

SOLUTIONS

PHASE TEST-1

MGZS-1901,1902,1903

AIIMS PATTERN

Test Date: 05-11-2017



PHYSICS

1. (2)

Nm → Unit of torque

mN → Milli newton ⇒ 10^3 N

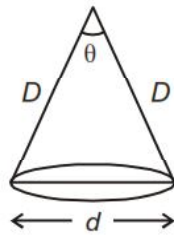
nm → Nano metre

Ns → 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 sAge of universe = 10^{17} s

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

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

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

4. (4)

$$3 \times 10^{-3}$$

$$3.0 \times 10^{-3}$$

$$3.0 \times 10^{-3}$$

$$3.00 \times 10^{-3}$$

So, fourth measurement is most precise.

5. (2)

$$r = (2.6 \pm 0.1) \text{ cm}$$

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

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

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

6. (4)

41.68 cm

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

So, 8 → most insignificant

4 → 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 → 1 ii) Length → 2 iii) Time → -2

9. (3)

$$\text{Energy density} = \frac{E}{V} = \frac{1}{2} \epsilon_0 E^2 \Rightarrow \frac{ML^2T^{-2}}{L^3} \Rightarrow \boxed{[ML^{-1}T^{-2}] = \frac{1}{2} \epsilon_0 E^2}$$

10. (3)

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

y → pressure, x → velocity gradient

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

11. (3)

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

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

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

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

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

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

12. (2)

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

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

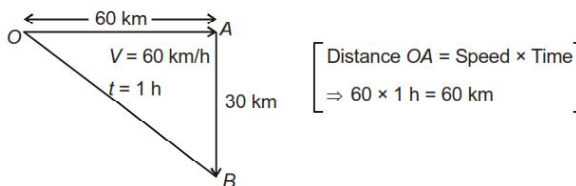
13. (1)

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

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

14. (3)

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



15. (4)

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

$$= t^2 + 49 + 14t \quad (\text{squaring})$$

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

Acceleration :

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

16. (3)

17. (2)

$$x = A \sin \omega t$$

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

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

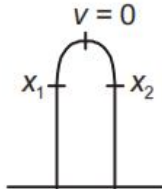
18. (1)

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)

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

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



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

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

19. (4)

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

20. (2)

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

21. (4)

This graph is possible.

22. (2)

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

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)

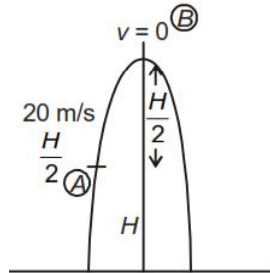
$$a = kx \text{ and } \frac{vdv}{dx} = a \Rightarrow \int_u^v v \, dv = \int_0^x a \, dx = \int_0^x kx \, dx$$

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

26. (4)

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

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



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

27. (4)

None of the graph is physically possible.

28. (2)

Let the total height of tower = H

Total time of journey = t

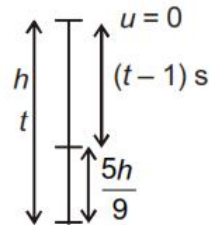
Time taken to cover the $\frac{5h}{9}$ is = last second

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

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

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

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



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

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

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

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

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

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

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.

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

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)

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

32. (4)

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

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

33. (2)

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

$$\therefore \theta = 45^\circ$$

34. (1)

35. (4)

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

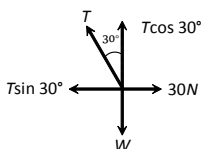
$$AB \sin \theta = \sqrt{3} AB \cos \theta \Rightarrow \tan \theta = \sqrt{3} \therefore \theta = 60^\circ$$

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

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

36. (2)

37. (2)



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

$$T \cos 30^\circ = W \dots(ii)$$

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

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

38. (3)

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

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

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

39. (2)

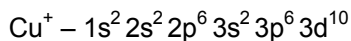
40. (4)

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

41. (1)	42. (3)	43. (1)	44. (3)	45. (2)
46. (3)	47. (4)	48. (2)	49. (4)	50. (3)
51. (2)	52. (1)	53. (2)	54. (2)	55. (1)
56. (1)	57. (1)	58. (2)	59. (1)	60. (2)

CHEMISTRY

61. (1)



62. (3)

$$n = 5, l = 0 \rightarrow 5s$$

$$n = 4, l = 1 \rightarrow 4P$$

$$n = 3, l = 2 \rightarrow 3d \rightarrow \text{lower energy.}$$

63. (4)

$$E_1 = -13.6\text{eV}$$

$$E_2 = -3.4\text{eV}$$

$$\Delta E = E_2 - E_1 = 13.6 - 3.4 = 10.2\text{eV}$$

64. (2)

65. (3)

For He^+

$$E = -13.6 \frac{Z^2}{n^2} = -\frac{13.6 \times Z^2}{1^2} = -54.4 \text{ eV}$$

66. (1)

$$\frac{1}{\lambda} = R \left(\frac{1}{1^2} - \frac{1}{\infty^2} \right)$$

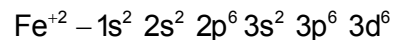
$$\frac{1}{\lambda} = 1.097 \times 10^7$$

$$\frac{1}{\lambda} = \frac{1}{1.097} \times 10^{-7} \text{ m}$$

$$= \frac{100}{1.097} \times 10^{-9} \text{ m} = 91 \text{ nm}$$

67. (2)

68. (1)



69. (3)

Mn^{+2} has maximum unpaired electron (5) so its magnetic moment is highest.

70. (2)

$$n = 3, l = 2 \quad m = +2 \rightarrow 3d$$

$$m = -2 \quad -1 \quad 0 \quad +1 \quad +2$$

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71. (4)

72. (2)

$$\text{orbital angular momentum} = \sqrt{l(l+1)} \frac{h}{2\pi}$$

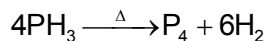
$$= \sqrt{l(l+1)} \frac{h}{2\pi}$$

$$= \sqrt{2} \frac{h}{2\pi} = \frac{h}{\sqrt{2}\pi}$$

73. (3)

74. (1)

75. (4)



4 ml PH_3 gives 6 ml H_2

$$\therefore 100 \text{ ml } \text{PH}_3 = \frac{6}{4} \times 100 = 150 \text{ ml } \text{H}_2.$$

so volume increases by 50 ml.

76. (3)

77. (2)

$$\text{Average at. mass} = \frac{\begin{array}{l} \% \text{ of 1st isotope} \times \text{At. mass} + \% \\ \text{of 2nd isotope} \times \text{At. mass} + \% \\ \text{of 3rd isotope} \times \text{At. mass.} \end{array}}{100}$$

78. (3)

79. (1)

80. (1)

Let molar mass be x

$$x \times \frac{4.6}{100} = 56$$

$$\therefore x = \frac{5600}{4.6} = 1200 \text{ u.}$$

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

BIOLOGY

21.	(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.	(1)	142.	(2)	143.	(1)	144.	(4)	145.	(4)
146.	(4)	147.	(1)	148.	(1)	149.	(4)	150.	(4)
151.	(3)	152.	(4)	153.	(3)	154.	(4)	155.	(1)
156.	(2)	157.	(3)	158.	(1)	159.	(4)	160.	(4)
161.	(1)	162.	(2)	163.	(2)	164.	(2)	165.	(3)
166.	(1)	177.	(1)	168.	(2)	169.	(2)	170.	(3)
171.	(2)	172.	(1)	173.	(3)	174.	(1)	175.	(3)
176.	(1)	177.	(2)	178.	(1)	179.	(1)	180.	(2)

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)