LEADER & ACHIEVER COURSE

PHASE : MLM,N,R,S,MAZI,L,T,U,M2AP1A, M2AP1B, M4AA2A
TARGET : PRE-MEDICAL 2020

Test Type : **MAJOR** Test Pattern : NEET(UG)

TEST DATE : 24 - 02 - 2020

TEST SYLLABUS : 02

HINT – SHEET

1. Work done does not depend on time.

3. $_{Z}X^{A} \longrightarrow {}_{Z-2}X^{A-4} + {}_{2}He^{4}$

$\vec{P}_i = \vec{P}_f$

$0 = (A-4)\,\vec{v}_1 + 4\vec{v}$

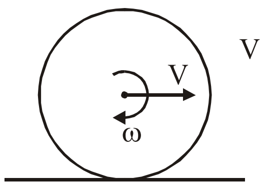
$\vec{v}_1 = -\dfrac{4\vec{v}}{A-4}$

So relative velocity of separation

$= v + v_1$

$= v + \dfrac{4v}{A-4} = \dfrac{Av}{A-4}$

4. $L = MVR + \left(\dfrac{2}{3}MR^2\right)\left(\dfrac{V}{R}\right)$



$V = \omega R$

$= \dfrac{5}{3}MVR$

5. Given that; $T_A = 8T_B$

According to Kepler's law : $T^2 \propto R^3$

$\dfrac{T_A^2}{T_B^2} = \dfrac{R_A^3}{R_B^3}$

or $\dfrac{(8T_B)^2}{T_B^2} = \dfrac{R_A^3}{R_B^3}$

$\therefore$ $R_A = 4R_B$

6. $W = \dfrac{1}{2}k(x_2^2 - x_1^2) = \dfrac{1}{2}\times 800 \times (15^2 - 5^2)\times 10^{-4}$

$= 8$ J

7. $\theta = \omega_0 t + \dfrac{1}{2}\alpha t^2$

$\theta_1 = \dfrac{1}{2} \times \alpha \times (2)^2 = 2\alpha$

$\theta_1 + \theta_2 = \dfrac{1}{2}\alpha \times (4)^2 = 8\alpha$

$\boxed{\theta_2 = 6\alpha}$ $\dfrac{\theta_2}{\theta_1} = \dfrac{6\alpha}{2\alpha} = \dfrac{3}{1}$

8. $\vec{P}_i = \vec{P}_f$

$0 = -2P\hat{i} + P\hat{j} + \vec{P}$

$\vec{P} = -2P\hat{i} - P\hat{j}$

$|P| = \sqrt{4P^2 + P^2} = \sqrt{5}P$

9. $\dfrac{KE_R}{KE_T} = \dfrac{1}{1+\dfrac{K^2}{R^2}}$

10. $\Delta L = \dfrac{WL}{2AY} = \dfrac{\rho ALgL}{2AY} = \dfrac{\rho g L^2}{2Y}$

11. $w = \int \vec{F}.\overrightarrow{ds}$

$w = \int x^2 dy + \int y dx$

$w = \int_0^1 y^2 dy + \int_0^1 x dx$ (as x = y)

$w = \frac{5}{6} J$

12. $KE = \frac{1}{2}mv^2 = \frac{p^2}{2m}$ ....(1)

$\frac{mv^2}{r} = f_{cp}$ ....(2)

13. $\text{Loss in K.E.} = \frac{m_1 m_2}{2(m_1 + m_2)}(u_1 - u_2)^2$

$= \frac{4 \times 6}{2 \times 10} \times (12 - 0)^2 = 172.8 \text{ J}$

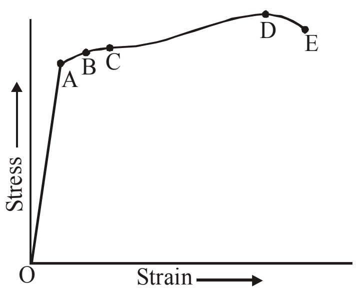
14. $\frac{1}{2}mv^2\left[1 + \frac{K^2}{R^2}\right] = mgh$

$v^2\left[1 + \frac{1}{2}\right] = 2gh$

$h = \frac{3}{4}\frac{v^2}{g}$

15. In the region OA, the graph is linear showing that stress is proportional to the strain. Is proportional to the strain. Thus, in this region Hooke's law is obeyed.

