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NEET FRESH 2023-24

Mark 720	Group PCB	PCB EXAM - 62	Date : 02/01/2024 Time : 3:20 Hours

Answer Key Version - Q (NEET FRESH All Batches)

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PHYSICS

SECTION - A (35 Questions)

01. **(1)** $P_{in} = P_a + \frac{4T}{R}$

When R increases, pressure inside the soap bubble decreases.

02. **(1)** Net downward force in the string,

$ma = mg - T$

But $T_{\max} = \frac{2}{3}mg \quad \therefore \quad ma_{\min} = mg - \frac{2}{3}mg$

$a_{\min} = g - \frac{2}{3}g = \frac{g}{3}.$

03. **(4)** $U = 2 \times 4\pi R^2 T$

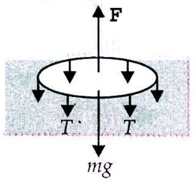
$= 8\pi(0.5\times10^{-2})^2 \times 0.04\,\text{J} = 8\pi\times10^{-6}\,\text{J}.$

04. **(2)** U = Work done on the wire

= Average force × Increase in length

$= \left(\frac{O+F}{2}\right)l = \frac{1}{2}Mgl \qquad [F = Mg]$

05. **(4)**



Force required to lift the ring from the water surface,

F = Weight of ring + Force of surface tension

$= mg + 2\times 2\pi R \times T$

$= mg + 4\pi TR.$

06. **(4)** Restoring force on the spring,

$F = -kx \Rightarrow F \propto x$

$\Rightarrow$ F-x graph is a straight line with a negative slope. Option (4) is correct.

07. **(4)** Increase in surface area = 2 × (20 – 8) cm^2

= 24 × 10^{-4}m^2

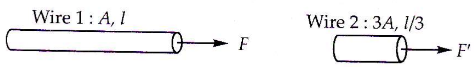
Work done = 3 × 10^{-4}J

$\text{Surface tension} = \frac{\text{Work done}}{\text{Increase in surface area}}$

$= \frac{3\times10^{-4}}{24\times10^{-4}} = \frac{1}{8}\,\text{Nm}^{-1}$

= 0.125 Nm^{-1}.

08. **(1)** As same volume $A_1 l_1 = A_2 l_2$



$Y = \frac{Fl}{A\Delta l} \Rightarrow F = \frac{YA\Delta l}{l}$

$F' = \frac{Y(3A)\Delta l}{(l/3)} = 9F$

09. **(4)**

Velocity of efflux, $\upsilon = \sqrt{2gh}$

Volume flow rate,

$Q = A\upsilon = A\sqrt{2gh}$

$= 2\times10^{-6}\times\sqrt{2\times10\times2} = 4\sqrt{10}\times10^{-6}\,\text{m}^3/\text{s}$

$= 4\times3.16\times10^{-6}\,\text{m}^3/\text{s} \simeq 12.6\times10^{-6}\,\text{m}^3/\text{s}.$

10. **(3)**

$Y = \frac{\text{Stress}}{\text{Strain}}$

Strain is dimensionless.

$[Y] = [\text{Stress}] = [\text{Pressure}] = \frac{\text{MLT}^{-2}}{\text{L}^2} = [\text{ML}^{-1}\text{T}^2]$

11. **(2)** Applying Bernoulli's theorem,

$P_1 + \frac{1}{2}\rho\upsilon_1^2 = P_2 + \frac{1}{2}\rho\upsilon_2^2$

$P_1 - P_2 = \frac{1}{2}\rho(\upsilon_2^2 - \upsilon_1^2)$

$h\rho g = \frac{1}{2}\rho(\upsilon_2^2 - \upsilon_1^2)$

$\upsilon_2^2 - \upsilon_1^2 = 2hg = 2\times0.51\times1000 = 1020$

$\upsilon_2^2 = 1020 + \upsilon_1^2 = 1020 + 4 = 1024$

$\therefore \quad \upsilon_2 = \sqrt{1024} = 32\,\text{cm}\,\text{s}^{-1}$

12. **(1)** The wooden block rises up with an acceleration,

$a = \frac{\text{Upthrust} - \text{Weight of block}}{\text{Mass of block}}$

13. **(4)** Using equation of continuity,

$a_1\upsilon_1 = a_2\upsilon_2$

$\pi(2R)^2\upsilon = \pi R^2\upsilon_2$

$\upsilon_2 = 4\upsilon$

14. **(3)** Due to the acceleration of the elevator, the change in the apparent weight of the ice cubes is the same as the change in the buoyant force. So the portion of ice outside the soft drink remains the same.

