Kantipur Engineering College

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING

Solution of B.E. Entrance Test (2075)

Set: II (A)

1.	**(A)**	2. **(B)**	**3.** (**C**)	4. (**D**)
5.	**(D)**	6. **(C)**	7. (**B**)	8. **(A)**
9.	**(A)**	10. **(A)**	11. **(C)**	**12. (C)**
13.	**(D)**	14. **(D)**	15. **(B)**	

16. **(B)**

Solution

280 ml of gas at NTP weigh 2 gm

22400 ml of gas at NTP weigh $\frac{2\times22400}{280} = 160$ gm

Molecular weight of the gas = 160

17. **(D)**

Solution: pH = - log of strong acid

= - log 0.2 = 0.69

18. **(C)**

Solution:

Co -27 d-block element

19. **(B)**

Solution: $C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$

44 g of Propane required 5× 22.4 L

4.4 g Propane required $\frac{5\times22.4\ \text{L}}{44\ \text{L}} \times 4.4$

= 11.2 L

20.	**(A)**	21. **(A)**	22. **(C)**	23. **(D)**
24.	**(B)**	**25. (A)**	26. **(D)**	

27. **(B)** Two vectors of equal magnitude and directed in opposite directions give zero resultant.

28. **(C)** When the particle moves with uniform velocity, acceleration is zero.

29. **(C)** The energy transfer in vacuum is by radiation.

30. **(C)** Beats cannot be heard due to persistence of sound if the beat frequency is more than 10 Hz.

31. **(D)** The critical angle for diamond is small due to high refractive index. So large scale total internal reflection takes place.

32. **(D)** concave mirror produces magnified virtual image when the object is between the pole and the focus.

33. **(A)** The image formed in an astronomical telescope is inverted and virtual.

34. **(A)** The work done in taking a charge on the closed path is zero because the electric field is conservative.

35. **(B)** The radius of the circular path is given by $r = \frac{mv}{qB}$. As radius is directly proportional to v and hence the radius of the circle increases.

36. **(B)** By increasing the intensity of incident beam, the number of emitted photo-electrons can be increased. Hence number of photo-electrons emitted is proportional to the intensity of incident beams.

37. **(D)** 3 men and 3 women be seated in a row if two persons of the same sex do not sit together =3!.3!.2! = 72

38. **(C)** $y = \frac{2}{1-x}$

$$\frac{dy}{dx} = \frac{2}{(1-x)^2}$$

$\frac{d^2y}{d^2x} = \frac{4}{(1-x)^3}$、

At $x = -1$, $\frac{d^2y}{d^2x} = \frac{4}{(1+1)^3} = \frac{1}{2}$

39. **(A)** Here $a_1 = 2, a_2 = -1, a_3 = 4$ and $b_1 = -3,\ b_2 = 2,\ b_3 = 2$ and if θ is the angle then

$$\cos\theta = \frac{a_1b_1 + a_2b_2 + a_3b_3}{\sqrt{a_1^2 + a_2^2 + a_3^2}\sqrt{b_1^2 + b_2^2 + b_3^2}} = 0$$

Therefore, $\theta = \frac{\pi}{2}$.

40. **(B)** $\tan 3\theta = -1$

$$3\theta = -\frac{\pi}{4}$$

$$3\theta = n\pi - \frac{\pi}{4}$$

$$\theta = \frac{n\pi}{3} - \frac{\pi}{12}$$

41. **(D)** $f(x+2) = x^2 + 4x + 8$ \

$f(x+2) = (x+2)^2 + 4$

$f(x) = (x)^2 + 4$

$f(-2) = (-2)^2 + 4 = 8$

42. **(D)** y is negative for all x

43. **(D)** $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$

$|\vec{a} + \vec{b}|^2 = |\vec{a} - \vec{b}|^2$

$\overrightarrow{4a}.\vec{b} = 0$

$|\vec{a}||\vec{b}|\cos\theta = 0$ i.e. $\theta = \frac{\pi}{2}$

44. **(B)** $2k - 2 = 1 - k$

$k = 1$

45. **(B)** $y = x^2 - 2x - 5$

x component of the stationary point = $-\frac{b}{2a} = -\frac{-2}{2.1} = 1$

and y = - 6. Therefore (1, -6) is the stationary point.

46. **(B)** If $x > 0$, $\frac{d}{dx}\log|x| = \frac{d}{dx}\log x = \frac{1}{x}$

If $x < 0$, $\frac{d}{dx}\log|x| = \frac{d}{dx}\log(-x) = \frac{1}{-x}.-1 = \frac{1}{x}$

47.	**(A)**	48. **(A)**	49. **(A)**	50. **(C)**
51.	**(C)**	**52. (C)**	53 **(D)**	54. **(A)**
55.	**(C)**	56. **(B)**	57. **(D)**	58. **(A)**
59.	**(C)**	**60. (B)**	61. **(D)**	**62. (A)**
63.	**(C)**	**64. (B)**		

65. (C)

Solution

V_1S_1 (acid) = V_2S_2 (base)