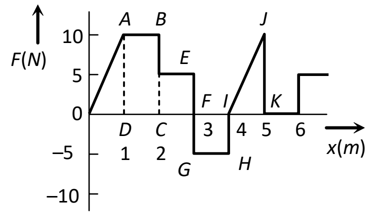
The point D on the graph is known as ultimate tensile strength.



The point E on the graph is known as fracture point.

16. Work done = area under F-x graph

= area of rectangle ABCD + area of rectangle LCEF + area of rectangle GFIH + area of triangle IJK



$= (2-1) \times (10-0) + (3-2)(5-0) + (4-3)(-5-0)$

$+ \frac{1}{2}(5-4)(10-0) = 15 \text{ J}$

17. $v = \sqrt{rg\frac{\tan\theta + \mu}{1 - \tan\theta(\mu)}}$

$= \sqrt{10^4\left[\frac{1+0.5}{1-0.5}\right]}$

$= 100\sqrt{3}$

18. $\vec{v}_2 = \left(\frac{m_2 - m_1}{m_1 + m_2}\right)\vec{u}_2 + \frac{2m_1\vec{u}_1}{m_1 + m_2}$

Here $m_1 = m$, $m_2 = 3m$, $\vec{u}_1 = ui$ and $\vec{u}_2 = 0$

19. $F_{12} = F_{21}$

$M_1 a_1 = M_2 a_2$

$\frac{a_2}{a_1} = \frac{M_1}{M_2}$

20. Conceptual

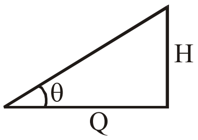
21. According to the law of conservation of energy,

$\frac{1}{2}mu^2 = \frac{1}{2}\left(\frac{1}{2}mu^2\right) + mgh$

$\Rightarrow$ 490 = 245 + 5 × 9.8 × h

$h = \frac{245}{49} = 5m$

22.



$$\tan\theta = \frac{X^2}{pg} = \frac{H}{Q}$$

$$H = \frac{QX^2}{Pg}$$

23. $\omega = \omega_0 + \alpha t$

$$\omega = 0 + \frac{1000}{200}\times 3 = 15 \text{ rad/s} \qquad (\because \alpha = \frac{\tau}{I})$$

25. By Bernaulli's theorem

$$3\times10^5 + \frac{1}{2}\rho v^2 = 3.5\times10^5 + 0$$

$v = 10$ m/s

26. $P = F.v = mgv = 500 \times 10 \times 0.4$ W

$= 2000$ W

$$= \frac{2000}{750}\text{hp} = \frac{8}{3}\text{ hp}$$

27. Normal reaction at the highest point

$$R = \frac{m\upsilon^2}{r} - mg$$

Reaction is inversely proportional to the radius of the curvature of path and radius is minimum for path depicted in (a).

28. $I_{\text{hollow sphere}} > I_{\text{other body}}$

29. $$g' = g\left(\frac{R}{R+h}\right)^2 = g\left(\frac{R}{R+\frac{R}{2}}\right)^2 = \frac{4}{9}g$$

