KHOJ-2025

Exam for Young Scientists..!

SCIENCE APTITUDE TEST

CLASS 9

ANSWER KEY WITH SOLUTION

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Vasna - Bhayli Branch : Akshar Pavilion, 3rd Floor, Tower A, Vasna Bhayli Road, Gotri Opp. Bhyali TP - 1 Vadodara - 390021

Manjalpur Branch : SF-1 TO 12, Kabir Plaza, Beside Kabir Complex, Above IDBI Bank, Manjalpur, Vadodara - 390010 .

Anand Branch : 2nd Floor, HR Stone Building, Beside Croma Showroom, A.V. Road, Nr. Town Hall, Anand.

www. iitashram.com | Email :- iitashram.2011@gmail.com

ALKAPURI	VASNA-BHAYLI	MANJALPUR	ANAND
9081062221 / 9033063029	6358891896 / 9081062221	9033063027 / 9033063028	9227777098 / 8460009041

PART - I : MENTAL ABILITY

1.

Sol (b) 17

Applying algorithm

Input = 8

= 8 + 9 - 2 = 15 (more than 12)

Step 4 $\Rightarrow$ 15 + 5 = 20 (greater than 16)

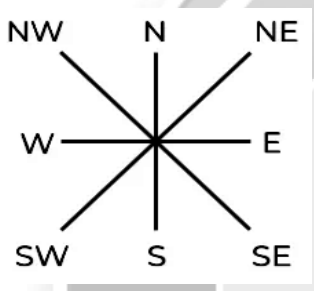
= 20 - 3

2.

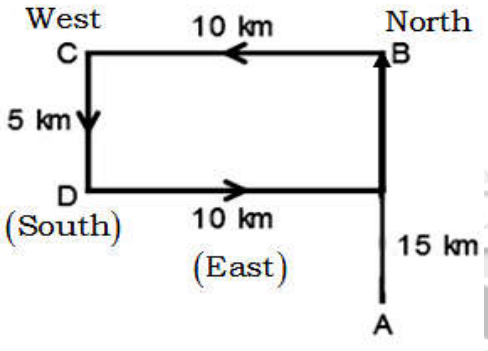
Sol. (d) Sunday

3.

Sol. (c) North



Let letter 'A' denotes kabir's house.



From the figure we can say that he's on the north direction from his house.

4.

Sol. (d) 6

(i) On first dice number 1 is adjacent to 2 and 5

(ii) On second dice number 2 is adjacent 3 and 6

$\Rightarrow$ 1 should be opposite to 6.

[If (i) die is rotated through 360^0, we obtain figure of die (ii)]

5.

Sol. (c) First term 6 = 1 × 2 × 3

Second term 24 = 2 × 3 × 4

Third term 60 =3 × 4 × 5

Fourth term 120 = 4 × 5 × 6

Fifth term 210 = 5 × 6 × 7,

Sixth term 336 = 6 × 7 × 8 and the

missing term =7 × 8 × 9 = 504 and

Last term 720 = 8 × 9 × 10

6.

Sol. (b) 5, 31, 19, 25

Actual Position in Alphabet	1	3	14	5
Letter	A	C	N	E
Gven Code	3	29	7	11

Position of C & N are Interchanged

$A \rightarrow 1\times2+1=3$

$C \rightarrow 3\times2+1=7$

$N \rightarrow 14\times2+1=29$

$E \rightarrow 5\times2+1=11$

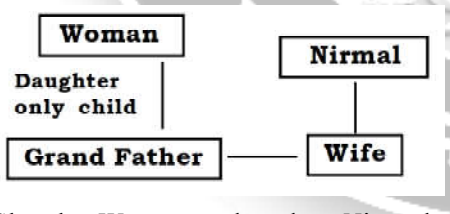
7.

Sol. (d) 50

ab + cd = x $\Rightarrow$ code $(a+b+c+d)\times 2 = x$

8.

Sol. (a) Wife



Clearly, Woman related to Nirmal – wife

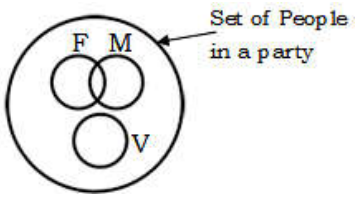
9.

