AVIRAL
JEE | NEET | FOUNDATIONS

FINAL TEST SERIES XI JEE
TEST-03 ANSWER KEY

Test Date :02-02-2020

[PHYSICS]

1. Answer (1)
2. Answer (4)
3. Answer (3)

$$E_1 = \frac{1}{2}kx^2 \Rightarrow x = \sqrt{\frac{2E_1}{k}}$$

$$y = \sqrt{\frac{2E_2}{k}}$$

$$E = \frac{1}{2}k(x+y)^2 \Rightarrow \sqrt{E} = \sqrt{E_1} + \sqrt{E_2}$$

4. Answer (4)

Let $x = A\cos\omega t$

$p = A - A\cos\omega$

$p + q = A - A\cos 2\omega = 2A\,(1 - \cos^2\omega)$

$$\frac{p+q}{2p} = 1 + \cos\omega$$

$$\frac{P}{A} = 1 - \cos\omega$$

5. Answer (2)
6. Answer (2)
7. Answer (3)
8. Answer (4)
9. Answer (2)
10. Answer (3)
11. Answer (1)

$$W = \frac{nR\Delta T}{1-\gamma}, n = \frac{1}{4}$$

12. Answer (4)
13. Answer (1)
14. Answer (3)
15. Answer (4)

$$|f_1 - f_2| = 10$$

16. Answer (4)

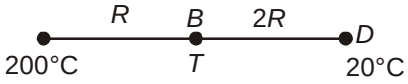
$$\frac{A_1 + A_2}{A_1 - A_2} = n; \frac{A_2}{A_1} = \frac{n-1}{n+1}$$

$$\frac{E_2}{E_1} = \frac{A_2^2}{A_1^2} = \left(\frac{n-1}{n+1}\right)^2$$

17. Answer (3)
18. Answer (3)

$$\frac{n_1 + n_2}{\gamma - 1} = \frac{n_1}{\gamma_1 - 1} + \frac{n_2}{\gamma_2 - 1}$$

19. Answer (4)



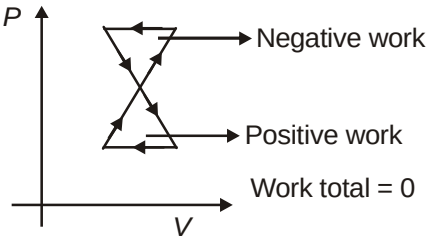
$$\frac{200 - T}{R} = \frac{T - 20}{2R}$$

$400 - 2T = T - 20$

$3T = 420$

$T = 140°C$

20. Answer (2)
21. Answer (4)
22. 3
23. 2
24. Answer (0)



Negative work = Positive work

25. 2

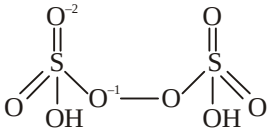
[CHEMISTRY]

26. (D)

27. (C)

PF_5 have trigonal bipyramidal structure which have a unsymmtrical structure in which equatorial lengths and axial lengths are not equal

28. (D)



29. (C) $HClO_4$ has least oxidising power

30. (C)

31. (B)

32. Diamond crystalizes in the face centred cubic lattice.

33. (A)

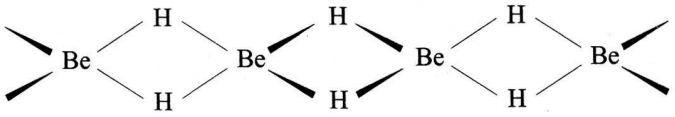
34. (A)

35. (C)

36. Thermal stability increases in the group

37. A

38. The structure of BeH_2 is



39. Besides σ bond between boron and halogen atoms, there exist additional pπ-pπ bond between the two atoms resulting from back-donation of electrons from halide to boron (back bonding). The tendency to form back bonding is maximum in BF_3 and falls rapidly on passing to BCl_3 and BBr_3. The tendency to accept electron pair, therefore, increases from BF_3 to BBr_3.

40. BF_3 hydrolyses incompletely and forms fluoborates.

$$4BF_3 + 12H_2O \rightarrow 4H_3BO_3 + 12HF$$
$$12HF + 3H_3BO_3 \rightarrow 3H^+ + 3[BF_4]^- + 9H_2O$$
$$\overline{4BF_3 + 3H_2O \rightarrow H_3BO_3 + 3H^+ + 3[BF_4]^-}$$

The other halides undergo complete hydrolysis $BCl_3 + 3H_2O \rightarrow H_3BO_3 + 3HCl$

41. B

42. Answer (1)

Since Li^+ has most power of polarization among alkali metal ion hence LiCl is least ionic.

