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:

1. **Extended Response Questions (ERQs)**

HOW TO ATTEMPT ERQs:

- 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 C (LONG ANSWER QUESTIONS)

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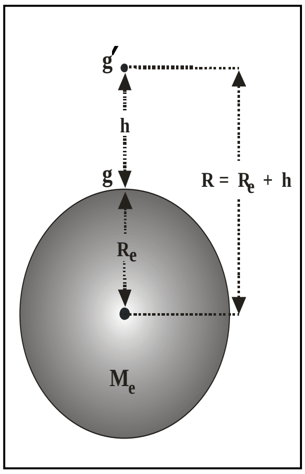
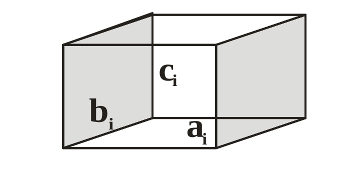
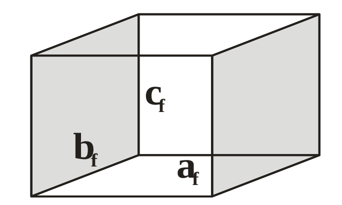
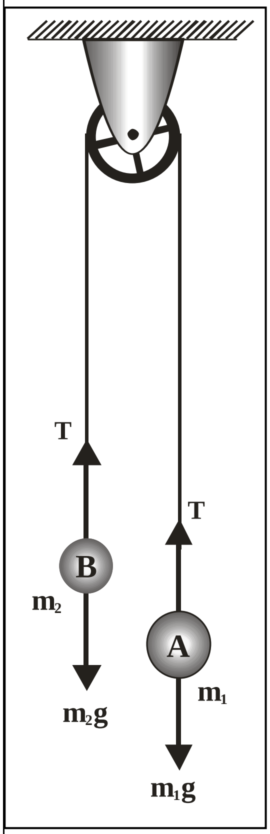
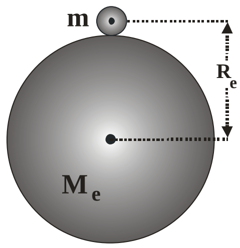
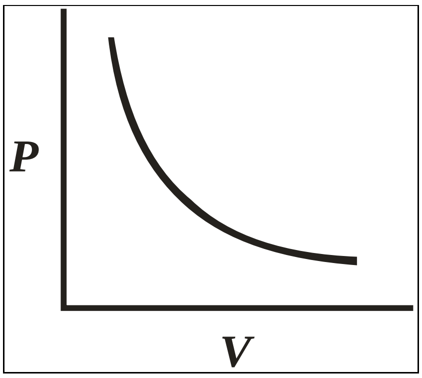
S.NO	ERQ	ANSWER	CL	DL
1.	Define Acceleration and Force. Derive the equation Vf=Vi+at	FORCE “Force is the agent which changes or tends to change the state of a body i.e state of rest or motion.” EQUATIONS OF MOTION FOR UNIFORMLY ACCELERATED BODIES FIRST EQUATION OF MOTION Let a body of mass ‘m’ moving with uniform acceleration “a” starting with initial velocity ‘Vi’ and attains a final velocity ‘Vf‘ in time ‘t’ then according to the definition of the acceleration, Acceleration = change in velocity time $a = \frac{\Delta V}{t}$ $a = \frac{Vf - Vi}{t}$ $a\,t = Vf - Vi$ $Vf = Vi + a\,t$	**U**	**M**
2.	Explain the variation in “g” with altitude?	*If **g** and **g’** be the acceleration due to gravity at the surface of the earth and at a height **h** above earth surface then we can write:* $g = \frac{G\ M_e}{R_e^{\ 2}}$ ..... **(i) Eq.** $g' = \frac{G\ M_e}{(R_e + h)^2}$ .... **(ii) Eq.** ***Dividing Eq. (ii) by Eq. (i)*** $\frac{g'}{g} = \frac{\frac{G\ M_e}{(R_e + h)^2}}{\frac{G\ M_e}{R_e^{\ 2}}}$  $\frac{g'}{g} = \frac{R_e^{\ 2}}{(R_e + h)^2}$ $\frac{g'}{g} = \frac{(R_e + h)^{-2}}{R_e^{\ -2}}$ $\frac{g'}{g} = \left(\frac{R_e + h}{R_e}\right)^{-2}$ $\frac{g'}{g} = \left(\frac{R_e}{R_e} + \frac{h}{R_e}\right)^{-2}$ $\frac{g'}{g} = \left(1 + \frac{h}{R_e}\right)^{-2}$ ***$(1 + b)^n = 1 + n b$*** ***If $b < 1$***	**R**	**M**