Sol. (a) 0

$$\frac{(36-4)\div 8-4}{4\times 8-2\times 16+1} = \frac{32\div 8-4}{32-32+1} = \frac{4-4}{32-32} = \frac{0}{1} = 0$$

10.

Sol. (a)



A : Set of People in a party.

B : Set of People who took fish.

M : Set of People who took Meat.

V: Set of People who are vegetarians.

11.

Sol. (c)

12.

Sol. (d) Required ratio:$=\frac{(75+65)}{(85+95)}=\frac{140}{180}=\frac{7}{9}$

13.

Sol. (c) Required % = $\left[\frac{(70+80)}{(95+110)}\times 100\right] = \left[\frac{150}{205}\times 100\right]\% = 73.17\%$

14.

Sol. (d) Average sales (in thousand number) of branches B1, B3 and B6 in 2000

$=\frac{1}{3}\times(80+95+70)=\left(\frac{245}{3}\right)$

Average sales (in thousand number) of branches B1, B2 and B3 in 2001

$=\frac{1}{3}\times(105+65+110)=\left(\frac{280}{3}\right)$

$\therefore$ Required percentage $=\left(\frac{245/3}{280/3}\times 100\right)\% = \left(\frac{245}{280}\times 100\right)\% = 87.5\%$

15.

Sol. (b) Average sales of all the six branches (in thousand numbers) for the year 2000

$=\frac{1}{6}\times[80+75+95+85+75+70]=80$

PART - II : MATHEMATICS

1.

Sol. (a) 155°

$\angle ECD = 35 + 70^0 = 105^0$..... By exterior angle property

$\angle FED = 105 + 25 = 130^0$..... By exterior angle property

$\angle GFD = 130^0 + 25^0$..... By exterior angle property & DE is bisector of $\angle D$

$\therefore \quad x = 155^0$

2.

Sol. (d) Let weight of meenu = x kg

Let weight of Binu = **y kg**

Let weight of Dia = **z kg**

$\Rightarrow \quad \frac{x+y+z}{3} = 45 \quad \Rightarrow \quad$ **x + y + z = 45 × 3 = 135** $\quad \Rightarrow \quad \frac{x+y}{2} = 40$

x + y = 40 × 2 = 80

$\therefore$ **z = 135 – (x + y) = 135 – 80 = 55**

Now,

$\Rightarrow \quad \frac{y+z}{2} = 43$

$\Rightarrow \quad y + z = 2 \times 43 = 86$

$\Rightarrow \quad y = 86 - Z = 86 - 55 = 31$ **Weight of Binu = 31 kg**

3.

Sol. (b)

$$\frac{6+2\sqrt{3}}{33-19\sqrt{3}} = \frac{6+2\sqrt{3}}{33-19\sqrt{3}} \times \frac{33+19\sqrt{3}}{33+19\sqrt{3}} = \frac{198+66\sqrt{3}+114\sqrt{3}+114}{1089-1083} = \frac{312+180\sqrt{3}}{6} = 52+30\sqrt{3}$$

$$= 25 + 27 + 30\sqrt{3} = (5)^2 + \left(3\sqrt{3}\right)^2 + 2 \times 5 \times 3\sqrt{3}$$

$\Rightarrow \quad \frac{6+2\sqrt{3}}{33-19\sqrt{3}} = \left(5+3\sqrt{3}\right)^2 \quad \Rightarrow \quad \sqrt{\frac{6+2\sqrt{3}}{33-19\sqrt{3}}} = 5+3\sqrt{3} \quad \Rightarrow \quad a+b\sqrt{3} = 5+3\sqrt{3}$

$\Rightarrow$ **a = 5, b = 3** $\quad \therefore$ **a + b = 5 + 3 = 8**

4.

Sol. (b) $\frac{3}{25}$

$M = \frac{30}{100}Q.....(1)$

$Q = \frac{20}{100}P.....(2) \Rightarrow \frac{Q}{P} = \frac{1}{5}$

$$N = \frac{50}{100}P.....(3)$$

$(1) \div (3)$,

$$\frac{M}{N} = \frac{3}{5}\frac{Q}{P} = \frac{3}{5}\frac{1}{5} = \frac{3}{25}$$

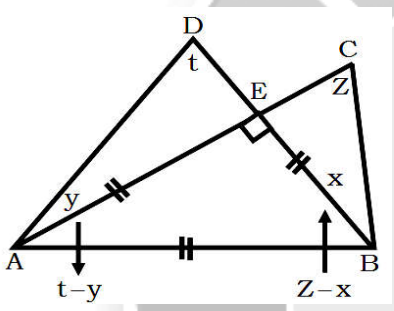
5.