15. **(2)** Initial speed of the ball is zero. As the ball falls through the viscous liquid, its speed first increases and after some time, it attains a constant terminal velocity.

16. **(1)** The ball attains constant velocity after falling through some distance in oil when the weight of

ball gets balanced by upthrust and the upward viscous force.

17. **(1)** By Stoke's law, viscous drag force is

$F = 6\pi\eta r\upsilon = 6\times3.14\times0.9\times5\times10^{-3}\times10\times10^{-2}\,\text{N}$

$= 847.8 \times 10^{-5}\text{N} \simeq 8.48 \times 10^{-3}\text{N}.$

18. **(3)** $\rho >_{\text{oil}}$, ball must sink in oil

As $\rho <_{\text{water}}$, ball must float in water

In equilibrium, the ball will stay at the interface of water and oil.

19. **(2)** Let V_1 and V_2 be the volumes of the parts of the sphere immersed in liquids of densities ρ_1 and ρ_2 respectively.

According to the law of floatation,

Weight of sphere = Weight of liquid 1 displaced + Weight of liquid 2 displaced

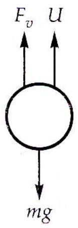
$V\rho g = V_1\rho_1 g + V_2\rho_2 g$

$\Rightarrow \quad (V_1+V_2)\rho g = V_1\rho_1 g + V_2\rho_2 g$

$\Rightarrow \quad V_1(\rho-\rho_1) = V_2(\rho_2-\rho)$

$\therefore \quad \dfrac{V_1}{V_2} = \dfrac{\rho_2-\rho}{\rho-\rho_1}.$

20. **(2)**



When the ball attains a constant velocity,

$F_\upsilon + U = mg \Rightarrow F_\upsilon = mg - U$

U = Weight of glycerine displaced

$= Vd_2 g = \left(\dfrac{m}{d_1}\right)d_2 g \Rightarrow \quad F_\upsilon = mg\left(1-\dfrac{d_2}{d_1}\right)$

21. **(2)** The body will sink to the bottom due to the applied force.

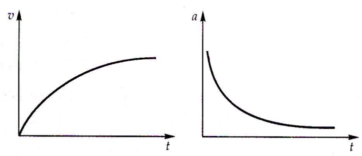
22. **(3)** $\upsilon_t = \dfrac{2}{9}\dfrac{gr^2(\rho-\sigma)}{\eta} \quad \Rightarrow \upsilon_t \propto r^2$

23. **(4)** Archemedes' upward thrust will not act in the absence of gravity.

24. **(4)** Net downward force, $ma = mg - k\upsilon$

$\therefore \quad a = g - \dfrac{k}{m}\upsilon = g - \alpha\upsilon$

$\left(\dfrac{k}{m} = \alpha(\text{say})\right)$



$\Rightarrow \quad \dfrac{d\upsilon}{dt} = g - \alpha\upsilon \Rightarrow \quad \dfrac{1}{g-\alpha\upsilon}d\upsilon = dt$

$\therefore \quad \int_0^\upsilon \dfrac{1}{g-\alpha\upsilon}d\upsilon = \int_0^t dt \Rightarrow \left[\dfrac{\ln(g-\alpha\upsilon)}{-\alpha}\right]_0^\upsilon = [t]_0^t$

$\Rightarrow \quad \ln(g-\alpha\upsilon) - \ln g = -\alpha t$

$\Rightarrow \quad \ln\dfrac{g-\alpha\upsilon}{g} = -\alpha t$

$\therefore \quad 1 - \dfrac{\alpha}{g}\upsilon = e^{-\alpha t}$

$\Rightarrow \quad \upsilon = \dfrac{g}{\alpha}(1-e^{-\alpha t}) = \upsilon_0(1-e^{-\alpha t})$

$a = \dfrac{d\upsilon}{dt} = \upsilon_0\alpha e^{-\alpha t} = a_0 e^{-\alpha t}$

25. **(2)** Upthrust on the body is always equal to the weight of liquid displaced.

26. **(2)** [Tension] = [Force] = $[MLT^{-2}]$

$[\text{Surface tension}] = \dfrac{[\text{Force}]}{[\text{Length}]} = [MT^{-2}]$

27. **(4)** $h_{\text{oil}}\rho_{\text{oil}}\, g = h_{\text{water}}\rho_{\text{water}} g$

$140\times\rho_{\text{oil}} = 130\times\rho_{\text{water}}$

$\rho_{\text{oil}} = \dfrac{13}{14}\times1000\,\text{kg/m}^3$

$\rho_{\text{oil}} = 928\,\text{kg m}^{-3}$

28. **(1)** Pressure depends only on the height of the liquid column and not on the shape of the containing vessel.

