# Sri Chaitanya IIT Academy, India

A.P, TELANGANA, KARNATAKA, TAMILNADU, MAHARASHTRA, DELHI, RANCHI

A right Choice for the Real Aspirant

ICON CENTRAL OFFICE, MADHAPUR-HYD

| Sec: Sr.IPLCO | JEE–ADVANCE | Date: 16-08-15 |
|---|---|---|
| Time: 3 Hours | 2012-P1-Model | Max Marks: 210 |

## PAPER-I

## KEY & SOLUTIONS

**PHYSICS**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **D** | 2 | **B** | 3 | **A** | 4 | **B** | 5 | **D** | 6 | **C** |
| 7 | **C** | 8 | **A** | 9 | **B** | 10 | **D** | 11 | **ABCD** | 12 | **AB** |
| 13 | **BD** | 14 | **ACD** | 15 | **AB** | 16 | **1** | 17 | **1** | 18 | **6** |
| 19 | **7** | 20 | **4** | | | | | | | | |

**CHEMISTRY**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | **B** | 22 | **A** | 23 | **C** | 24 | **A** | 25 | **A** | 26 | **C** |
| 27 | **D** | 28 | **C** | 29 | **D** | 30 | **C** | 31 | **BD** | 32 | **ABCD** |
| 33 | **BD** | 34 | **BCD** | 35 | **BCD** | 36 | **6** | 37 | **5** | 38 | **4** |
| 39 | **4** | 40 | **2** | | | | | | | | |

**MATHS**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | **D** | 42 | **B** | 43 | **D** | 44 | **B** | 45 | **C** | 46 | **B** |
| 47 | **B** | 48 | **C** | 49 | **C** | 50 | **D** | 51 | **A,B,C,D** | 52 | **A,C** |
| 53 | **B,C** | 54 | **A,B,C** | 55 | **A,B,C,D** | 56 | **8** | 57 | **0** | 58 | **1** |
| 59 | **4** | 60 | **2** | | | | | | | | |

# PHYSICS

1. $\frac{1}{2}mV^2 = mg\ell(\cos\theta - \cos\theta_o)$

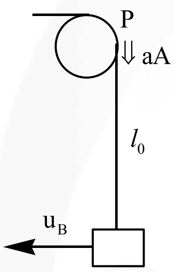
$\therefore a_r = V^2/\ell = 2g(\cos\theta - \cos\theta_o)\ \&\ a_t = g\sin\theta$.

$a_{min} \Rightarrow \frac{da}{d\theta} = 0 \Rightarrow \theta = 37^o$

2. As the rope is pulled down, positive work is done on the rope by the external agent. Hence gravitational potential energy must continuously increase.

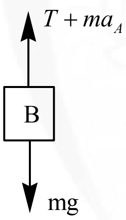
3. 


$T = ma_A$




Point 'P' on the string has an acceleration of $a_A(\downarrow)$

$\therefore$ w.r.t P,

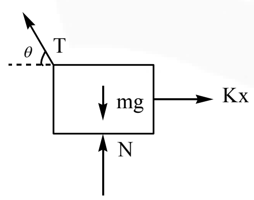



$T + ma_A - mg = \frac{mu_B^2}{\ell} \Rightarrow T = mg$

$\therefore a_B$=zero

5. $W_{net} = -\Delta U$, independent of path

6.




When the block B looses contact with the ground,

$$Kx = T\cos\theta\ \&\ T\sin\theta = mg \Rightarrow x = \frac{mg}{k\tan\theta} = \frac{60}{k}$$

Now, using work energy theorem, $Fx = \frac{1}{2}Kx^2$

$F = 30N$.

7. $P = -mg\,\mu_y = -mg\left(u\sin\theta - gt\right)$

8. $Mgh = \frac{1}{2}k\left[\left(x_0 + 2h\right)^2 - x_0^2\right]$

9. loss in $KE : \frac{1}{2}m\left(4\right)^2$ is corresponding to loss in KE in the first 4m with initial speed 5m/s. i.e.$\frac{1}{2}m\left(5^2 - 3^2\right)$.

10. Before the brakes are applied, acceleration of the bicycle is $\mu g$ towards the centre of the circular track. When the tyres are stopped rotating, the bicycles skids tangentially on the track due to inertia of motion. Then the acceleration will be $\mu g$ oppositive to velocity (tangential)

11. Let dx be the change in length of spring in 'dt' interval. Then in the same interval

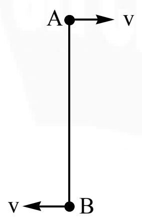
$dS_A = \frac{2}{3}dx(\leftarrow) \Rightarrow W_{M,S} = +\int (kx)\left(\frac{2}{3}dx\right)$

$dS_B = \frac{1}{3}dx(\rightarrow) \Rightarrow W_{W,S} = +\int (kx)\left(\frac{1}{3}dx\right)$

$dS_{trolley} = \frac{1}{3}dx(\leftarrow) \Rightarrow W_{M,T} = -\int (kx)\left(\frac{1}{3}dx\right)$

$W_{spring} = \frac{1}{2}k\left(x_i^2 - x_f^2\right)$

12. At ever instant, the components of net force along the horizontal is the same for both the balls (opposite direction).




$\therefore$ $a_A = 0$ (No horizontal force)

& $2\times\frac{1}{2}mV^2 = mg\ell$

w.r.t 'A' (initial at this instant), $V_{BA} = 2V$

$a_B = a_{B,A} = \frac{(2V)^2}{\ell} = 4g \Uparrow$

$\therefore T=5mg$

13. Until the upper ball leaves contact with wall, its horizontal acceleration is zero. The contact forces in the system vary gradually. At the instant, the upper ball leaves contact, $N_{wall}=0$. Hence $T_{rod}=0$ $[\because a_{Horizontal}=0]$

$\therefore a_{lower\,ball}=0$, $\therefore a_{upper\,ball}=g\Downarrow$

14. $N=m\left(g\cos\theta+a_0\sin\theta\right)$

$W_N=N\sin\theta\times S\left(t=0\,to\,1s\right)$

$W_f\,/\,total=-\mu N\times S_{rel}$

$\Delta E=W_f\,/\,total$

16. $F_x=\frac{-\partial U}{\partial x}, Fy=\frac{-\partial U}{\partial y}, a_n=\left|\vec{a}.\hat{r}\right| \,\&\, a_t=\sqrt{a^2-a_n^2}$

17. [W=0 as point of application of f on the board is not moving].

18. Extension is independent of frame of reference. Solve it with respect to free and of the spring, which is inertial use conservation of mechanical energy.

19. use conservation of energy.

20. centrefugal force is independent of motion of particle and location of observer.