Sol. (b) $3x^2 + 12 - \left(\sqrt{3x + \sqrt{12}}\right)^2 + 12x + 4$

$= 3x^2 + 12 - \left(3x + \sqrt{12}\right) + 12x + 4$ $\therefore$ degree = 2

6.

Sol. **(c)** 135



AB = AC AB = BD

$\therefore \angle ABC = \angle ACB = Z$ $\therefore \angle BAD = \angle BDA = t$

Let $\angle DAE = y$, $\angle CBE = x$

$\therefore \angle EAB = t - y, \angle EBA = z - x$

Clearly. $t + y = = 90^0$ & $x + z = 90^0$

Also, $x - y + z - x = 90^0$

$\therefore (z + t) - (x + y) = 90^0$....(3)

1 + 2, $(t + z) + (x + y) = 180^0$

3 + 4, $2(z + t) = 270$

$\therefore z + t = 135^0$

7.

Sol. **(c)**

$f(x) = 2x^3 + (p + 2)x + p - 2$

when f(x) is divided by (x – 2) then

Remainder = f(2)

$= 2(2)^3 + (p + 2)(2) + p - 2$

$= 16 + 2p + 4 + p - 2$

$= 3p + 18$

When f(x) is divided by (x + 1) then

Remainder = f(–1)

$= 2(-1)^3 + (p+2)(-1) + p - 2$

$= -2 - p - 2 + p - 2 = -6$

$\therefore$ $f(2) + f(-1) = 0$

$3p + 18 - 6 = 0$

$3p + 12 = 0$

$3p = -12$

$p = -4$

8.

Sol. (a) $2^{2/3} - 1 + 2^{-2/3}$

$$\left(2^{\frac{1}{3}}\right)^3 + \left(2^{\frac{-1}{3}}\right)^3 = \left(2^{\frac{1}{3}} + 2^{\frac{-1}{3}}\right)\left[\left(2^{\frac{1}{3}}\right)^2 + \left(2^{\frac{-1}{3}}\right)^2 - \left(2^{\frac{1}{3}}.2^{\frac{-1}{3}}\right)\right] = \left(2^{\frac{1}{3}} + 2^{\frac{-1}{3}}\right)\left(2^{\frac{2}{3}} + 2^{\frac{-2}{3}} - 1\right)$$

9.

Sol. (a) $1/\sqrt{5}$

$$\frac{\sqrt{x}}{\sqrt{2}+\sqrt{3x-2}} = \frac{\sqrt{3-\sqrt{5}}}{\sqrt{2}+\sqrt{3\left(3-\sqrt{5}\right)-2}} = \frac{\sqrt{\frac{5}{2}}-\sqrt{\frac{1}{2}}}{\sqrt{2}+\sqrt{\frac{9}{2}}-\sqrt{\frac{5}{2}}} = \frac{\frac{1}{\sqrt{2}}\left(\sqrt{5}-\sqrt{1}\right)}{\sqrt{2}+\frac{1}{\sqrt{2}}\left[3-\sqrt{5}\right]} = \frac{\frac{1}{\sqrt{2}}\left(\sqrt{5}-1\right)}{\frac{1}{\sqrt{2}}\left[2+3-\sqrt{5}\right]}$$

$$= \frac{\sqrt{5}-1}{5-\sqrt{5}} = \frac{\left(\sqrt{5}-1\right)}{\sqrt{5}\left(\sqrt{5}-1\right)} = \frac{1}{\sqrt{5}}$$

10.

Sol.: (b) $\left(\frac{a+b}{a-b}\right)^2$

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

11.

Sol. **(c)** (i) and (iii)

12.

Sol. (c) 3

$$10^x.\left(10^2\right)^{2x} = \left(10^3\right)^5$$

$\therefore$ $10^x.10^{4x} = 10^{15}$

$\therefore$ $10^{5x} = 10^{15}$

$x = 3$

13.

