

NATIONAL TALENT SEARCH EXAMINATION-2018, RAJASTHAN

SCHOLASTIC APTITUDE TEST (SAT) HINTS & SOLUTIONS

1. Constant speed means equal distance in equal interval of time.
∴ In graph (A) and graph (D) slope is constant

2. Recoil velocity

$$V = \frac{mv}{M} = \frac{50 \times 10^{-3} \times 10^2}{10} = \frac{1}{2} = .5 \text{ m/s} = \text{Ans (3)}$$

3. $h \times u^2 \dots\dots\dots(i)$

$100 \times u^2 \dots\dots\dots(ii)$

$h \times (2u)^2 \dots\dots\dots(iii)$

$$3 \div 2$$

$$= \frac{h}{100} = \frac{4u^2}{u^2} = h = 400$$

4. Acceleration due to gravity (g) = $\frac{GM}{R^2}$

Universal gravitation constant = G

$$\frac{g}{G} = \frac{M}{R^2}$$

5. frequency = $\frac{1}{\text{timeperiod}}$

$$= \frac{1}{\text{sec}} = \text{Hertz}$$

6. frequency ⁽ⁿ⁾ = 10 KHz

$$= 10 \times 10^3 \text{ Hz}$$

$$\lambda = 3\text{mm}$$

$$= 3 \times 10^{-3} \text{ m}$$

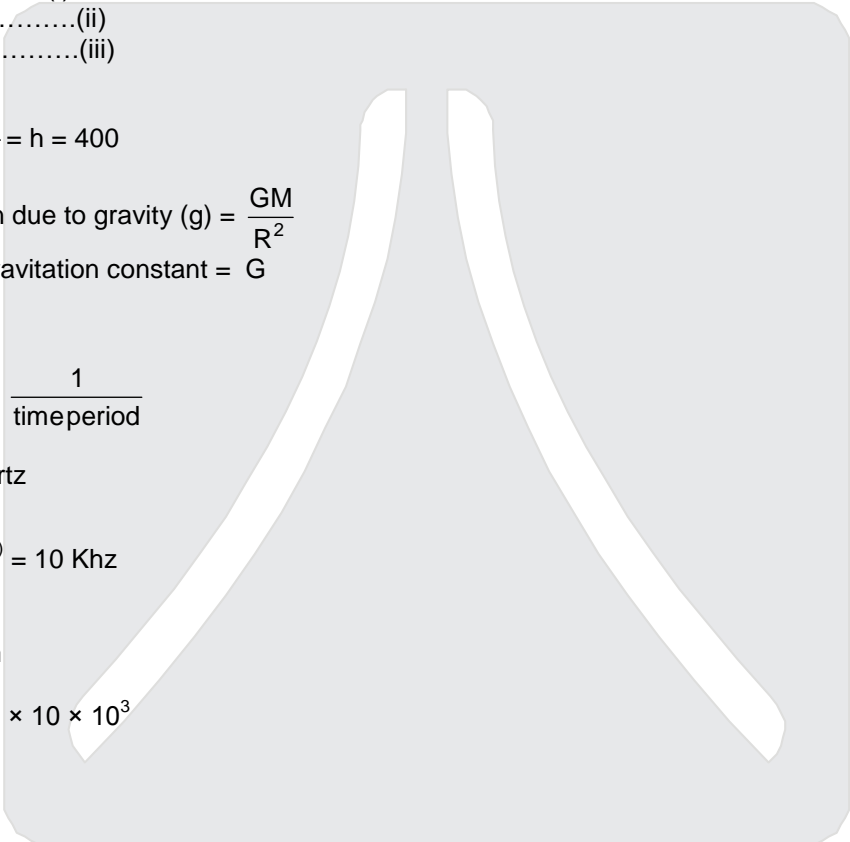
$$V = n\lambda$$

$$V = 3 \times 10^{-3} \times 10 \times 10^3$$

$$V = 30 \text{ m/s}$$

$$V = \frac{D}{T}$$

$$T = \frac{3}{30} = 0.1 \text{ sec}$$



7. Size of Image = size of object image will be formed at centre of curvature.

8. F = 30 cm

$$u = -15\text{cm}$$

$$m = \frac{1}{V} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{V} + \frac{1}{15} = \frac{1}{30}$$

$$\frac{1}{V} + \frac{1}{30} - \frac{1}{15}$$

$$= \frac{1-2}{30}$$

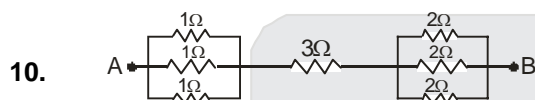
$$\frac{1}{V} = -\frac{1}{30}$$

$$V = -30$$

$$M = + \left(\frac{V}{u} \right)$$

$$= \frac{30}{15} = 2$$

9. $P = k$
Resistivity does not depend on length and area.