		If $\frac{h}{R_e} < 1$ *OR* $h < R_e$ *Then above equation becomes:* $\therefore \quad \frac{g'}{g} = 1 + (-2)\frac{h}{R_e}$ $g' = g\left[1 - \frac{2h}{R_e}\right]$ *This shows that acceleration due to gravity decreases with altitude*		
3.	Define Thermal expansion, Co-efficient of linear Expansion. Also prove β=3α	CO-EFFICIENT OF LINEAR EXPANSION "Co-efficient of linear expansion is the fractional change in length per degree change of temperature." Thermal Expansion When a metal is heated, its molecules vibrate more energetically against the action of inter molecular force producing greater displacement since the average distances among the molecules increase, the size of the solid increases. Such an expansion is called thermal expansion. ***Proof:*** *If a_i, b_i and c_i be the initial length, width and height of cubical metal body then initial volume of the body is given by:* $V_i = a_i\ b_i\ c_i$ **Eq. (i)**  **BEFORE HEATING** *If a_f, b_f and c_f be the final length, width and height of cubical metal body then final volume of the body is given by:* $V_f = a_f\ b_f\ c_f$ .. **Eq. (ii)**  **AFTER HEATING** $\alpha = \frac{\Delta L}{L_i\ \Delta T}$ $\alpha L_i \Delta T = \Delta L$ ***Since*** $L_f = L_i + \Delta L$ $L_f = L_i + \alpha\ L_i\ \Delta T$ $L_f = L_i(1 + \alpha\,\Delta T)$ ***Similarly*** $a_f = a_i\ (1 + \alpha\,\Delta T)$ $b_f = b_i\ (1 + \alpha\,\Delta T)$ $c_f = c_i\ (1 + \alpha\,\Delta T)$	**U**	**M**

		Putting the value of a_f, b_f *and* c_f *in Eq. (ii) we get:* $V_f = a_i(1 + \propto \Delta T)\, b_i(1 + \propto \Delta T)\, c_i(1 + \propto \Delta T)$ $V_f = a_i\, b_i\, c_i\, (1 + \propto \Delta T)^3$ *Using Eq. (i) above equation become* $V_f = V_i\,(1 + \alpha\,\Delta T)^3$ $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ $V_f = V_i\left(1 + 3\propto \Delta T + 3\propto^2 \Delta T^2 + \propto^3 \Delta T^3\right)$ *Since* $\propto$ *is very small therefore* $\propto^2 = 0$ *and* $\propto^3 = 0$ *So above equation can be express as:* $V_f = V_i\,(1 + 3\propto \Delta T)$ $V_f = V_i + 3\propto V_i\,\Delta T$ $V_f - V_i = 3\propto V_i\,\Delta T$ $\frac{V_f - V_i}{V_i\,\Delta T} = 3\alpha$ $\frac{\Delta V}{V_i\,\Delta T} = 3\alpha$ $\beta = 3\alpha$		
4.	Write down the principle, construction, working and use of the hydraulic lift.	**HYDRAULIC LIFT** Hydraulic lift is a device used as a platform for a body which is to be lifted. **PRINCIPLE** Hydraulic lift work on the to principle of Pascal's law **CONSTRUCTION** In a connected with a wider cylinder B and they are fitted with air tight pistons. It is filled with incompressible fluid. as shown in fig	U	D

		WORKING: Pressure can be applied by moving the piston in the cylinder A in downward direction. The pressure so applied is transmitted undiminished according to Pascal's principle to the piston of cylinder B. Consequently, the piston B moves upward		
5.	Derive the relation for Tension in string and acceleration of the bodies when two bodies of different masses are attached with the string which passes over a frictionless pulley such that both the bodies are moving vertically. 	***Construction:*** *Consider two bodies **A** and **B** of mass m_1 and m_2 respectively are connected by a string which passes over a frictionless pulley if $m_1 > m_2$ then body **A** move downwards and body **B** move upwards with same acceleration as shown in fig* ***Downward motion:*** *If **F** is the amount of force with which the body **A** move down wards then according to Newton's second law of motion:* $F = m_1 a$ *But* $F = m_1 g - T$ *By Comparing both we get* $m_1 a = m_1 g - T$ …… ***Eq. (i)*** ***Upward motion:*** *If **F** is the amount of force with which the body **B** move upward then According to Newton's second law of motion:* $F = m_2 a$ *But* $F = T - m_2 g$ *By Comparing both we get* $m_2 a = T - m_2 g$ …… ***Eq. (ii)*** ***Calculation o f "a":*** *To calculate the acceleration 'a' adding eq. (i) and (ii) we get:* $m_1 a = m_1 g - \cancel{T}$ $m_2 a = \cancel{T} - m_2 g$ $m_1 a + m_2 a = m_1 g - m_2 g$ $a(m_1 + m_2) = (m_1 - m_2) g$ $a = \frac{(m_1 - m_2)g}{(m_1 + m_2)}$ *This is required expression of acceleration.* ***Calculation of "T":*** *Tension in the string can be calculated by dividing Eq.(i) by (ii)*	**K**	**M**