29. **(3)** Pressure difference between lungs and atmosphere

$= 760\text{ mm} - 750\text{ mm}$

$= 10\text{ mm of Hg} = 1\text{ cm of Hg}$

Suppose the student can suck water from depth h.

Then

$P = hdg = 1\text{ cm of Hg}$

$h \times 1 \times g = 1 \times 13.6 \times g$

$h = 13.6\text{ cm}$

30. **(3)** $P = 76\,\text{cm}\times\rho_{\text{Hg}}\times g = h\times\rho_L\times g$

$h = \dfrac{\rho_{\text{Hg}}}{\rho_L}\times76\,\text{cm} = \dfrac{13600}{760}\times76\,\text{cm}$

$= 1360\text{ cm} = 13.6\text{ m}.$

31. **(3)** $Y = \dfrac{F}{A}.\dfrac{l}{\Delta l} = \dfrac{2500}{10^{-5}}\times\dfrac{10}{0.01} = 2.5\times10^{11}\,\text{Nm}^{-2}$

32. **(1)** As temperature increase then surface tension decrease so angle of contact increase.

33. **(1)** From the above problem, Energy stored per unit volume = Work done per unit volume = $\dfrac{1}{2}\times\text{Stress}\times\text{strain}$

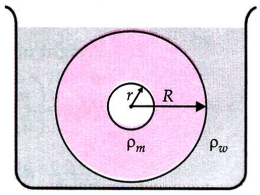
34. **(4)** As the liquid does not wet the solid surface, so $\theta > 90^\circ$

35. **(2)** $\kappa = \frac{p}{\Delta V / V} = \frac{pV}{\Delta V}$

$$= \frac{100 \times \frac{4}{3}\pi(3)^3}{0.3} \text{atm} = 4\pi \times 3 \times 10^3 \text{ atm}$$

Section - B (Attempt Any 10 Questions)

36. **(4)**



Weight of the shell = Weight of water displaced

$$\frac{4}{3}\pi(R^3 - r^3)\rho_m g = \frac{4}{3}\pi R^3 \rho_w g$$

$$1 - \frac{r^3}{R^3} = \frac{\rho_w}{\rho_m} = \frac{8}{27}$$

$$\frac{r^3}{R^3} = 1 - \frac{8}{27} = \frac{19}{27} \Rightarrow \frac{r}{R} = \frac{(19)^{1/3}}{3}$$

37. **(1)**

38. **(2)** If A_0 is the area of the orifice at the bottom below the free surface and A that of the vessel, then the time taken to empty the vessel is

$$t = \frac{A}{A_0}\sqrt{\frac{2H}{g}} \Rightarrow t \propto \sqrt{H}$$

$$\therefore \quad \frac{t'}{t} = \sqrt{\frac{H/2}{H}} = \frac{1}{\sqrt{2}}$$

$$t' = \frac{1}{\sqrt{2}} \times t \simeq 0.7 \times 10 \text{ min} = 7 \text{ min}.$$

39. **(3)** $m = \pi r^2 h \rho = \pi r^2 \left(\frac{2T\cos\theta}{r\rho g}\right)\rho = \frac{2\pi r T\cos\theta}{g}$

$$\Rightarrow \quad m \propto r \Rightarrow \frac{m'}{m} = \frac{2r}{r} = 2$$

$$m' = 2m = 2 \times 5\text{g} = 10\text{g}.$$

40. **(3)** When a spring is stretched, there is only a change in its shape. So shear modulus is useful. Tensile strength of steel spring is more than that of copper spring.
Assertion is true and reason is false.

41. **(3)** Surface energy of smaller bubbles
= Surface energy of resulting bubble

$$8\pi r_1^2 T + 8\pi r_2^2 T = 8\pi r^2 T$$

$$r_1^2 + r_2^2 = r^2 \Rightarrow r = \sqrt{r_1^2 + r_2^2}$$

42. **(4)** $h = \frac{2\sigma\cos\theta}{\rho r g}$

But h, σ, r and g are same for the three liquids.

$$\therefore \quad \frac{\cos\theta}{\rho} = \text{constant}$$

$$\Rightarrow \quad \frac{\cos\theta_1}{\rho_1} = \frac{\cos\theta_2}{\rho_2} = \frac{\cos\theta_3}{\rho_3}$$

