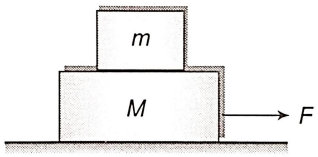
NEW STANDARD ACADEMY

Marks: 90

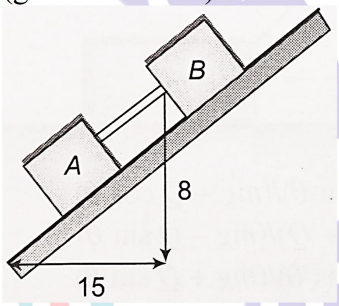
Date : 20-08-24 **CLASS : 11TH JEE** **Time: 3 HRS**

PHYSICS

1. A block slides with velocity of 10 m/s on a rough horizontal surface. It comes to rest after covering a distance of 50 metres. If g is 10m /sec^2 then the coefficient of dynamic friction between the block and the surface is
   (a) 0.1 (b) 1
   (c) 10 (d) 5
2. A heavy uniform chain lies on a horizontal table top. If the coefficient of friction between the chain and the table surface is 0.25, then the maximum fraction of the length of the chain that can hang over one edge of the table is
   (a) 20% (b) 25%
   (c) 35% (d) 15%
3. A block of mass m is placed on another block of mass M which itself is lying on a horizontal surface. The coefficient of friction between two blocks is μ_1 and that between the block of block M and horizontal surface is μ_2. What maximum horizontal force can be applied to the lower block so that the two blocks move without separation?



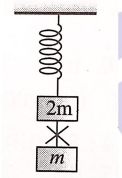
   (a) (M + m)(μ_2 - μ_1) g
   (b) (M - m)(μ_2 - μ_1) g
   (c) (M - m)(μ_2 + μ_1) g
   (d) (M + m)(μ_2 + μ_1) g
4. A horizontal force, just sufficient to move a body of mass 4 kg lying on a rough horizontal surface, is applied on it. The coefficient of static and kinetic friction between the body and the surface are 0.8 and 0.6 respectively. If the force continues to act even after the block has started moving, the acceleration of the block in m/s^2) is (g = 10m / s^2).
   (a) ¼ (b) 1/2
   (c) 2 (d) 4
5. Blocks A and B in the figure are connected by a bar of negligible weight. Mass of each block is 170 kg and μ_A = 0.2 and μ_B = 0.4 where μ_A and μ_B are the coefficients of limiting friction between blocks and plane, calculate the force developed in the bar (g= 10m /sec^{nb})



   (a) 150 N (b) 75 N
   (c) 200 N (d) 250 N
6. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m. If a force P is applied at the free end of the rope, the force exerted by the rope on the block is
   (a) $\frac{PM}{M+m}$
   (b) $\frac{Pm}{M+m}$
   (c) $\frac{PM}{M-m}$
   (d) P
7. A machine gun fires a bullet of mass 40 g with a velocity of 1200 m/s. The man holding it can exert a maximum force of 144 N on the gun. How many bullets can he fire per second at the most?
   (a) two (b) four
   (c) one (d) three
8. A light string passing over a smooth light pulley connects two blocks of masses $m_1$and m_2 (vertically). If the acceleration of the system is g / 8 then the ratio of the masses is

(a) 8:1 (b) 9:7
(c) 4:3 (d) 5:3

9. A particle of mass 0.3 kg is subjected to a force F = - kx with k = 15N / m What will be its initial acceleration if it is released from a point 20 cm away from the origin?
(a) 5 m / s^2 (b) 10m / s^2
(c) 3m / s^2 (d) 15m / s^2
10. A player caught a cricket ball of mass 150 g moving at a rate of 20 m/s. If the catching process is completed in 0.1 s, the force of the blow exerted by the ball on the hand of the player is
(a) 30 N (b) 300 N
(c) 150 N (d) 3 N
11. A ball of mass 0.2 kg is thrown vertically upward by applying a force by hand. If the hand moves 0.2 m while applying the force and the ball goes up to 2 m height further, find the magnitude of the force. Consider g = 10m/s^2
(a) 20 N (b) 22 N
(c) 4 N (d) 16 N
12. System shown in the figure is in equilibrium and at rest. The spring and string are massless, now the string is cut The acceleration of mass 2 m and m just after string is cut will be