$$R_{eq} = \frac{1}{3} + 3 + \frac{2}{3}$$

$$= \frac{1+9+2}{3} = \frac{12}{3} = 4\Omega$$

11. $\frac{\text{No. of appliance} \times \text{power (watt)} \times \text{time (Hours)}}{1000}$

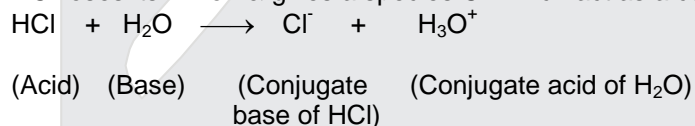
$$\text{energy (KWH)} = \frac{4 \times 1000(6) \times 30}{1000} = 72 \text{ kwh}$$

$$\text{Cost of electricity} = 72 \times 5 = 360 \text{ Rs.}$$

12. According to snow rule deflection at point A and B the needle will deflect but in opposite direction .

13. When light goes from rarer to denser medium it bends towards the normal.

14. (3)
HCl loses its H^+ ion & gives a species Cl^- which act as a conjugate base.

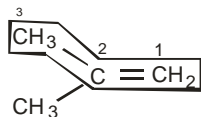


15. (3) As per the theory
Plaster of Paris is $\longrightarrow \text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$
 $\text{CaSO}_4 \cdot 2\text{H}_2\text{O} \xrightarrow{373\text{K}} \text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$

16. (2)
Chloroform on oxidation form phosgene gas which is toxic, therefore to deaccelerate the reaction we pour ethanol solution so that this reaction does not occur

17. (4)
Lithium \longrightarrow Metal
Sodium \longrightarrow Metal
Sulphur \longrightarrow Non Metal
Silicon \longrightarrow Metalloid

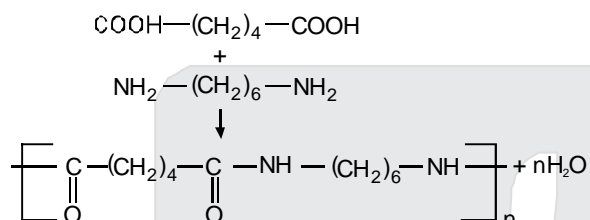
18. (2)



2 – methyl -1- propene. (Numbering start from double bonded carbon.)

19. (4)

Nylon-66 formed by the condensation of adipic acid and hexamethylene diamine.



20. (2)

On heating ammonium chloride is sublime while sodium chloride not. So sublimation is the suitable method to separate sodium chloride and ammonium chloride.

21. (2)

∴ 28 gram Nitrogen (N_2) contain = 6.022×10^{23} molecules

∴ 14 gram N_2 contain = $\frac{6.022 \times 10^{23}}{28} \times 14 = 3.011 \times 10^{23}$ molecule

22. (1)

Atomic number of sulphur = 16

Electronic configuration =

K	L	M
2	8	6

23. (3)

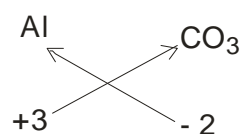
Elements of d – block show more than one valency.

Iron (Fe) show variable valency because it is a d- block element.

Iron shows 2 & 3 valency i.e. Fe^{+2} (ferrous) and Fe^{+3} (ferric)

24. (1)

$\text{Al}_2(\text{CO}_3)_3$



Chemical formula of aluminium carbonate.

25. (1)

Freon – 112 \longrightarrow $\text{C}_2\text{F}_2\text{Cl}_4$

Nomenclature of freone : - Freon - XYZ

X = number of carbon atom -1

Y = number of H – atom +1

Z = number of F – atom

$\text{C}_2\text{F}_2\text{Cl}_4 \longrightarrow X = 2 - 1 = 1$

$Y = 0 + 1 = 1$

$Z = 2$

Freon – 112

26. (1)

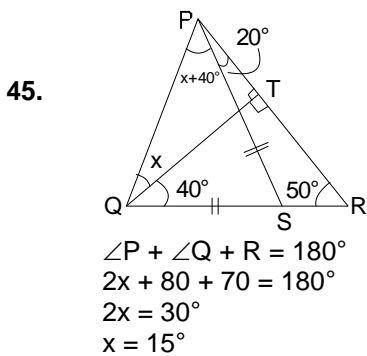
Mg is metal which forms ionic compound with Cl which has high melting point.
 $Mg + Cl_2 \longrightarrow MgCl_2$

41. $\frac{3+2\sqrt{3}}{3-\sqrt{3}} \times \frac{3+\sqrt{3}}{3+\sqrt{3}} = a+\sqrt{3}b \quad \Rightarrow \quad \frac{9+3\sqrt{3}+6\sqrt{3}+6}{9-3} = a+\sqrt{3}b$
 $\Rightarrow \quad \frac{15+9\sqrt{3}}{6} = a+\sqrt{3}b \quad \Rightarrow \quad \frac{5}{2} + \frac{3}{2}\sqrt{3} = a+\sqrt{3}b$
 $\sqrt{a+b} = \sqrt{\frac{5}{2} + \frac{3}{2}} = \sqrt{4} = 2.$

42. $D = 0$
 $p^2 - 4(2)(8) = 0$
 $p^2 = 64$ $p = 8$
 $px^2 + px + k = 0$
 $D = 0$
 $p^2 - 4(p)k = 0$
 $p - 4k = 0$
 $4k = 8$
 $k = 2.$

43. $x^2 - px - p - k$ $\begin{cases} \alpha \\ \beta \end{cases}$
 $\alpha + \beta = p \quad \alpha\beta = -p - k$
 $\alpha + \beta + \alpha\beta + 1 = 6$
 $\Rightarrow \quad p - p - k + 1 = 6$
 $k = -5$

44. End digit of $6^{18} = 6$
 End digit $5^{10} = 5$
 Answer = $6 - 5 = 1$



46. $20, 19\frac{1}{4}, 18\frac{1}{2}, \dots$

$$T_n < 0$$

$$20 + (n-1) \left(-\frac{3}{4}\right) < 0$$

$$20 - \frac{3(n-1)}{4} < 0$$

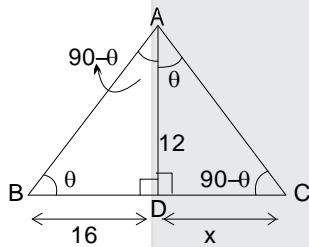
$$80 - 3n + 3 < 0$$

$$3n > 83$$

$$n > 27\frac{2}{3}$$

$$n = 28.$$

47.



$$\triangle ABD \sim \triangle CAD$$

$$\frac{AB}{AC} = \frac{BD}{AD} = \frac{AD}{CD}$$

$$\frac{BD}{AD} = \frac{AD}{CD}$$

$$\frac{16}{12} = \frac{12}{x}$$

$$x = \frac{12 \times 12}{16}$$

$$x = 9 \text{ m}$$

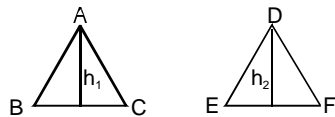
48.

$$(m^2 + n^2) \cos^2 B$$

$$= \left(\frac{\cos^2 A}{\cos^2 B} + \frac{\cos^2 A}{\sin^2 B} \right) \cos^2 B$$

$$= \frac{\cos^2 A \sin^2 B + \cos^2 A \cos^2 B}{\cos^2 B \sin^2 B} \cdot \cos^2 B$$

$$= \frac{\cos^2 A}{\sin^2 B} (\sin^2 B + \cos^2 B) = \frac{\cos^2 A}{\sin^2 B} = n^2.$$



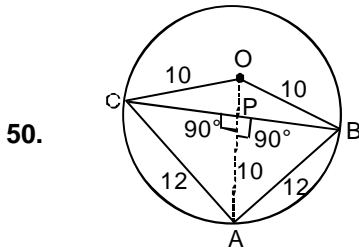
49.

$$\triangle ABC \sim \triangle DEF$$

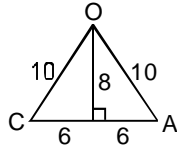
$$\frac{h_1}{h_2} = \frac{4}{9}$$

$$\frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle DEF)} = \left(\frac{h_1}{h_2}\right)^2 = \left(\frac{4}{9}\right)^2 = \frac{16}{81}$$

$$16 : 81.$$



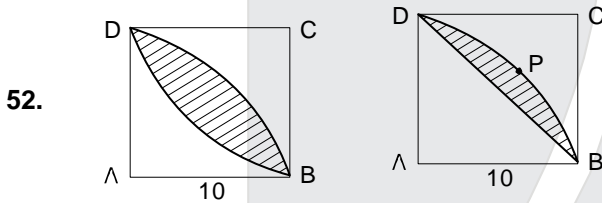
Sides = 10, 12, 10
 CP = 9.6
 BC = $9.6 \times 2 = 19.2$