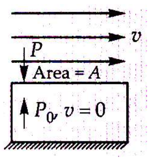
Given ; $\rho_1 > \rho_2 > \rho_3$

$$\Rightarrow \quad \cos\theta_1 > \cos\theta_2 > \cos\theta_3 \Rightarrow \theta_1 < \theta_2 < \theta_3$$

Also, θ is acute for liquid which rises in a capillary.

$$\therefore \quad 0 \le \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$$

43. **(2)**
By Bernoulli's equation,



$$P + \frac{1}{2}\rho\upsilon^2 = P_0 + 0$$

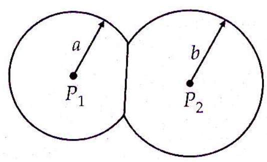
$$P_0 - P = \frac{1}{2}\rho\upsilon^2$$

$$F_{net} = \frac{1}{2}\rho\upsilon^2 A$$

$$= \left(\frac{1}{2} \times 1.2 \times 40 \times 40 \times 250\right)\text{N}$$

$= 2.4 \times 10^5$N, upwards.

44. **(1)**



$$P_1 = P_0 + \frac{4T}{a}$$

$$P_2 = P_0 + \frac{4T}{b}$$

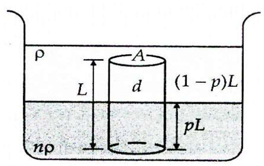
Excess pressure at the common surface is

$$P_1 - P_2 = 4T\left(\frac{1}{a} - \frac{1}{b}\right)$$

$$\frac{4T}{r} = 4T\left(\frac{1}{a} - \frac{1}{b}\right)$$

$$r = \frac{ab}{b-a}$$

45. **(4)**



Weight of the cylinder
= Upthrust exerted by the two liquids

$\Rightarrow \quad ALdg = (1-x)LA\rho g + A(xL)(n\rho)g$

$d = (1-x)\rho + xn\rho$

$= \rho - \rho x + xn\rho$

$= \rho[1-x+xn]$

$= \rho[1+x+(n-1)]$

$= \rho[1+(n-1)x]\rho$

46. **(1)** $K = \frac{P}{-\frac{\Delta V}{V}}$

As $\rho V =$ constant, so

$-\frac{\Delta V}{V} = \frac{\Delta\rho}{\rho}$

$\therefore \quad K = \frac{P}{\frac{\Delta\rho}{\rho}} \Rightarrow \Delta\rho = \frac{\rho P}{K}$

47. **(3)** $T = \frac{2m_1m_2}{m_1+m_2}g = \frac{2\times3\times5\times10}{3+5} = \frac{75}{2}\text{N}$

Stress, $\frac{T}{\pi r^2} \le \frac{24}{\pi}\times100$

$r^2 \ge \frac{75}{2\times24\times100}$

$r_{\min} = \frac{5}{40}\text{m} = 12.5\,\text{cm}$

48. **(2)** Thermal expansion = Mechanical compression

$L_0\alpha\Delta T = \frac{FL_0}{AY}$

$\therefore \quad Y = \frac{F}{A\alpha\Delta T}$

49. **(4)** $V = \frac{4}{3}\pi r^3 \Rightarrow \frac{\Delta V}{V} = 3\frac{\Delta r}{r}$

$B = \frac{p}{-\left(\frac{\Delta V}{V}\right)} \Rightarrow -\frac{\Delta V}{V} = \frac{p}{B}$

$\Rightarrow -3\frac{\Delta r}{r} = \frac{p}{B} \Rightarrow -\frac{\Delta r}{r} = \frac{p}{3B}$

50. **(2)** $Y = \frac{F}{A}\frac{l}{\Delta l} \Rightarrow \Delta l = \frac{Fl}{AY}$

For series combination,

$\Delta l = \Delta l_1 + \Delta l_2$

$\frac{F\times 2l}{AY} = \frac{Fl}{AY_1} + \frac{Fl}{AY_2}$

$\Rightarrow \frac{2}{Y} = \frac{1}{Y_1} + \frac{1}{Y_2} \Rightarrow Y = \frac{2Y_1Y_2}{Y_1+Y_2}$

CHEMISTRY

SECTION - A (35 Questions)

51. **(4)**

$H_2C=CH_2 \xrightarrow{dil.alkaline, KMnO_4} HO-CH_2-CH_2-OH$

52. **(2)**
Soda lime and zinc dust

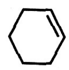
53. **(2)**
–Cl group is o-, p-directing due to +R effect ; however it is deactivating due to strong –I effect of Cl (difference from other o-, p-directing groups which are activating). The net result is that chlorobenzene undergoes o, psubstitution, but with difficulty.

