SOLUTIONS

PHASE TEST-1

MGZK-1903,1904

AIIMS PATTERN

Test Date: 05-11-2017

Mentors Eduserv: Plot No.-136/137, Parus Lok Complex, Boring Road Crossing,
Patna-1, Ph. No. : 0612-3223680 / 81, 7781005550 / 51

PHYSICS

1. **(2)**

$Nm \rightarrow$ Unit of torque

$mN \rightarrow$ Milli newton $\Rightarrow 10^3 N$

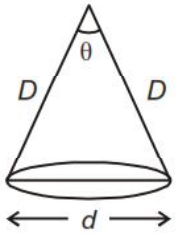
$nm \rightarrow$ Nano metre

$Ns \rightarrow$ Unit of momentum

2. **(3)**

$$\theta = \frac{\text{Arc length}}{\text{Radius}}$$

$$\theta = \frac{d}{D}$$



$$\Rightarrow \boxed{d = D\theta}$$

3. **(1)**

Time span of human life $= 10^9$ s

Age of universe $= 10^{17}$ s

So, $\frac{\text{Age of universe}}{\text{Time of human}} = \frac{10^{17}}{10^9} = 10^8$

If, $\frac{\text{Age of universe}}{100} = 10^8$

$$\Rightarrow \boxed{\text{Age of universe} = 10^{10}\text{ s}}$$

4. **(4)**

3×10^{-3}

3.0×10^{-3}

3.0×10^{-3}

3.00×10^{-3}

So, fourth measurement is most precise.

5. **(2)**

$r = (2.6 \pm 0.1)$cm

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

$$\frac{\Delta V}{V} \times 100\% = \frac{3\Delta r}{r} \times 100\%$$

$$\boxed{\frac{\Delta V}{V} \times 100\% = \frac{3 \times 0.1}{2.6} \times 100\%}$$

6. **(4)**

41.68 cm

The rightmost digit is most insignificant and leftmost is most significant.

So, 8 $\rightarrow$ most insignificant

4 $\rightarrow$ most significant

7. **(1)**

$F \propto V^a \rho^b g^c$

$F = [L^3]^a [ML^{-3}]^b [LT^{-2}]^c$

$[MLT^{-2}] = F = [M^b L^{3a-3b+c} T^{-2c}]$

On comparing

$\boxed{b = 1}$, $\quad -2c = -2 \quad \Rightarrow \quad \boxed{c = 1}$

$3a - 3b + c = 1$

$\Rightarrow 3a - 3 + 1 = 1$

$\Rightarrow \; 3a - 2 = 1$

$\Rightarrow 3a = 3 \Rightarrow \boxed{a = 1}$

So, on putting all these values, $\boxed{F = V\rho g}$

8. **(2)**

The dimensional formula of energy $E = [ML^2T^{-2}]$

So, dimensions of i) Mass $\rightarrow$ 1 ii) Length $\rightarrow$ 2 iii) Time $\rightarrow -2$

9. **(3)**

$$\text{Energy density} = \frac{E}{V} = \frac{1}{2}\varepsilon_0 E^2 \Rightarrow \frac{ML^2T^{-2}}{L^3} \Rightarrow \boxed{[ML^{-1}T^{-2}] = \frac{1}{2}\varepsilon_0 E^2}$$

10. **(3)**

$\frac{d^2y}{dx^2}$ will have dimensions of $\frac{y}{x^2}$

$y \rightarrow$ pressure, $x \rightarrow$ velocity gradient

$$x \rightarrow \frac{V}{L} \Rightarrow \frac{LT^{-1}}{L} \Rightarrow T^{-1} \qquad \frac{y}{x^2} = \frac{ML^{-1}T^{-2}}{T^{-2}} \Rightarrow [ML^{-1}]$$

11. **(3)**

$$F = \frac{\alpha - t^2}{\beta v^2}$$

Dimensionally, $\alpha = [T^2]$

$$[MLT^{-2}] = \frac{[T^2]}{\beta[L^2T^{-2}]}$$

$$\beta = \frac{T^2}{[MLT^{-2}.L^2T^{-2}]}$$

$$\Rightarrow \beta = [M^{-1}L^{-3}T^6]$$

Dimensions of $\frac{\alpha}{\beta} = \frac{T^2}{M^{-1}L^{-3}T^6} = [ML^3T^{-4}]$

12. (2)