43. Answer (1)

Mg on burning forms MgO and Mg_3N_2.

44. Answer (1)

45. Answer (1)

Cl–O bond length is shortest in case of ClO_4^- because of high bond order that is 1.75.

[MATHEMATICS]

51. Answer (3)

$l^2 + m^2 + n^2 = 1$

$l = m = n$

$\Rightarrow l = m = n = \frac{1}{\sqrt{3}}$

52. Answer (3)

53. Answer (1)

p	q	$p \wedge q$	$p \wedge q \rightarrow p$
T	T	T	T
T	F	F	T
F	T	F	T
F	F	F	T

54. Answer (4)

55. Answer (1)

56. Answer (3)

This equation is of the form

$Y^2 = 4a(X)$

$\Rightarrow$ vertex is $(a, 0)$.

57. Answer (2)

$$\lim_{x\to 0}\frac{e^{ax}-e^{bx}}{x} = \lim_{x\to 0}\frac{ae^{ax}-be^{bx}}{1} = a-b$$

58. Answer (2)

Let (x, y) be the other end of the chord.

$\frac{x+0}{2} = 2a,\ \frac{y+0}{2} = 3b \Rightarrow x = 4a, y = 6b.$

$(4a, 6b)$ lies on the parabola.

$\Rightarrow 36b^2 = 4(4a)$

$\Rightarrow 9b^2 = 4a.$

59. Answer (3)

Case(i)	Case(ii)
$x > 0$	$x < 0$
$\frac{2}{3} < x$	$x < \frac{2}{3}$

$\Rightarrow x < 0$

Hence from case (i) & (ii),

$$x \in (-\infty, 0) \cup \left(\frac{2}{3}, \infty\right)$$

60. Answer (2)

$$\lim_{n\to\infty}\frac{n(n+1)}{2(n+2)(2n+3)}.$$

$$\lim_{n\to\infty}\frac{n^2\left[1+\frac{1}{n}\right]}{2n^2\left[1+\frac{2}{n}\right]\left[2+\frac{3}{n}\right]} = \frac{1}{2(1)(2)} = \frac{1}{4}.$$

61. Answer (3)

$$x = a\left(y^2 + \frac{b}{a}y + \frac{b^2}{4a^2}\right) - \frac{b^2}{4a} + c$$

or $a\left(y + \frac{b}{2a}\right)^2 = x + \frac{b^2}{4a} - c$

$$\Rightarrow \left(y + \frac{b}{2a}\right)^2 = \frac{1}{a}\left(x + \left(\frac{b^2}{4a} - c\right)\right)$$

Hence L.R. $= \frac{1}{a}$

62. Answer (4)

$2 - \lambda > 0, \lambda - 5 > 0$

$\Rightarrow \lambda < 2$ and $\lambda > 5 \quad \Rightarrow \quad \lambda \in \phi$

63. Answer (2)

Let $y = \cos\frac{x}{2}\cos\frac{x}{4}...\cos\frac{x}{2^n}$

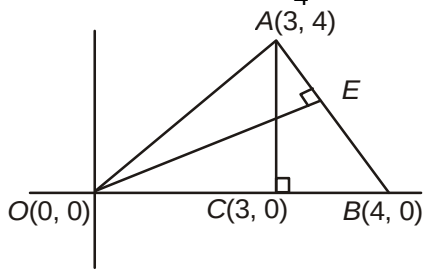
$$= \frac{1}{2\sin\frac{x}{2^n}}\left(\cos\frac{x}{2}\cos\frac{x}{4}...\cos\frac{x}{2^{n-2}}\sin\frac{x}{2^{n-2}}\right)$$

$$= \frac{\sin x}{2^n \sin\frac{x}{2^n}}$$

$$\lim_{n\to\infty} y = \lim_{n\to\infty}\frac{\frac{x}{2^n}}{\sin\frac{x}{2^n}}.\frac{\sin x}{x} = 1.\frac{\sin x}{x} = \frac{\sin x}{x}$$

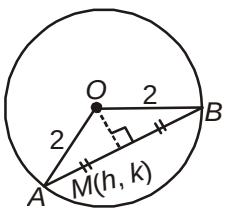
64. Answer (3)

Equation of altitude OE is $y = \frac{x}{4}$



Solving AC and OE, point of intersection comes out to be $\left(3, \frac{3}{4}\right)$.

