanishes & horizontal components of the vector is passed out. If the horizontal components of the vector is further passed through a sample, at 90° then horizontal components is also cut off.

If Vertical component is only along one plane, then is called as 'polarised electromagnetic radiation.'

Due to removal of background noise, light elements also detected through sample.

- Block diagram of XRF :-



Generally, x-ray tube is used in x-ray fluorescene spectroscopy. But for very few applications synchroton is used as source of x-ray fluorescene spectroscopy. There are two types of XRT, Depending on the position of Berilium tube is used.

There are two types of XRF-

1) ED XRF (Energy dispersive x-ray fluore-scene spectroscopy.)

ED XRF Detector detects energies of x-ray radiations. It is used in 2D as well as 3D type of spectroscopy. The range of ED XRF is Na-U.

2) WD XRF (Wavelength dispersive x-ray fluore scene spectroscopy.)

WD XRF Detector detects Wavelength of x-ray radiations. It is used in only 2D type of spectroscopy. The range of WD XRF is Be-U. WD-XRF are of two types-

a) Sequential WD-XRF:-

Sequential WD-XRF detects the wavelength sequentially that is one after another Therefore, it is called as 'sequential WD-XRF.'

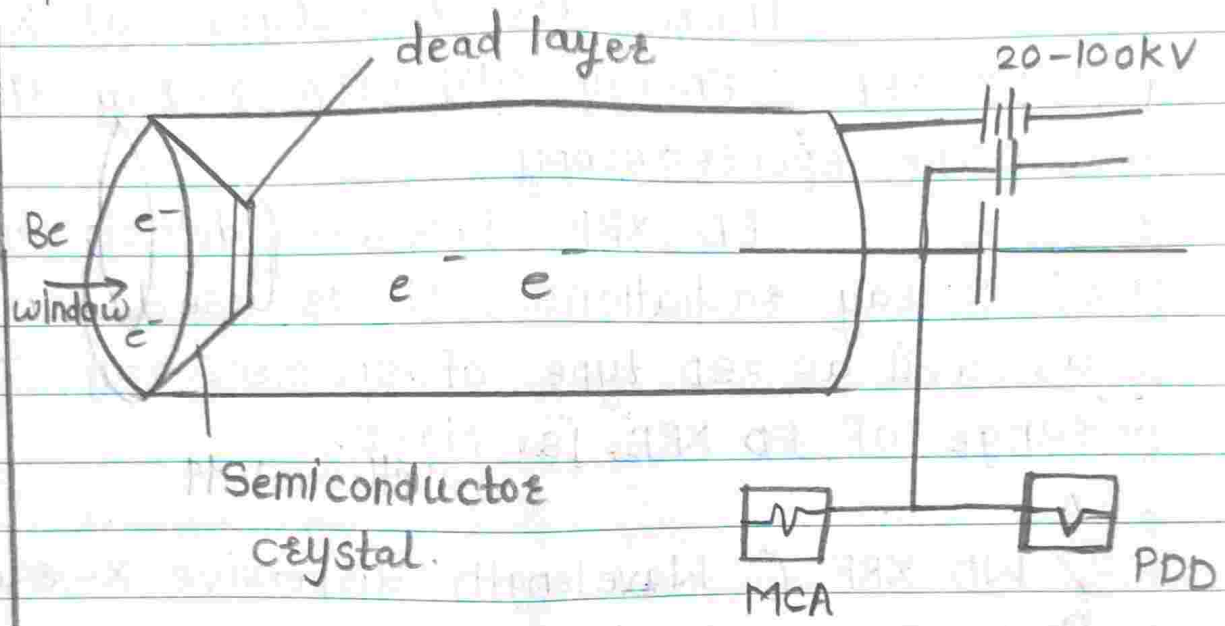
b) Simultaneous WD-XRF:-

Simultaneous WD-XRF detects the wavelength simultaneously. Therefore, it is

called as simultaneous WD -XRF.

ED XRF use as solid state detector, while WD XRF use as Gas state detector & santillation detector.

1) Solid state Detector:-



Solid state detector is consist of Be window, photomultier & multi-channel analyser, & Pulse depth detector.

In solid state detector, incoming XRF is passed through Beerilium window is analysed through semiconductor crystal. If the high positive potential is applied nearly 20-100kV between anode & cathode then electeons are accelerated. After acceleration $e^{\ominus}$ is then potential drop & is recorded in pulse depth detector further it analysed in multichannel channel analyser.

Depth of the pulse detector is directly proportional to electron generated,

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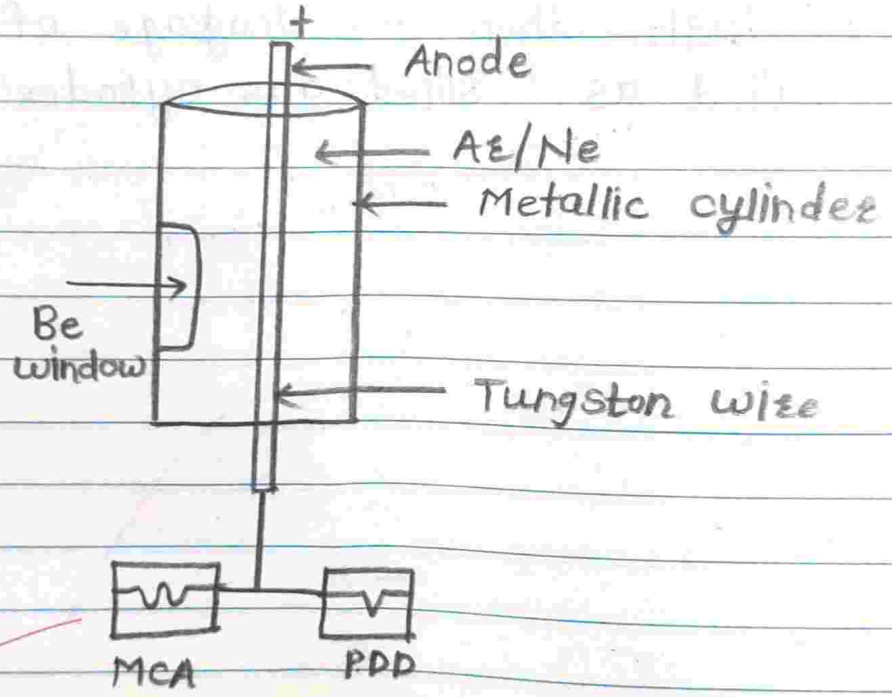
Class _____ Div _____ Roll No. 1624

Suppliment No. _____ Subject _____

Test / Tutorial No. _____

& electron generated is directly proportional to incoming photons.

2) Gas filled Detector:-

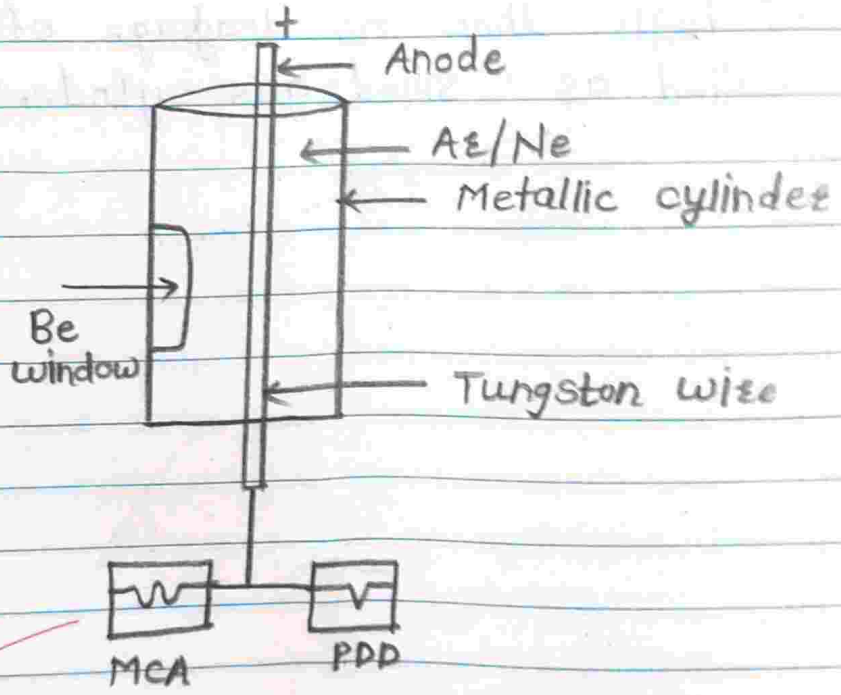


Gas filled detector consist of Be window with Argon & Neon gaseous are filled.

In gas filled detector incoming photons XRF is passed through Beerilium window is interact with Ar/Ne gaseous e⁻s are generated.. The high positive potential is applied to the tongston filament.

& electron generated is directly proportional to incoming photons.

e) Gas filled Detector:-



Gas filled detector consist of Be window with Argon & Neon gaseous are filled.

In gas filled detector incoming photons XRF is passed through Beerilium window is interact with Ar/ Ne gaseous e⊖s are generated.. The high positive potential is applied to the tongston filament.

Due to Generated electron potential drops & is recorded in pulse detector. MU To analyse the photon multichannel analyser is used.