$g = LT^{-2}$ $\qquad \frac{\Delta g}{g} = \frac{\Delta L}{L} = \frac{2\Delta T}{T}$

$$\Rightarrow \boxed{\frac{\Delta g}{g} = e_1 + 2e_2}$$

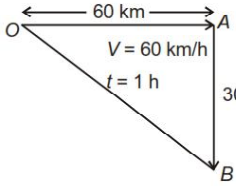
13. (1)

$$KE = \frac{1}{2}MV^2 \Rightarrow \frac{\Delta K}{K} \times 100\% = \frac{\Delta M}{M} \times 100\% + \frac{2\Delta V}{V} \times 100\%$$

$$\Rightarrow \boxed{\frac{\Delta K}{K} \times 100\% = 8\%}$$

14. (3)

Displacement of car $= \sqrt{60^2 + 30^2} = 30\sqrt{5}$ km



[Distance OA = Speed × Time
$\Rightarrow$ 60 × 1 h = 60 km]

15. (4)

$\sqrt{x} = t + 7$ $\qquad \Rightarrow x = (t+7)^2$

$= t^2 + 49 + 14t$ (squaring)

$\frac{dx}{dt} = 2t + 14$ $\boxed{v = 2t + 14} \Rightarrow \boxed{v \propto t}$

Acceleration :

$a = \frac{dv}{dt}$ $\qquad \boxed{a = 2ms^{-2}} \rightarrow$ constant

16. (3)

17. (2)

$x = A\sin\omega t$

$\frac{dx}{dt} = A\omega\cos\omega t$ $\qquad \Rightarrow \frac{d^2x}{dt^2} = -A\omega^2\sin\omega t$

$\Rightarrow \boxed{a = -\omega^2 x}$ $\quad (\because A\sin\omega t = x)$

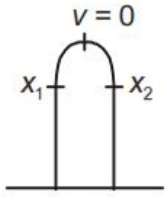
18. (1)

As the motion under gravity is symmetric, so distance travelled in last second of ascent is equal to first second of descent.

t = 1 s (1st second)

$$-x_2 = ut - \frac{1}{2}g \times 1^2$$

$$x_2 = \frac{1}{2}9.8 \times 1^2 \left(\because u = 0\right)$$



$$\Rightarrow \boxed{x_2 = 4.9\text{m}}$$

This distance is constant for every body thrown with any speed.

19. (4)

$$\text{Average acceleration} = \frac{\text{Change in velocity}}{\text{Time}} \Rightarrow \boxed{a_{av} = \frac{\int_{t_1}^{t_2} a\,dt}{t_2 - t_1}}$$

20. (2)

$$s = \frac{1}{2}g \times 1^2 \Rightarrow \boxed{s = \frac{g}{2}}$$

21. (4)

This graph is possible.

22. (2)

The speed of an object is directly proportional to time $\boxed{v \propto t}$

23. (3)

From 0 to 6 s $\rightarrow$ Displacement = 0

so, average velocity = 0

at t = 3 s, the displacement = 0, so v = 0

24. (2)

$$v = \frac{\text{Distance}}{\text{Time}} = \frac{40}{8} = 5\,\text{ms}^{-1}$$

25. (3)

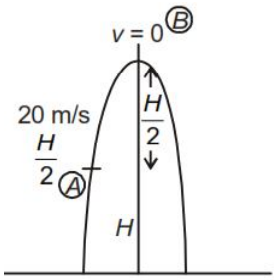
$$a = kx \text{ and } \frac{vdv}{dx} = a \Rightarrow \int_u^v vdv = \int_0^x adx = \int_0^x kxdx$$

$$\Rightarrow \frac{v^2}{2}\Big|_u^v = \frac{kx^2}{2}\Big|_0^2 \Rightarrow v^2 - u^2 = kx^2 \Rightarrow \boxed{v^2 = u^2 + kx^2}$$

26. (4)

$$v_B^2 - v_A^2 = -2g\left(\frac{H}{2}\right)$$

$$\Rightarrow 0 - 400 = -2 \times 10 \times \frac{H}{2}$$



$$\Rightarrow \boxed{40\ m = H}$$

27. (4)

None of the graph is physically possible.

28. (2)

Let the total height of tower = H

Total time of journey = t

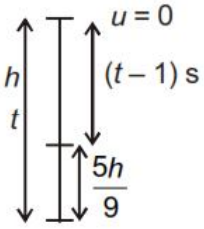
Time taken to cover the $\frac{5h}{9}$ is = last second

so, $s_t - s_{t-1} = \frac{5h}{9}$

$$\Rightarrow \frac{1}{2}gt^2 - \frac{1}{2}g(t-1)^2 = \frac{5}{9} \times \frac{1}{2}gt^2 \qquad \left[\because h = \frac{1}{2}gt^2\right]$$

$$\Rightarrow \frac{1}{2}g(t^2 - t^2 - 1 + 2t) = \frac{1}{2}gt^2 \times \frac{5}{9}$$

$$\Rightarrow (2t - 1) = \frac{5}{9}t^2$$



$$\Rightarrow 18t - 9 = 5t^2$$

$$\Rightarrow 5t^2 - 18t + 9 = 0$$

$$\Rightarrow 5t^2 - 15t - 3t + 9 = 0$$

$\Rightarrow 5t(t-3)-3(t-3)=0$

$\Rightarrow (5t-3)(t-3)=0$

$t=\frac{3}{5}, \boxed{r=3s}$ $\left(t=\frac{3}{5},\right.$ doesn't satisfy the given criterion, so we neglect it)