$$\therefore\ W' = \frac{4}{9}\times W = \frac{4}{9}\times 72 = 32N$$

30. $V = \frac{4}{3}\pi r^3$, $A = 4\pi r^2 = \frac{3V}{r}$

$$W = AT = \frac{3V}{r}T$$

$$2V = \frac{4}{3}\pi R^3$$

$$2\left(\frac{4}{3}\pi r^3\right) = \frac{4}{3}\pi R^3$$

$(2)^{1/3}\, r = R$

$A_0 = 4\pi R^2$

$= 4\pi r^2 (2)^{2/3}$

$$W_0 = A_0T = \frac{3V}{r}(2)^{2/3}T$$

$= W\,(4)^{1/3}$

31. $U_2 = (2x^2 + 3y^3 + 2z)$

$$\Rightarrow\quad \vec{F} = -\left(\frac{\partial U}{\partial x}\hat{i} + \frac{\partial U}{\partial y}\hat{j} + \frac{\partial U}{\partial z}\hat{k}\right)$$

$$= -(4x\hat{i} + 9y^2\hat{j} + 2\hat{k})N$$

So, $\vec{F}_{(1,2,3)} = -(4\hat{i} + 36\hat{j} + 2\hat{k})N$

32. m(0,0) $x_{cm} = \frac{m\times 2L + m\times 2L + m\times L}{5m} = L$

m(2L,0)

m(2L,2L) $y_{cm} = \frac{m\times 2L + m\times 2L + m\times 4L}{5m} = \frac{8L}{5}$

m(0,2L)

m(L,4L)

33. $$I = \frac{ML^2}{12} + M\left(\frac{L}{2} - \frac{L}{3}\right)^2$$

$$= \frac{ML^2}{12} + \frac{ML^2}{36} = \frac{ML^2}{9}$$

34. $\frac{GM_1}{x^2}=\frac{GM_2}{(d-x)^2}\Rightarrow\frac{d-x}{x}=\sqrt{\frac{M_2}{M_1}}$

$\Rightarrow\frac{d}{x}=1+\sqrt{\frac{M_2}{M_1}}\Rightarrow x=\frac{\sqrt{M_1}d}{\sqrt{M_1}+\sqrt{M_2}}$

Now potential $=-\frac{GM_1}{x}-\frac{GM_2}{d-x}$

$=\frac{-G}{d}\left(\sqrt{M_1}+\sqrt{M_2}\right)^2$

35. $P=P_0-\frac{2T}{R}$

$Q=P_0$

$\Delta P=\frac{2T}{R}$ $\{R\cos\theta=r\}$

$=\frac{2T}{r}\cos\theta$

36. $\frac{1}{2}mv^2=mgh$

$v=\sqrt{2gh}=\sqrt{2\times980\times10}$ cm/s

= 140 cm/s = 1.4 m/s.

37. $dm=\lambda\,dx=(1+2x)\,dx$

$x_{cm}=\frac{\int_0^1(dm)x}{\int_0^1 dm}=\frac{\int_0^1 x(1+2x)dx}{\int_0^1(1+2x)dx}=\frac{7}{12}m$

38. Moment of 4N force

$=4\times\frac{20}{100}$ N-m (anti-clockwise)

Moment of 8N force

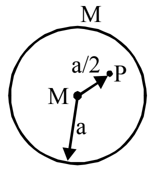
$=8\times\frac{20}{100}\times\sin30°$ N-m (clockwise)

Moment of 9N force $=9\times\frac{20}{100}$ N-m (clockwise)

Moment of 6N force $=6\times\frac{20}{100}\times\sin0°=0$

$\therefore\ \tau=\left(4\times0.2-8\times0.2\times\frac{1}{2}-9\times0.2\right)=-1.8$ N-m

= 1.8 N-m clockwise

39. 