		$$\frac{m_1 a}{m_2 a} = \frac{m_1 g - T}{T - m_2 g}$$ $m_1 (T - m_2 g) = m_2 (m_1 g - T)$ $m_1 T - m_1 m_2 g = m_1 m_2 g - m_2 T$ $m_1 T + m_2 T = m_1 m_2 g + m_1 m_2 g$ $T(m_1 + m_2) = 2 m_1 m_2 g$ $$T = \frac{2 m_1 m_2 g}{m_1 + m_2}$$ *This is required expression of tension.*		
6.	State Law of Universal Gravitation. Determine the mass of Earth using Law of Gravitation	**STATEMENT:** "Every body in this Universe attracts every other body with same magnitude of force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them and directed along the line joining their centers". If a body of mass **m** but of very small radius as compare to the radius of earth placed on the earth surface then force with which earth attracts a body is given by: $F = \frac{G m M_e}{R_e^2}$ .... **Eq. (i)** The force with which earth attracts a body towards its centre is equal to the weight of the body. Mathematically it can be expressed as: $F = m g$ ..... ***Eq. (ii)***  *Comparing Eq. (i) and Eq. (ii) we get:* $\frac{G m M_e}{R_e^2} = m g$ $M_e = \frac{\not{m}\, g R_e^2}{\not{m}\, G}$ $M_e = \frac{g R_e^2}{G}$ *Here* $G = 6.67 \times 10^{-11} Nm^2/Kg^2$ $R_e = 6.4 \times 10^6 m$ $g = 9.8 m/s^2$ *We put in above* $M_e = \frac{(9.8)(6.4 \times 10^6)^2}{6.67 \times 10^{-11}}$ $M_e = 6 \times 10^{24} Kg$	**U**	**M**
7.	Write down any 02	**NEWTON'S SECOND LAW OF MOTION:**	**U**	**M**

	Newton's law of motion. Explain with example	**STATEMENT:** "When a force acts on an object, it produces acceleration in its own direction, which is directly proportional to the magnitude of the force & inversely proportional to the mass of an object." **EXPLANATION:** If 'F' is the force acts on an object of mass 'm' and 'a' is the acceleration then mathematically $F \alpha a$ $F = ma$ **NEWTON'S THIRD LAW OF MOTION:** **STATEMENT:** *"To Every action, there is an equal and opposite reaction."* **EXPLANATION:** *When a body A exerts a force on other body B then the body B exerts an equal and opposite force on body A then mathematically Newton's third law of motion is given by* $\vec{F}_{Action} = - \vec{F}_{Reaction}$		
8.	Define Boyles law, Charles law and derive general gas equation?	*There are two ideal gas laws. Boyle's law and Charles law* ***BOYLE'S LAW*** ***Introduction:*** *In **1660, Robert Boyle** studied the relation between the volumes and pressure at constant temperature and he stat that* ***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:*  $V \propto \frac{1}{P}$ $V = \frac{K}{P}$ $PV = K$ *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."* **GRAPHICAL REPRESENTATION:**	**R**	**E**

*If we plot graph between pressure and volume then for Boyle's law we obtain a **'Hyperbola'***

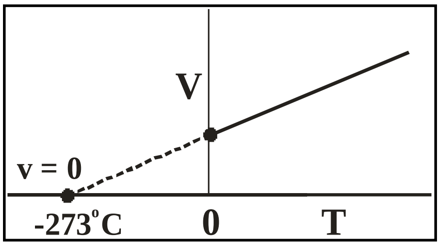
CHARLES LAW

Introduction: *In **1787, Jacques Charles** studied the relation between the volume and temperature at constant pressure.*

Statement: *"At constant pressure and for fix no. of molecule volume is directly proportional to the absolute 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 absolute temperature remain constant"

GRAPHICAL REPRESENTATION:

*If we plot graph between temperature and volume then for Charles law we obtain a 'Straight line'. If we extend graph between volume and temperature then we notice that volume of gas become zero at **-273℃**. This temperature is called **Zero Kelvin or Absolute Zero***

Ideal gas equation is a single relation into which Boyle's law, Charles law and Avogadro's law can be combined

According to Boyle's Law volume is inversely proportional to the pressure

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

According to Charles law volume is directly proportional to the absolute temperature.

$$V \propto T$$

According to Avogadro's law volume is directly proportional to the no. of mole.

$$V \propto n$$

Combining these three laws we get

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

		$$V = \frac{R\,n\,T}{P}$$ ***P V = n R T*** *Where **R** is the constant of proportionality and it is known as universal gas constant or molar gas constant or combine gas constant. In **SI System** its value is **8.314 J/mol k.***		