(a) g/2 upwards, g downwards
(b) g upwards, g/2 downwards
(c) g upwards, 2g downwards
(d) 2g upwards, g downwards
13. A piece of wire is bent in the shape of a parabola $y = kx^2$ (-axis vertical) with a bead of mass m on it. The bead can slide on the wire without friction. It stays at the lowest point of the parabola when the wire is at rest. The wire is now accelerated parallel to the x-axis with a constant acceleration a. The distance of the new equilibrium position of the bead, where the bead can stay at rest with respect to the wire, from the y-axis is
(a) a/gk (b) a/2gk
(c) 2a/8k (d) a/4gk
14. A car is moving in a circular horizontal track of radius 10 m with a constant speed of 10ms^{-1} A plumb bob is suspended from the roof of the car by a light rigid rod. The angle made by the rod with the vertical is
(a) Zero (c) 45°
(b) 30° (d) 60°
15. The pulleys and strings shown in the figure are smooth and of negligible mass. For the system to remain in equilibrium, the angle theta should be
(a) 0° (b) 30°
(c) 45° (d) 60°

CHEMISTRY

1. Enthalpy of solution of NaOH (solid) in water is - 4.16 kJ mol^{-1}. When NaOH is dissolved in water, the temperature of water
(a) Increase
(b) Decreases
(c) Does not change
(d) Fluctuates indefinitely
2. The equation $\frac{1}{2}H_2 + \frac{1}{2}Cl_2 \rightarrow$ HCI (ΔH_{298} = -22060 kcal) means
(a) The heat absorbed when one gram molecule of HCI is formed from its elements at 25°C is 22.060 kcal.
(b) The heat given out when one gram molecule of HCI is formed from its elements at 298 K is 22.060 kcal
(c) The heat absorbed when one atom of hydrogen reacts with one atom of chlorine to form one molecule of HCI at 250°C and one atmospheric pressure is 22.060 kcal
(d) The heat absorbed when one gram equivalent of HCI is formed from its elements at 298 K is 22.060 kcal
3. When 50cm^3 of 0.2N H_2SO_4 is mixed with 50cm^3 of 1 N KOH, the heat liberated is
(a) 11.46 kJ (b) 57.3 kJ
(c) 573 kJ (d) 573 J
4. For the reaction
$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$ ΔH= - 2858kJmol^{-1} ΔS = - 0.163kJ mol^{-1} K^{-1}
What is the value of free energy change at 27°C for the reaction?
(a) – 2369kJmol^{-1} (b) - 2814kJmol^{-1}
(c) - 3347kJmol^{-1} (d) 3347kJmol^{-1}
5. Gibb's free energy G, enthalpy H and entropy S are interrelated as in

(a) G = H + TS
(b) G = H - TS
(c) G - TS = H
(d) G = S = H

6. Calculate ΔH in kJ for the following reaction:

$C(g) + O_2(g) \longrightarrow CO_2(g)$

Given that,

$H_2O(g) + C(g) \longrightarrow CO(g);\ \Delta H = +131\ kJ$

$CO(g) + \frac{1}{2}O_2(g) \longrightarrow CO_2(g);\ \Delta H = +282\ kJ$

$H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(g);\ \Delta H = -242\ kJ$

(a)-393 (b) +393
(c) +655 (d)-655

7. For the reaction $CH_3COOH\ (l) + 2O_2(g) \rightleftharpoons 2CO_2(g) + 2H_2(g) + 2H_2O(l)$ at 25°C and 1 atm pressure, ΔH = - 874kJ Then the change in internal energy (ΔE) is
(a) - 874 kJ
(b) -871.53 kJ
(c) -876.47 kJ
(d) + 874 kJ

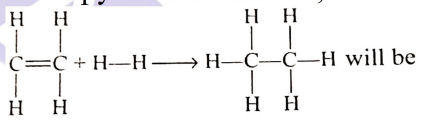
8. For a hypothetical reaction A→B, the activation energies for forward and backward reactions are 19 kJ/mole and 9 kJ/mole respectively. The heat of reaction is
(a) 28 kJ
(b) 19 kJ
(c) 10 kJ
(d) 9 kJ

9. Enthalpy (H) is equal to
(a) Internal energy (E)
(b) Product of pressure (P) and volume (V) of gas
(c) Internal energy (E) + PV
(d) Work (W) done by a system

10. The standard heat of formation in kcal mol^{-1} of $NO_2(g)$ and $N_2O_4(g)$ are 8.0 and 2.0 respectively. The dimerization of NO_2 in kcal is $2NO_2(g) = N_2O_4(g)$
(a) 10.0
(b) -6.0
(c)-12.0
(d) - 14.0

11. The difference between heats of reaction at constant pressure and at constant volume for the reaction $2C_6H_6(l) + 15O_2(g) \rightarrow 12CO_2(g) + 6H_2O(l)$ at 8°C in kJ is
(a) -7.43
(b) +3.72
(c) -3.72
(d) +7.43