$V_P=-\frac{GM}{a/2}-\frac{GM}{a}=-\frac{3GM}{a}$

40. $E=2[4\pi(4r^2)-4\pi r^2]\,T$

$=24\pi r^2T$

41. momentum half $\rightarrow$ velocity half

so, $\frac{1}{2}m\times V^2=\frac{1}{2}m\times\left(\frac{V}{2}\right)^2+\frac{1}{2}k\times x^2$

$\Rightarrow\ \frac{1}{2}\times1\times(8)^2=\frac{1}{2}\times1\times(4)^2+\frac{1}{2}k\times(3)^2$

$\Rightarrow\ k=\frac{16}{3}N/m$

43. $\tau=31.4=I\alpha=I\times4\pi$

$\therefore\ I=\frac{31.4}{4\pi}=2.5$ kg-m^2

44. A/c to COME

$E_S=E_\infty$

$\frac{1}{2}mV_e^2+\left(\frac{-GMm}{R}\right)=0+0$

$KE=\frac{1}{2}mV_e^2=\frac{GMm}{R}=mgR$

45. $v_T = \frac{2}{9}\frac{(\sigma-\rho)r^2g}{\eta}$

$$\frac{(v_T)_{gold}}{(v_T)_{silver}} = \frac{\sigma_{gold}-\rho}{\sigma_{silver}-\rho} = \frac{19.5-1.5}{10.5-1.5} = \frac{18}{9} = 2$$

$$(v_T)_s = \frac{(v_T)_g}{2} = \frac{0.5}{2} = 0.1 \text{ m/s}$$

47. According to molecular orbital theory

O_2 has bond order is equal to 2 KO_2 has $K^+O_2^-$ ions and O_2^- ion has bond order is equal to 1.5 BaO_2 has $Ba^{+2}O_2^{-2}$ ions and bond order of O_2^{-2} is 1.0

$\because$ Bond length $\propto \frac{1}{\text{Bond order}}$

So order of O–O Bond length will be

$O_2 < KO_2 < BaO_2$

48. BeF_2 :- linear (planar)

PCl_5 :- Trigonal bipyramidal (non-planar)

SF_4 :- See-saw (non - planar)

ClF_3 :- T-shape (planar)

50. He & Li^+ Both have $1S^2$ configuration but Zeff of Li^+ is greater than the thus more I.P.

51.

	XeF_2	IBr_2^{-1}
Valence $e^-s \rightarrow$	$22e^-$	$e^-s \Rightarrow 22e^-$
	(Linear)	(Linear)

52. $LiNO_3 < NaNO < KNO_3 < RbNO_3$

$\because$ Size of cation $\uparrow$

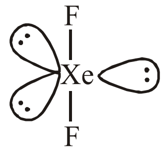
$\therefore$ Polarisation $\downarrow$

$\therefore$ Thermal stability $\uparrow$

54. $CaO \rightarrow$ 50% to 60%

55. Ionic size order :- $\boxed{Li^+ \geq Mg^{+2}}$ due to diagonal relationship.

56. $XeF_2 \rightarrow \begin{bmatrix} lp = 3 \\ \sigma = 2 \end{bmatrix} sp^3d$



57. $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$
Basic Acidic

$LiNO_3 \xrightarrow{\Delta} Li_2O + NO_2 + O_2$
Basic Acidic

$MgCO_3 \xrightarrow{\Delta} MgO + CO_2$
Basic Acidic

$ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2$
Amphoteric Acidic

59. Due to more surface area BP of H_2 is greater than He.

60. $\left[\begin{matrix}\text{Atomic size} \\ \text{OR} \\ \text{Ionic size}\end{matrix} \propto \frac{1}{\text{Zeff}} \propto \frac{\ominus \text{ve charge}}{\oplus \text{ve charge}}\right]$

61. $PH_3 \rightarrow \boxed{B.A \simeq 90°}$ Drago's rule

62. If lattice energy < Hydration energy compound is water soluble

65. Given electronic configuration

[Xe] $6s^2\ 4f^{14}\ 5d^{10}\ 6p^3$

period = n = 6

Block = p

Gp. no $\Rightarrow npe^{\ominus} + 12$

$\Rightarrow 6pe^{\ominus} + 12$

$\Rightarrow 3+12$

$\Rightarrow 15$

$\therefore$ x is $\Rightarrow$ Bi

66. $XeF_{6(s)} \rightarrow \left[XeF_5^{\oplus}\right] + F^{\ominus}$

$XeF_5^{\oplus} \rightarrow \left.\begin{matrix}\ell p = 1 \\ \sigma = 5\end{matrix}\right] sp^3d^2$

67. Latlic energy $\propto$ Charge

68. Due to high IP, be donot ionise in liq. NH_3

70.

