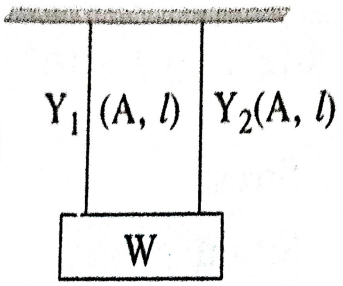
NEW STANDARD ACADEMY

Marks: 60

Date : 03-10-25 **CLASS : 11TH** **Time: 3 hours.**

PHYSICS

1. A uniform steel wire of length 2 m and area of cross-section 1mm ^{2} is stretched through 3 mm. If the extension is with in elastic limit, find the elastic potential energy and energy density of the wire. Young's modulus for steel is 2×10^{11} Nm^{-2}.
2. A metal wire of length 2 m under a given load is elongated through 2 mm. Find the change in diameter of the wire if the original diameter is 1 mm. Take Poisson's ratio = 0.24
3. A solid brass sphere of volume 0.1 m ^{3} is brought in the deep sea water. If the pressure on the brass sphere is 2×10^8 N m $^{-2}$, find the change in volume of the sphere. Bulk modulus of elasticity of water is 6×10^{10} N m^{-2}.
4. The fractional compression of water in the ocean at a certain depth is 1.36 %. If the bulk modulus of elasticity of water is 2.2×10^9 Nm $^{-2}$,find the depth of ocean at that place. Given, density of water in the ocean $= 1.03 \times 10^3$ kg m^{-3} and g = 9.8 m s^{-2}
5. A pressure of 20 atmosphere is applied on 10^4 c m ^{3} of water. Find the % age change in volume of water. Given the compressibility of water = 5×10^{-10} N^{-1} m ^{2} , density of mercury = 13600 kg m^{-3} g = 9.8m s^{-2} and 1 atmosphere = 76 cm of mercury.
6. Two wires of same material are subjected to forces in the ratio 1: 3. Their lengths are in the ratio 5: 1 and diameters in the ratio 4: 1. Find the ratio of extensions produced in the two wires.
7. Two wires of equal lengths and cross-sectional area are suspended as shown in figure. The Young's modulii of wires are $Y_1 = 2 \times 10^{11}$ Pa and 9×10^{10} Pa respectively. Find the equivalent Y.



8. A copper wire of length 2.2 m and a steel wire of length 1.6 m, both of diameter 3.0 mm are connected end to end. When stretched by a load, the net elongation is found to 0.70 mm. Obtain the load applied. Y for steel is 2×10^{11} N m $^{-2}$ and for copper is 1.1×10^{11} Nm $^{-2}$.
9. A structural steel rod has a radius of 10 mm and a length of 1.0 m. A 100 kN force stretches it along its length. Calculate (a) stress, (b) elongation and (c) strain on the rod. Young's modulus, of structural steel is 2.0×10^{11} N m $^{-2}$.
10. A wire increases by 1.5×10^{-3} of its length when a stress of 3.0×10^8 N m^{-2} appears in it. What is Young's modulus of material of the wire ?

CHEMISTRY

1. Increase in internal energy of a system is 350 J. It does work of 700 J on the surroundings. How much heat the system needs ?
2. Two litre N_2 gas at O°C and 5 atm are expanded isothermally and irreversibly against a constant pressure of one atm until the pressure of the gas reaches one atm. Calculate the work of expansion.
3. Heat of combustion of benzene in bomb calorimeter is found to be 3263.9 kJ mol^{-1} at 298 K. Calculate the heat of combustion at constant pressure.
4. Enthalpy of combustion of C, H_2 and C_2H_6 is -394, -286 and-1560 kJ. Enthalpy of formation of C_2H_2 is 227 kJ. Calculate the enthalpy change for the hydrogenation of C_2H_2 to C_2H_6
5. an organic compound (molar mass 114 amu) on oxidation in bomb calorimeter increases the temperature from 300 K to 306.73 K. The heat capacity of the calorimeter is 8.93 kJ/K. Calculate the enthalpy of oxidation of organic compound.
6. Specific heat of water is 4.18 JK^{-1} g^{-1}. If the heat absorbed by the apparatus is negligible, calculate the heat liberated when following solutions are mixed together. Also calculate the rise in temperature. Given that heat of neutralisation of a strong base and strong acid is 57 kJ/mol.

