ZIAUDDIN UNIVERSITY
EXAMINATION BOARD

RESOURCES FOR

"SSC-II PHYSICS"

ZUEB EXAMINATIONS 2021

PREFACE:

The ZUEB examination board acknowledges the serious problems encountered by the schools and colleges in smooth execution of the teaching and learning processes due to sudden and prolonged school closures during the covid-19 spread. The board also recognizes the health, psychological and financial issues encountered by students due to the spread of covid-19.

Considering all these problems and issues the ZUEB Board has developed these resources based on the condensed syllabus 2021 to facilitate students in learning the content through quality resource materials.

The schools and students could download these materials from www.zueb.pk to prepare their students for the high quality and standardized ZUEB examinations 2021.

The materials consist of examination syllabus with specific students learning outcomes per topic, Multiple Choice Questions (MCQs) to assess different thinking levels, Constructed Response Questions (CRQs) with possible answers, Extended Response Questions (ERQs) with possible answers and learning materials.

ACADEMIC UNIT ZUEB:

2. **Constructed Response Questions (CRQs)**

HOW TO ATTEMPT CRQs:

- Write the answer to each Constructed Response Question/ERQs in the space given below it.
- Use black pen/pencil to write the responses. Do not use glue or pin on the paper.

SECTION B (SHORT ANSWER QUESTIONS)

1. **State and explain ideal gas law.**

S.NO	CRQ	ANSWER	CL	DL
		CHAPTER 2		
1.	**What are physical quantities?**	There are thousands of physical things and quantities present around us. To understand them and to explain them there must be some scales of measurement so they can be effectively use universally. In 1960 in the international conference, a system of measurements is recommended which is universally acceptable. In this system which is called S.I, seven physical quantities are said to be basic quantities and their scale of measurement are said to be basic units.	**K/R**	**E**

		Following are these basic quantities and their units. **PHYSICAL QUANTITY** / **SYMBOL** / **UNIT** / **SYMBOL** Length / l / Meter / m Mass / m / Kilogram / Kg Time / t / Second / S Current / I / Ampere / A Temperature / T / Kelvin / K Light intensity / I_v / Candela / Cd Quantity of matter / n / Mole / Mol		

S.NO	CRQ	ANSWER	CL	DL
		CHAPTER 3		
2.	**Define the following:** **Rest** **Motion** **Distance** **Displacement**	**REST:** "A body is said to be in a state of rest if its position with respect to its surrounding does not change with time." **Examples:** A book placed on a table, a fixed pole, buildings etc. **MOTION:** "A body is said to be in the state of motion if it is continuously changing its position with respect to its surrounding with time." **Examples:** A running boy, a flowing stream, moving car, etc. **DISTANCE:** "It is the length of the actual path of the motion between two points. It may be curve or straight line". It is a scalar quantity. It is usually denoted by 'S' **Unit:** Unit of distance is meter denoted by (m)	**K/R**	**E**

		DISPLACEMENT "It is the shortest straight line distance between two location directed from one point to the other." It is a vector quantity. It is usually denoted by 'd'. **Unit:** Unit of displacement is meter denoted by 'm'.		
3.	**Define types of motion?**	**TYPES OF MOTION** All types of motions can be classified as **TRANSLATORY (OR) LINEAR MOTION:** *"If a body is moving on a straight line or curved path but every particle in the body is being displaced by the same amount and not repeating its motion, then it is said to be in linear or translatory motion."* **Examples:** Motion of a car on a straight road, motion of falling object, motion of motorbike on a circular road etc. **ROTATIONAL (OR) CIRCULATTORY MOTION:** "If a body is moving in a circular path around a fixed point called center and thus repeating its motion with time then this motion is called rotational motion." **Example:** Motion of planets around the Sun, electron motion around nucleus, motion of wheels etc. **VIBRATORY (OR) OSCILLATORY MOTION:** "If a body is moving back and forth or up and down about a fixed point called equilibrium point then this type of motion is known as vibratory or oscillatory motion." **Example:** Motion of a pendulum, motion of a swing, motion of bird's feather during flight.	**K/R**	**E**
4.	**Derive first equation of motion?**	**FIRST EQUATION OF MOTION** Let a body of mass 'm' moving with uniform acceleration "a" starting with initial velocity 'V_i' and attains a final velocity 'V_f' in time 't' then according to the definition of the acceleration, $\text{Acceleration} = \frac{\text{change in velocity}}{\text{time}}$	**K/A**	**M**

