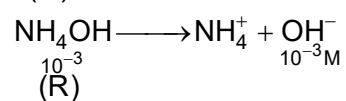
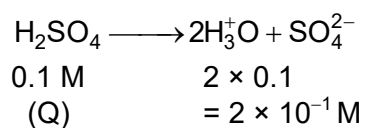
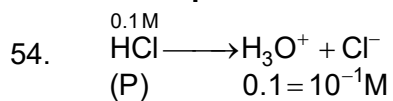


**INDIAN ASSOCIATION OF PHYSICS TEACHERS  
NATIONAL STANDARD EXAMINATION IN JUNIOR SCIENCE (NSEJS) 2019 – 20**  
Question Paper Code: 51  
Held on: November 17, 2019

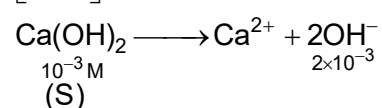
**ANSWER KEYS**

1. d	2. b	3. c	4. c
5. d	6. a	7. d	8. d
9. a	10. b	11. a	12. a
13. a	14. a	15. a	16. c
17. a	18. D	19. c	20. b
21. c	22. b	23. c	24. d
25. a	26. b	27. c	28. d
29. d	30. c	31. d	32. b
33. c	34. d	35. d	36. d
37. c	38. b	39. c	40. a
41. b	42. a	43. c	44. c
45. b	46. b	47. c	48. d
49. c	50. b	51. a	52. a
53. a	54. *	55. b	56. a
57. c	58. c	59. d	60. a
61. c	62. a	63. b	64. d
65. c	66. b	67. b	68. b
69. a	70. c	71. d	72. a
73. b	74. c	75. c	76. c
77. a	78. a	79. a	80. d

54. \*No option is correct and it should be  $Q > P > R > S$ .



$$\left[ \overset{+}{\text{H}_3\text{O}} \right] = \frac{10^{-14}}{10^{-3}} = 10^{-11} \text{ (considering complete ionization)}$$



$$[\text{OH}^-] = 2 \times 10^{-3}$$

$$\left[ \overset{+}{\text{H}_3\text{O}} \right] = \frac{10^{-14}}{2 \times 10^{-3}} = 5 \times 10^{-12}$$

## HINTS AND SOLUTIONS

1. d

1.  $\alpha, \beta$  are roots of  $x^2 - 5x + 3 = 0$

$$\Rightarrow \alpha^2 - 5\alpha + 3 = 0 \text{ and } \beta^2 - 5\beta + 3 = 0$$

$$\Rightarrow \alpha^2 + 3 = 5\alpha \text{ and } \beta^2 + 3 = 5\beta$$

$$\text{Now, } \frac{3a_6 + a_8}{a_7} = \frac{3(\alpha^6 - \beta^6) + (\alpha^8 - \beta^8)}{\alpha^7 - \beta^7}$$

$$= \frac{\alpha^6(3 + \alpha^2) - \beta^6(3 + \beta^2)}{\alpha^7 - \beta^7}$$

$$= \frac{5\alpha^7 - 5\beta^7}{\alpha^7 - \beta^7} = 5$$

2. b

2.  $x + yz = 2$  and  $y + xz = 2$  and  $z + xy = 2$

$$\Rightarrow x + yz = y + xz = z + xy$$

$$\text{Now } x + yz = y + xz$$

$$\Rightarrow x - y - z(x - y) = 0$$

$$\Rightarrow (x - y)(1 - z) = 0$$

$$\Rightarrow x = y \text{ or } z = 1$$

$$\text{Similarly } y + xz = z + xy \Rightarrow y = z \text{ or } x = 1$$

$$\text{and } z + xy = x + yz \Rightarrow z = x \text{ or } y = 1$$

$$\Rightarrow \text{either } x = y = z = k \text{ (let) or } x = y = z = 1$$

$$\text{when } x = y = z = k$$

$$\text{then given equation reduces to } k^2 + k - 2 = 0 \Rightarrow k = -2 \text{ or } k = 1$$

So, there are two triples  $(-2, -2, -2)$  and  $(1, 1, 1)$

3. c

$$3. \frac{\text{ar}(\triangle AEB)}{\text{ar}(\triangle FEG)} = \left(\frac{5}{2}\right)^2 = \frac{25}{4} \quad [\because \triangle EFG \sim \triangle EAB]$$

$$\therefore \frac{\text{ar}(\triangle FEG)}{\text{ar}(\square AFGB)} = \frac{4}{21}$$

$$\text{ar}(\square AFGB) = \text{ar}(\square ABCD) - \text{ar}(\triangle AFD) - \text{ar}(\triangle BCG)$$

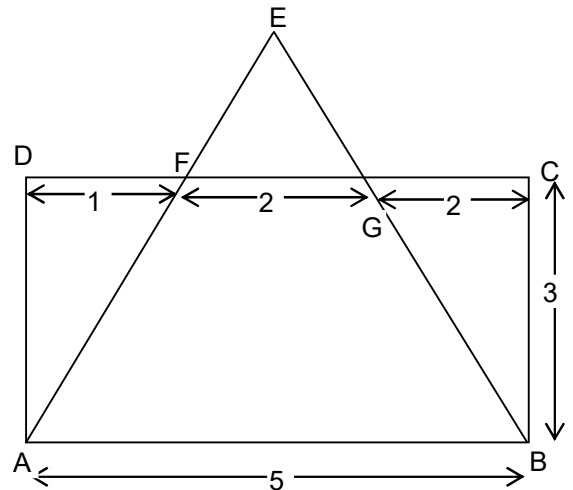
$$= 15 - \left(\frac{1}{2} \times 1 \times 3\right) - \left(\frac{1}{2} \times 2 \times 3\right)$$

$$= 15 - \frac{9}{2}$$

$$= \frac{21}{2} \text{ sq. units}$$

$$\therefore \text{ar}(\triangle EFG) = \frac{4}{21} \times \frac{21}{2} = 2 \text{ sq. units}$$

$$\therefore \text{ar}(\triangle AEB) = \frac{25}{4} \times 2 = \frac{25}{2} \text{ sq. units}$$



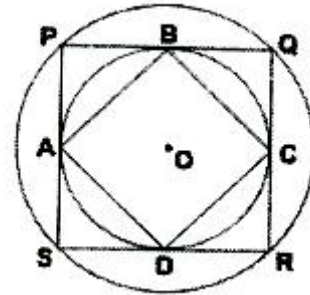
4. c  
 4. Clearly, ABCD is a square.  
 Let side of ABCD be S units

$$\therefore \text{radius of inner circle} = \frac{S}{\sqrt{2}}$$

$$\Rightarrow PQ = S\sqrt{2}$$

$$\therefore \text{radius of outer circle} = S$$

$$\therefore \frac{\text{Perimeter of outer circle}}{\text{Perimeter of ABCD}} = \frac{2\pi S}{4S} = \frac{\pi}{2}$$



5. d  
 5.  $2008 = NQ_1 + 8$   
 $\Rightarrow NQ_1 = 2000$   
 $\Rightarrow N = \text{number of factors of } 2000 \text{ which are } > 8.$   
 $= \text{number of factors of } 2^4 \times 5^3 \text{ which are } > 8$   
 $= (4 + 1)(3 + 1) - 5$   
 $= 20 - 5 = 15$

6. a  
 6.  $\sqrt{5|x| + 8} = \sqrt{x^2 - 16}$   
 $\Rightarrow 5|x| + 8 = x^2 - 16$   
 $\Rightarrow x^2 - 5|x| - 24 = 0$   
 $\Rightarrow p^2 - 5p - 24 = 0$  (Put  $|x| = p$ )  
 $\Rightarrow (p - 8)(p + 3) = 0$   
 $\Rightarrow p = 8$  [ $p = |x| \geq 0$ ]  
 $\therefore |x| = 8$   
 $\Rightarrow x = 8, -8$   
 $\therefore \text{Products of all roots} = -64$

7. d  
 7. HCF is always a factor of LCM  
 $5775 = 3 \times 5^2 \times 7 \times 11$   
 $175 = 7 \times 5^2$   
 $231 = 3 \times 7 \times 11$   
 $385 = 5 \times 7 \times 11$   
 $455 = 5 \times 7 \times 13$   
 $\therefore 455 \text{ cannot be the HCF as it is not a factor of } 5775.$

8. d  
 8.  $a + \frac{1}{b} = b + \frac{1}{c} = c + \frac{1}{a}$   
 $a + \frac{1}{b} = b + \frac{1}{c} \Rightarrow a - b = \frac{1}{c} - \frac{1}{b} \Rightarrow a - b = \frac{b - c}{bc}$  .....(i)  
 Similarly  $b + \frac{1}{c} = c + \frac{1}{a} \Rightarrow b - c = \frac{c - a}{ac}$  .....(ii)  
 and  $c + \frac{1}{a} = a + \frac{1}{b} \Rightarrow c - a = \frac{a - b}{ab}$  .....(iii)  
 on multiplying equation (i), equation (ii), equation (iii)

$$(a-b)(b-c)(c-a) = \frac{(b-c)(c-a)(a-b)}{(abc)^2}$$

$$\Rightarrow abc = \pm 1$$

9. a

9. The given equation will have more than two roots, iff, it is an identity.

$$\therefore \alpha^2 - 5\alpha + 6 = 0 \Rightarrow (\alpha - 3)(\alpha - 2) = 0$$

$$\alpha^2 - 3\alpha + 2 = 0 \Rightarrow (\alpha - 2)(\alpha - 1) = 0$$

$$\alpha^2 - 4 = 0 \Rightarrow (\alpha - 2)(\alpha + 2) = 0$$

$\therefore$  At  $\alpha = 2$ , all the three coefficients equal 0.

10. b

10. Let the number on number plate be k

$\therefore$  (i) k is a 4 digit number

(ii) Last 2 digits of k cannot be 0.

(iii) k is the LCM of any 8 numbers from 1 to 9, and definitely, 9, 8, 1, 2 and 3 is not the number to be left out (as scan from option)

(iv) Since k is a multiple of 8 and 9, it is a multiple of 72  $\Rightarrow$  option (a) 4 and (c) 6 also get eliminated.

(v) The father specifies that last two digits are his age, so the number cannot have xy xy form.

Seeing all these conditions, the number k can have 2 forms xxyy or xyyx.

Let the 8<sup>th</sup> number be 5 then units digit = 0

$\Rightarrow$  The number will have to be xx00 or 0yy0, both of which are not possible, according to previous conditions

So, we conclude, the 8<sup>th</sup> number surely is not 5.

$\therefore$  The number on number plate is 5544.

11. a

11. Let  $N = 21m + 12 = 18m + 9 + 3m + 3$

Now when N is divided by 9 it gives remainder of 6

$\Rightarrow 3m + 3$  gives remainder of 6 on division by 9  $\Rightarrow m$  can take values 1, 4, 7,.....which forms an AP with k<sup>th</sup> term  $3k - 2$

Now  $11 < N < 1111 \Rightarrow 11 < 21m + 12 < 1111$

$$\Rightarrow 0 \leq m < \frac{1099}{21} \quad (m \in \text{whole number})$$

$$\text{So, } 0 \leq 3k - 2 < \frac{1099}{21}$$

$$\Rightarrow \frac{2}{3} \leq k < \frac{1141}{63}$$

$$\Rightarrow 0.\bar{6} \leq k < 18.\bar{1}$$

So, k can take 18 values.

12. a

12. P (sum is neither 7 nor 11)

= 1 - P (sum is either 7 or 11)

$$= 1 - \frac{8}{36} = \frac{7}{9}$$

13. a

13.  $1 + 4 + 7 + \dots + x = 925$

$$\Rightarrow \frac{n}{2}[2 + (n-1)3] = 925, \text{ here } n \text{ is number of terms.}$$

$$\Rightarrow (n-25)(3n+74) = 0$$

$$\Rightarrow n = 25$$

$$\text{So, } x = 1 + (25-1)3$$

$$= 73$$

14. a

$$14. \quad \tan \theta + \sec \theta = \frac{3}{2}$$

$$\Rightarrow -\tan \theta + \sec \theta = \frac{2}{3}$$

On adding both equation we get

$$\sec \theta = \frac{13}{12} \Rightarrow \sin \theta = \frac{5}{13}$$

15. a

$$15. \quad \text{In } \triangle ABD, \tan \alpha = \frac{H-h}{x} \dots (i)$$

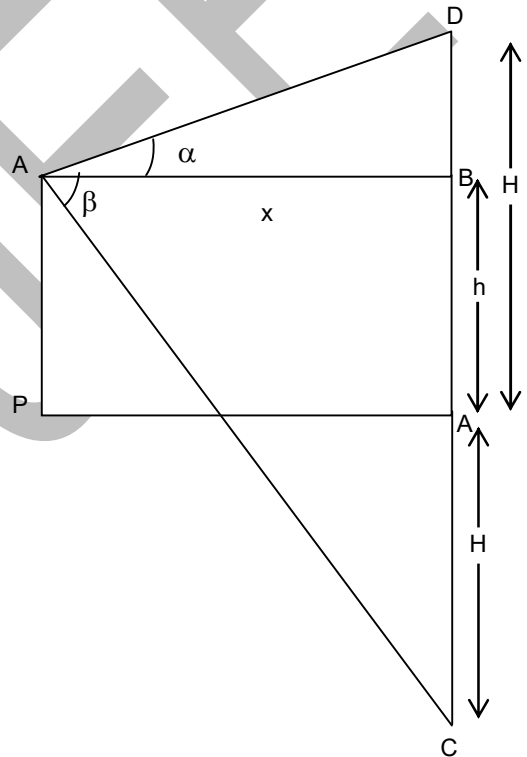
$$\text{In } \triangle ABC, \tan \beta = \frac{H+h}{x} \dots (ii)$$

From (i) and (ii)

$$\frac{H+h}{\tan \beta} = \frac{H-h}{\tan \alpha}$$

$$H(\tan \alpha - \tan \beta) = -h(\tan \beta + \tan \alpha)$$

$$h = \frac{H(\tan \beta - \tan \alpha)}{(\tan \beta + \tan \alpha)}$$



16. c

$$16. \quad \frac{1}{x+a} + \frac{1}{x+b} = \frac{1}{c}$$

$$\Rightarrow x^2 + (a+b-2c)x + ab - (a+b)c = 0$$

Now sum of roots = 0

$$\Rightarrow a+b = 2c \text{ or } c = \frac{a+b}{2}$$

Product of roots =  $ab - (a+b)c$

$$= ab - (a+b) \frac{(a+b)}{2}$$

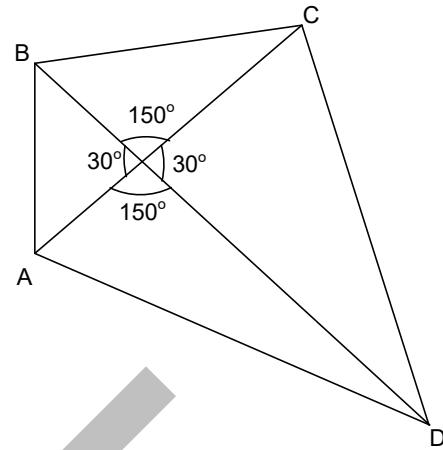
$$= -\frac{(a^2 + b^2)}{2}$$

17. a

17. Area of quadrilateral

$$\frac{1}{2} AC \times BD \sin 30^\circ = 1 + 2 + 8 + 4 = 15$$

$$\Rightarrow AC \times BD = 60$$



18. d

18.  $\sin^2 x + \sin^2 y + \sin^2 z = 0$

$$\Rightarrow \sin^2 x = \sin^2 y = \sin^2 z = 0$$

$$\Rightarrow \cos^2 x = \cos^2 y = \cos^2 z = 1$$

$$\therefore \cos x + \cos y + \cos z = 3 \text{ (possible)}$$

$$\cos x + \cos y + \cos z = -3 \text{ (possible)}$$

If any 2 of  $\cos x, \cos y$  and  $\cos z = -1$ , and the third be 1  
then,  $\cos x + \cos y + \cos z = -1$

If any 2 of  $\cos x, \cos y$  and  $\cos z = 1$ , and the third be  $-1$

Then,  $\cos x + \cos y + \cos z = 1$

$\therefore -2$  (option D) is NOT a possible value of  $\cos x + \cos y + \cos z$

19. c

19. Let remainder be  $ax + b, f(x) = x^{51}$

$$x^{51} = (x^2 - 3x + 2)Q(x) + ax + b$$

$$\Rightarrow x^{51} = (x-1)(x-2)Q(x) + ax + b$$

$$f(1) = 1 = a + b$$

$$f(2) = 2^{51} = 2a + b$$

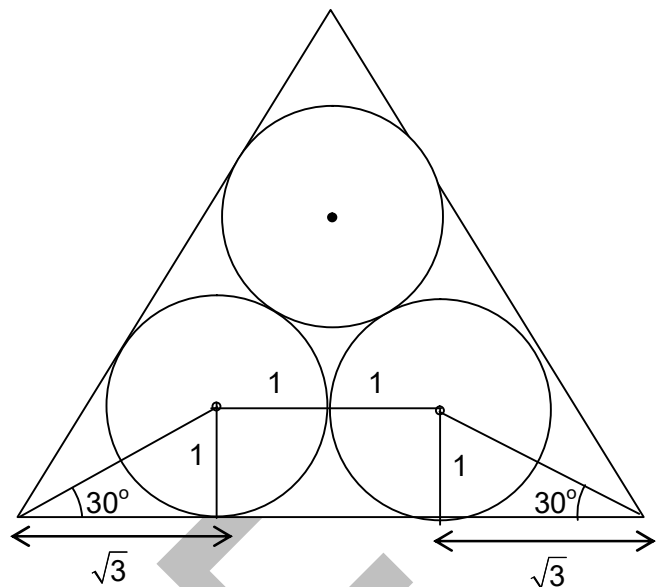
$$\Rightarrow a = 2^{51} - 1$$

$$\Rightarrow b = 2 - 2^{51}$$

$$\therefore \text{Remainder} = (2^{51} - 1)x + (2 - 2^{51})$$

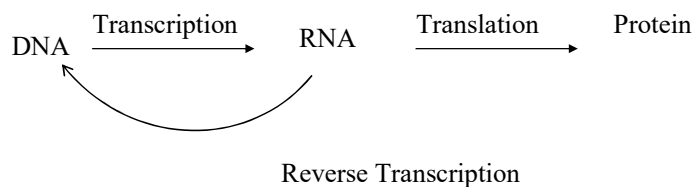
20. b

20. radius of each circle = 1 unit  
 $\therefore$  side of equilateral  $\Delta = 2\sqrt{3} + 2$   
 $\therefore$  area ( $\Delta ABC$ ) =  $\frac{\sqrt{3}}{4} \times 2^2 (\sqrt{3} + 1)^2$   
 $= \sqrt{3} (4 + 2\sqrt{3})$   
 $= 6 + 4\sqrt{3}$



21. c  
 21. Gymnosperm are called 'naked seed bearing plants' because they lack ovary
22. c  
 22. This is the case of multiple allelism, where Agouti is a dominant trait.  
 AA – agouti (yellow band on dark shaft)  
 Aa – agouti  
 aa – Recessive (no yellow band)  
 A<sup>Y</sup> A<sup>Y</sup> – lethal  
 In a cross, of two yellow mice various possibilities arises and the most probable answer is 4.
23. c  
 23. The stain was tested on various tissues derived from an autopsy sample from a mammal. The organelles were counted. The result showed maximum number of golgi bodies reticulum in cells of brain, lesser in cells of heart, least in mature sperms and absent in erythrocytes.
24. d  
 24. Unsaturated lipid contains double bond which makes it harder for lipids to pack together by putting kinks in otherwise straight lipid chain. Hence, at extremely low temperature, poly unsaturated lipids prevent membrane freezing and maintain fluidity.
25. a  
 25. Penicillium, an antibiotic that attack almost all microbes except viruses, belongs to blue green mold. Penicillium block peptidoglycan linking in cell wall. Fungal cell wall is made up of chitin, hence possible causative agent of disease can be virus or fungi.
26. b  
 26. An organism has 27 pairs of homologous chromosomes. In each daughter cell after completion of meiosis II, 54 and 27 chromosomes would be present respectively.
27. c  
 27. The above mentioned features (in question) belongs to phylum Protochordata.
28. d  
 28. According to central dogma mentioned below :





P is Reverse Transcription; Q is Replication; R is Transcription and S is Translation.

29. d
29. Genetic imprinting is an epigenetic phenomenon that causes genes to be expressed in a parent-of-origin-specific manner. Forms of **genomic imprinting** have been demonstrated in fungi, plants and animals. **Imprinted genes are genes** whose expression is determined by the parent that contributed them.
30. c
30. In the baking industry, when the dough is prepared, various ingredients are mixed together with the flour. At one instance, the dough was fermented, but failed to rise sufficiently during the baking process. The correct causes are
- If salt was mixed before fermentation then it will result into exosmosis.
  - Excess sugar also affect the raising dough by exosmosis.
  - In activated yeast granules will not result into fermentation.
31. d
31. Statement I and III are incorrect.  
In statement I eukaryotes may be unicellular or multicellular.  
In statement III nucleoid contains the genetic material is present only in prokaroytes.
32. b
32. In Planaria every cut pieces will grow into complete organism so from three cut pieces three Planaria regenerates. In Asterias which was cut into six pieces only two pieces regrows which contains central disc.
33. c
33. All the three factors
- Availability of food during breeding season
  - Mode of fertilization
  - Population density
- Can regulate Fecundity.
34. d
34. The chemical 'X' might be Gibberellic acid.
35. d
35. Driving forces are increased pollution, stable transposition of a gene in moths, limitations of vision of birds and lichen growth.
36. d
36. The most probable reasons for this may be receptive fields in fingers are smaller, number of receptor in forearm is less and finger tips release more prostaglandins.
37. c
37. On a study tour, plants with leathery leaves with thick cuticle, vivipary, salt glands, apogeotropic roots, and stomata limited to abaxial surface were observed. The plants might be Mangroves.

38. b  
 38. Wavelength is the parameter which plotted on X axis (At certain wavelength (green colour) rate of photosynthesis decreases and then increases (red colour))

39. c  
 39. Magnification =  $\frac{\text{Size of retinal image seen with the instrument}}{\text{Size of retinal image seen with the unaided eye}} = \frac{6 \times 10^{-2}}{4 \times 10^{-6}} = 1.5 \times 10^4$

40. a  
 40. Sample A has minimum  $p^H$  so it is gastric HCl.  
 Sample B is Venous blood.  
 Sample C is intracellular fluid.  
 Sample D is urine.

41. b  
 41. 4g (CaCO<sub>3</sub> + Sand) + HCl excess  

$$\text{CaCO}_3 + 2\text{HCl} \longrightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$$

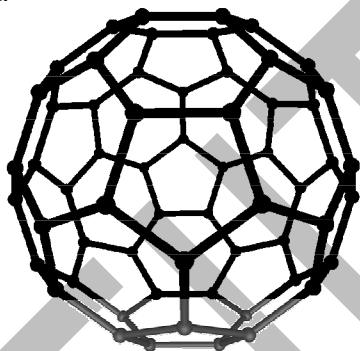
x g  0.880 g

$$44\text{g CO}_2 \rightarrow 100\text{g CaCO}_3$$

$$0.88\text{g CO}_2 \rightarrow \frac{100}{44} \times 0.88 = \frac{100 \times 88}{44 \times 100} = 2\text{g CaCO}_3$$

$$\% \text{ of CaCO}_3 = \frac{2}{4} \times 100 = 50$$

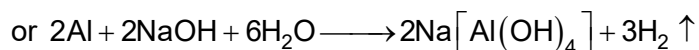
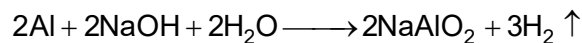
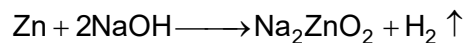
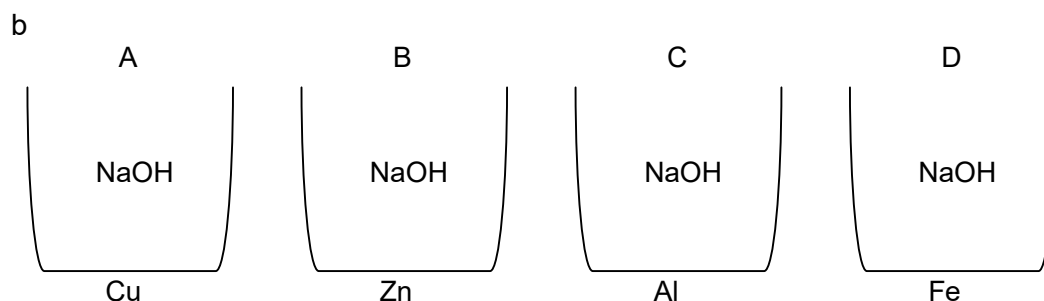
42. a  
 42.



43. c  
 43.  $\text{C}_6\text{H}_6 + 3\text{Cl}_2 \xrightarrow{h\nu} \text{C}_6\text{H}_6\text{Cl}_6$   
 213 g Cl<sub>2</sub> reacts with 78 g benzene to give 291 g gammaxene.  
 106.5 g Cl<sub>2</sub> reacts with 39 g benzene to give  $\frac{291}{2} = 145.5$  g gammaxene.

44. c  
 44. Y (Many Allotropic forms)  
 White translucent solid at room temperature.  
 $\Rightarrow$  Y = phosphorus and forms P<sub>4</sub>O<sub>6</sub> and P<sub>4</sub>O<sub>10</sub>.

45.  
45.



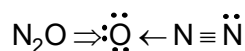
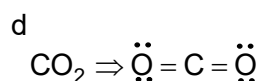
46.  
46.

b  
Polyvinyl chloride and polythene are ideal for remoulding.

47.  
47.

c  
The note did not burn because the Rs 50 note failed to reach ignition temperature.

48.  
48.



49.  
49.

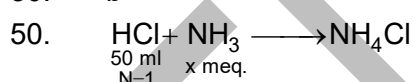
c  
X  $\xrightarrow{\text{melts}}$  in 10 sec in flame.  
white crystalline solid

X + H<sub>2</sub>O  $\Rightarrow$  soluble

X + CCl<sub>4</sub>  $\Rightarrow$  insoluble.

and X is poor conductor. Hence it is a polar covalent compound.

50.



Number of meq of HCl = 50

NaOH = 60 ml  $\times$   $\frac{1}{2}$  N = 30 meq.

Meq of NH<sub>3</sub> + Meq of NaOH = Meq of HCl

x + 30 = 50 meq.

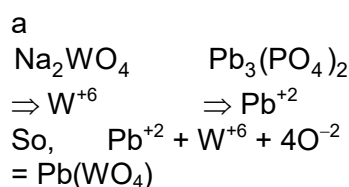
x = 20 meq. =  $\frac{\text{wt.} \times 1000}{17}$

wt =  $\frac{20 \times 17}{1000} = \frac{34}{100} = 0.34 \text{ g}$

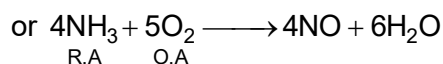
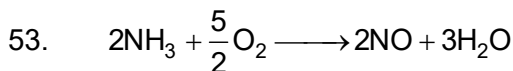
51.  
51.

a  
Hg (-38.83°C), Ga (29.8°C), Li (180.5°C), Ca(842°C)

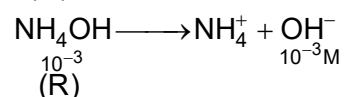
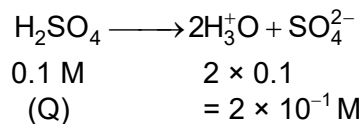
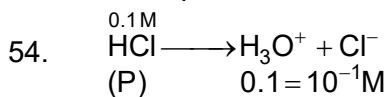
52.  
52.



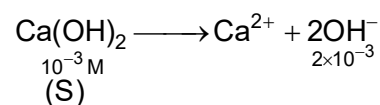
53. a



54. \*No option is correct and it should be  $Q > P > R > S$ .



$$[\text{H}_3\text{O}^+] = \frac{10^{-14}}{10^{-3}} = 10^{-11} \text{ (considering complete ionization)}$$



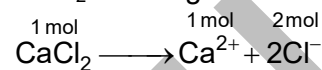
$$[\text{OH}^-] = 2 \times 10^{-3}$$

$$[\text{H}_3\text{O}^+] = \frac{10^{-14}}{2 \times 10^{-3}} = 5 \times 10^{-12}$$

55. b

55.  $\text{H}_2\text{O}$  1 litre

$\text{CaCl}_2 = 44.4\text{ g}$



$$40 + 71 = 111\text{ g}$$

$$\frac{44.4}{111}\text{ mol} = 0.4\text{ mole of CaCl}_2$$

1 mole  $\text{CaCl}_2$  give 3 mole ions

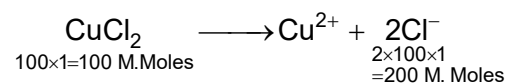
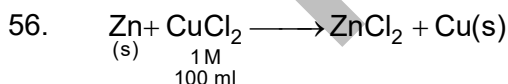
0.4 mol give  $3 \times 0.4 = 1.2$  mole

$$= 1.2 \times 6.022 \times 10^{23} \text{ number of ions}$$

$$= 7.2264 \times 10^{23} \text{ number of ions}$$

$\Rightarrow$  1 ml has  $7.2264 \times 10^{20}$  ions

56. a



$$\text{Molarity of Cl}^- = \frac{200}{100} = 2\text{M}$$

57. c

57. I. vinegar  $\rightarrow \text{CH}_3\text{COOH}$  pH < 7, red

II. common salt  $\rightarrow \text{NaCl}$  pH = 7 green

III. caustic soda  $\rightarrow \text{NaOH}$  pH > 7 and strongly basic violet

IV. baking soda  $\rightarrow \text{NaHCO}_3$  pH > 7 and weakly basic, blue

58. c  
 58. Ne – 10  
 $N^{3-} \rightarrow 10$   
 $Mg^{2+} \rightarrow 10$

59. d  
 59.  $N_2 = 28 \text{ g mol}^{-1}$   
 $CO = 12 + 16 = 28 \text{ g mol}^{-1}$   
 Under similar conditions of temperature and pressure, equal volume of gases contains equal number of moles.

60. a  
 60.  $AlCl_3$  and  $LiCl$  are covalent in nature.

61. c  
 61. Every action has equal and opposite reaction.

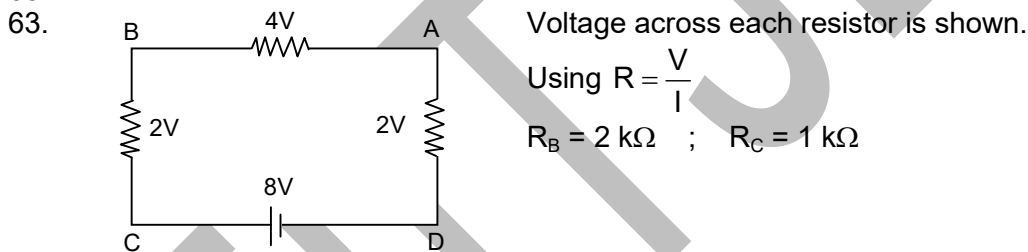
62. a

62. Charge of shaded portion =  $\frac{\text{Total charge}}{\text{Total area}} \times \text{Area of shaded portion}$   

$$= \frac{420}{28 \times 14} \left[ \frac{28 \times 14}{2} - \frac{22}{7} \times 7 \times 7 \right]$$
  

$$= 45 \mu\text{C}$$

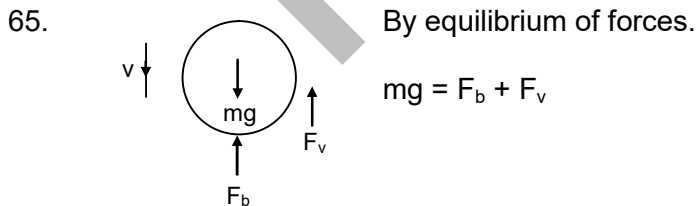
63. b



64. d

64.  $\frac{T - 20}{200} = \frac{20^\circ - 0^\circ}{100}$   
 $\Rightarrow T = 60 \text{ Z.}$

65. c



66. b

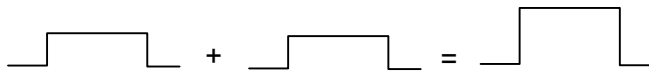
66.  $R_p = R$   $R_Q = 4R$   
 $V_p = 3V$   $V_Q = NV$   
 $H_p = \frac{9V^2}{R}$   $H_Q = \frac{N^2V^2}{4R}$   
 As,  $H_p = H_Q$

$$N = 6$$

67. b  
67.



When wave having equal amplitude & opposite phases superimpose amplitude is zero.



When wave having equal amplitude & same phases superimpose amplitude doubles.

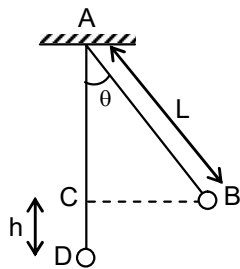
68. b

$$68. \quad x = \frac{1}{10} \text{ m} \quad E = 4 \times 10^{-3} \text{ J}$$

$$\frac{1}{2} \times k \times \left(\frac{1}{10}\right)^2 = 4 \times 10^{-3}$$

$$\Rightarrow k = 0.8 \text{ Nm}^{-1}$$

69. a  
69.

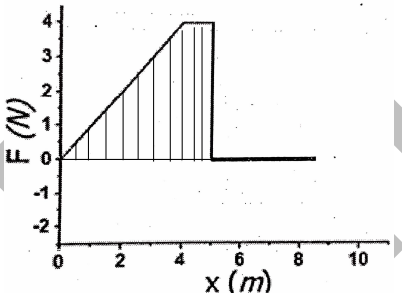


$$\text{In } \triangle ACB \quad AC = AB \cos \theta \\ = L \cos \theta$$

$$h = CD = L(1 - \cos \theta)$$

$$\Delta PE = mgh = mgL(1 - \cos \theta)$$

70. c  
70.



$$\text{Area under } F - x \text{ graph} = \Delta KE$$

$$12 = \frac{1}{2} \times 6 \times v^2 - 0$$

$$\Rightarrow v = 2 \text{ m/s}$$

At 5 sec  $v = 2 \text{ m/s}$  & after that force ceases to act, so body moves with same speed.

71. d

$$71. \quad \text{Given: } \frac{v_H}{v_D} = \frac{2}{1} \quad \text{and} \quad \frac{m_H}{m_D} = \frac{1}{2}$$

$$\frac{r_H}{r_D} = \frac{m_H v_H}{m_D v_D} = \frac{1}{1}$$

72. a

72. When ice melts, equilibrium temperature will be less than  $4^\circ\text{C}$ , hence density of water will be less than at  $4^\circ\text{C}$ . So, volume will increase.

73. b

$$73. \quad m = \frac{f}{f + u}$$

Given:  $f = 6 \text{ cm}$

Case-I. say  $u = -x$

$$\therefore -3 = \frac{6}{6-x} \Rightarrow x = 8.$$

Case-II Now  $u = -[x + n(0.1)]$

Here,  $n$  is number of rotations and  $0.1 \text{ cm}$  is linear distance travelled in each rotation.

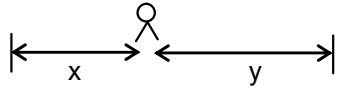
$$\therefore -2 = \frac{6}{6 - [x + n(0.1)]}$$

$$\Rightarrow n = 10$$

74.

c

74.



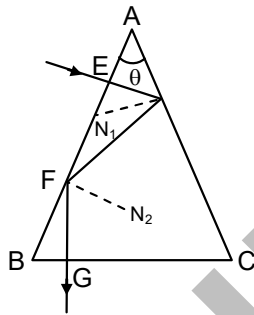
$$x = \frac{340 \times 2.4}{2} \quad \& \quad y = \frac{340 \times 4.4}{2}$$

$$\text{Total distance} = x + y = 1.16 \text{ km}$$

75.

75.

c



Say  $A = \theta$

$$\angle ADE = 90 - \theta$$

( $\triangle ADE$ )

$$\therefore \angle EDN_1 = \theta = \angle N_1DF$$

( $\angle i = \angle r$ )

$$ED \parallel FN_2$$

$$\Rightarrow \angle EDF = 2\theta = \angle DFN_2 = \angle N_2FG$$

( $\angle i = \angle r$ )

$$\angle G = 90^\circ$$

$$\angle BFG = 90 - 2\theta$$

$$\Rightarrow \angle B = 2\theta$$

( $\triangle FGB$ )

$$\angle B = \angle C$$

(isosceles triangle)

$$\therefore \angle A + \angle B + \angle C = 180^\circ$$

$$\Rightarrow \theta = 36^\circ$$

76.

c

76.

$$\text{Using } f = \sqrt{u_f v_f}$$

Here,  $u_f$  and  $v_f$  are object and image distance from focus.

$$\therefore v_f = \frac{x^2}{4y}$$

77.

a

77.

Safest place will be inside the car as the charges due to lightning tend to remain on the metal sheet / skin of the vehicle if struck by lightning.

78.

a

78.

Using Right Hand Thumb Rule.

79.

a

79.

$$\text{Using } s = ut + \frac{1}{2}at^2$$

$$S_1 = \frac{1}{2} \times a \times 100 \text{ and}$$

$$S_2 = \frac{1}{2} \times a \times (400 - 100) = \frac{1}{2} \times a \times 300$$

$$\therefore S_2 = 3S_1$$

80. d  
80. Loudness of sound is proportional to the square of the amplitude of the vibrating string.

एम्प्लिट्यूड