If the thickness of Be-window is very low, then there may be leakage of Ar/Ne gas. ~~Due~~ To avoid these cylinder is filled with Ar/Ne gas is called as 'open gas cylinder'.

If the thickness of Be-window is high, then no leakage of gas & is called as 'silled gas cylinder'.

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Vivekanand College, Kolhapur (Autonomous)

Department of Physics

M.Sc. Part-II SEM IV Internal Examination (2021-22)

Electronic devices

Time - 11:00 am - 12:00 pm Total Marks: 20

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. Choose correct alternative **(5)**

i) In case of n-p-n transistor, base transport factor (α_T) is .....

a) measure of the injected hole current compared with the total emitter current
b) ratio of the hole current reaching the collector to the hole current injected from the emitter
c) leakage current between the collector and the base with the emitter base junction open
d) common base current gain

ii) The collector current for the common-base configuration in p-n-p transistor is given by

a) $Ic = \alpha_0 I_E + I_{CBO}$ b) $Ic = \alpha_0 I_B + I_{CEO}$ c) $Ic = \gamma + I_{CEO}$ d) $Ic = \alpha_0 I_B + \gamma$

iii) To derive the current-voltage expression for an ideal transistor, which of the following condition is wrong ?

a) The device has uniform doping in each region
b) The hole drift current in the base region as well as the collector saturation current is negligible
c) There is high-level injection
d) There are no series resistances in the device

iv) In p-n-p transistor , to improve the frequency response, the transit time of minority carriers across the base must be....., therefore, high-frequency transistors are designed with a ..... base width.

a) Short, short b) High, high c)Short, high d)High, short

v) MESFET stands for .....

a) metal-semiconductor field-effect transistor
b) metal electron semiconductor field-effect transistor
c) metal elemental semiconductor field-effect transistor
d) metal based electrical semiconductor field-effect transistor

Q2.Attempt any one **(5)**

i) Explain modes of operation of BJT depending of polarities of EB and CB junction
ii) Write a note on frequency response of BJT and hence obtain equation for transit time of minorities carriers

Q3.Attempt any one **(10)**

i) Write a note on construction and working of BJT. Hence obtain the relation of collector current for n-p-n transistor
ii) Elucidate MESFET device structure and its application

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Vivekanand College (Autonomous), Kolhapur

Department of Physics

M.Sc. II

Date: 24/05/2022

2021-22

Attendance Sheet

Internal Exam-2021-22: Sem-IV

Paper: Semiconductor Devices and Applications

Roll. No.	Name of Candidate	Sign	Marks
1	Komal Jotiram Bhosale		12
2	Priyarani Ravindra Burud		10
3	Pratiskha Pandit Chogale		09
4	Sunil Ratnakar Chougae		08
5	Rishikesh Tukaram Devtale		13
6	Pranav Shankar Ghosalkar		12
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22	Girish Suresh Adake		08

Teacher Incharge .....

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Name: Sujata Anandrao Patil

26850

Signature of Jr. Super.

विवेकानंद कॉलेज, कोल्हापूर (स्वायत्त)

परीक्षेच्या या विषयाच्या प्रयोग परीक्षा

Practical Examination in, M.Sc-II Internal Exam.

at the Physics (Electronic Devices & Applications) Examination

उमेदवाराचा आसन क्रमांक (Candidate's Seat No.) 1624 विभाग (Section)

18/20

उमेदवारांना सूचना

१. प्रश्न काळजीपूर्वक वाचा आणि त्याप्रमाणे विचारलेला प्रयोग करा.
२. उपकरणांच्या वापराबाबत तुम्हांला काही माहीत नसेल तर परीक्षक किंवा प्रयोगशाळा सहाय्यक यांना तुम्हाला मदत करण्याविषयी विनंती करा.
३. कोणताही विद्युतप्रयोग करण्यापूर्वी, प्रत्यक्ष पुरविलेली सर्व उपकरणे आणि सर्व 'कनेक्शन' नीट पाहून घेऊन संबंधित कामाची नीटनेटकी कार्ययोजना करण्याची नितांत आवश्यकता आहे आणि ह्या नंतर पुढे काम चालू करण्याविषयी परीक्षकांची परवानगी मिळविणे आवश्यक आहे.
४. सर्व निरीक्षणे कोटकवजा तक्त्यात भरावी. मधल्या सर्व गणना आणि निर्णय हे शक्य तितक्या सुवाच्यपणे आणि स्पष्टपणे नोंदविलेले असणे हे हितावह आहे.
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(येथून लेखनास सुरवात करा.) (Begin writing here.)

प्र. क्र. Q. No.

Answer

Q-1) i) d)

ii) b) 05

iii) a)

iv) c)

v) a)

VIVEKANAND COLLEGE KOLHAPUR ESTD JUNE 1964 (Autonomous)

Section | Q. No. | Marks | 02

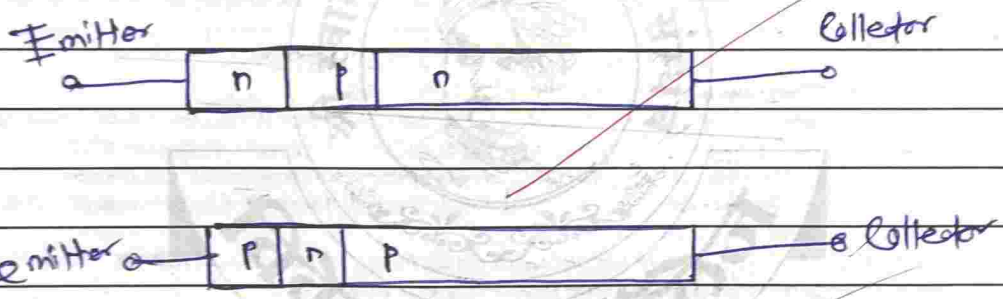
प्र. क्र.
Q. No.

Q.2

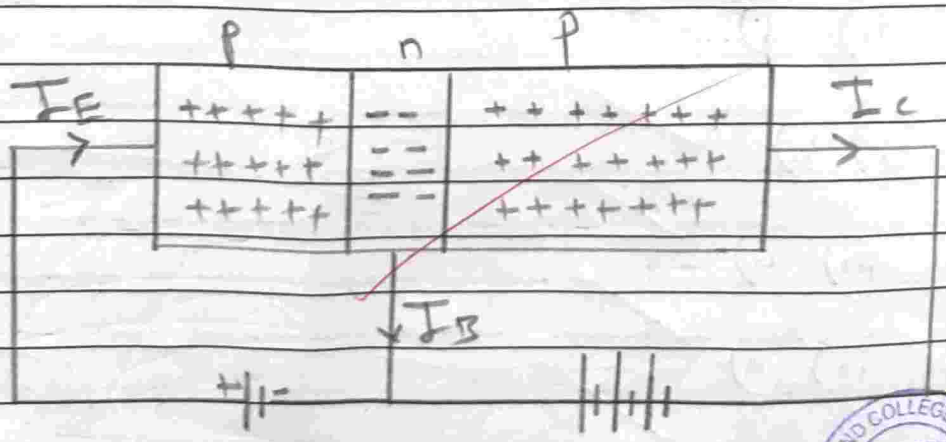
Bipolar Junction Transistor

- It is basically a three terminal device whose output current, voltage & power are controlled by its input current.

- It consists of two P-N junction
- junction formed by sandwitching P-type & N-type Semiconductor layer.



Operation of PNP transistor



Section	Q. No.													03
	Marks													

प्र. क्र.
Q. No.

- Current passes due to moment of holes
- In this case EB junction is forward biased & Collector bed is reversed biased.
- holes in the base region combines electron & constitute base current
- Similarly after reaching to Collector region it also constitute Collector Current
- This is called reverse saturation current.

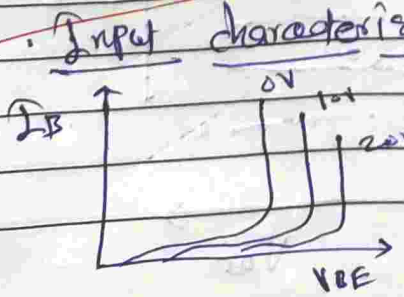
$$I_E = I_B + I_C$$

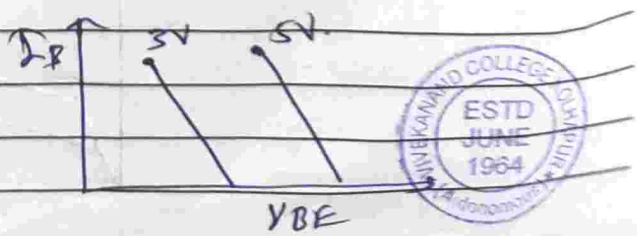
$$\alpha = \frac{I_C}{I_E}$$

$$\therefore \beta = \frac{I_C}{I_B} \quad \& \quad \alpha = \frac{\beta}{\beta+1}$$

- Types of Configuration
  a) Common Base
  b) Common Collector
  c) Common Emitter

- Input characteristics :





Section | Q. No. | Marks

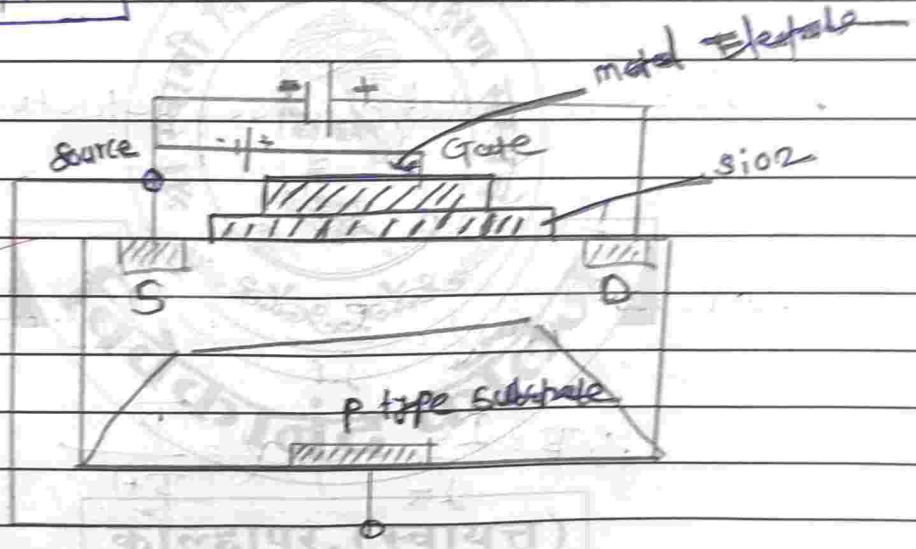
प्र. क्र.
Q. No.