54. **(3)**
Peroxide

55. **(1)**
Acidic nature of terminal alkynes

56. **(3)**
HI > HBr > HCl

57. **(3)**

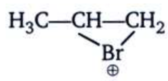


58. **(3)**
Dehydrohalogenation

59. **(1)**
Na in liq.NH_3

60. **(2)**
H_2/Ni

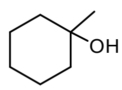
61. **(2)**



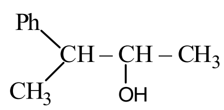
62. **(3)**
Delocalisation of benzene leads to saturation

63. **(4)**
–NHR

64. **(1)**



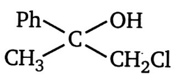
65. **(2)**



66. **(4)**
BHC (or) Gammaxene (or) 6,6,6 is called lindane
67. **(3)**
Reactivity depends on stability of alkene product form according to hyper conjugation effect.
68. **(3)**
Butane, 2, 5-dimethylhexane and isohexane
69. **(4)** Hex-3-ene
70. **(3)** In presence of sunlight addition occurs
71. **(2)** 2, 3 dimethyl butane
72. **(4)** All
73. **(2)**
(A) CH_3Cl, (B) $C_6H_5CH_2Cl$, (C) KCN
74. **(1)**
$-NO_2$ is a meta-directing group. As it is also a deactivating group so no chance of introduction of second –Br atom.
75. **(2)**
For statement (iii), Fluorination is too violent to be controlled. For statement (iv), Iodination is very slow and a irreversible reaction. It can be carried out in the presence of oxidizing agents like HIO_3 or HNO_3

$$CH_4 + I_2 \Rightarrow CH_3I + HI$$
$$5HI + HIO_3 \rightarrow 3I_2 + 3H_2O$$

76. **(3)**
In nitration reaction $NO_2^{\oplus}$ (nitronium ion) form as an electrophile.
77. **(1)**

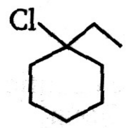


78. **(2)**
Eclipsed form has maximum torsional strain while staggered form has the least.
79. **(2)** (i)-(d), (ii)-(a), (iii)-(e), (iv)-(c), (v)-(b)
80. **(4)** A is correct but (R) is incorrect
81. **(2)** $AlCl_3 / HCl$
82. **(1)**
As number of carbons increases boiling point increases and as branching increases boiling point decreases
83. **(1)** A – (s), B – (r), C – (q), D – (p)
84. **(1)**
Assertion is correct, reason is correct; reason is a correct explanation for assertion
85. **(4)**

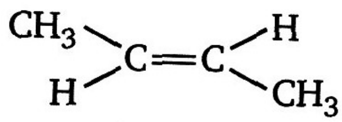
$$CH_3 - CH_2 - CH = CH - CH_3 \xrightarrow{O_3\ Zn/H_2O} CH_3CH_2CHO + CH_3CHO$$

SECTION - B (Attempt Any 10 Questions)

86. **(1)**
π-electrons of benzene rings are delocalised throughout the molecule. This makes the molecule very stable. The stability resists breaking of double bonds for addition.
87. **(3)**
(A) $C_6H_5NO_2$, (B) m-Bromonitrobenzene, (C) m-Bromoaniline
88. **(3)**



89. **(3)**
$(4n + 2)\pi$ electrons and planar structure are the essential conditions for aromaticity.
90. **(4)** 3
91. **(1)** A and B as major and C as minor products
92. **(2)**
Stability of carbanion is directly proportional to % of S character of carbon on which negative charges is present.
93. **(4)**

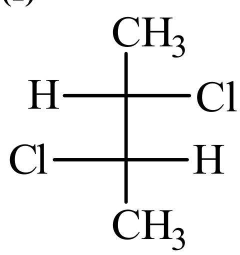


94. **(2)**

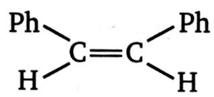
(iii) $CH_4(g) + O_2(g) \xrightarrow{Mo_2O_3} HCHO + H_2O$

(iv) $2CH_4(g) + O_2(g) \xrightarrow{Cu/523/100\ atm} 2CH_3OH$

95. **(3)**
(A), (C), (E), (F), (H)
96. **(2)** Hydration of acetylene
97. **(2)** According to Markovnikov rule
98. **(1)**



99. **(2)**



100. **(3)**
It gives Glyaxal, Methy Glyaxal