		$a = \frac{\Delta V}{t}$ $a = \frac{V_f - V_i}{t}$ $at = V_f - V_i$ $\boxed{V_f = V_i + at}$		
5.	**Derive second equation of motion?**	**SECOND EQUATION OF MOTION** Let a body is moving with a uniform acceleration "a" starting with a initial velocity V_i and attains a final velocity V_f in time 't' and covers a distance 'S'. This distance can be written as, $S = V_{av} \times t$ ---------- (1) But $V_{av} = \frac{V_f + V_i}{2}$ put in equation (1) $S = \frac{V_f + V_i}{2} \times t$ ----------(2) from first equation of motion $V_f = V_i + at$ put in equation (2) $S = \frac{(at + V_i + V_i)}{2} \times t$ $S = \frac{(at + 2V_i)}{2} \times t$ $S = \frac{(at^2 + 2tV_i)}{2}$ $S = \frac{at^2}{2} + \frac{2tV_i}{2}$ $\boxed{S = V_i t + \frac{1}{2} at^2}$	**K/A**	**M**
6.	A motor cyclist covers 150 m in 10 seconds. Find the speed of the motor cyclist.	**15m/s**	**K/A**	**E**
7.	Find the time taken by sunlight to reach the	**8 min 20 seconds**	**K/A**	**E**

	ground if the distance between the sun and the earth is 1.5 x 10^8 Km. Velocity of light is 3 x 10^8 m/s.			
8.	**Define and explain Newtons first law of motion?**	**FIRST LAW OF MOTION** **Statement:** "A body remains at rest or continues to move with constant speed on a straight line unless acted by an unbalance force." **Explanation:** This law explains that, if a body is under the influence of several forces and if there is no net force acting on the body then it will keep its state i-e rest or motion with uniform velocity. This law also explains an important property of bodies namely inertia, by which a body tries to maintain its state. **Examples:**Book placed on a table, motion of a parachute, motion of coin in a viscous fluid.	**K/R**	**M**
9.	**Define and explain Newtons second law of motion?**	**SECOND LAW OF MOTION** **Statement:** "It states that whenever an unbalance force is applied on a body it produces acceleration in the body in its own direction, this acceleration is directly proportional to the magnitude of unbalanced force and inversely proportional to the mass of the body." *Mathematical Form:* Consider an object of mass "m" on which an unbalance force of magnitude "F" is acting and due to which acceleration "a" is produced in the direction of force. Now according to the first part of the law we can write a α F ---------- (1)	**K/R**	**M**

<table>
<tr>
<td></td>
<td></td>
<td>According to the second part of the law

$a \alpha \frac{1}{m}$ ---------- (2)
Combining these result

$a \alpha \frac{F}{m}$

$a = k \frac{F}{m}$ In S.I system constant k = 1
Or F = m a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Differenciate between mass and weight?</td>
<td>
<table>
<tr><th>S.NO</th><th>MASS</th><th>WEIGHT</th></tr>
<tr><td>1</td><td>Mass is the quantity of matter in a body and measures the inertia.</td><td>Weight is the force by which earth pulls a body towards its center.</td></tr>
<tr><td>2</td><td>Mass has no direction.</td><td>Weight is always acts towards the center of earth.</td></tr>
<tr><td>3</td><td>Mass is a constant quantity and remains same everywhere.</td><td>Weight is different at different distances from center of earth.</td></tr>
<tr><td>4</td><td>Mass can be measured by a common balance.</td><td>Weight is always measured by spring balance</td></tr>
</table>
</td>
<td>K/R</td>
<td>E</td>
</tr>
<tr>
<td>11.</td>
<td>An object of mass 20 kg is moving with an acceleration of 3 m/s^2; find</td>
<td>(60 N)</td>
<td>K/A</td>
<td>M</td>
</tr>
</table>