65. Answer (3)



$AM = MB = OM$

$\Rightarrow \quad OM = \sqrt{2}$

$\Rightarrow \quad h^2 + k^2 = 2$

Hence locus of (h, k) is $x^2 + y^2 = 2$.

66. Answer (3)

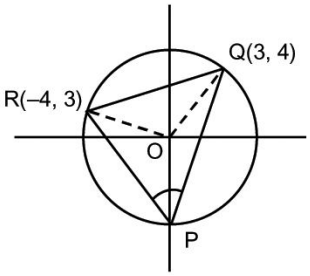
For given slope, there exist 2 parallel tangents to ellipse. Hence, there are 2 values of *C.*

67. Slope of OR × Slope of OQ = $\frac{-3}{4} \times \frac{4}{3} = -1$

$\Rightarrow \angle QOR = \frac{\pi}{2}$

$\Rightarrow \angle QPR = \frac{\pi}{4}$ (i.e. angle subtended at the centre of a circle is double the angle subtended in the alternate segment).

Hence (C) is the correct answer.



68. Let the centre be C (h, k). Since the circle passes through the origin,

radius = OC = $\sqrt{h^2 + k^2}$.

Let x = c meets the circle in A and B.

CD ⊥ AB.

From figure, $CB^2 = CD^2 + BD^2$

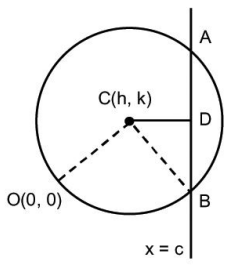
$\Rightarrow OC^2 = CD^2 + b^2$ ($\because$ CB=OC and BD=b)

$\Rightarrow h^2 + k^2 = (h - c)^2 + b^2$

$\Rightarrow k^2 + 2ch - c^2 - b^2 = 0$

$\Rightarrow$ locus is $y^2 + 2cx = b^2 + c^2$.

Hence (C) is the correct answer.



69. Let the point of contact be (x′, y′) then equation of tangent is $\frac{xx'}{4} + \frac{yy'}{1} = 1$ comparing it with y – x = $\sqrt{3}$, we get

$\frac{x'}{-4} = \frac{y'}{1} = \frac{1}{\sqrt{3}} \Rightarrow x' = \frac{-4}{\sqrt{3}}$ and $y' = \frac{1}{\sqrt{3}}$.

70. Equation of normal at (asecθ, btanθ) is;
$ax\cos\theta + by\cot\theta = a^2 + b^2$

Comparing it with $lx+my+n=0$ we get $\frac{a\cos\theta}{l} = \frac{b\cot\theta}{m} = \frac{\left(a^2+b^2\right)}{-n}$

$\Rightarrow \cos\theta = \frac{l\left(a^2+b^2\right)}{-an}$ and $\cot\theta = \frac{m\left(a^2+b^2\right)}{-nb}$

$\Rightarrow \sin\theta = \frac{bl}{am}$

Thus $\frac{b^2l^2}{a^2m^2} + \frac{l^2\left(a^2+b^2\right)^2}{a^2n^2} = 1$ or, $\frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{\left(a^2+b^2\right)^2}{n^2}$.

Hence (B) is the correct answer.

71. Answer (1)

$$\lim_{x\to 3}\frac{(x-3)(\sqrt{x-2}+\sqrt{4-x})}{(x-2)-(4-x)}$$

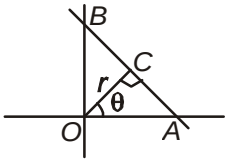
$$= \lim_{x\to 3}\frac{(x-3)(\sqrt{x-2}+\sqrt{4-x})}{2x-6}$$

$$= \frac{1+1}{2} = 1.$$

72. Answer (9)

$A\left(\frac{\lambda}{3}, 0\right), B(0,\lambda)$

Equation of $OC \equiv \boxed{x = 3y}$



$\frac{BC}{AC} = \tan^2\theta = 9$

73. Answer (0)

In any triangle, four circles can be drawn touching all the three sides of triangle. But in this case, the three lines are concurrent.

74. Answer (2)

If they touch $x = y$ is a tangent to both the circles.

$\Rightarrow -\frac{2}{\sqrt{2}} = \sqrt{4-c} \Rightarrow 4-c = 2 \Rightarrow \boxed{c = 2}$

75. Centre is (1, 3) and radius = 2

If r = radius of second circle then $r^2 = 2^2 + (3-1)^2 + (2-1)^2$

$\Rightarrow r = 3.$

Hence (C) is the correct answer.