MOSFET

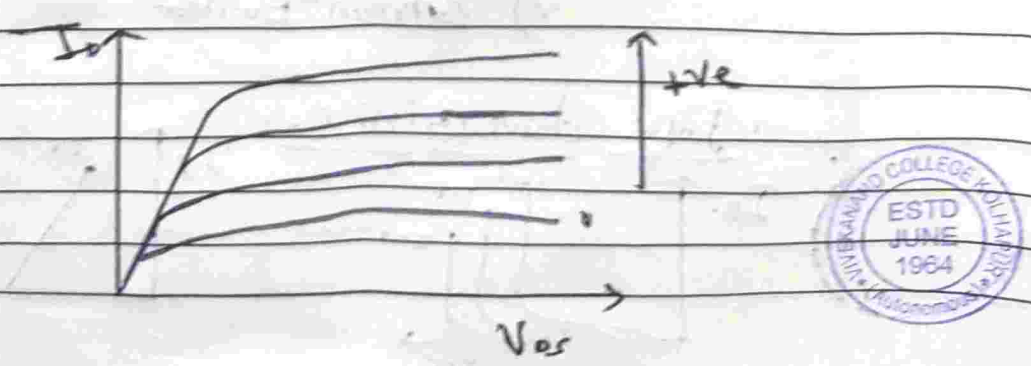
It is called as Metal oxide Semiconductor Field effect Transistor.

- It acts as voltage Controlled register
- It has metal oxide gate.

Structure:



- It consists of combination of metal electrode & sio2 material.
- Working of FET is based on two types such as Enhancement & depletion type
- This modes are reverse to each other.



· Name- Shweta shital Patil

26851

Signature of Jr. Super.

विवेकानंद कॉलेज, कोल्हापूर (स्वायत्त)

परीक्षेच्या _____ या विषयाच्या प्रयोग परीक्षा

Practical Examination in, M.Sc-II internal exam

at the Physics (Semiconductor / Electronic Devices & Applications) Examination

उमेदवाराचा आसन क्रमांक (Candidate's Seat No.) ·1637· विभाग (Section)

17/20

उमेदवारांना सूचना

१. प्रश्न काळजीपूर्वक वाचा आणि त्याप्रमाणे विचारलेला प्रयोग करा.
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(येथून लेखनास सुरवात करा.) (Begin writing here.)

· Question - 1

प्र. क्र. Q. No.

i) Ans - leakage Current between the collector & the base with emitter base junction open X.

ii) The collector current for the common-base configuration P-n-P transistor is given by = $I_C = \gamma + I_{CEO}$

iii) The device has uniform doping in each region

iv) metal Semiconductor field-effect transistor.

v) Short & High

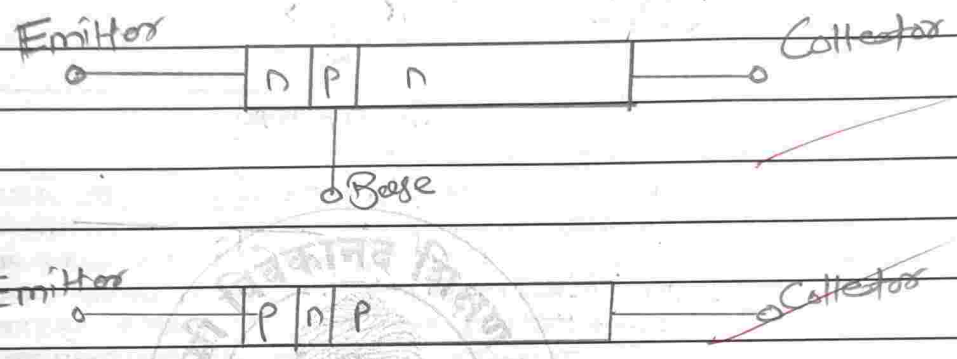
05

ESTD JUNE 1964

प्र. क्र.
Q. No.

Bipolar Field Effect Transistor.

It has three regions known as Emitter, Base & Collector.

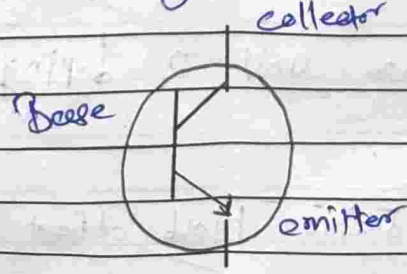


1) Emitter : · Situated on one side of transistor
· heavily doped region

05

2) Base : · middle region · forms P-N junction
· Thin layer

3) Collector : · situated on another side
· Collect charge carrier
· This region is greater than emitter region.
· dopping level is intermediate.

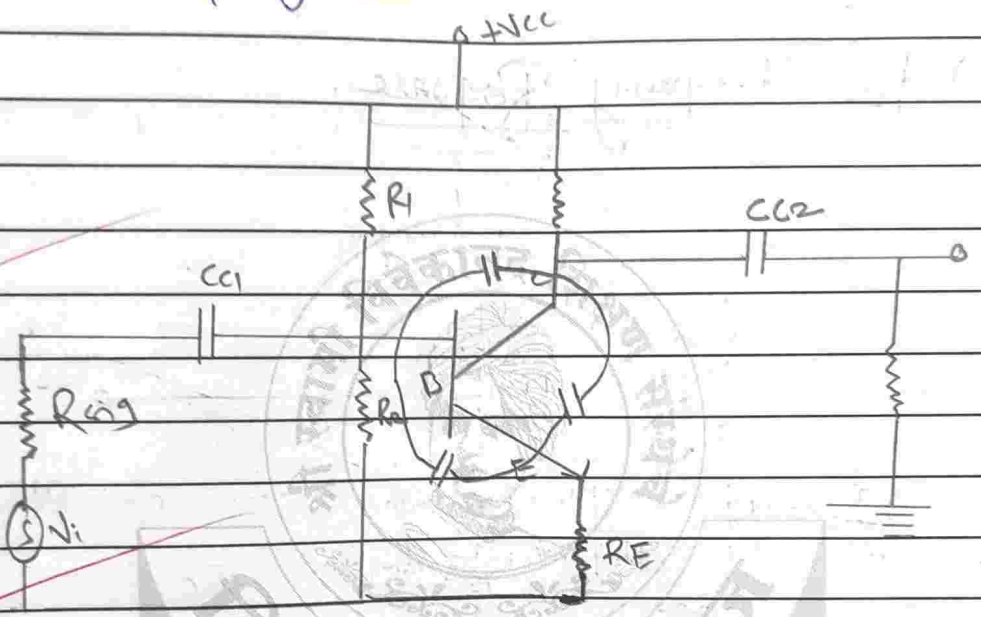


प्र. क्र.
Q. No.

