Answer key

Physics	Chemistry	Biology	General knowledge
1. (b)	61. (d)	121. (d)	181. (c)
2. (b)	62. (b)	122. (c)	182. (c)
3. (d)	63. (c)	123. (c)	183. (c)
4. (d)	64. (c)	124. (c)	184. (c)
5. (c)	65. (b)	125. (a)	185. (d)
6. (b)	66. (d)	126. (d)	186. (d)
7. (d)	67. (a)	127. (d)	187. (d)
8. (a)	68. (b)	128. (a)	188. (b)
9. (b)	69. (a)	129. (a)	189. (d)
10. (c)	70. (b)	130. (d)	190. (a)
11. (b)	71. (d)	131. (d)	191. (c)
12. (b)	72. (b)	132. (a)	192. (c)
13. (a)	73. (c)	133. (c)	193. (c)
14. (b)	74. (a)	134. (c)	194. (c)
15. (d)	75. (a)	135. (c)	195. (b)
16. (c)	76. (d)	136. (d)	196. (b)
17. (a)	77. (d)	137. (d)	197. (d)
18. (d)	78. (c)	138. (d)	198. (c)
19. (d)	79. (a)	139. (c)	199. (d)
20. (a)	80. (c)	140. (b)	200. (d)
21. (d)	81. (b)	141. (c)	
22. (d)	82. (b)	142. (d)	
23. (c)	83. (a)	143. (c)	
24. (a)	84. (c)	144. (c)	
25. (c)	85. (d)	145. (b)	
26. (a)	86. (c)	146. (d)	
27. (d)	87. (d)	147. (c)	
28. (b)	88. (d)	148. (a)	
29. (c)	89. (d)	149. (b)	
30. (b)	90. (c)	150. (c)	
31. (b)	91. (a)	151. (d)	
32. (d)	92. (c)	152. (a)	
33. (b)	93. (b)	153. (c)	
34. (a)	94. (c)	154. (d)	
35. (b)	95. (c)	155. (c)	
36. (b)	96. (b)	156. (b)	
37. (d)	97. (a)	157. (b)	
38. (c)	98. (c)	158. (d)	
39. (a)	99. (d)	159. (b)	
40. (a)	100. (a)	160. (a)	
41. (a)	101. (d)	161. (c)	
42. (a)	102. (a)	162. (a)	
43. (a)	103. (a)	163. (b)	
44. (a)	104. (b)	164. (b)	
45. (a)	105. (c)	165. (c)	
46. (a)	106. (a)	166. (b)	
47. (a)	107. (a)	167. (d)	
48. (c)	108. (a)	168. (b)	
49. (a)	109. (a)	169. (b)	
50. (b)	110. (a)	170. (b)	
51. (a)	111. (b)	171. (c)	
52. (a)	112. (a)	172. (a)	
53. (b)	113. (a)	173. (a)	
54. (a)	114. (c)	174. (d)	
55. (a)	115. (d)	175. (a)	
56. (a)	116. (d)	176. (b)	
57. (a)	117. (b)	177. (c)	
58. (c)	118. (d)	178. (c)	
59. (d)	119. (b)	179. (a)	
60. (a)	120. (b)	180. (c)	

Hints & Solutions

PHYSICS

1. (b)

$D \rightarrow$ Minimum least count

$C \rightarrow$ Minimum percentage error.

2. (b)

$u\cos\theta = u\sin\theta - gt$

$t = \frac{u}{g}\left[\sin\theta - \cos\theta\right].$

3. (d)

$v = 20 - 10\,t$

$x = \int_0^t v\,dt = 20t - 5t^2$

x – t plot will be parabolic.

4. (d)

Power of d is three so it should be measure with care because it may contribute maximum error in P.

5. (c)

$F_{av} = \frac{m(v_2 - v_1)}{\Delta t}$

6. (b)

$\Delta p = \int_{t_1}^{t_2} F\,dt = \text{Area of graph} = \frac{1}{2}\times(20+15)\times 10$

$= 175 \text{ kg ms}^{-1}.$

7. (d)

$\vec{F} = -\frac{\partial u}{\partial x}\hat{i} = -\left[-2x + 2\right] = -\left[-2\times 1 \div 2\right] = 0$

8. (a)

$\frac{1}{2}mv^2 = \frac{1}{2}kx^2 \Rightarrow x = v\sqrt{\frac{m}{k}}.$

9. (b)

Centre of mass lies on the symmetric line and towards the heavier side.