	the force acting on it.			
12.	An object of mass 50 kg is moving with an acceleration of 5 m/s^2; find the force acting on it.	**(250 N)**	**K/A**	**E**
13.	**Define Torque?**	**DEFINITION** "Torque or movement of force is the turning effect of force" **FORMULA** Torque is the product of the force "F" and force arm "d" Mathematically it can be expressed as $\tau = F \times d$ **FORCE ARM** Force arm or moment arm is the perpendicular distance between the axis of rotation of the body and line of the action of the force **UNIT** In M.K.S system the unit of torque is Nm. **QUANTITY** Torque is a vector quantity **POSITIVE TORQUE:** Torque is said to be positive if the direction of rotation of the body is anti-clock wise **NEGATIVE TORQUE** Torque is said to be negative if the direction of rotation of the body is clock wise	**K/A**	**D**
14.	**Define Equilibrium?**	**DEFINITION** "A body is said to be in equilibrium if it is in rest or move with uniform speed by the influence of force" There are two types of equilibrium **STATIC EQUILIBRIUM** **DYNAMIC EQUILIBRIUM**	**K/R**	**M**

		STATIC EQUILIBRIUM "A body is said to be in static equilibrium if it is in rest by the influence of force". **EXAMPLE** 1) A body lying on the table 2) A body hanging at rest from the ceiling by a string. **DYNAMIC EQUILIBRIUM** "A body is said to be in dynamic equilibrium if it move with uniform speed by the influence of force". **EXAMPLE** 1) Train moving with uniform velocity. 2) Paratrooper falling down with uniform velocity **CONDITIONS** There are two conditions of equilibrium 1) First condition of equilibrium 2) Second condition of equilibrium **FIRST CONDITION OF EQUILIBRIUM** The resultant of all the forces acting on a body is zero. OR Algebraic sum of all the forces acting along x-axis and y- axis must equal to zero, mathematically it can be expressed as: $\Sigma F_x = 0$ $\Sigma F_y = 0$ **SECOND CONDITION OF EQUILIBRIUM** The resultant of all the torque acting on a body is zero Mathematically it can be expressed as: $\Sigma \tau = 0$		
15.	**Define centripetal acceleration.**	**PHYSICAL DEFINITION:** "If a body move in a circular path then directions of tangential velocity continuously change. Such an acceleration which produce due to change of direction of tangential velocity called centripetal acceleration." **MATHEMATICAL DEFINITION:** It is the ratio of square of the speed to the radius of a circle mathematically it can be expressed as: $\boxed{a_c = \frac{V^2}{r}}$	**K/R**	**M**

		DIRECTION: The direction of centripetal acceleration always towards the centre of a circle		
16.	**Define centripetal force and centrifugal force.**	**CENTRIPETAL FORCE:** "Such a force which keeps a body in a circular path called centripetal force." If a body of mass 'm' move in a circular path of radius 'r' with uniform speed 'V' then body must possess centripetal force and according to Newton's second law of motion centripetal force can obtained by the formula $$\mathbf{F_{cp} = ma_c}$$ Here $$\mathbf{a_c = \frac{V^2}{r}}$$ we put in above $$\boxed{\mathbf{F_{cp} = \frac{mV^2}{r}}}$$ This is the magnitude of centripetal force direction of centripetal force always towards the centre of a circle. **CENTRIFUGAL FORCE:** It is the reaction of centripetal force therefore magnitude of centrifugal force is equal to the magnitude of centripetal force but direction of centrifugal force always away from the centre of a circle mathematically it can be express as; $$\mathbf{F_{cf} = -F_{cp}}$$ $$\mathbf{F_{cf} = -ma_c}$$ $$\boxed{\mathbf{F_{cf} = -\frac{mv^2}{r}}}$$	**K/R**	**M**
17.	**Define work and give its unit.**	**DEFINITION:** "Work is said to be done if a force act on the body and the body displace along the direction of force." **EXPLANATION:** If force **F** and displacement **S** are in the same direction then work can be obtained by the formula **Work = F S** If force **F** and displacement **S** makes an angle θ with respect to each other then work can be obtain by the formula **Work = F S Cos θ**	**K/R**	**R**