3) Bypass Capacitor

$$I_b = \frac{I_E}{1+\beta}$$

4) High Frequency Response :



$$X_c = \frac{1}{2\pi f_c}$$

$$C_i = C_{be} \quad \& \quad A_V = \frac{V_{in}}{V_{out}}$$

$$f_{Hi} = \frac{1}{2\pi R_i C_i}$$

$$R_i = R_{B1} \| R_{B2} \| R_{sig}.$$

$$f_{Hi} \quad \frac{1}{2\pi (R_{B1} \| R_{B2} \| R_{sig}) . C_{be}}$$

$$f_{Hi} = \frac{1}{2\pi (R_L \| R_L) . C_{be}}$$

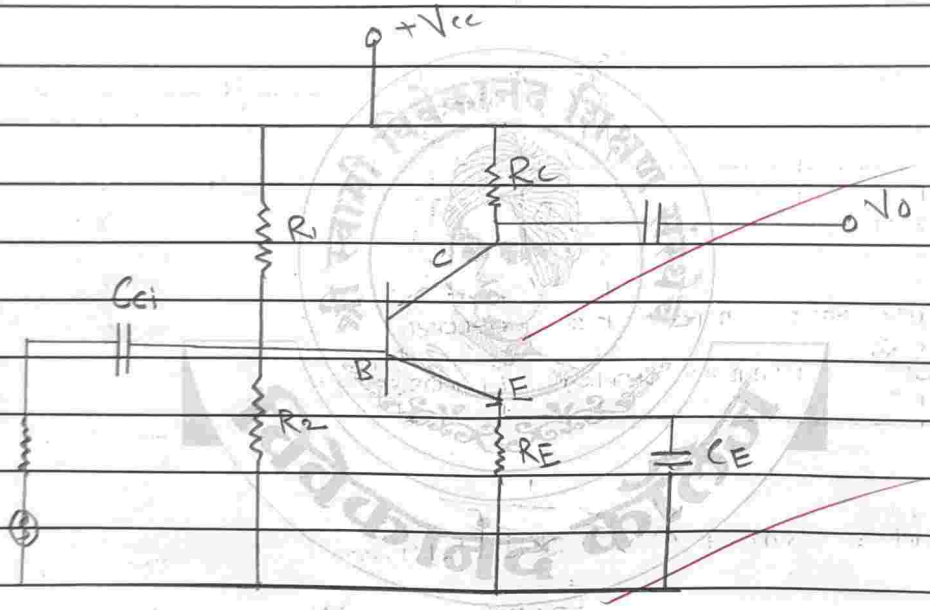
4 Section | Q. No. | Marks

प्र. क्र. Q. No.

Q.2> Frequency Response : BJT

a) High frequency Response
b) Low frequency Response

a) Low Frequency Response :



· Coupling capacitor : C_{c1} C_{c2}

· Bypass capacitor : C_E

08

1) First RC Network

$R_B = R_1 \parallel R_2$

$f_L = \frac{1}{2\pi RC}$

$\therefore R = R_{sig} + (R_B \parallel r_\pi)$

$C = C_{ci}$

2) 2nd RC Network :

$f_{L2} = \frac{1}{2\pi RC}$

$R = R_C + R_L$

Name- Gauri Govind Jadhav.

26852

Signature of Jr. Super.

विवेकानंद कॉलेज, कोल्हापूर (स्वायत्त)

परीक्षेच्या

~~Practical~~ Examination in, M.Sc-II Internal exam या विषयाच्या प्रयोग परीक्षा

at the physic deparment (Semiconductor Device & Application) Examination

उमेदवाराचा आसन क्रमांक (Candidate's Seat No.) 1623

विभाग (Section) 17/27

उमेदवारांना सूचना

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प्र. क्र. Q. No.

Alternatives

i) Comman base current gain

ii) $I_c = \gamma + I_{CEO}$

iii) the device has uniform dopping in the region

iv) short & High

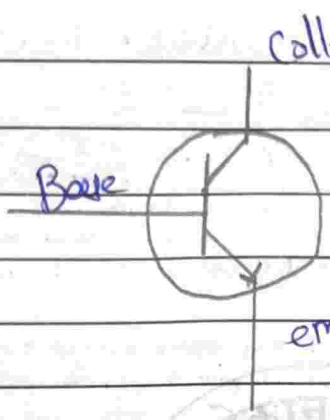
v) Metal Semiconductor FET.

05

प्र. क्र.
Q. No.

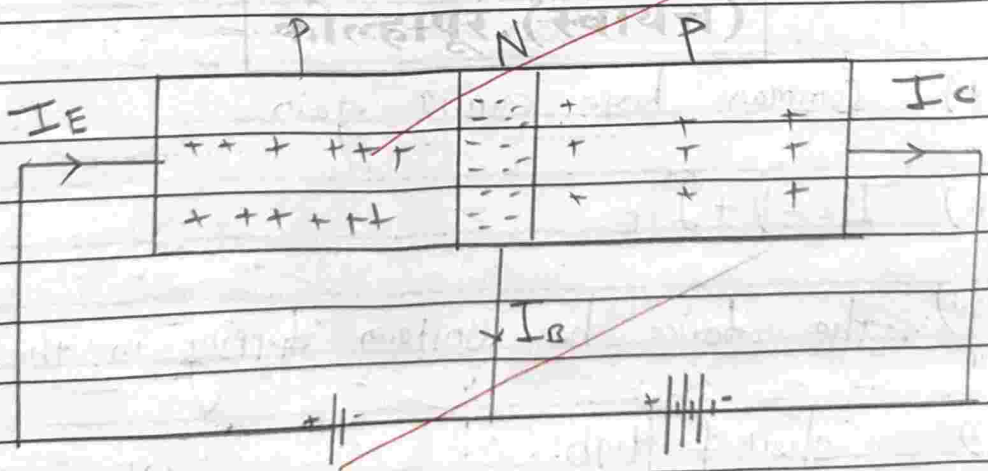
Bipolar junction Transistor :—

· Symbol —



It has three main region
a) Emitter
b) Base
c) Collector

a) Emitter : This region is situated middle part
b) Base : Sandwitched region with PN junction
c) Collector : Collects charge from emitter



Operation -
· Current mainly passes due to holes
· On polarity basis E-B junction forward biased

प्र. क्र.
Q. No.

& Collector - B. junction reverse biased.

· Base region also forms current due to Combination H & E & forms base current.

· Collector region also forms current called Collector current. i.e. reverse saturation current

$$\alpha = \frac{I_C}{I_E} \quad \text{— (i)}$$

&

$$I_E = I_B + I_C \quad \text{— (ii)}$$

$$\text{So } \alpha = \frac{\beta}{\beta+1} \quad \text{— (b)} \quad \& \quad \beta = \frac{I_C}{I_B} \quad \text{— (a)}$$

Types of Configuration.

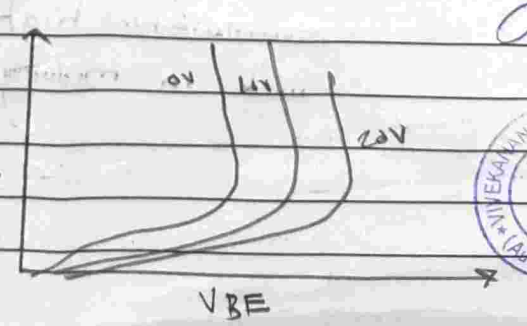
a) Comman base Configuration

b) Comman Collector Configuration

c) Comman Emitter Configuration

· Input characteristics are different according to the BCE Configuration.

(a)



· As VBE ↑ IB ↓

04	Section	Q. No.												
		Marks												

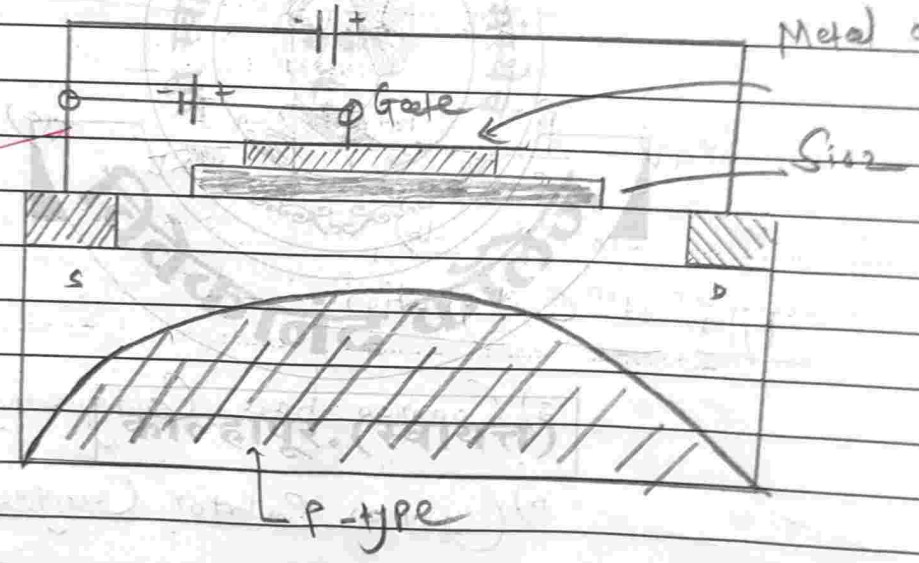
प्र. क्र.
Q. No.

· Metal - Oxide Semiconductor FET ·

· It mainly work as a Voltage Controlled Resistor
· It mainly porseses metal oxide gate sitoated in p region

· on upper side it consist combination metal & semiconductor

04



Operation

· Gate is electrically insulated from P & N channel
· It's input resistance is extremly high.
· accumulates high charge & easily damaged.
· Used in making of logic gates

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

Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

Vivekanand College, Kolhapur (Autonomous)

Department of Physics

M.Sc. Part-II SEM IV Internal Examination (2021-22)

SSP 3 : Physical Properties of Solid

Time - 11:00 am - 12:00 pm Total Marks: 20

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. Choose correct alternative (5)

i) $\frac{k}{\sigma T} = constant$ is called as ..... Law.

a) Weidmann – Franz Law b) Weidmann –Hertz Law

c) Franz Law d) Hertz Law

ii) An electrical conductivity σ is given by .....

a) nez/m b) ne^2z/m c) ne^2z/m^2 d) None of above

iii) Botzmann equation is .....

a) $(\frac{\partial F}{\partial t})_{collision} = 0$ b) $(\frac{\partial F}{\partial t})_{collision} = 1$ c) $(\frac{\partial F}{\partial t})_{collision} = b - a$ d) $(\frac{\partial F}{\partial t})_{collision} = \infty$

iv) Sommerfeld Model consider potential inside a box to be equal to .....

a) 0 b) 1 c) ∞ d) None of above

v) The number of electrons crossing the plane A is .....

a) $nP/6$ b) $nV/6$ c) $n/6$ d) None of above

Q2.Attempt any one (5)

i) Derive expression for drift velocity
ii) Write note on thermal conductivity of metals

Q3.Attempt any one (10)

i) Explain Sommerfeld theory of electrical conductivity.
ii) Derive Boltzmann transport relation.