10. (c)

$\frac{1}{2}I\omega^2 = mgh$

11. (b)

12. (b)

13. (a)

Use Kepler's 3rd law : $\left(\frac{T_2}{T_1}\right)^2 = \left(\frac{R_2}{R_1}\right)^3$

14. (b)

Time period of simple pendulum $T = 2\pi\sqrt{\frac{L}{g}}$

$g = \frac{4\pi^2 L}{T^2}$

$\therefore \frac{\Delta g}{g}\times 100 = \left(\frac{\Delta L}{L} + 2\frac{\Delta T}{T}\right)\times 100$

15. (d)

According to Bernoulli's Theorem,

$$P + \frac{1}{2}\rho v^2 + \rho gh = \text{constant.}$$

for a horizontal flow, 'h' is also constant

$$\Rightarrow \quad P + \frac{1}{2}\rho v^2 = \text{constant}$$

Now, by law of continuity

av = constant

$\Rightarrow$ It is clear that point where a is small velocity will be higher and so pressure will be lower.

Thus, (d) is correct choice.

16. (c)

Stress = Y × strain

F = YA × strain

17. (a)

$$\text{Surface Tension} = \frac{\text{Work done}}{\text{Change in area}}$$

18. (d)

$V_T \propto r^2$

19. (d)

$$Y = \frac{FL}{A\Delta L} = \frac{4FL}{\pi d^2 \times \Delta L}$$

Since Y, F and L are same for all wire

$$\frac{F}{\Delta L} = \left(\frac{\pi Y}{4L}\right) d^2$$

20. (a)

$$\frac{4T}{r_1} = 3 \times \frac{4T}{r_2}$$

$$\frac{r_1}{r_2} = \frac{1}{3}$$

$$\frac{A_1}{A_2} = \frac{4\pi r_1^2}{4\pi r_2^2} = \frac{1}{9}$$

21. (d)

22. (d)

U + K = Constant Hence U – K graph is straight-line with negative intercept on y-axis.

23. (c)

$v = \frac{\upsilon}{4l_1}$ (for first harmonic)

$v = \frac{3\upsilon}{2l_3}$ (for third harmonic)

$\therefore \quad \frac{l_1}{l_3} = \frac{1}{6}$

24. (a)

Particle velocity v_p = – (slope) v

If v_p is positive then it is along positive x-axis and if it is negative it is along negative x-axis.

25. (c)

Due to thermal expansion, all x, r and d would increase.

26. (a)

Total work done = Area of the Trapezium

$= \frac{1}{2}(8P - P)(3V + V)$

$= 14\ PV$

27. (d)

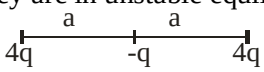
28. (b)

$$\frac{1}{V_1} + \frac{1}{-1000} = \frac{1}{-400}$$

$$\frac{1}{V_2} + \frac{1}{-800} = \frac{1}{-400}$$

29. (c)

At the present position all the charges are in equilibrium. But when they displaced slightly from their present position, they do not return back. So, they are in unstable equilibrium position.



30. (b)

31. (b)

$$\frac{1}{R_{eq}} = \frac{1}{R} + \frac{1}{R} + \frac{1}{2R}$$

32. (d)

$$q = \int_0^{40\times10^{-3}} 15\sin 50\pi t\ dt = 0$$

33. (b)

Magnetic fields due to opposite wires will be cancelled out.

34. (a)

Choice 'd' alone is directly discarded, but 'b' cannot be, because it has field outside. However, 'b' can also be discarded because field outside cannot be uniform.

Choice 'c' is discarded because there is abrupt change in field outside.

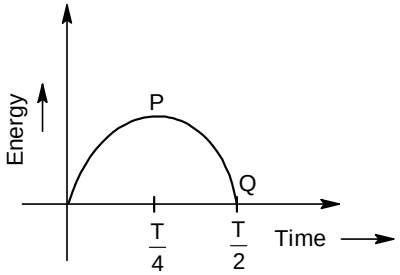
35. (b)

$$\varphi = \vec{B}.\vec{A} = BA\cos 60 = \frac{1}{2500}$$

$$\therefore \qquad E = \frac{d\phi}{dt} = \frac{1}{2500\times 0.2} = 2 \times 10^{-3}\ V$$

36. (b)

37. (d)



Time to change maximum P to minimum Qc

$$= \frac{T}{2} - \frac{T}{4} = \frac{T}{4}$$

$$\Rightarrow \quad \frac{T}{4} = 2.5\times10^{-3}$$

$T = 10 \times 10^{-3}$s

$$f = \frac{1}{T} = \frac{1}{10\times10^{-3}} = 100$$

$\Rightarrow$ f = 100 Hz

which is (d) option.