		UNIT: In M.K.S. System unit of work is **Joule** [**J]**		
18.	**Define Elasticity, Elastic limit, Stress, Strains, Hooks Law, Young's Modulus.**	**ELASTICITY:** When force is applied on a body to change its length, shapes or volume and after removal of this force if a body regains or comes back to its original position then this property is called elasticity. **ELASTIC LIMIT:**It is the maximum limit of body with in which a body regains its original position after removal of applied force . **STRESS:** Stress is the amount of reaction force per unit area. Mathematically it can be expressed as: **Stress** = $\frac{\text{Reaction force}}{\text{area}}$ **OR** $\sigma = \frac{F}{A}$ In MKS system unit of stress is N/m^2. **STRAIN:** Strain is the deformation produce by the stress. **LONGITUDINAL STRAIN** Longitudinal strain is the fractional change in length by the application of stress. Mathematically it can be expressed as $\epsilon = \frac{\text{Change in length}}{\text{Orignal length}}$ $\epsilon = \frac{\Delta L}{L}$ It has no units. **HOOK'S LAW:**According to Hook's law, "Within elastic limit stress is directly proportional to strain". Mathematically it can be expressed as: $\therefore$ Stress $\propto$ Strain Stress = k Strain OR $\frac{\text{Stress}}{\text{Strain}} = k$ With the help of above equation Hook's Law can also be state as:	**K/R**	**D**

<table>
<tr>
<td></td>
<td></td>
<td>"Within elastic limit the ratio of stress to the strain always remains unchanged".

YOUNG'S MODULUS: Young's Modulus is the ratio of stress to the longitudinal strain. Mathematically it can be expressed as:

$$Y = \frac{\text{Stress}}{\text{Longitudinal Strain}}$$
$$Y = \frac{\frac{F}{A}}{\frac{\Delta L}{L}} = \frac{F}{A} \times \frac{L}{\Delta L}$$
In MKS system its unit is N/m^2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Give the difference between heat and temperature?</td>
<td>
<table>
<tr><th>HEAT</th><th>TEMPERATURE</th></tr>
<tr><td>Heat is the form of energy which can transfer from hot body to cold body.</td><td>Temperature measures the degree of hotness or coldness of a body.</td></tr>
<tr><td>Heat is the total kinetic energy of the molecule of a substance.</td><td>Temperature is the average kinetic energy of the molecule of a substance.</td></tr>
<tr><td>Physically heat cannot be measured but calculated by the formula $\Delta Q = m c \Delta T$</td><td>Temperature can be measured with the help of thermometer</td></tr>
<tr><td>In S.I system unit of heat is Joule.</td><td>In S.I system unit of temperature is Kelvin.</td></tr>
</table>
</td>
<td>K/R</td>
<td>M</td>
</tr>
<tr>
<td>20.</td>
<td>State and explain Boyle's law ,Charles law and pressure law?</td>
<td>BOYLE'S LAW
STATEMENT: "At constant temperature and for fix no of molecule volume is inversely proportional to the pressure."

EXPLANATION: If 'P' represents pressure and 'V' represents volume of a gas then mathematically Boyle's law can be expressed as:</td>
<td>K/R</td>
<td>D</td>
</tr>
</table>

$$V \propto \frac{1}{P}$$

$$V = \frac{K}{P}$$

$$PV = K$$

This is the equation of Boyle's law and with the help of above equation Boyle's law can also be stated as:

"At constant temperature and for fix no. of molecule the product of pressure and volume remain constant."

CHARLES LAW

STATEMENT: "At constant pressure and for fix no. of molecule volume is directly proportional to the temperature."

EXPLANATION: If 'V' represent volume of the gas and 'T' represent temperature of a gas then Charles law can be expressed as

$$V \propto T$$

$$V = kT$$

$$\frac{V}{T} = K$$

This is the equation of Charles law and with the help of above equation Charles law can also be stated as:

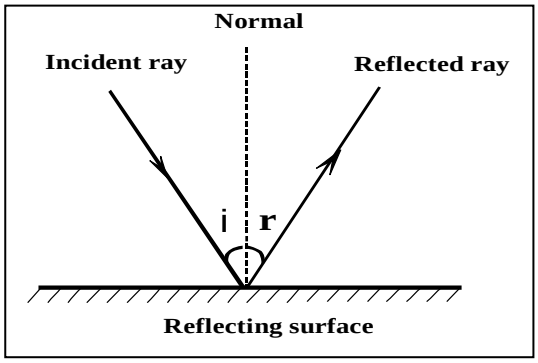
"At constant pressure and for fix no. of molecule the ratio of volume to the temperature remain constant"

PRESSURE LAW

STATEMENT: "At constant volume the pressure of given mass of a gas is directly proportional to its absolute temperature."