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

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College (Autonomous), Kolhapur

Department of Physics

M.Sc. II

Date: 23/05/2022

2021-22

Attendance Sheet

Internal Exam-2021-22: Sem-IV

Paper: SSP-3

Roll. No.	Name of Candidate	Sign	Marks
1	Komal Jotiram Bhosale		10
2	Priyarani Ravindra Burud		11
3	Pratiskha Pandit Chogale	C.P.P.	12
4	Sunil Ratnakar Chougae	C.R.S.	09
5	Rishikesh Tukaram Devtale		13
6	Pranav Shankar Ghosalkar		12
7	Gouri Govind Jadhav		17
8	Manasi Khanderao Jagadale	P.V.U.	14
9	Prasad Vilas Kamble		11
10	Snehal Narayan Mane		10
11	Priyanka Sanjay Patil	S.A. Patil	09
12	Shweta Shital .Patil		16
13	Sujata Anandrao Patil		18
14	Bhagyashri Mahadev Pednekar		14
15	Prajyot Sunilkumar Pradnyasagar		12
16	Manisha Shivram Sawant		11
17	Sadiya Mustafa Shaikh		15
18	Rutuja Subhash Shetti		16
19	Swapnil Sakharam Shinde		11
20	Neha Sunil Thorat		10
21	Yogita Vishnu Zirange		13
22	Girish Suresh Adake		09

Teacher Incharge .....

VIVEKANAND COLLEGE KOLHAPUR (Autonomous) ESTD JUNE 1964

Date: 23-05-2022

26858

Name: Gauri Govinda Jadhav

Signature of Jr. Super.

विवेकानंद कॉलेज, कोल्हापूर (स्वायत्त)

परीक्षेच्या या विषयाच्या प्रयोग परीक्षा

Practical Examination in, Internal exam. M.Sc-II 2021-22

at the Examination

उमेदवाराचा आसन क्रमांक (Candidate's Seat No.) 1623

विभाग (Section)

17/20

उमेदवारांना सूचना

१. प्रश्न काळजीपूर्वक वाचा आणि त्याप्रमाणे विचारलेला प्रयोग करा.
२. उपकरणांच्या वापराबाबत तुम्हांला काही माहीत नसेल तर परीक्षक किंवा प्रयोगशाळा सहाय्यक यांना तुम्हाला मदत करण्याविषयी विनंती करा.
३. कोणताही विद्युतप्रयोग करण्यापूर्वी, प्रत्यक्ष पुरविलेली सर्व उपकरणे आणि सर्व 'कनेक्शन' नीट पाहून घेऊन संबंधित कामाची नीटनेटकी कार्ययोजना करण्याची नितांत आवश्यकता आहे आणि ह्या नंतर पुढे काम चालू करण्याविषयी परीक्षकांची परवानगी मिळविणे आवश्यक आहे.
४. सर्व निरीक्षणे कोटकवजा तक्त्यात भरावी. मधल्या सर्व गणना आणि निर्णय हे शक्य तितक्या सुवाच्यपणे आणि स्पष्टपणे नोंदविलेले असणे हे हितावह आहे.
५. प्रारंभिक किंवा अंतिम निरीक्षणात संख्यावाचक आकडे एकावर एक लिहू नयेत. जर लिहिलेला कोणताही आकडा नको असेल तर त्यावर एक रेघ ओढून पाहिजे असलेला आकडा त्याच्याजवळ लिहा. प्रयोगशाळेतून बाहेर पडण्यापूर्वी आपले टेबल चांगल्या स्थितीत आहे याची खात्री करा.

INSTRUCTIONS TO CANDIDATES

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(येथून लेखनास सुरवात करा.) (Begin writing here.)

प्र. क्र. Q. No.

Q.1) choose Correct Alternatives.

i) Weidmann - Franz Law

ii) None of these 05

iii) $\left(\frac{\partial f}{\partial t}\right)_{collision} = 0$

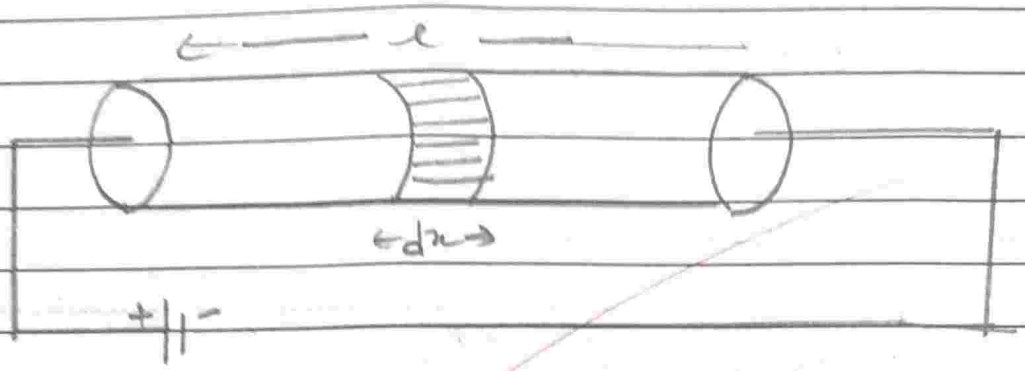
iv) 1

v) $\frac{N}{0}$

Section | Q. No. | Marks | 02

प्र. क्र. Q. No.

Drift Velocity : mobile electron.



Drift Velocity :

Velocity with which electron travel towards positive terminal under action of electric field.

So electron get momentum with diff. time गया

for single electron value of $v_d = \overline{V_1} = \overline{e_1} + a_1 t_1$

sum of velocities e & a

τ_1 = time required.

So average velocity (Drift) =

$$V_N = U_N + \bar{a}\tau_N$$

So for all electron

$$v_d = \frac{(\overline{u_1} + \overline{u_2} + \cdots + \overline{u_N})}{N} + \bar{a}\,\frac{(\overline{\tau_1} + \overline{\tau_2} + \cdots \overline{\tau_N})}{N}$$

Section	Q. No.													
	Marks													

प्र. क्र.
Q. No.

$$\therefore \frac{\bar{t}_1 + \bar{t}_2 + \dots + \bar{t}_N}{N}$$

$$\therefore V_d = \bar{a}\left(\frac{t_1 + \tau_2 + \dots + t_N}{N}\right)$$

$$\therefore V_d = \bar{a}\tau = -\frac{eE}{m}\tau$$

equation of drift velocity.

07

Now current & drift velocity is given by,

$$I = nAL$$

$$\therefore \Delta q = neAL$$

$$\text{or } \Delta t = \frac{L}{V_d}$$

$$\therefore I = \frac{\Delta q}{\Delta t} = neAV_d$$

04 Section | Q. No. | Marks

प्र. क्र. Q. No.

Boltzman Transport Relation.

BT equation used to determine the destribution function of particle in phase space (r, k)

The no. of particles in the range

$r \to r+dr$ & $P \to P+dP$

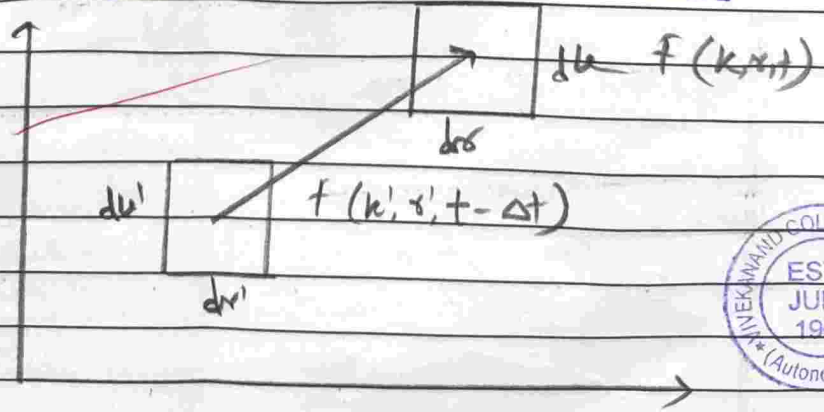
$$\therefore dN = f(P, r, t)\, dr\, dP$$

$$\text{so} \sum_k f(k) \to \frac{2V}{(2\pi)^3} \int dk$$

$$\therefore \psi_k(r) = |k\rangle = e^{ikr} u_k(r)$$

$$\therefore \frac{2}{(2\pi)^3} f(k, r)\, dk$$

$$\left(\frac{\partial f}{\partial t}\right)_{drift} = -v \cdot \nabla_r f - \frac{1}{\hbar} F \cdot \nabla_k f$$



Name: Sujata Anandrao Patil

Date: 23/05/2022

26856

Signature of Jr. Super.

विवेकानंद कॉलेज, कोल्हापूर (स्वायत्त)

परीक्षेच्या _____ या विषयाच्या प्रयोग परीक्षा

Practical Examination in, M.Sc-II Internal exam

at the Physics Examination

उमेदवाराचा आसन क्रमांक (Candidate's Seat No.) 1624 विभाग (Section)

18/20

उमेदवारांना सूचना

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(येथून लेखनास सुरवात करा.) (Begin writing here.)

प्र. क्र. Q. No.

Q. 4

1) (a)

2) (d)

3) (c)

4) (b)

5) (b)

VIVEKANAND COLLEGE KOLHAPUR ESTD JUNE 1964 (Autonomous)

Section	Q. No.													02
	Marks													

प्र. क्र.
Q. No.

Q.2)

(1) Drift Velocity

Drift velocity is defined as the velocity with which the free electrons get drifted towards the positive terminal under the effect of the applied external electric field.

In addition to it's thermal velocity, it also possesses additional momentum.

At any given time, an electron has a velocity

$$\bar{v}_1 = \bar{e}_1 + \bar{a}\tau_1$$

where, $\bar{e}_1$ = thermal velocity

$a\tau_1$ = v. due to applied electric field.

$\bar{\tau}_1$ = time elapsed since last collision

Similarly for other electron,

$$\bar{v}_2 = \bar{e}_2 + \bar{a}\tau_2,\ \bar{v}_3 = \bar{e}_3 + \bar{a}\tau_3 \ldots\ \bar{v}_N = \bar{u}_N + \bar{a}\tau_N$$

Now the average velocity $\bar{v}_d$ of all electron is given by,

$$v_d = \frac{\bar{v}_1 + \bar{v}_2 + \bar{v}_3 + \ldots \bar{v}_N}{N} = \frac{(\bar{u}_1 + \bar{a}\tau_1) + (\bar{u}_2 + \bar{a}\tau_2) + \ldots + (\bar{u}_N + \bar{a}\tau_N)}{N}$$

$$= \frac{(\bar{u}_1 + \bar{u}_2 + \ldots + \bar{u}_N)}{N} + \bar{a}\frac{(\tau_1 + \tau_2 \ldots + \tau_N)}{N}$$

प्र. क्र.
Q. No.

$$\therefore \frac{\bar{e}_1 + \bar{e}_2 + \cdots + \bar{e}_N}{N} = 0$$

$$\therefore \bar{V}_d = \bar{a}\left(\frac{\bar{t}_1 + \bar{t}_2 + \cdots + \bar{t}_N}{N}\right)$$

$$\therefore \bar{V}_d = \bar{a}\bar{\tau} = -\frac{e\bar{E}}{m}\tau$$

Relation bet? Current & drift velocity

no. of free electron in conductor

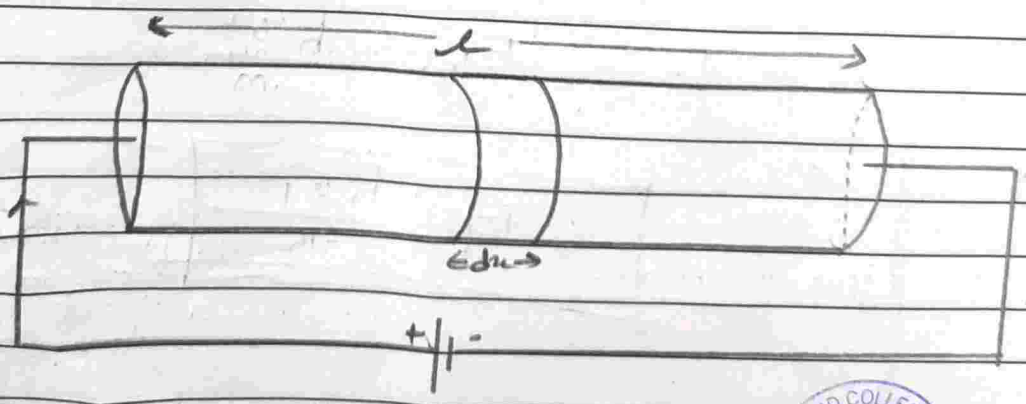
$$L = nAL$$

$$\therefore \Delta q = neAL$$

$$\therefore \text{Time taken} : \Delta t = \frac{L}{V_d}$$

$$\therefore I = \frac{\Delta q}{\Delta t} = neAv_d.$$

08



04	Section	Q. No.												
		Marks												

• Sommerfeld Theory of Electrical Conductivity •

प्र. क्र.
Q. No.

Q.3) Sommerfeld Considered metal as free electron Confined in surface of solid.

- electron treated as by quantum mechanics
- It is completly free
- So the eigenstates of electron are characterized by wave & spin vector

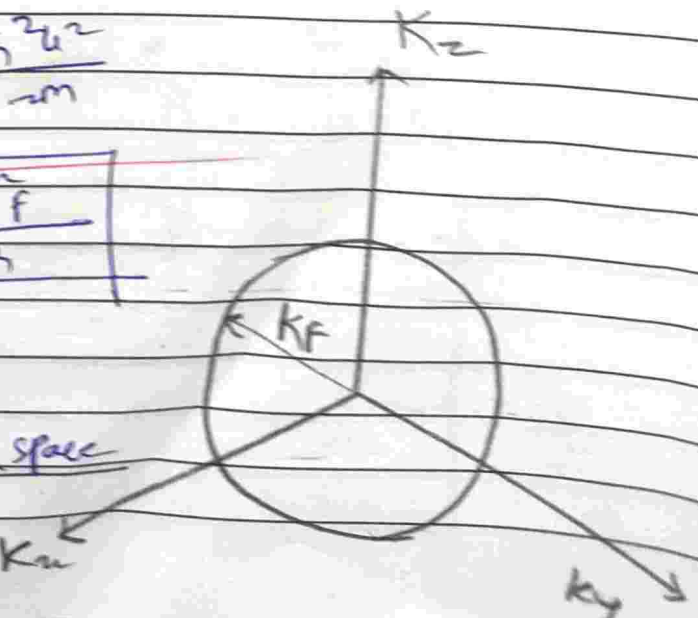
∴ Total Hamiltonian $H = \frac{p^2}{2m} = -\frac{\hbar^2}{2m}\nabla^2$

$\therefore \psi_{ks}(r) = e^{ikr}\chi_s$

So $\chi_+ = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad \chi_- = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

$E_{k,s} = \frac{\hbar^2 k^2}{2m}$

$\therefore E_F = \frac{\hbar^2 k_F^2}{2m}$



• Fermi sphere in K space

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

Shri Swami Vivekanand Shikshan Sanstha, Kolhapur

Vivekanand College, Kolhapur (Autonomous)

Department of Physics

M.Sc. Part-II SEM IV Internal Examination (2021-22)

SSP IV Semiconductor Physics

Time - 11:00 am - 12:00 pm Total Marks: 20

Instructions:-

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

Q1. Fill in the Blanks (1 mark for each) **(5)**

1. The region where the electrons and holes diffused across the junction is called _____

A) Depletion space B) Forward bias C) Depletion region

2. Dark current is the …….. That flows in the Solar cells is due to the absence of light.

A) Current at night B) leakage current C) light generated current

3. Solar cell generates I-V curve in ……. Quadrant.

A) I B) IV C) III

4. The series resistance in solar cell is a ……..between the metal contact and the silicon.

A) Insulator B) contact resistance C) charge generators

5. The amount of photo generated current increases slightly with increases in……

A) Resistance B) Temperature C) Low power

Q2. Answer the following (Any one) **(5)**

1. Discuss p-n junction Solar cells under dark and illumination state.
2. Derive I-V equation for solar cells
3. How solar simulator works?

Q3. Answer the following (Any one) **(10)**

1. Explain the Design of solar cell for High Voc, Fill factor and efficiency.
2. What are Second generation solar cells? Explain in details with Examples.
3. Define Solar cell. Explain the effect of various parameters on solar cells.

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

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College (Autonomous), Kolhapur

Department of Physics

M.Sc. II

2021-22

dt: 26-05-2022

Attendance Sheet

Internal Exam-2021-22: Sem-IV

Paper: SSP-4

Roll. No.	Name of Candidate	Sign	Marks
1	Komal Jotiram Bhosale		11
2	Priyarani Ravindra Burud		10
3	Pratiskha Pandit Chogale		09
4	Sunil Ratnakar Chougae		10
5	Rishikesh Tukaram Devtale		12
6	Pranav Shankar Ghosalkar		13
7	Gouri Govind Jadhav		17
8	Manasi Khanderao Jagadale		15
9	Prasad Vilas Kamble		10
10	Snehal Narayan Mane		11
11	Priyanka Sanjay Patil		12
12	Shweta Shital .Patil		17
13	Sujata Anandrao Patil		18
14	Bhagyashri Mahadev Pednekar		15
15	Prajyot Sunilkumar Pradnyasagar		14
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Teacher Incharge .....

VIVEKANAND COLLEGE KOLHAPUR (Autonomous) ESTD JUNE 1964

Name: Manasi Khanderao Jagdale

Date: 24-05-2022

26853

Patil
Signature of Jr. Super.