(a) 100 mL of 0.1 M HCl and 50 mL of 0.2 M KOH
(b) 100 mL of 0.1 N H_2SO_4 and 100 mL of 0.2 M KOH
(c) 170 mL of 0.1 M H_2SO_4 and 50 mL of 0.4 M NaOH.

7. For the reaction $Zn + 2H^+ = Zn^{2+} + H_2(g)$ the value of ΔH is -154.4 kJ/mol. Due to the formation of 1 mole H_2 gas, system expands to 22.4 litre at 1 atm pressure, calculate ΔU.
8. A player takes 100 g of glucose which gives 1560 kJ energy. The 50% of the energy is used up by the body. Enthalpy of evaporation of water is 44 kJ/mol. How much water should the player sweat out so that no energy is stored in the body?
9. A heated metal at 403 K loses 340 J of heat to the surroundings at 305 K. Calculate the total entropy change in the universe. Assume that temperature of the metal and surrounding remain constant.
10. Calculate the free energy change and entropy change per mole when water boils against one atm pressure. For water $\Delta_{Vap}H = 2.0723KJ/g$

BIOLOGY

1. Explain the process of exchange of gases between alveoli and blood.
2. Describe the mechanism of breathing in humans (inspiration and expiration).
3. What are the differences between breathing and respiration?
4. Write the pathway of air from the external nostrils to the alveoli.
5. Explain the transport of oxygen in human blood.
6. Explain the transport of carbon dioxide in human blood.
7. What is the role of hemoglobin in respiration? How does it help in oxygen transport?
8. Define tidal volume, vital capacity, and residual volume. Explain their significance.
9. What is the oxygen Haemoglobin dissociation Curve Explain it?
10. Describe the regulation of respiration by the respiratory centers in the brain.

MATHS

1. Write down the equation of the line whose slope is $\frac{3}{2}$ and which passes through P where P divides the line segment joining A(-2, 6) and B (3, -4) in the ratio 2: 1.
2. A straight line passing through the point A(2, 3) has inclination 45° and intersects the line 2x-3y +9 = 0 at point P. Find the distance AP.
3. A line passes through the point (2, 2) and is perpendicular to the line 3x + y = 3 Find its y-intercept.
4. (i) Find the image of the point (1, 2) in the line x - 3y + 4 = 0 assuming the line to be a plane mirror.
   (ii) Find the reflection of the point (4,-13) in the line 5x + y + 6 = 0 .
5. The value of λ with $|\lambda| < 16$ such that $2x^2 - 10xy + 12y^2 + 5x + \lambda y - 3 = 0$ represents a pair of straight lines, is
6. The point A(sin θ, cos θ) is 3 units away from the point B (2 cos75°, 2 sin75°). If $0° \leq \theta < 360°$, then θ is.
7. The number of rational values of m for which the y-coordinate of the point of intersection of the lines 3x + 2y = 10 and x = my + 2 is an integer is
8. If the vertices of a quadrilateral are given by $(x^2 - 4)^2 + (y^2 - 9)^2 = 0$ then area of quadrilateral is.
9. If m_1 and m_2 are the roots of the equation $x^2 + (\sqrt{3} + 2)x + \sqrt{3} - 1 = 0$ then the area of the triangle formed by the $y = m_1x$, $y = m_2x$ and $y = 2$ is
10. One side of a rectangle lies along the line 4x + 7y + 5 = 0. Two of its vertices are (-3, 1) and (1, 1). Find the equations of the other three sides.