		$$P \propto T$$ $$P = KT$$ $$\frac{P}{T} = K$$ This is the equation of pressure law and with the help of above equation pressure law can also be stated as: "At constant volume and for fix number of molecules the ratio of pressure to the temperature remains constant."		
21.	**Derive an expression for general gas equation.**	General gas equation is a single relation in to which Boyle's law, Charles law and Avogadro's law can be combined. According to Boyle's Law $V \propto \frac{1}{P}$ According to Charles law $V \propto T$ According to Avogadro's law $V \propto n$ **Combining these three laws we get** $V \propto \frac{nT}{P}$ $V = \frac{RnT}{P}$ $PV = nRT$ Where R is the constant of proportionality and it is known as universal gas constant or general gas constant. In M.K.S. System its value is 8.313 J/mol K.	**K/A**	**M**
22.	Calculate the volume occupied by **5 mole** of gas at **27°C** if it is subjected to a pressure of **1.0×10^5 N/m^2**. (gas constant **R = 8.13 J mole^{-1}K^{-1}**)	**[0.12m^3]**	**U/A**	**M**

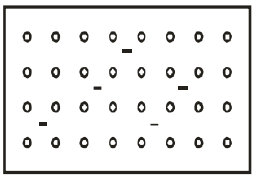
23.	If **10 mole** of a gas exert a pressure of **20×10^4 N/m²** when confined in a tank of **40 m³** capacity at **57°C** what would be the pressure of **100 mole** of the same gas when confined in a **80 m³** tank at **477°C.**	**[2.27×10^6 N/m²]**	**U/A**	**M**
24.	The coefficient of linear thermal expansion of aluminum is **26×10^{-6} °C^{-1}**. An aluminum rod is **2 m** long at **25°C.** what will be its length at **75°C.**	**[2.0026m]**	**U/A**	**M**
25.	At **16°C** the length of an iron rod is **510cm**. How long is it at **99°C** if the co-efficient of linear expansion of iron **$\alpha = 12 \times 10^{-6}$ °C^{-1}.**	**[510.508m]**	**U/A**	**M**
26.	**Define simple Harmonic motion and explain it with an example?**	Such a vibratory motion in which 1)The magnitude of acceleration is directly proportional to the magnitude of displacement. 2)The direction of acceleration always towards mean position but the direction of displacement away from the mean position called Simple Harmonic Motion. Mathematically it can be expressed as: **$a \propto -x$**	**K/R**	**E**
27.	The wave length of a wave is 0.1 nm. Its speed is 3 x1 0^8 ms^{-1}. What is the frequency of the wave?	**[3×10^{18} Hz]**		
28.	A tuning fork vibrates 256 times each second and produces a wave 1.3m long. Calculate (a) the period and (b) the velocity of the wave.	**[3.9×10^{-3}s , 332.8 m/s]**		
29.	A radio station broad casts an AM radio waves whose frequency is 1230 x 10^3 Hz and an FM radio wave whose frequency is 91.9 x 10^6 Hz. Find the distance between adjacent crest in each wave.	**[24390 cm, 326.44cm]**		
30.	A sound wave of frequency 400 Hz and wavelength 3m passes through a certain medium. Calculate the	**[1200 m/s]**		

<table>
<tr><td></td><td>velocity of the wave in the medium.</td><td></td><td></td><td></td></tr>
<tr><td>31.</td><td>State law of reflection?</td><td>Law of reflection consists of two statements.
1. The angle of incidence is equal to the angle of reflection. Mathematically we can express this as follows:
m∠i = m∠r
2. The incident ray, the reflected ray and the normal all lie in the same plane
 