Sol. (d) –24 abc

$a + b + c = 0$

$a + b = -c$

$b + c = -a$

$c + a = -b$

$(a + b - c)^3 + (b + c - a)^3 + (c + a - b)^3$

$= (-2c)^3 + (-2a)^3 + (-2b)^3$

$= -8\,(a^3 + b^3 + c^3)$

$= -8 \times 3abc$

$= -24abc$

14.

Sol. (d) $N^{\frac{13}{27}}$

$$\left(N\left(N^1.N^{\frac{1}{3}}\right)^{\frac{1}{3}}\right)^{\frac{1}{3}} = \left(N.\left(N^{\frac{4}{3}}\right)^{\frac{1}{3}}\right)^{\frac{1}{3}} = \left(N^1.N^{\frac{4}{9}}\right)^{\frac{1}{3}} = \left(N^{\frac{13}{9}}\right)^{\frac{1}{3}} = N^{\frac{13}{27}}$$

15.

Sol. (a) 9

$$\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + ... + \frac{1}{\sqrt{99}+\sqrt{100}} = \frac{1+\sqrt{2}+\sqrt{2}-\sqrt{3}+\sqrt{3}-\sqrt{4}+.....+\sqrt{99}-\sqrt{100}}{-1}$$

$= (-1)[1-10] = (-1)(-9) = 9$

16.

Sol. (c) $\frac{31}{11}$

$$2+\frac{45}{99}+\frac{36}{99} = 2+\frac{5}{11}+\frac{4}{11} = \frac{22+5+4}{11} = \frac{31}{11}$$

17.

Sol. (d) $14\left(2+\sqrt{2}\right)$cm

Let equal sides have length be x cm

$\therefore$ Area $= \frac{1}{2} \times x \times x$ $\therefore$ $98 = \frac{1}{2}x^2 \Rightarrow x^2 = 49 \times 4$

$\therefore x = 7 \times 2 = 14$ cm

$\therefore$ By pythogoras theorem

$\therefore$ ℓ (Hypotenuse) = $14\sqrt{2}$

$\therefore$ Perimeter= $14 + 14 + 14\sqrt{2} = 28 + 14\sqrt{2} = 14\left(2+\sqrt{2}\right)$cm

18.

Sol. (b) 269

$$A(\Delta ACD) = \frac{\sqrt{3}}{4}(20)^2 = \sqrt{3} \times 5 \times 20$$

$$= 100(1.73)$$

$$= 173(\text{unit})^2$$

$(AB)^2 = 400 - 144 = 256$

$\therefore$ AB = 16 cm

$$A(\Delta ABC) = \frac{1}{2} \times 12 \times 16 = 6 \times 16 = 96 \ \text{(unit)}^2$$

$\therefore$ $A(\square ABCD) = 173 + 96 = 269(\text{unit})^2$

19.

Sol. (b) $\left(x - \frac{1}{x} + 1\right)\left(x - \frac{1}{x} - 1\right)$

$$x^2 + \frac{1}{x^2} - 3 \quad = \quad x^2 + \frac{1}{x^2} - 2.x.\frac{1}{x} - 1 \quad = \quad \left(x - \frac{1}{x}\right)^2 - 1^2 \quad = \left(x - \frac{1}{x} + 1\right)\left(x - \frac{1}{x} - 1\right)$$

20.

Sol. (c) 18

$$8 = \frac{\sum x_i}{9} \qquad 9 = \frac{72 + x}{10}$$

$\therefore \sum x_i = 72$ $\qquad \therefore x = 90 - 72 = 18$

21.

Sol. (a) $5\sqrt{5} \times 5^3 \div 5^{-3/2} = 5^{a+2}$

$\Rightarrow$ $5(5)^{1/2} \times 5^{\left(3+\frac{3}{2}\right)} = 5^{a+2}$ $\Rightarrow$ $5^{3/2} \times 5^{9/2} = 5^{a+2}$

$\Rightarrow$ $5^{12/2} = 5^{a+2}$ $\Rightarrow$ $5^6 = 5^{a+2}$

$\Rightarrow$ $a + 2 = 6$ $\therefore$ $a = 6 - 2 = 4$

22.

Sol. (b) 10

10 years ago

Let D : (Daughter's age) = x yrs

M (Mother's age) = y yrs

After 10 yrs

D = (x + 20) yrs

M = (y + 20) yrs

$\therefore (y+20) = 2(x+20)$ $\quad \therefore 4x + 20 = 2x + 40$ $\quad \therefore x = 10$

$\therefore$ Present age of Simran = 20 yrs

23.

Sol. **(d)** Parallelogram

$\square PQRS$ is a quadrilateral

A, B, C & D are midpoints of RS, RA, QR & PS respectvely Draw QS.

Obvioubly, $DC = \frac{1}{2}QS$ & DC || SQ

Also $AB = \frac{1}{2}QS$ & AB || SQ

$\therefore$ DC = AB & DC || AB $\Rightarrow$ $\square ABCD$ is Parallelogram

24.

Sol. **(b)**

By exterior angle property

y + y = x

2y = x

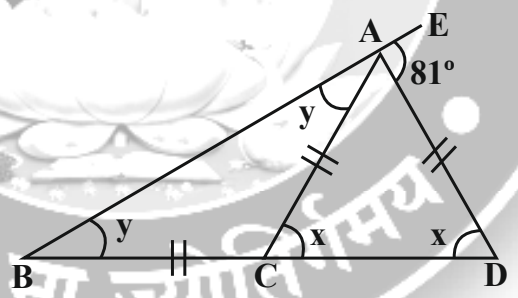
Also $\angle B + \angle D = \angle EAD$

$\Rightarrow$ y + x = 81°

y + 2y = 81°

3y = 81°

$y = \frac{81}{3} = 27°$ $\quad \therefore$ x = 2y = 2 × 27° = 54°



25.

Sol. (b) 150°

In ΔABC,

$\angle ABC + 60^0 + y = 180^0$

$x + \angle DBC + y = 120^0$

$\therefore \angle DBC = 120 - x - y$

In ΔDBC

$120 - x - y + 30 = z \qquad \therefore x + y + z = 150$

26.

Sol. (d) $2^x = 2^{2y} = 2^{3z}$ & $xyz = 288$

$\Rightarrow \quad x = 2y = 3z \;\&\; (3z)\left(\frac{3}{2}z\right)z = 288 \quad \Rightarrow \quad z^3 = \frac{288 \times 2}{9} = 16 \times 2 \times \times 2 = 64 \Rightarrow z = 4$

$$\frac{1}{2x} + \frac{1}{4y} + \frac{1}{8z} = \frac{1}{6z} + \frac{1}{4\left(\frac{3}{2}z\right)} + \frac{1}{8z} = \frac{1}{6z} + \frac{1}{6z} + \frac{1}{8z} = \frac{4+4+3}{24z} = \frac{11}{24z} = \frac{11}{96}$$

27.

Sol. (d) 80^o

In $\square ABCD$,

$2\angle PAB + 2\angle PBA + 60^0 + 100^0 = 360^0$

$\therefore 2\left(\angle PAB + \angle PBA\right) = 200^0$

$\therefore 180 - \angle APB = 100$

$\therefore \angle APB = 80^0$

28.

Sol. (a) $3\frac{5}{13}\%$ profit

1st toy

s.p = 504

$$\text{s.p.} = \left(\frac{100 + \text{gain}\%}{100}\right)\text{c.p.} \qquad \therefore \quad 504 = \frac{112}{100}.\text{c.p.}$$

$$\therefore \quad \text{c.p.} = \frac{504 \times 100}{112} = \frac{2.2.2.7.9 \times 100}{16 \times 7} = 9 \times 50 = 450$$

2nd Toy

$$504 = \frac{96}{100}\text{c.p}$$

$$\therefore \quad \text{c.p.} = \frac{504 \times 100}{96} = \frac{2.2.2.7.9 \times 100}{2.2.2.2.2.3} = 2.5 \times 3 \times 7 = 75 \times 7 = 525$$

$\therefore$ Total = 2 (504) - [525+450]

= 1008 - 975 = 33

$$\therefore \quad \text{Gain}\% = \frac{33}{975} \times 100 = \frac{11.3}{5.5.3.13} \times 100 = \frac{11}{13} \times 4 = \frac{44}{13} = 3\frac{5}{13}$$

29. **Sol:** (a)

$x = 2^{1/3} + 2^{-1/3}$

$x^3 = (2^{1/3} + 2^{-1/3})^3$

$= (2^{1/3})^3 + (2^{-1/3})^3 + 3 \times 2^{1/3} \times 2^{-1/3} (2^{1/3} + 2^{-1/3})$

$= 2 + 2^{-1} + 3x$

$= 2 + 1/2 + 3x$

$x^3 = \frac{5}{2} + 3x \quad \Rightarrow \quad 2x^3 = 5 + 6x \quad \Rightarrow 2x^3 - 6x = 5$

30.

Sol. (d) 1650

$sp = \left(\frac{100 + Gain\%}{100}\right) c.p$

$\therefore \quad \frac{112}{100} c.p. + 33 = \frac{114}{100} c.p \quad \therefore \quad 3300 = 2\ c.p. \quad \therefore \quad c.p. = 1650$

31.

Sol. (c) 308

$s.p = \left(\frac{100 - Discount\%}{100}\right) MP$

$\therefore \quad s.p = \frac{87.5}{100}(M.P)$

Also, $s.p = \frac{110}{100} \times 245 \quad \therefore \quad MP = 308$

32.

Sol. (d) 2

Let $x - \frac{1}{x} = k$

$\therefore \quad \left(x - \frac{1}{x}\right)^3 = k^3 \quad \therefore \quad \left(x^3 - \frac{1}{x^3}\right) - 3.x.\frac{1}{x}.\left(x - \frac{1}{x}\right) = k^3$

$\therefore \quad 14 - 3.k = k^3 \quad \therefore \quad k^3 + 3k = 14 \quad \therefore \quad k(k^2 + 3) = 14$

from options '2' sasifies the equation

33.

Sol. (a) line-segment

34.

Sol. (d)

$= a^2 + b^2 - x^2 + 2ab - 6x - 9$

$= (a^2 + 2ab + b^2) - (x^2 + 6x + 9)$

$= (a + b)^2 - (x + 3)^2$

$= (a + b + x + 3)(a + b - x - 3)$

35.

Sol: (b) 60°

Let common multiple be 'x' for angles in ratio

$\therefore$ $3x + 4x + 5x + 6x = 360^\circ$

$\therefore$ $18x = 360^\circ$

$\therefore$ $x = 20$

$\therefore$ difference $= 6x - 3x$

$= 3x = 3(20^\circ) = 60^\circ$

36. Sol. (d)

$$\left(\sqrt[6]{27} - \sqrt{6\frac{3}{4}}\right)^2 = \left(\sqrt[6]{3^3} - \sqrt{\frac{27}{4}}\right)^2 = \left(3^{\frac{3}{6}} - \frac{3\sqrt{3}}{2}\right)^2 = \left(\frac{\sqrt{3}}{1} - \frac{3\sqrt{3}}{2}\right)^2 = \left(\frac{2\sqrt{3} - 3\sqrt{3}}{2}\right)^2 = \left(-\frac{\sqrt{3}}{2}\right)^2 = \left(\frac{3}{4}\right)$$

37.

Sol. (a) Let a, b and c are sides of triangle then,

$$\text{Semiperimeter} = S_1 = \frac{a+b+c}{2}$$

$$\text{Area} = A_1 = \sqrt{S_1(S_1-a)(S_1-b)(S_1-c)}$$

If each side is quadrupled then,

$$\text{Semiperimeter} = S_2 = \frac{4a+4b+4c}{2} = 4\left(\frac{a+b+c}{2}\right) = 4S_1$$

$\therefore$ Area =

$$A_2 = \sqrt{4S_1(4S_1-4a)(4S_1-4b)(4S_1-4c)} = \sqrt{4S_1 \times 4(S_1-a) \times 4(S_1-b) \times 4(S_1-c)}$$

$$= \sqrt{4 \times 4 \times 4 \times 4 \times S_1(S_1-a)(S_1-b)(S_1-c)}$$

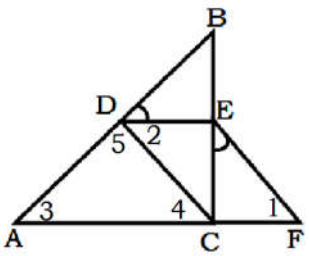
$$= 4 \times 4\sqrt{S_1(S_1-a)(S_1-b)(S_1-c)} = 16A_1$$

$$\% \text{ increase} = \left(\frac{16A_1 - A_1}{A_1} \times 100\right)\% = \left(\frac{15A_1}{A_1} \times 100\right)\% = 1500\%$$

38.

Sol. (c) $\angle ACB = 90^0$

$\angle FEC = 10^0$



In ΔCEF,

$\angle FCE + \angle FEC + \angle 1 = 180^0$

$\Rightarrow 90^0 + 10^0 + \angle 1 = 180^0$ $\Rightarrow 100^0 + \angle 1 = 180^0$

$\therefore$ $\angle 1 = 180^0 - 100^0 = 80^0$ $\therefore$ CDEF is a parallelogram

$\angle 1 = \angle 2 = 80^0$

$\therefore \quad \angle 2 = \angle 4 = 80^0$ (Alternate angles) $\therefore$ AC = CD $\therefore \quad \angle 5 = \angle 3$ (Isosceles triangle)

$\Rightarrow \quad \angle 5 + \angle 3 + \angle 4 = 180^0 \quad \Rightarrow \quad \angle 5 + \angle 5 + 80^0 = 180^0 \quad \Rightarrow \quad 2\angle 5 = 180^0 - 80^0$

$\Rightarrow \quad 2\angle 5 = 100^0 \quad \therefore \quad \angle 5 = \frac{100^0}{2} = 50^0$

Now, $\angle 5 + \angle 2 + \angle BDE = 180^0$

$\Rightarrow \quad 50^0 + 80^0 + \angle BDE = 180^0 \quad \Rightarrow \quad 130^0 + \angle BDE = 180^0$

$\therefore \quad \angle BDE = 180^0 - 130^0 = 50^0$

39.

Sol. (c) $\sqrt{3}$ a

By applying pythagoras theorem)

40.

Sol. (c) 5

(x_i)	(f_i)	$(f_i x_i)$
No.	frequency	—
3	x – 2	3x – 6
5	x + 2	5x + 10
7	x – 3	7x – 21
9	x + 3	9x + 27
total	$\sum f_i$	$\sum(f_i x_i)$

Mean = $\frac{\sum(f_i x_i)}{\sum f_i}$

6.5 = $\frac{24x + 10}{4x}$

$\therefore$ 26x = 24x + 10

$\therefore$ 2x = 10

$\therefore$ x = 5

PART - III : PHYSICS & CHEMISTRY

1.

Sol. **(d)** As pressure is inversely proportional to Area of contact, the basement pillars of a building are made wider enough to reduce the pressure by increasing area of contact

2.

Sol. **(c)** $\sqrt{\left(\frac{u^2+v^2}{2}\right)}$

Clearly $V^2 = u^2 + 2as$

$\Rightarrow V^2 = u^2 + 2aL \quad \Rightarrow \quad aL = \frac{V^2-u^2}{2}$

For middle point of train

$V_m^2 = u^2 + 2as_m$

$= u^2 + 2a\left(\frac{L}{2}\right) = u^2 + \frac{v^2-u^2}{2} = \frac{v^2+u^2}{2} \quad \Rightarrow \quad v_m = \sqrt{\frac{v^2+u^2}{2}}$

3.

Sol. **(c)** 9 F

Let m be the mass of the car and a be the deceleration produced by force F, then F= ma, where a is given by $2as = v^2 - u^2$

$2as = v^2$ or $a = \frac{v^2}{2s}$

Therefor, $F = \frac{mv^2}{2s}$

Thuse $F \alpha v^2$

If v is increased to 3 times, F will increase by 9 times.

4.

Sol. **(d)** The time taken is $2\sqrt{10}$ s.

The ball attains maximum height of 50m, so distance travelled by the ball will be 100m, and displacement of the ball will be 0 as it reaches to its initial position.

For time of flight,

Max height $h = \frac{u^2}{2g}, u = \sqrt{2\times10\times50} = 10\sqrt{10}$

The time of flight will be = $2u/g = 2\sqrt{10}$ sec

5.