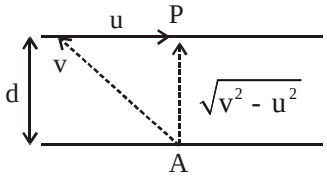
38. (c)
At resonance, $V_L = V_C$ also V_L and V_C are in opposite phase

39. (a)
Number of emitted electrons $= \frac{10^{12} \times 2 \times 10^{-4} \times 25}{10^5} = 5 \times 10^4$ electrons
$q = + ne = 8 \times 10^{-14}$ C.

40. (a)
40 The stopping potential for curves a and b is same
Hence,
$f_a = f_b$
Also saturation current is proportional to intensity
$\therefore\ I_a < I_b$
Hence the correct answer is (a)

41. (a)

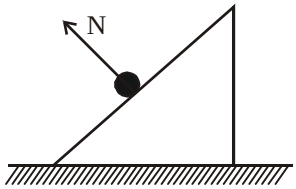
42. (a)
Time to cross the river $t = \frac{d}{\sqrt{v^2 - u^2}}$.



43. (a)

44. (a)
$f = -\frac{dv}{dx} \therefore F = 0$ at point B and C.

45. (a)



During collision force exerted by wedge on particle is perpendicular to inclined face. So linear momentum of wedge is conserved along the face of wedge.

46. (a)

47. (a)
$\frac{dA}{dt} = \frac{1}{2} r^2 \frac{d\theta}{dt} = \frac{1}{2} r^2 \omega$
$\frac{mr^2\omega}{2m} = \frac{2}{2m} =$ constant
$\therefore$ L = constant.

48. (c)

49. (a)
The height of capillary tube rise is inversely proportional to radius (or diameter) of capillary tube i.e. $h \propto \frac{1}{r}$, so far smaller 'r' the value of h is higher.

50. (b)
$\because\quad T = 2\pi \sqrt{\frac{1}{g\left(\frac{1}{\ell} + \frac{1}{R_e}\right)}}$.

51. (a)

The potential energy of the element is the work done to stretch it from dx to d*l*.

$DU = F\,(dl - dx)$

$$= F\left(\sqrt{(dx)^2 + (dy)^2} - dx\right)$$

$$= F\,dx\left[\left(1 + \frac{dy}{dx}\right)^{\frac{1}{2}} - 1\right]$$

$$= \frac{1}{2} F\,dx\left(\frac{\partial y}{\partial x}\right)^2,$$

Assuming that the disturbance is small.

52. (a)

$$\alpha = \frac{1}{\ell}\frac{d\ell}{dT}$$

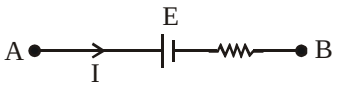
$$\Rightarrow \quad \alpha \int_{T_0}^{T} dT = \int_{\ell_0}^{\ell} \frac{d\ell}{\ell}$$

$$\Rightarrow \quad \ell = \ell_0 e^{\alpha \Delta T}.$$

53. (b)

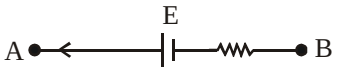
The rays of light are diverging out from a virtual image. These can be easily converged onto the film of a concave lens by convergent action of its lens.

54. (a)



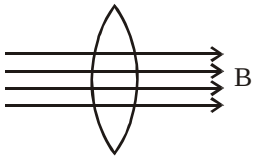
$V_A - E - Ir + V_B = 0 \Rightarrow \quad V_A - V_B = E + Ir$

Similarly



$V_A - V_B = E - Ir.$

55. (a)



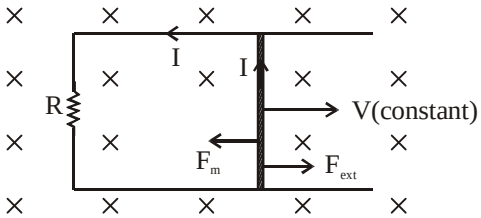
$B = \mu_0 nI_t$

$\phi = \pi r^2 nI_t$

$$e = -\frac{d\phi}{dt} = -\pi r^2 n \frac{dI_t}{dt}$$

$r \rightarrow$ radius of solenoid.

56. (a)



$\varepsilon = B\ell V$

$$I = \frac{B\ell V}{R}$$

$$F_B = I\ell B = \frac{B^2 \ell^2 V}{R}.$$

57. (a)

$$\Delta q = -\frac{\Delta \phi_B}{R}$$

As R is constant, $\Delta q \propto \Delta\phi_B$.

58. (c)

59. (d)

K_β radiation represents greater level of energy than K_α and hence also a greater frequency (E = hv).

60. (a)

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