</td><td>K/U</td><td>D</td></tr>
<tr><td>32.</td><td>Difference between regular and irregular reflection of light?</td><td><table><tr><th>REGULAR REFLECTION</th><th>IRREGULAR REFLECTION</th></tr><tr><td>Regular reflection takes place when light rays incident on a highly polish regular surface.</td><td>Irregular reflection takes place when light rays incident on rough irregular surface such as white paper.</td></tr><tr><td>In regular reflection parallel incident rays after reflection will remain parallel.</td><td>In irregular reflection parallel incident rays will not remain parallel.</td></tr></table></td><td>K/R</td><td>E</td></tr>
<tr><td>33.</td><td>The focal length of a concave mirror is 10cm. where should an object be placed so as to get its, real image magnified twice.</td><td>[15 cm]</td><td>K/A</td><td>M</td></tr>
<tr><td>34.</td><td>Light travels from air into water whose index of</td><td>[28.90^0]</td><td>K/A</td><td>M</td></tr>
</table>

	refraction is **1.33.** If the angle of incidence is **40°** What is the angle of refraction?			
35.	he focal length of a convex lens is **10 cm.** where should an image be placed to get (a) a real image (b) a virtual image twice the size of the object?	**[15 cm , 5 cm]**	**K/A**	**M**
36.	**Describe the Quantum Theory of light.**	**QUANTUM THEORY OF LIGHT** According to Quantum theory of light "Light consist of energy packets called "photon" or "Quanta". Energy of photon is directly proportional to the frequency of vibration." Mathematically it can be expressed as: **$E \alpha \upsilon$** **$E = h\upsilon$** **where h = plank's constant = 6.63 x 10^{-34} J/Sec.**	**K/R**	**E**
37.	**Define and explain capacitance.**	**DEFINITION:** Capacitance of a capacitor is the ratio of charge to potential difference between the plates of the capacitor. OR it is the charge stored per unit potential difference between the plates. OR It is the charge required by a capacitor to rise its potential difference by one volt. **USES OF CAPACITORS:** $\text{Capacitance} = \frac{\text{Coulomb}}{\text{Volt}}$ $= \text{Farad}$ **DEFINITION OF FARAD:** The capacitance of a capacitor is one farad if a charge of one coulomb produces a potential difference of one volt between the plates of the capacitor. **SUB MULTIPLE UNITS OF FARAD:** $1\,\text{micro farad}(1\mu\text{F}) = 10^{-6}$ Farad $1\,\text{micro} - \text{micro farad}(1\mu\mu\text{F}) = 10^{-12}$ Farad	**K/R**	**M**
38.	**Define and explain ohms law**	**OHM'S LAW:**	**K/R**	**E**

<table>
<tr>
<td></td>
<td></td>
<td><u>DEFINITION:</u>
The potential difference between the two ends of a conductor is directly proportional to the current passing through it, provided there is no change in the physical state of the conductor.

<u>MATHEMATICAL REPRESENTATION:</u>
Suppose current ‘I’ is passing through a conductor and the potential difference between the two ends of a conductor is V, then
$V \propto I$
$V = IR$
Where ‘R’ is a constant known as resistance of the conductor.
<u>UNIT OF RESISTANCE:</u>
$$R = \frac{V}{I}$$
$$R = \frac{\text{Volt}}{\text{Ampere}}$$
$$= \text{Ohm}(\Omega)$$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39.</td>
<td>Give difference between conductor and insulator.</td>
<td>
<table>
<tr><th>CONDUCTOR</th><th>INSULATOR</th></tr>
<tr><td>Conductor is a substance which can pass electricity as well as heat.</td><td>Insulator is a substance which can not pass electricity as well as heat.</td></tr>
<tr><td>Conductor contain free electron</td><td>Insulator does not contain free electron.</td></tr>
<tr><td>Copter, silver, gold are the example of good conductor.</td><td>Rubber, Plastic, paper are the example of good insulator.</td></tr>
</table>
</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40.</td>
<td>Write down the difference between p-type and n-type substances.</td>
<td>
<table>
<tr><th>p –TYPE</th><th>n- TYPE</th></tr>
</table>
</td>
<td>K/R</td>
<td>M</td>
</tr>
</table>

			1. Such materials which can be formed by adding the impurity from the 3rd group of periodic table such as indium (trivalent) in the pure semi–conductor crystals known as p-type semi-conductors. 2. In p-type materials the majority charge carriers are positive and the minority charge carriers are negative. 3. p-type materials represented by hole (o) (+ve charge) 4. The p-type material can be sketch as: 	1. Such materials which can be formed by adding the impurity from the 5th group of the periodic table such as antimony (pentavalent) in the pure semi-conductor crystals known as n-type semi-conductors. 2. In n-type materials, the majority charge carriers are negative and the minority charge carriers are positive. 3. n-type materials represented by free electrons (-) 4. The n-type material can be sketch as: