

**ANSWER KEY & SOLUTIONS  
FOR  
NATIONAL STANDARD EXAMINATION (JUNIOR SCIENCE) – 2013  
PAPER CODE - 516**

**ANSWERS**

- |   |                         |       |       |
|---|-------------------------|-------|-------|
| 1. B  | 2. D                    | 3. A  | 4. D  |
| 5. D  | 6. B                    | 7. A  | 8. C  |
| 9. C  | 10. Option not matching | 11. A |       |
| 12. A   |                         |       |       |
| 13. None of the answer is correct (The answer should be 56 J) |                         |       |       |
| 14. C   | 15. C                   | 16. A | 17. D |
| 18. There can be 4 such points                                |                         |       |       |
| 19. D   | 20. C                   | 21. B | 22. D |
| 23. C   | 24. C                   | 25. C | 26. C |
| 27. B   | 28. A                   | 29. C | 30. A |
| 31. C   | 32. B                   | 33. B | 34. A |
| 35. D   | 36. A                   | 37. D | 38. D |
| 39. A   | 40. C                   | 41. B | 42. B |
| 43. C   | 44. B                   | 45. A | 46. D |
| 47. C   | 48. D                   | 49. D | 50. B |
| 51. C   | 52. A                   | 53. C | 54. B |
| 55. C   | 56. D                   | 57. C | 58. A |
| 59. C   | 60. A                   | 61. C | 62. D |
| 63. B   | 64. B                   | 65. B | 66. B |
| 67. B   | 68. A                   | 69. A | 70. D |
| 71. B   | 72. B                   | 73. D | 74. B |
| 75. D   | 76. C                   | 77. C | 78. A |
| 79. B   | 80. D                   |       |       |

## SOLUTIONS

1. B  
 Sol. (1)  $B_1$  will be inward,  $B_2$  will be outward,  $|B_1| = |B_2|$   
 (2) Both  $B_1$  and  $B_2$  will be inward,  $|B_1| < |B_2|$   
 (3) Both  $B_1$  and  $B_2$  will be inward,  $|B_1| = |B_2|$   
 (4)  $B_1$  will be inward, will be outward,  $|B_1| < |B_2|$

2. D

2.  $l^2 = h^2 + r^2$

$$l_1^2 = h^2 + 4r^2$$

$$l_2^2 = h^2 + 16r^2$$

$$\pi r l = \pi r \sqrt{(h^2 + r^2)}$$

$$\pi r l_1 = \pi 2r \sqrt{h^2 + 4r^2}$$

$$\pi r l_2 = 4\pi r \sqrt{h^2 + 16r^2}$$

$$4\pi r \sqrt{h^2 + 16r^2}$$

$$= k\pi r (h^2 + r^2)$$

$$16h^2 + 256r^2$$

$$= k^2 h^2 + k^2 r^2$$

$$2\pi r \sqrt{h^2 + 4r^2} = 3\pi r (\sqrt{h^2 + r^2})$$

$$4h^2 + 16r^2 = 9h^2 + 9r^2$$

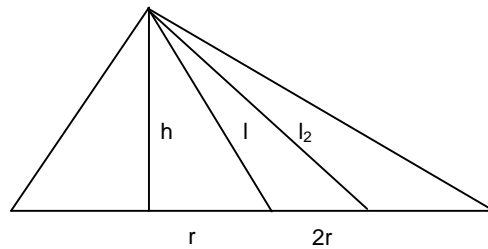
$$7r^2 = 5h^2$$

$$r^2 \frac{7}{5} = h^2$$

$$16 \times \frac{7}{5} r^2 + 256r^2 = k^2 \left( r^2 \frac{7}{5} + r^2 \right)$$

$$k^2 = 116$$

k is nearest to 11



3. A

- Sol. 2 mole of  $O_2 = 64$  g  
 .2 mole of  $O_2 = 6.4$  g

4. D

- Sol. Wuchereria is the member of phylum nematoda (Aschelminthes)

5. D

Sol.  $l = \frac{Q}{t}$

$$Q = n (1.6 \times 10^{-19})$$

N = Number of charged particle.

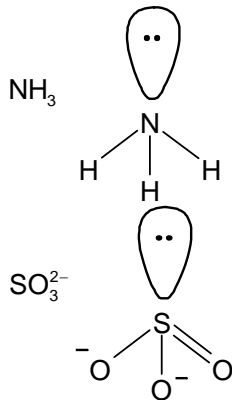
6. B

$$1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} - \frac{1}{6} + \dots - \frac{1}{2012} + \frac{1}{2013}$$

$$= \left( 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \dots + \frac{1}{2012} + \frac{1}{2013} \right)$$

$$\begin{aligned}
& -2\left(\frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8} + \dots + \frac{1}{2012}\right) \\
& = \left(1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{2012} + \frac{1}{2013}\right) - \left(1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots + \frac{1}{1006}\right) \\
& = \frac{1}{1007} + \frac{1}{1008} + \frac{1}{1009} + \dots + \frac{1}{2013}
\end{aligned}$$

7. A  
Sol.



8. C  
Sol. Because plastic is a non biodegradable agent.

9. C  
Sol. By conservation of linear momentum  $m_1\vec{u}_1 + m_2\vec{u}_2 = (m_1 + m_2)\vec{v}$   
The sound energy produced  $\leq$  the loss in energy  
 $\frac{1}{2}m_1u_1^2 + \frac{1}{2}m_2u_2^2 - \frac{1}{2}(m_1 + m_2)v^2 = \text{loss in energy}$

11. A  
Sol. Alpha radiation

12. A  
Sol. DNA and proteins are present in chromosomes.

13. None of the answer is correct (The answer should be 56 J)  
Sol.  $\Delta K = W_{\text{Total}} = 14 \times 4 = 56 \text{ J}$   
 $K_f - K_i = 56$   
( $\because K_i = 0$ )

14. C

14.  $x^2 + \frac{b^2}{x^2} + 26 = a^2$   
 $x^2 + \frac{b^2}{x^2} = a^2 - 26$   
 $x^3 + \frac{b^2}{x} = a^2x - 26x$   
 $a + 1 + \frac{b}{x} \cdot b = x(a^2 - 26)$   
 $a + 1 + (a - x) \cdot b = x(a^2 - 26)$

$$a + 1 + ab - bx = x(a^2 - 2b)$$

$$x(b + a^2 - 2b) = ab + 1 + a$$

$$x = \frac{ab + a + 1}{a^2 - b}$$

15. C

Sol.  $E_{\text{cell}}^{\circ} = E_{\text{C}} - E_{\text{A}}$

$$0.75 = 0.34 - E_{\text{A}}$$

$$E_{\text{A}} = -0.410 \text{ V}$$

16. A

Sol. Deodar and Pinus are gymnosperm plants.

18.

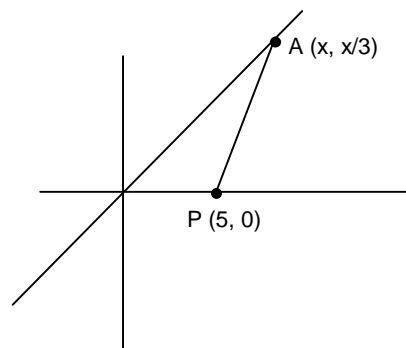
18.  $OP = PA$

$$OA = OP$$

$$OA = AP$$

$\Rightarrow$  A can be (9, 3),

$$\left(\frac{3\sqrt{5}}{2}, \frac{3\sqrt{5}}{6}\right), \left(\frac{-3\sqrt{5}}{2}, \frac{-3\sqrt{5}}{6}\right) \& \left(\frac{5}{2}, \frac{5}{6}\right)$$



19. D

Sol.  $-\frac{1}{2} \times \Delta[A] = +\Delta[C]$

20. C

Sol. The females egg carries only one x chromosome (22 + x).

21. B

Sol. Like charges always repel each other while a charge body may attract an uncharged body due to polarisation.

22. D

22.  $13a + 35b = 1000$

$$\Rightarrow a = 50, b = 10$$

$$m = a + b = 50 + 10 = 60$$

$$13x + 35y = 1000$$

$$y = 23, x = 15$$

$$n = x + y = 38$$

$$m + n = 60 + 38 = 98$$

24. C

Sol. It is the controlling centre of cell.

25. C

Sol. Distance = velocity x time

$$350 \times 6 = 2100 \text{ m}$$

26. C

$$A = P \left( 1 + \frac{r}{100} \right)^n$$
$$96,800 = P \left( 1 + \frac{r}{100} \right)^2 \quad (1)$$
$$97,240 = P \left( 1 + \frac{r}{200} \right)^4 \quad (2)$$

$$\frac{(2)}{(1)} \Rightarrow \frac{97,240}{96,800} = \frac{\left( 1 + \frac{r}{200} \right)^4}{\left( 1 + \frac{r}{100} \right)^2}$$

27. B

Sol. I and III only  
Poly alkene are highly flammable. This do not make its disposal difficult.

28. A

Sol. It is because of the reflex arc.

29. C

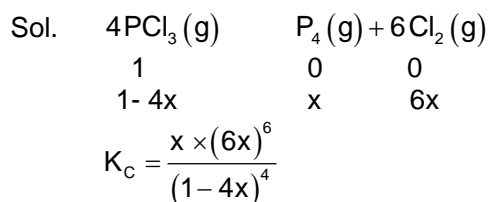
Sol. The change of magnetic flux linked with the coils.

30. A

$$30. \quad \frac{1}{2}ac \sin B = \frac{1}{2}c^2 \sin A$$
$$\Rightarrow \frac{c}{a} = \frac{\sin B}{\sin A}$$
$$\Rightarrow \frac{AB}{BC} = \frac{\sin B}{\sin(180 - 2B)}$$
$$\Rightarrow \frac{AB}{BC} = \frac{\sin B}{\sin 2B}$$
$$\Rightarrow \frac{AB}{BC} = \frac{1}{2 \cos B} = \frac{1}{2} \sec B \quad \text{Sec } B \geq 1$$

or  $\sec B \geq 1$

31. C



32. B

Sol. Placenta is responsible for the physiological activities like nutrition, respiration and excretion in foetus's during pregnancy.

33. B

Sol.  $E_k = hf - \phi$   
 $h = \text{plank's constant}$

34. A

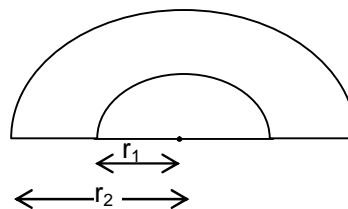
$$34. \quad \frac{\frac{\pi r_1^2}{2}}{\frac{\pi r_2^2 - \pi r_1^2}{2}} = \frac{25}{24}$$

$$24r_1^2 = 25r_2^2 - 25r_1^2$$

$$49r_1^2 = 25r_2^2$$

$$\frac{49}{25} = \frac{r_2^2}{r_1^2} \quad \frac{r_2}{r_1} = \frac{7}{5}$$

$$\text{Ratio} = \frac{\pi r_2}{\pi r_1} = \frac{r_2}{r_1} = \frac{7}{5}$$



35. D  
 Sol. Boiling removes temporary hardness of water.

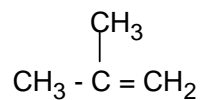
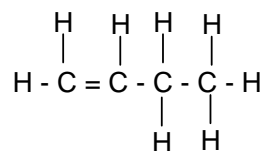
36. A  
 Sol. In angiosperm plants transportation of food takes place with the help of companion cells and sieve tubes.

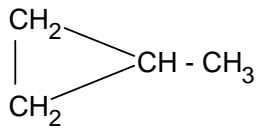
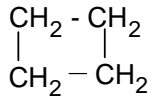
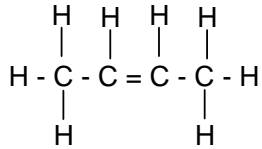
37. D  
 Sol.  $Q = mc\Delta t$   
 $96 = m (0.8) \times 6$

38. D

38. Putting  $x = a$ , we have  
 $x^3 - 3ax^2 + 3ax - a = 0$   
 $a^3 - 3a^3 + 3a^2 - a = 0$   
 $a(-2a^2 + 3a - 1) = 0$   
 $a(2a^2 - 3a + 1) = 0$   
 $a(a - 1)(2a - 1) = 0$   
 $a = 0, 1, \frac{1}{2}$   
 $\therefore$  The 3 real roots are  $0, 1, \frac{1}{2}$

39. A  
 Sol.  $C_4H_8$  Butene



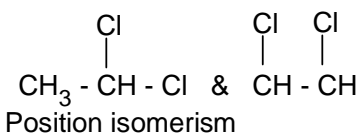


40. C  
Sol. Iodine is a core element for the formation of thyroxine hormone. It is abundantly available in the coastal area.
41. B  
Sol. The gravity always acts downward
42. B
42.  $x^2 + y^2 + z^2 = 1000$   
 $(x + y + z)^2 = (50)^2$   
 $x^2 + y^2 + z^2 + 2(xy + yz + zx) = 2500$   
 $2(xy + yz + zx) = 2500 - 1000$   
 $xy + yz + zx = \frac{1500}{2}$   
 $xy + yz + zx = 750$   
 $\therefore$  cost of y pencils + z pens + x note books = Rs. 750
43. C  
Sol. Ag is placed below hydrogen in reactivity series.
44. B  
Sol. It is adaptation according to their habitat.
45. A  
Sol. The pressure at the same horizontal level remains same  
 $h_a \times (1.6) = h_b (\rho_B)$   
 $\rho_B = \frac{26.6 \times 1.6}{50}$
46. D
46.  $\frac{a^2 + b^2}{ab} = 6$   
 $\frac{a}{b} + \frac{b}{a} = 6$   
Let  $\frac{a}{b} = x$   
 $x + \frac{1}{x} = 6$

$$\begin{aligned}
 x^2 + 1 &= 6x \\
 x^2 - 6x + 1 &= 0 \\
 f(5) &= 25 - 30 + 1 = -4 \\
 f(6) &= 36 - 36 + 1 = 1 \\
 f(x) &= 0 \text{ if } f(5) < f(x) < f(6) \\
 \therefore 5 < x < 6 \\
 \therefore 5 < \frac{a}{b} < 6
 \end{aligned}$$

47. C

Sol.



48. D

Sol.

Biological diversity is the variety and variability among living organisms and the ecological complexes in which they occur.

49. D

Sol.

The acceleration is defined as a rate of change of velocity.

50. B

50. At 4'o clock, angle will be  $120^\circ$

We know that,

$$\theta = \frac{11}{2}m - 30h$$

$$120^\circ = \frac{11}{2}m - 120 (\because h = 4)$$

$$240^\circ = \frac{11}{2}m$$

$$\Rightarrow m = \frac{480}{11} = 43 \frac{7}{11} \text{ min.} \\ = 43^m 38^s$$

$\therefore$ , time will be  $4^h 43^m 38^s$

51. C

Sol.

$$\begin{aligned}
 PV &= \frac{W}{\text{Molar Mass}} RT \\
 \Rightarrow \frac{50.01 \times 10^3}{101325} \times 0.255 &= \frac{.5755}{\text{MM}} \times .0821 \times 288 \\
 \text{MM} &= 108
 \end{aligned}$$

52. A

Sol.

As per phylogenetic tree humans evolved from chimpanzees.

53. C

Sol.

$\therefore$  Brightness  $\propto$  heat produced per unit time.

In parallel heat produced per unit time  $\propto \frac{1}{R}$

In series, heat produced per unit time  $\propto R$ .



54. B

54. 4 digit numbers are 1000 to 9999. Least 4 digit multiple of 11 is 1001 and highest 4 digit multiple of 11 is 9999.

$$11 \times 91 = 1001$$

$$11 \times 909 = 9999$$

Among we will get 3 in the unit's place only with products of 11 with 93, 103, 113, .....903. So there are 82 such numbers.

$$80 \leq T \leq 89$$

55. C

Sol. Solution 1:  $M_1 = .100 \text{ mol L}$

$$V_1 = 1.00 \text{ mL}$$

Solution 2: 100 mL

$$M_2 = \frac{M_1 V_1}{V_2} = \frac{.1 \times 1}{100} = .001$$

Solution 3:  $M_2 V_2' = M_3 V_3$

$$.001 \times 10 = M_3 \times 100$$

$$M_3 = .0001$$

$$\text{pH} = -\log [\text{H}^+]$$

$$\text{pH} = -\log [10^{-4}] = 4$$

$$\text{----- } ([\text{H}^+] = M_3)$$

56. D

Sol. Antibiotics are provided specially for infectious diseases.

57. C

Sol.  $g' = \frac{g}{\left(1 + \frac{h}{R_e}\right)^2}$  ; h = height from the surface of earth.

Here,  $h = R_e$ .

58.  $a < b < \frac{1}{a}$

$$\Rightarrow x = \left(a + \frac{1}{a}\right) - \left(b + \frac{1}{b}\right)$$

$$= (a - b) + \left(\frac{1}{a} - \frac{1}{b}\right)$$

$b > a$

Let  $b - a = y \Rightarrow a - b = -y$

$$\therefore x = (a - b) + \frac{(b - a)}{ab} = -y + \frac{y}{ab}$$

$\frac{y}{ab} > y$  since  $a < 1$

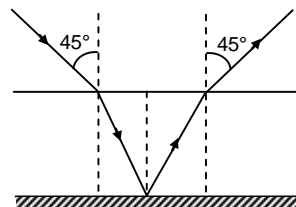
So,  $x = +ve$

59. C

Sol. Enthalpy of formation of an element in its standard state is zero.

60. A  
Sol. Slope must first increase and then decrease. Also initial and final slope must be zero
61. C
61. m has 7 possibilities  
Possibilities are (7, 7, 1), (6, 6, 3), (5, 7, 3)  
(5, 6, 4), (4, 7, 4), (5, 5, 5)  
(7, 6, 2)  
n has 5 possibilities  
possibilities are : (3, 6, 7), (4, 5, 7), (6, 6, 4)  
(7, 7, 2), (5, 5, 6)  
 $\therefore m - n = 7 - 5 = 2$
62. D  
Sol. Mole mass of  $C_{27}H_{28}Br_2O_5S = 624$   
No. of moles =  $\frac{100}{624} = .160$  mole  
Molality =  $\frac{n_{\text{solute}}}{\text{mass of solvent (kg)}}$   
Molality =  $\frac{.160}{.7979} = 0.201 \text{ mol kg}^{-1}$
63. B  
Sol. Refractive index  $\mu > 1$  for light and  $\mu < 1$  for sound.
64. B
64.  $xy^2 = a^3, yz^2 = b^3, zx^2 = c^3$   
 $x^3y^3z^3 = a^3b^3c^3 \Rightarrow xyz = abc$   
 $xyz \times yz^2 = b^3 \times abc$   
 $xy^2 \times z^3 = b^3 \times abc$   
 $z^3 = \frac{b^3 \times abc}{a^3} = \frac{b^4 \times c}{a^2}$
65. B  
Sol. no. of moles =  $\frac{3.4}{342} = .009$  mole  
No. of H-atom =  $.009 \times 6.023 \times 10^{23} \times 22$   
 $= 1.3 \times 10^{23}$
66. B
67. B
68. A  
Sol. for question nos. 66 to 68: due to the water pollution which leads problem of Eutrophication
69. A

Sol. From the path of ray  
Deviation =  $90^\circ$



70. D

$$70. (5\sqrt{41})^2 = x^2$$

$$25 \times 41 = x^2$$

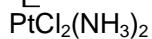
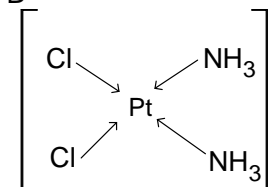
$$1025 = x^2$$

$$x > 32$$

$$32 < x < 33$$

71. B

Sol.



↓

$$X - 2 + (0) = 0$$

$$X = +2$$

O.No = +2

C.No = 4

72. B

73. D

74. B

Sol. for question nos. 72 – 74: Pea is a winter season crop

75. D

$$\text{Sol. K.E.} = \frac{1}{2}mv^2$$

$$= \frac{1}{2}m[(0)^2 + 2(g\sin\theta)s]$$

76. C

76. There can be 6 such circles.

77. C

Sol. O is more electronegative element.

78. A

Sol. Hydrostatic force is perpendicular to surface.

79. B

$$79. 3x + 3y - 1 = 4x^2 + y - 5 = 4x + 2y$$

$$3x + 3y - 1 = 4x + 2y$$

$$x = y - 1$$

$$\therefore y = x + 1 \quad (1)$$

$$\text{Again, } 4x^2 + y - 5 = 4x + 2y$$

$$4x^2 - 4x - y - 5 = 0$$

$$4x^2 - 4x - (x + 1) - 5 = 0$$

$$4x^2 - 4x - x - 1 - 5 = 0$$

$$4x^2 - 5x - 6 = 0$$

$$4x^2 - 8x + 3x - 6 = 0$$

$$(x - 2)(4x + 3) = 0$$

$$x = 2, \quad x = \frac{-3}{4}$$

If  $x = \frac{-3}{4}$  Length of side of becomes negative which is not possible

$$\text{So, } x = 2$$

$$\therefore y = 3$$

$$\begin{aligned} \therefore \text{Side} &= 4x + 2y \\ &= 8 + 6 = 14 \end{aligned}$$

$$\begin{aligned} \therefore \text{Area} &= \frac{\sqrt{3}}{4}(14)^2 = \sqrt{3} \times 49 \\ &= 84.87 \\ &\approx 85 \end{aligned}$$

80. D

Sol.

$$\begin{aligned} \text{pOH} &= -\log[\text{OH}^-] \\ &= -\log[2.5 \times 10^{-2}] \\ &= -\log 2.5 + 2 \log 10 \\ &= -.3118 + 2 \\ \text{pOH} &= 1.68 \\ \text{pH} &= 14 - 1.68 \\ &= 12.32 \end{aligned}$$