51. $a - 9, a - 7, a - 5, a - 3, a - 1, a + 1, a + 3, a + 5, a + 7, a + 9.$

$$\text{mean} = \frac{10a}{10} = 120 \Rightarrow a = 120.$$

$$\text{mean of first five number} = \frac{5a - 25}{5} = a - 5 = 120 - 5 = 115.$$



$$\text{Area of sector (DAB)} = \frac{\pi \cdot (10)^2}{4} = 25\pi$$

$$\text{Area } (\Delta DAB) = \frac{1}{2} \times 10 \times 10 = 50$$

$$\text{Area of segment (DPB)} = 25\pi - 50$$

$$\text{So, area of shaded region} = 2(25\pi - 50)$$

$$= 50 \left(\frac{22}{7} - 2 \right) = 100 \left(\frac{11}{7} - 1 \right) = 100 \left(\frac{11-7}{7} \right) = \frac{400}{7} \text{ unit}^2.$$

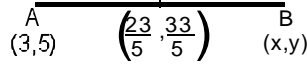
53. $h = 14, r_1 = 2 \text{ cm}, r_2 = 1 \text{ cm}$

$$\text{Volume} = \frac{\pi}{3} (r_1^2 + r_2^2 + r_1 r_2) h$$

$$= \frac{22}{7} (4 + 1 + 2) \frac{14}{3}$$

$$= \frac{44 \times 7}{3} = \frac{308}{3} \text{ cm}^3.$$

54. $2 : 3$
 P



$$\frac{23}{5} = \frac{2x + 9}{2 + 3} \Rightarrow 23 = 2x + 9 \Rightarrow 14 = 2x \Rightarrow x = 7.$$

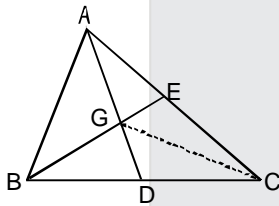
$$\text{And } \frac{33}{5} = \frac{2y + 15}{2 + 3} \Rightarrow 2y + 15 = 33 \Rightarrow 2y = 18 \Rightarrow y = 9.$$

55. In leap year there are 366 days which contains 52 weeks + 2 days.
52 weeks contains 52 Mondays and the remaining 2 days can be
(M, T), (T, W), (W, Th), (Th, F), (F, Sat), (Sat, Sun), (Sun, M)
So there are 7 possibilities for 2 days. out of which 2 of the cases are favorable cases.
So required probability = $\frac{2}{7}$.

56. $2\pi r = d + 60$
 $\Rightarrow 2\pi r = 2r + 60$
 $\Rightarrow r(2\pi - 2) = 60$
 $\Rightarrow r = \frac{60}{2(\pi - 1)} = \frac{30}{\pi - 1}$.

Circumference = $2\pi r = \frac{2\pi \cdot (30)}{\pi - 1} = \frac{60\pi}{\pi - 1} = \frac{60\pi}{\frac{22}{7} - 1} = \frac{60\pi}{15} \times 7 = 28\pi$.

57.



GD is median
 $\text{ar}(\triangle BGD) = \text{ar}(\triangle GDC) = 1$
 $\therefore \text{ar}(\triangle BGC) = 2$
 $\text{ar}(\triangle GEC) = 1$
 $\therefore \text{ar}(\triangle GEC) = 1 + 1 = 2$.

58.

$180^\circ = \pi^c$
 $1^\circ = \left(\frac{\pi}{180}\right)^c$
 $60^\circ 30' = \left(60\frac{1}{2}\right)^\circ = \frac{\pi}{180^\circ} \left(\frac{121}{2} \times \frac{\pi}{180}\right)^c = \frac{121}{360} \pi^c$.

59.

$r_1 \quad A_1 = 4\pi r_1^2$
 $r_2 = 0.75 r_1 = \frac{3}{4} r_1$
 $A_2 = 4\pi r_2^2 = 4\pi \cdot \frac{9}{16} r_1^2 = \frac{36}{16} \pi r_1^2$
 $\Delta A = A_1 - A_2 = \left(\frac{64}{16} - \frac{36}{16}\right) \pi r_1^2 = \frac{28}{16} \pi r_1^2$
 $\% \text{ Decrease in surface area} = \frac{\frac{28}{16} \pi r_1^2}{4\pi r_1^2} \cdot 100 = \frac{28}{16} \times 100$
 $= \frac{7}{6} \times 100 = \frac{700}{6} = 43.75\%$

60.

Let $a = x - y$
 $b = y - z$
 $c = z - x$
 $a + b + c = x - y + y - z + z - x = 0$
 $\therefore a^3 + b^3 + c^3 = 3abc$
 $(x - y)^3 + (y - z)^3 + (z - x)^3 = 3(x - y)(y - z)(z - x)$.

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