12. From the following bond energies:
H-H bond energy: 431.37kJmol^{-1}
C= C bond energy: 606.1kJmol^{-1}
C-C bond energy: 336.49kJmol^{-1}
C-H bond energy: 410.5kJmo l^{-1}
Enthalpy for the reaction,



a) 1523.6kJmol^{-1}
(b) - 243.6kJmol^{-1}
(c) - 120kJmol^{-1}
(d) 553kJmol^{-1}

13. An engine operating between 150°C and 8°C takes 500 J heat from a higher temperature reservoir if there are no frictional losses, then work done by engine is
(a) 147.7 J (b) 157.75 J
(c) 165.85 J (d) 169.95 J

14. 2.2016 g of acetaldehyde produced 13.9 kcal of heat on combustion in O_2 Calculate the heat of combustion of CH_3COOH will be.
(a) 279 kcal
(b) 972 kcal
(c) 27.9 kcal
(d) 2.79 kcal

15. Given that
$H_2O(l) \rightarrow H^+(aq) + OH^-(aq);\ \Delta H = 57.32kJ$
$H_2(g) + 1/2\ O_2(g) \rightarrow H_2O(l)\ \Delta H = -286.02kJ$
Then calculate the enthalpy of formation of OH at 25 °C
(a) -228.8 kJ
(b) -343.52 kJ
(c) + 228.8 kJ
(d) + 343.52 kJ

MATHS

1. Total number of values of a so that $x^2 - x - a = 0$ has integral roots, where a \in N and $6 \leq a \leq 100$ is

(a) 2 b) 8

(b) 4 c) 6

2. Let α and β be the roots of the equation $x^2 - 2x + 3 = 0$. Then the equation whose roots are $P = \alpha^3 - 3\alpha^2 + 5\alpha - 2$ and $Q = \beta^3 - \beta^2 + \beta + 5$ is
   (a) $x^2 + 3x + 2 = 0$
   (b) $x^2 - 3x - 2 = 0$
   (c) $x^2 - 3x + 2 = 0$
   (d) none of these
3. If $x^2 - hx - 21 = 0$ and $x^2 - 3hx + 35 = 0 (h > 0)$ have a common root, then the value of h is equal to
   (a) 1 (b) 2
   (c) 3 (d) 4
4. If α and β the roots of the equation $2x^2 - 35x + 2 = 0$ then the value of $(2\alpha - 35)^3 (2\beta - 35)^3$ is
   (a) 1 (b) 64
   (c) 8 (d) none of these
5. If α and β are roots of the equation $x^2 + x + 1 = 0$ then the value of $\alpha^{16} + \beta^{16}$ is
   a) 0 (b) 1
   (c) -1 (d) 2
6. If $x,y \in R$ satify the equation $x^2+y^2-4x-2y+5=0$ then the value of the expression $\frac{(\sqrt{x}-\sqrt{y})^2+4\sqrt{xy}}{+x\sqrt{xy}}$ is
   (a) $\sqrt{2}+1$ (b) $\frac{\sqrt{2}+1}{2}$
   (c) $\frac{\sqrt{2}-1}{2}$ (d) $\frac{\sqrt{2}+1}{\sqrt{2}}$
7. If the roots of the equation $ax^2 - 4x + a^2 = 0$ are imaginary and the sum of the roots is equal to their product, then a is
   (a) -2 (b) 4
   (c) 2 (d) none of these
8. If $\alpha \neq \beta$, $\alpha^2 = 5\alpha - 3$, and $\beta^2 = 5\beta - 3$, then the equation having α/β and β/α as its roots is
   (a) $3x^2 - 19x + 3 = 0$
   (b) $3x^2 + 19x - 3 = 0$
   (c) $3x^2 - 19x - 3 = 0$
   (d) $x^2 - 5x + 3 = 0$
9. If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is
   (a) 49/4 (b) 4
   (c) 3 (d) 12
10. If both the roots of the quadratic equation $x^2 - 2kx + k^2 + k - 5 = 0$ are less than 5, then k lies in the interval
    (a) (5,6] (b) $(6, \infty)$
    (c) $(-\infty, 4)$ (d) [4, 5]
11. The number of distinct real roots of the equation $|x||x + 2| - 5|x + 1| - 1 = 0$ is
12. The number of solutions of $\sin^2 x + (2 + 2x - x^2) \sin x - 3 (x - 1)^2 = 0$ where $-\pi \leq x \leq \pi$ is
13. Let $S = \{x \in R: (\sqrt{3} + \sqrt{2})^x + (\sqrt{3} + \sqrt{2})^x = 10\}$. Then the number of elements in S is:
14. If a and b are positive number and each of the equation $x^2 + ax + 2b = 0$ and $x^2 + 2bx + a = 0$ has real roots, then the smallest possible value of of (a +b) is____
15. Let α_1, β_1 be the roots of $x^2 - 6x + p = 0$ and α_2, β_2 be the roots of $x^2 - 54x + q = 0$. If $\alpha_1, \beta_1, \alpha_2, \beta_2$ from an increasing G.P., then sum of digit of the value of (q-p) is____