विवेकानंद कॉलेज, कोल्हापूर (स्वायत्त)

परीक्षेच्या

~~Practical~~ Examination in, Physics, Internal Exam - 2021-22 या विषयाच्या प्रयोग परीक्षा

at the Examination

उमेदवाराचा आसन क्रमांक (Candidate's Seat No.) 1635

विभाग (Section)

15/20

उमेदवारांना सूचना

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(येथून लेखनास सुरवात करा.) (Begin writing here.)

Answers:

प्र. क्र. Q. No.

Question 1. → C

2. → B

3. → B

4. → B

5. → B.

05

VIVEKANAND COLLEGE KOLHAPUR ESTD JUNE 1964 (Autonomous)

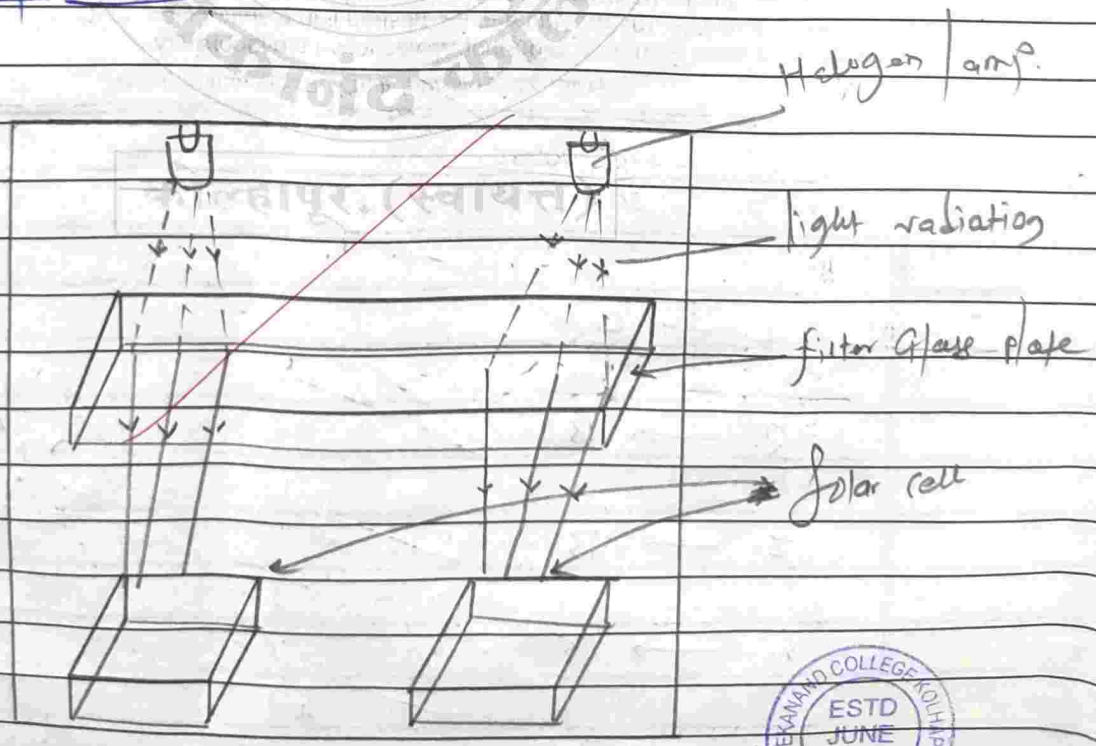
Section | Q. No. | Marks | 02

प्र. क्र.
Q. No.

· Solar Simulator ·

· A solar simulator kit is a device which provides illumination similar to natural sunlight.
· It provides controllable indoor test.
· Used for testing solar cells
· It has three main categories
  a) Categories
  b) Continuous
  c) Flashed
  d) Pulsed.

· Construction :

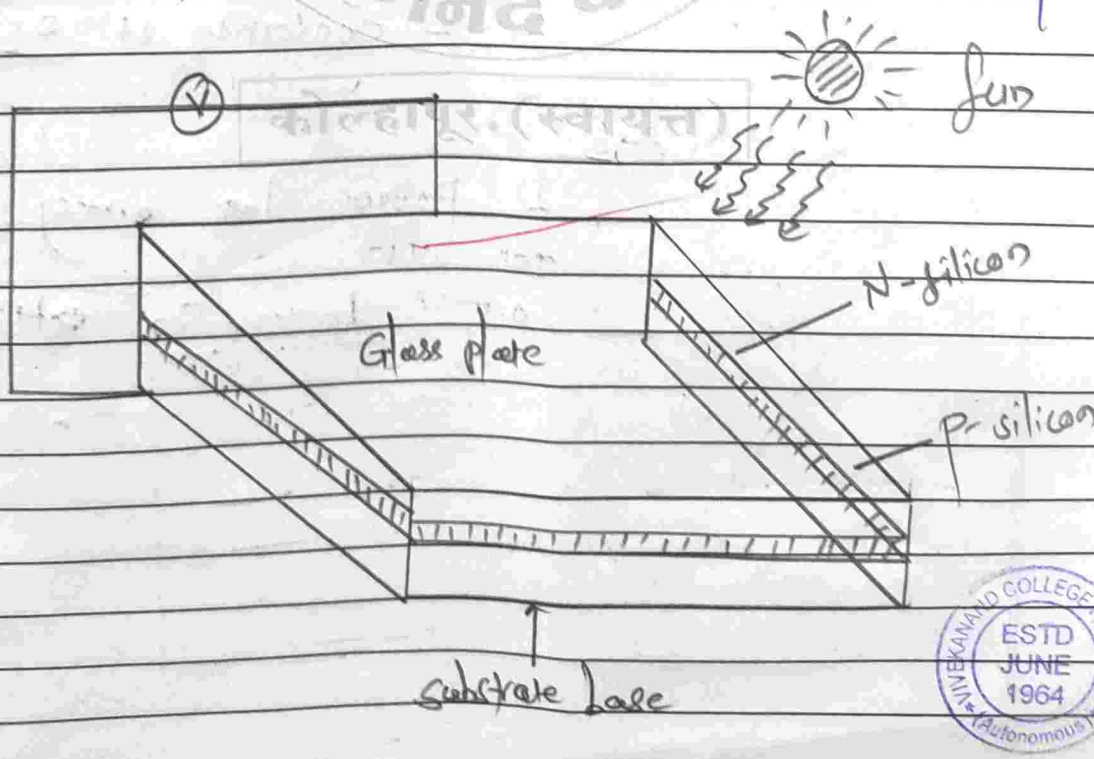


Section | Q. No. | Marks | 03

प्र. क्र. Q. No.

Solar cell : Parameters :

- It is Unit of solar energy generation
- Photovoltaic effect plays a important role in it.
- It is mainly formed by joining n-type material with p-type material.
- It is a p-N junction device.
- Combining of H & E takes place in depletion layer within solar cell.
- e-H Pairs are generally created at p-N junction
- It has two main Contact. +ve & -ve Contact.



04 Section | Q. No. | Marks

प्र. क्र. Q. No.

· IV characteristics equation -

$$I = I_0 \left[\exp\left(\frac{qV}{nkT}\right) - 1 \right] - I_L$$

· Parameters effects · Solar cell ·

- Temperature - SE varies with temperature.
- Soiling - which accumulates on surface of PV panel
- Shading - shading of tree leaves, building, terrain.
- mismatch - mismatch of modules
- Inverter efficiency
  - Conversion of DC into AC.
- Age:
  - It produces less energy when it get older.
  - 0.5 % decrease in efficiency

Date: 24/05/2022

26855

Name: Sujeeta Anandrao Patil

Signature of Jr. Super.

विवेकानंद कॉलेज, कोल्हापूर (स्वायत्त)

परीक्षेच्या या विषयाच्या प्रयोग परीक्षा

~~Practical~~ Examination in, Internal Exam- BSP-4

at the physics Examination

उमेदवाराचा आसन क्रमांक (Candidate's Seat No.) 1824 विभाग (Section)

18/20

उमेदवारांना सूचना

१. प्रश्न काळजीपूर्वक वाचा आणि त्याप्रमाणे विचारलेला प्रयोग करा.
२. उपकरणांच्या वापराबाबत तुम्हांला काही माहीत नसेल तर परीक्षक किंवा प्रयोगशाळा सहाय्यक यांना तुम्हाला मदत करण्याविषयी विनंती करा.
३. कोणताही विद्युतप्रयोग करण्यापूर्वी, प्रत्यक्ष पुरविलेली सर्व उपकरणे आणि सर्व 'कनेक्शन' नीट पाहून घेऊन संबंधित कामाची नीटनेटकी कार्ययोजना करण्याची नितांत आवश्यकता आहे आणि ह्या नंतर पुढे काम चालू करण्याविषयी परीक्षकांची परवानगी मिळविणे आवश्यक आहे.
४. सर्व निरीक्षणे कोटकवजा तक्त्यात भरावी. मधल्या सर्व गणना आणि निर्णय हे शक्य तितक्या सुवाच्यपणे आणि स्पष्टपणे नोंदविलेले असणे हे हितावह आहे.
५. प्रारंभिक किंवा अंतिम निरीक्षणात संख्यावाचक आकडे एकावर एक लिहू नयेत. जर लिहिलेला कोणताही आकडा नको असेल तर त्यावर एक रेघ ओढून पाहिजे असलेला आकडा त्याच्याजवळ लिहा. प्रयोगशाळेतून बाहेर पडण्यापूर्वी आपले टेबल चांगल्या स्थितीत आहे याची खात्री करा.