$20 \times S_1 = 25 \times 0.1$ $S_1 = \frac{25\times0.1}{20}$ N = 0.125 N

S_1= 0.125N

We know,

gm/liter = Normality × Equivalent weight

7.875 = 0.125 × Equivalent weight

Equivalent weight = 7.875 / 0.125

= 63.00

66. (B)

Solution:

Total quantity of electricity passed = 0.75× 45 × 60 = 2025 Coulombs

2025 coulomb of electricity deposits 0.6662 g of metal

96500 coulomb of electricity deposits = $\frac{0.6662}{2025}$ × 96500

= 31.75 g

67. (C) **68. (B)**

69. (D) Pascal second = pressure × time

$$= \frac{[ML\,T^{-2}]}{[L^2]} = [ML^{-1}\,T^{-1}]$$

Further, $\eta = = \frac{F}{6\pi\pi\vartheta} = \frac{[M\,L\,T^{-2}]}{[L \times L\,T^{-1}]} = [ML^{-1}\,T^{-1}]$

70. (A) $\lambda = \frac{0.693}{T_{1/2}} = \frac{0.693}{1620 \times 365 \times 24 \times 60 \times 60}$

And $N = \frac{6.023 \times 10^{23}}{226}$

We know that, $\frac{dN}{dt} = \lambda N$

$\therefore \frac{dN}{dt} = 3.61 \times 10^{10}$

71. (D) we know that $E \alpha \; 1/n^2$

$\therefore E_1 = \frac{-13.6}{2^2} = -3.4$ eV

72. **(A)** In case of simple harmonic motion

$$\text{K.E.} = \frac{1}{2}\,\text{m}\,\text{R}^2\,\omega^2\,\cos^2\,\omega t$$

$$\&\ \text{P.E.} = \frac{1}{2}\,\text{m}\,\text{R}^2\,\omega^2\,\sin^2\,\omega t$$

$$\text{T.E.} = \frac{1}{2}\,\text{m}\,\text{R}^2\,\omega^2$$

According to the equation,

$$\frac{1}{2}\,\text{m}\,\text{R}^2\,\text{w}^2\,\cos^2\,\omega t = \frac{1}{4}\,\frac{1}{2}\,\text{m}\,\text{R}^2\,\omega^2 \Rightarrow \omega t = \pi/3$$

$$\text{Now, } x = \text{R}\,\sin\,\omega t = \text{R}\,\sin(\text{A}/3) = \frac{\sqrt{3}}{2}\,\text{R}$$

73. **(A)** $x_n = \frac{a}{2}(2n-1) = \frac{10}{2}(2n-1)$

$$x_n = \frac{1}{2}at^2 = 5t^2 = 45$$

$$\therefore n = 5$$

$$\text{Now, } h = \frac{1}{2}\,g \times 5^2 = \frac{1}{2} \times 10 \times 25 = 125\,\text{m}$$

74. **(D)** Here, $\frac{n_s}{n_p} = \frac{p_o}{p_i}$

$$\frac{3}{2} = \frac{p}{p_i} \Rightarrow p_i = \frac{2p}{3}$$

75. **(B)** $\text{Cos}\,\theta = \frac{B_H}{B} = \frac{3 \times 10^{-5}}{6 \times 10^{-5}} = \frac{1}{2}$ $\qquad \therefore \theta = 60^0$

76. **(C)** Hence, $\frac{1}{2}\,mv^2 = eV$

$$v = \sqrt{\frac{2Ve}{m}} = \sqrt{2 \times 200 \times 1.6 \times 10^{11}} = 8 \times 10^6\ \text{m/s}$$

77. **(C)** $\mu = 1/\sin c$ $\qquad \text{sinc} = 3/5$

$\therefore \mu = 5/3$ $\qquad$ Also, $\tan i_p = \mu$

$\therefore i_p = \tan^{-1}(5/3)$

78. **(D)** He should use a concave lens of focal length 60cm.

$$\therefore p = -\frac{1}{0.6} = -1.66\,\text{D}$$

79. **(B)** $25 = \left(1 - \frac{300}{T_1}\right)100 = \frac{100T_1 - 30000}{T_1}$

$25\ T_1 = 100T_1 - 30000$

$\therefore T_1 = 400$ k. $= 400 - 273 = 127°C$

80. **(A)** $\frac{\Delta l}{l} = 0.10\% = 0.001$ & $\Delta T = 100°C$

Now, $\frac{\Delta l}{l} = \alpha \Delta T$ $\qquad 0.001 = \alpha \times 100 \Rightarrow \alpha = 10^{-5} / {}^0C$