29. (3)

Given vectors can be rewritten as $\vec{A}=2\hat{i}+3\hat{j}+8\hat{k}$ and $\vec{B}=-4\hat{i}+4\hat{j}+\alpha\hat{k}$

Dot product of these vectors should be equal to zero because they are perpendicular.

$\therefore\ \vec{A}.\vec{B}=-8+12+8\alpha=0\ \Rightarrow 8\alpha=-4\Rightarrow \alpha=-1/2$

30. (3)

We know that $\vec{A}\times\vec{B}=-(\vec{B}\times\vec{A})$ because the angle between these two is always 90°.

But if the angle between $\vec{A}$ and $\vec{B}$ is 0 or π. Then $\vec{A}\times\vec{B}=\vec{B}\times\vec{A}=0$.

31. (1)

$W=\vec{F}.\vec{s}=(5\hat{i}+6\hat{j}+4\hat{k})(6\hat{i}-5\hat{k})=30-20=10$

32. (4)

$$\cos\theta=\frac{\vec{A}\vec{B}}{AB}=\frac{42+24-12}{\sqrt{36+36+9}\sqrt{49+16+16}}=\frac{56}{9\sqrt{71}}$$

$\cos\theta=\frac{56}{9\sqrt{71}}\ \therefore \sin\theta=\frac{\sqrt{5}}{3}$ or $\theta=\sin^{-1}\left(\frac{\sqrt{5}}{3}\right)$

33. (2)

$|\vec{A}\times\vec{B}|=\vec{A}.\vec{B}\Rightarrow AB\sin\theta=AB\cos\theta\Rightarrow\tan\theta=1$

$\therefore\ \theta=45°$

34. (1)

35. (4)

$|\vec{A}\times\vec{B}|=\sqrt{3}(\vec{A}.\vec{B})$

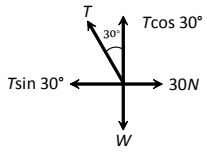
$AB\sin\theta=\sqrt{3}AB\cos\theta\Rightarrow\ \tan\theta=\sqrt{3}\ \therefore\ \theta=60°$

Now, $|\vec{R}|=|\vec{A}+\vec{B}|=\sqrt{A^2+B^2+2AB\cos\theta}$

$$=\sqrt{A^2+B^2+2AB\left(\frac{1}{2}\right)}=(A^2+B^2+AB)^{1/2}$$

36. (2)

37. (2)



From the figure $T\sin 30^\circ = 30$ ...(i)

$$T\cos 30^\circ = W \quad \text{...(ii)}$$

By solving equation (i) and (ii) we get

$W = 30\sqrt{3}N$ and $T = 60N$

38. (3)

$\sin^2\alpha + \sin^2\beta + \sin\gamma$

$= 1 - \cos^2\alpha + 1 - \cos^2\beta + 1 - \cos^2\gamma$

$= 3 - (\cos^2\alpha + \cos^2\beta + \cos^2\gamma) = 3 - 1 = 2$

39. (2)

40. (4)

$$\Delta v = 2v\sin\left(\frac{90^\circ}{2}\right) = 2v\sin 45^\circ = 2v \times \frac{1}{\sqrt{2}} = \sqrt{2}v \qquad = \sqrt{2} \times r\omega = \sqrt{2} \times 1 \times \frac{2\pi}{60} = \frac{\sqrt{2}\pi}{30}\ \text{cm/s}$$

CHEMISTRY

61. (4)

62. (4)

Vol. of Sol. $= \dfrac{1120}{1.15}$

Molarity = $\dfrac{120 \times 1000}{60 \times 1120} \times 1.15 = 2.05M$

63. (4)

64. (1)

65. (2)

1 Mol. O_2 = 32 gm

100 amu of U = $100 \times 1.66 \times 10^{-24}$ gm

10 mol. H_2 = 10 × 2 gm.

66. (3)

Mass of H_2O = 1gm [d = 1g/ml]

No. of H_2O molecules = $\frac{1}{18} \times N_A$.