INSTRUCTIONS TO CANDIDATES

1. Read the question carefully and perform the experiment as required.
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3. Before doing any electrical experiment, it is absolutely essential that you make a neat working sketch of all apparatus actually provided and of the necessary connection and obtain the examiner's permission to proceed.
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(येथून लेखनास सुरवात करा.) (Begin writing here.)

प्र. क्र. Q. No.

Q.1) Multiple Choice

1) Junction is called Depletion Region 05

2) Dark Current is Leakage Current

3) Series resistance in Solar cell is Contact resistance

4) IV curve in IV region

5) Current increases with Temperature

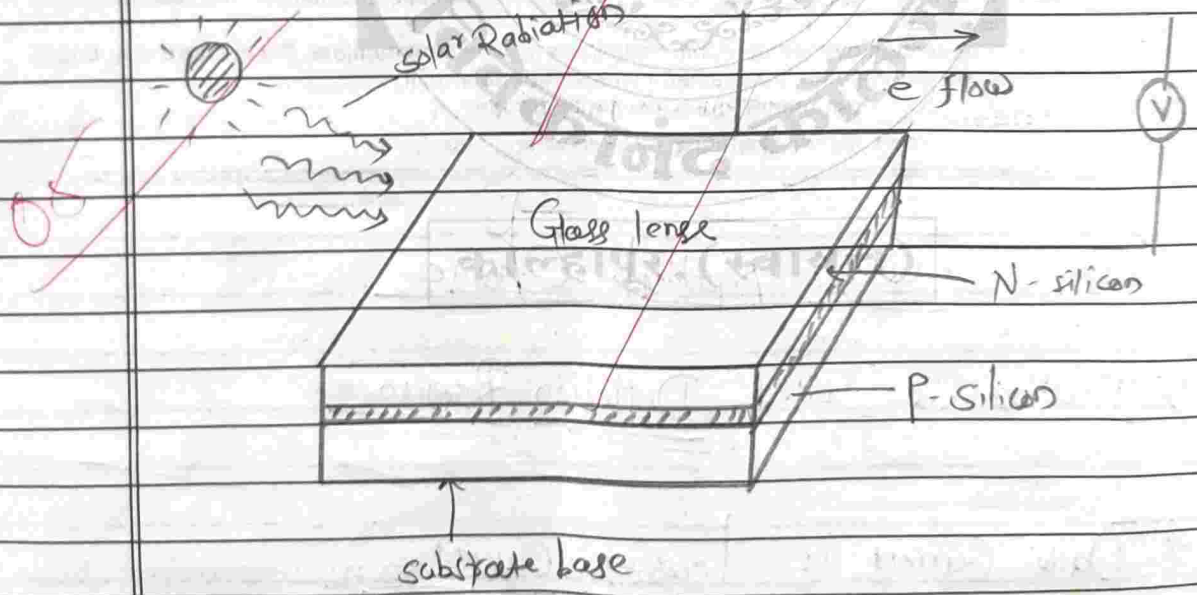
Section	Q. No.													02
	Marks													

प्र. क्र.
Q. No.

I-V Equation : Solar cell.

- It is a basic unit of solar energy generation
- Working of solar cell depends upon photovoltaic effect
- It is basically a P-N junction semiconductor device.
- formed by joining n-type material with P-type material.
- Combining of H4E forms depletion layer within solar cell.

- e-H Pair created at junction
- It has +ve front & -ve back Contact.



Equation of Solar cell : IV characteristics

$$I = I_0 \left[\exp\left(\frac{qV}{nkT}\right) - 1 \right] - I_L$$

Section	Q. No.													03
	Marks													

प्र. क्र.
Q. No.

Q.3) Second Generation Solar cell -

- They are basically a thin film solar cell.
- made by using amorphous silicon (a-si), cdTe, CIGS GaAs

- They have lower efficiency, much cheaper to Reduce cost per watt is lower

Advantage :-

- These cells contain active polycrystalline CIGS layer with no coated.
- sheets or steel substrate using energy economic methods
- These are relatively environmentally friendly solar cells as they employ very
- little cadmium in the form of cds
- efficiency range 22%.
- reduced mass
- They can be deposited on stainless steel ribbon.
  - can be deposited over large area by plasma enhanced vapour deposition.

Q. No.
Marks

- Used to produce large area photovoltaic
- Bandgap - 1.7 eV

Polycrystalline Silicon

- consists solely silicon grains
- Can be amorphous in form
- material shows greater stability under electric field.

- Cadmium Telluride
  - deposited on glass
  - PN junction solar cell
  - cheaper than silicon

- Copper gallium indium diselenide
  - deposited on glass
  - more complex heterojunction.
  - Band gap : 1.3 eV.

Name: Sadiya Mastaf shaikh

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विवेकानंद कॉलेज, कोल्हापूर (स्वायत्त)

D.24.05.2022

Signature of Jr. Super.

परीक्षेच्या _____ या विषयाच्या प्रयोग परीक्षा

~~Practical Examination~~ in, Internal Exam - SSP4

at the Physics Examination

उमेदवाराचा आसन क्रमांक (Candidate's Seat No.) 1638

विभाग (Section)

उमेदवारांना सूचना

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प्र. क्र. Q. No.

Q.1 MCQs.

1) Depletion Region

2) leakage current

3) IV

4) Contact Resistance

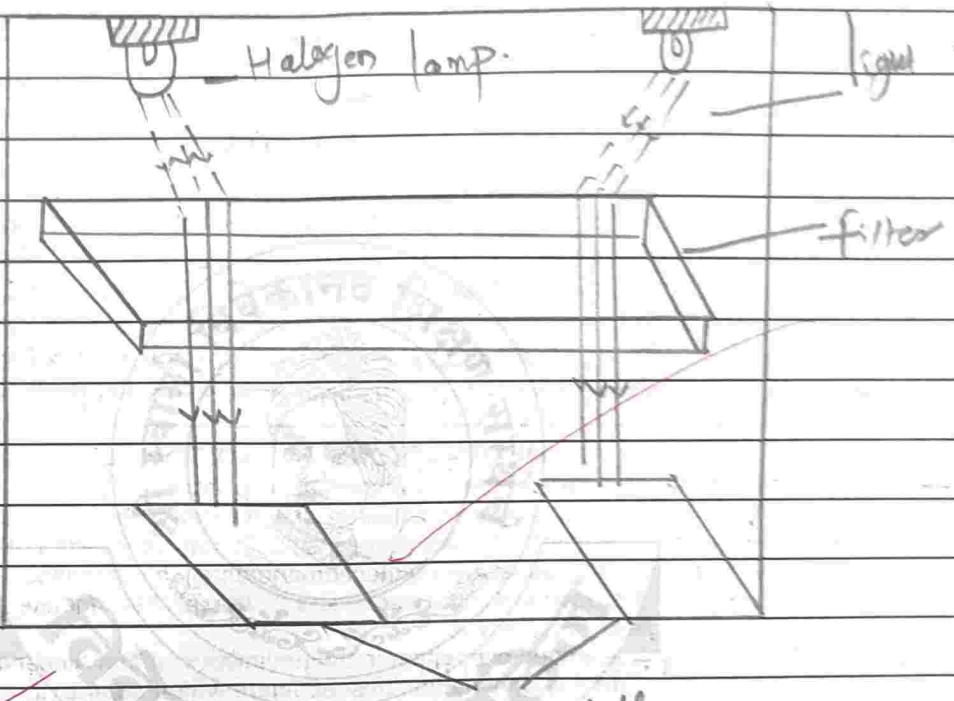
5) Temperature

VIVEKANAND COLLEGE KOLHAPUR ESTD JUNE 1964 Autonomous

Section	Q. No.													02
	Marks													

प्र. क्र.
Q. No.

- **Solar Simulator :**



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- It is basically a Simulator device which has an potential to neutral sunlight
- So it provides indoor test for environment to solar cell
- Used for testing of various devices such as solar cell etc.
- It has three main types
  a) Continuous type
  b) Flashed type
  c) pulsed type.

Section	Q. No.													03
	Marks													

प्र. क्र.
Q. No.

Q.3

Second generation Solar cell :-

- They are basically a thin film solar cells made up by using amorphous silicon (a-si), cdTe & CIGS.

- They have lower efficiency, much cheaper to produce

- However Cost per watt is also lower.

Advantages.

- These cells contain active polycrystalline CIGS layer with Mo coated.

- sheets Or steel substrate using energy economic methods.

- These are relatively environmetally friendly solar cells as they empty very

- little cadmium in the form of cds.

- efficiency range. 22%.

- They Possessed relatively reduced mass

प्र. क्र.
Q. No.

- Used to Produce large area photovoltaic cell.
- Band gap energy = 1.7 EV.

- Poly crystalline Silicon.

- It Consists fused Silicon grains
- can be amorphous in the form.
- Material shows greater stability under electric field.

- Cadmium Telluride.

- deposited on glass
- PN junction solar cell
- Cheaper than Silicon

- Copper Gallium Indium Diselenide

- deposited on glass
- more complex heterojunction
- Band gap - 1.3 Ev.