Further $\gamma = 3\alpha = 3\times 10^{-5} / {}^0C$

$\therefore \frac{\Delta v}{V} \times n\Delta T = 3\times 10^{-5} \times 100 = 3\times 10^{-3}$

or $\frac{\Delta v}{V} \times 100 = 0.30\%$

81. **(A)** $v \propto r^2$

Hence $5 \alpha r^2$ and $v \alpha R^2$

$v \alpha (2^{1/3} r)^2 \alpha 4^{1/3} r^2$

$\therefore \frac{v}{5} = (4)^{1/3} \Rightarrow v = 5\times 4^{1/3}$ cm/s

82. **(D)** $g_h = g(1 - \frac{2h}{r})$ and $g_x = g(1 - \frac{x}{R})$

Given that $g_h = g_x$

$\therefore x = 2h$

83. **(C)** The acceleration a_1 without friction is

$a_1 = g \sin\theta ---(a)$

The acceleration a_2 with friction is

$a_2 = g\sin\theta - \mu g \cos\theta ---(b)$

Further, $t = \sqrt{\left(\frac{2s}{a}\right)}$

$\therefore \frac{t_1}{t_2} = \sqrt{\frac{a_2}{a_1}}$

$\frac{1}{2} = \sqrt{\frac{g\sin\theta - \mu g\cos\theta}{g\sin\theta}}$

$\frac{1}{2} = \sqrt{1 - \mu \tan\theta}$

$\mu \tan\theta = \frac{3}{4}$

$\mu = \frac{3}{4} \frac{1}{\tan 45^0} = \frac{3}{4} = 0.75$

84. **(B)** $|\vec{a} - \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 - 2\vec{a}.\vec{b}$

$= 2 - 2|\vec{a}||\vec{b}|\cos\theta$

$= 2(1\cos\theta)$

$= 4\sin^2\frac{\theta}{2}$

Therefore, $|\vec{a} - \vec{b}| = 2\sin\frac{\theta}{2}$

85. **(B)** $\int(1-\cos x+\cos^2 x-\cos^3 x+\cos^4 x-\cdots)\,dx=\int\frac{1}{1+\cos x}\,dx$

$$=\int\frac{1}{2}\sec^2\frac{x}{2}\,dx$$
$$=\tan\frac{x}{2}+c$$

86. **(C)** Coefficient of x^3 in $(1+ax)^4=\binom{4}{3}a^3$

$$\binom{4}{3}a^3=1372$$
$$4a^3=1372$$
$$a=7$$

87. **(D)** modulus of $-1+\sqrt{3}\,i$ is $\sqrt{(-1)^2+\left(\sqrt{3}\right)^2}=2$

and the argument is $\theta=\tan^{-1}\frac{\sqrt{3}}{-1}=\frac{2\pi}{3}$

88. **(A)** $x^2-10x+17=(x-5)^2-8$
So $a=5$ and $b=-8$

89. **(A)** $|3x-2|<5$
$-5<3x-2<5$
$-5+2<3x<5+2$
$-\frac{3}{3}<x<\frac{7}{3}$

90. **(D)** Common difference $d=\frac{y-x}{4}$

$$m_1=x+\frac{y-x}{4}=\frac{3x+y}{4}$$
$$m_2=\frac{3x+y}{4}+\frac{y-x}{4}=\frac{x+y}{2}$$
$$m_2=\frac{x+y}{2}+\frac{y-x}{4}=\frac{x+3y}{4}$$

91. **(C)** The function is of the form $\frac{0}{0}$ for $x=0$
For $x<0,\ f(x)=-1$
For $x>0,\ f(x)=1$
So the range is $\{-1,1\}$

92. **(B)** $\int\frac{1}{f(x)}dx=\log[f(x)]^2+c$
$\frac{1}{f(x)}=2\frac{1}{f(x)}f'(x)$
$\frac{1}{2}=f'(x)$
$f(x)=\frac{1}{2}x+k$

93. **(A)** $x^2 - 4x - 12y - 32 = 0$
$(x-2)^2 = 12(y+3)$,
So vertex = (2, -3) and latus rectum =12

94. **(A)** $xy + 2x - y - 2 = 0$
$x(y+2) - 1(y-2) = 0$
$(x-1)(y+2) = 0$
These pair of st. lines are parallel to x-axis and y-axis. So they are perpendicular to each other.

95. **(C)** $f(x) = x + \sin x$
$f'(x) = 1 + \cos x$
$f''(x) = -\sin x$
For max or min $f'(x) = 0$
$1 + \cos x = 0$
$x = \pi$
And $f''(x) = 0$. So neither max. nor min.

96. **(A)** Area bounded by $y = \ln x$, the x- axis and the straight line $x = e$

$$\int_1^e \ln x = [x\ln x - x]_1^e = e$$

97. **(D)** $y = ax^2 - 2x + b$ passes through $(1,2)$
so $2 = a - 2 + b$

$$a + b = 4$$

$\frac{dy}{dx} = 2ax - 2$ but the tangent is parallel to x axis at
$x = -1$, Therefore, $\frac{dy}{dx} = 0$ at $x = -1$
$-2a - 2 = 0$, so $a = -1$ and $b = 5$.

98. **(D)** $3\cos^{-1}x + \sin^{-1}x = \pi$
$3\cos^{-1}x + \frac{\pi}{2} - \cos^{-1}x = \pi$
$2\cos^{-1}x = \frac{\pi}{2}$ so $x = \frac{1}{\sqrt{2}}$

99. **(B)** **100. (B)**

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