$= 0.05\ N_A$.

20 drops has $0.05N_A$ H_2O molecules

$\therefore$ 1 drops $\longrightarrow$ $\frac{0.05N_A}{20} H_2O$ molecule

67. (1)

68. (2)

$$NH_3 + HCl \longrightarrow NH_4Cl_{(s)}$$

Initially 1 Lit 1.5 Lit

After O 0.5 Lit

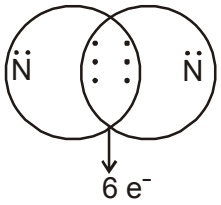
Reaction

69. (4)

70. (3)

Dative bond is formed by one sided sharing of electrons

71. (2)

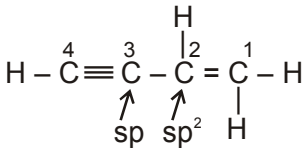


72. (4)

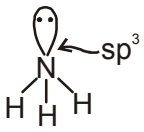
$$\left.\begin{array}{ll} SF_6 & = 12e^- \\ IF_7 & = 14e^- \\ BeCl_2 & = 4e^- \end{array}\right]$$

In all of these molecules central atom don't follow octet rule

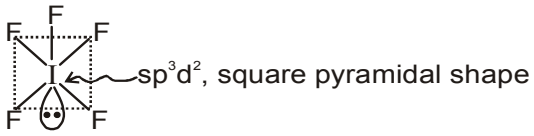
73. **(3)**



74. **(1)**



75. **(2)**



76. **(2)**

$O_2^- = 17e^-$

$\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_2^2 \pi 2p_x^2 \simeq \pi 2p_y^2 \pi^* 2p_x^2 \simeq \pi^* 2p_y^1$

$$B.O = \frac{10-7}{2} = \frac{3}{2} = 1.5$$

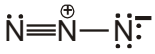
77. **(3)**

F forms strongest H-bond due to smalier size and more electronegativity.

78. **(2)**

Polarising power $\alpha \frac{\text{charge}}{\text{size}}$ ratio

79. **(2)**



80. (3)

CO has paired electron so it is diamagnetic

81.	**(3)**	**82.**	**(4)**	**83.**	**(1)**	**84.**	**(3)**	**85.**	**(2)**	**86.**	**(2)**	**87.**	**(2)**
88.	**(1)**	**89.**	**(1)**	**90.**	**(1)**	**91.**	**(3)**	**92.**	**(1)**	**93.**	**(3)**	**94.**	**(1)**
95.	**(1)**	**96.**	**(2)**	**97.**	**(2)**	**98.**	**(1)**	**99.**	**(1)**	**100.**	**(1)**	**101.**	**(1)**
102.	**(3)**	**103.**	**(1)**	**104.**	**(1)**	**105.**	**(2)**	**106.**	**(1)**	**107.**	**(1)**	**108.**	**(2)**
109.	**(2)**	**110.**	**(2)**	**111.**	**(2)**	**112.**	**(3)**	**113.**	**(4)**	**114.**	**(1)**	**115.**	**(4)**
116.	**(1)**	**117.**	**(4)**	**118.**	**(1)**	**119.**	**(1)**	**120.**	**(1)**				

BOTANY

121.	(1)	122.	(3)	123.	(3)	124.	(4)	125.	(3)	126.	(3)	127.	(3)
128.	(4)	129.	(4)	130.	(4)	131.	(2)	132.	(3)	133.	(3)	134.	(1)
135.	(4)	136.	(2)	137.	(2)	138.	(1)	139.	(1)	140.	(1)	141.	(4)
142.	(3)	143.	(1)	144.	(1)	145.	(2)	146.	(1)	147.	(3)	148.	(3)
149.	(4)	150.	(1)	151.	(2)	152.	(4)	153.	(3)	154.	(2)	155.	(3)
156.	(1)	157.	(4)	158.	(4)	159.	(3)	160.	(4)	161.	(1)	162.	(2)
163.	(2)	164.	(2)	165.	(3)	166.	(1)	177.	(1)	168.	(2)	169.	(2)
170.	(3)	171.	(4)	172.	(1)	173.	(3)	174.	(2)	175.	(1)	176.	(1)
177.	(1)	178.	(2)	179.	(1)	180.	(1)						

GENERAL KNOWLEDGE

181.	(4)	182.	(4)	183.	(3)	184.	(3)	185.	(3)	186.	(2)	187.	(2)
188.	(3)	189.	(2)	190.	(2)	191.	(1)	192.	(4)	193.	(1)	194.	(3)
195.	(4)	196.	(1)	197.	(3)	198.	(2)	199.	(3)	200.	(3)		