(1) $_{29}Cu = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ \underbrace{4s^1}\ 3d^{10}$

partial filled

(2) $_{24}Cr = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ \underbrace{4s^1\ \ 3d^5}$

Both s,d partially filled

(3) $_{26}Fe = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ \underbrace{3d^6}$

only d partially filled

(4) $_{30}Zn = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ \underbrace{4s^2\ \ 3d^{10}}$

both fully filled subshells

71. Bond strength order

[Ion - Ion > Ion - dipole > Dipole - dipole]
Polarity :-

[H_2O > HCl]

72. Solubility of Ionic componed $\propto$ polar solvent

73. NCERT XI, Pg.# 307 (table 10.2), para 2 Pg. # 312-10.10

75. $ns^2\ np^3$ - Half filled stable

- Thus least E.A.

76. According to M.O.T.

B_2 is paramagnetic having bond order is 1

O_2 is paramagnetic having bond order is 2

C_2^{-2} is diamagnetic having bond order is 3

O_2^+ is paramagnetic havig bond order is 25

77. Lattice energy $\propto$ charge

$$\propto \frac{1}{r \rightarrow \text{Inter ionic distance}}$$

order $Al_2O_3 > AlF_3 > NaF > KF$

78. due to basic nature, it absorb CO_2 and due to unstability KO_2 release O_2

80. $P^{\ominus} \xrightarrow{-e^-} P_{(g)} + e^{\ominus}$

– $3p^4$ – partially filled configuration

– $3p^3$ – Half filled stable

P.F to H.F conversion require least energy

81. According to MOT

Bond order of B_2 is 1 $\Rightarrow$ B π B only one π

Bond order of C_2 is 2 $\Rightarrow C \underset{\pi}{\overset{\pi}{=}} C$ 2 π bonds

Bond order of N_2 is 3 $\Rightarrow N \underset{2\pi}{\overset{\sigma}{\equiv}} N$ 1σ, 2π bonds

Bond order of O_2 is 2 $\Rightarrow O \underset{\pi}{\overset{\sigma}{=}} O$ 1σ, 1π bond

84. Atomic size of $\boxed{Li > I}$

and also top $\downarrow$ Bottom in a group Atomic size $\uparrow$ sec

thus order $\Rightarrow$ [Li > I > F < Cl < Br]

85. Since $\left[\underset{(E)}{\text{Energy}} \times \frac{1}{\text{wavelength }(\lambda)}\right]$

$\therefore$ process $O^+ \rightarrow O^{+2}$ requires more energy thus least λ

86. According to M.O.T.

Bond order of Li_2 is 1 so Li_2 exists

Bond order of B_2 is 1 so B_2 exists

Bond order of C_2 is 2 so C_2 exists

Bond order of Be_2 is zero so Be_2 does not exists

87. $Li^+ \geq Mg^{2+}$ (size)

89. size order $\Rightarrow$ III B group

3d – Sc

$\wedge$

4d – Y

$\wedge$

5d – La

33 L.C. effect

6d –AC

90. $\left[EA \propto Zeff \propto \frac{\oplus\text{ve charge}}{\ominus\text{ve charge}}\right]$

$\therefore$ Highest EA $\Rightarrow Li^+$

$\Rightarrow$ (small size & $\oplus$ve charge)

94. NCERT XI, Pg # 146, table 9.3

115. NCERT XI, Pg # 144

124. NCERT XI, Pg # 147, table 9.5

154. NCERT XI, Pg # 149, 9.5(para)

163. NCERT XI, Pg # 147, table 9.4

174. NCERT XI, Pg # 143, table 9.1