Sol. **(b)** 50 m/s

Given,

A body is thrown upward at speed, u

At 5th and 6th distance travelled is equal = S

Means in 4sec to 5 sec distance travelled = S

And in 5sec to 6 sec distance travelled = S

It is only possible if body deaccelerated in 4sec to 5 sec and accelerated in 5sec to 6 sec

In projectile motion, this condition is suited, if in 4sec to 5 sec body goes upward, and in 5sec to 6 sec body goes downward.

So, at the end of 5sec body is at top, and its vertical velocity is zero.

Acceleration of gravity, g

Time, t

Initial velocity, u

Final velocity, v

Apply kinematic equation at top position.

$v = u - gt$

$0 = u - gt$

$u = gt = 10 \times 5 = 50$ m/s Hence, body thrown upward at speed 50 m/s

6.

Sol. (a) Its weight in air is more than in water.
The iron ball weighs less in water due to buoyant force acting on it due to water.

7.

Sol. (b) Variable acceleration
In uniform circular motion, direction of acceleration (centripetal acceleration) is continuously changing hence uniform circular motion is example of variable accelerated motion.

8.

Sol. (a) 8m, 16m
Displacement is equal to area under the velocity time graph with proper sign.
$\therefore$ Displacement = $4 \times 2 - 2 \times 2 + 2 \times 2 = 8$m
Distance is equal to total area under the speed time graph.
$\therefore$ Distance = $4 \times 2 + 2 \times 2 + 2 \times 2 = 16$m.

9.

Sol. (a) $\frac{Mn}{60}$

We know that $F = \frac{dp}{dt}$

dp of one disc = – M
dp of ***n*** discs = – nM

So, the force associated with these discs are $\frac{Mn}{60}$. (coverting n disc per minute to per second)

10.

So. **(a)** $F_b = F_e$
According to newton's third law , every action has equal and opposite reaction.

11.

So. **(d)** zero
Since the spring balance and stone system is in free fall so the spring balance will not experience any force from stone and hence the reading will be zero. So the answer is d.

12.

Sol. (d) infinite

The force of gravitation between two bodies can be described by Newton's universal gravitation law. This law states that the gravitational force of attraction between two bodies is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

13.

Sol. (b) 4 : 1

As density is inversely proportional to the volume, the ratio of the densities will be 4 : 1

14.

Sol. (c) can be positive, negative or zero

Work can be positive, negative and zero.

positive : when force and displacement are is same direction.

Negative : when force and displacement are is opposite direction.

zero : when force and displacement are perpendicular to each other.

15.

Sol. (d) weak, large, decreases, decreases

Gravitational force is weak force and effect of gravitational force can be seen when large masses are involved. It decreases on increasing altitude and decreases when you go deep in the surface of earth.

16.

Sol. (c) A gas can be best liquefied by increasing the pressure and reducing the temperature.

17.

Sol. (d) petrol > alcohol > kerosene > water.

The correct order of evaporation of water, Alcohol, petrol and Kerosene is

18.

Sol. (a) p and Q are true and Q explains P.

19.

Sol. (d) Among the given statements , only adding milk in water results in the formation of a mixture.

20.

Sol. (c) Diamond is not a compord its a element

21.

Sol. The symbol of Tungsten is w

22.

Sol. (d) **32**

The maximum number of electrons in N shell is -32

23.

Sol. (d) 4, 6

Valency of sulphur in SO_2 and SO_3 are 4 and 6 respectively.

24.

Sol. (d) The mass of proton is 1.6×10^{-24}g

25.

Sol. (c) Bauxite is not an ore of Iron.

26.

Sol. (c) Atomic number are same but mass number are different.

27.

Sol. (b)

Discoverer of neutron particles is James chadwick

28.

Sol. (b) butane + propane

Butane and propane is mainly mixture of LPG.

29.

Sol. (d) all of these

Fire es extinguished by: removing of combustible substance, cutting off supply of dir, cooling the burning substance.

30.

Sol. (b) $NaHCO_3$

soda-acid extinguisher contain $NaHCO_3$

PART - IV : BIOLOGY

1

Sol. (a) Nucleus

The nucleus of a eukaryotic cell contains genetic information in the form of DNA.

2.

Sol. (c) Control of substances entering and leaving the cell

The cell membrane regulates the passage of substances in and out of the cell.

3.

Sol. (c) Connective tissue

Connective tissue includes tendons as a dense connective tissue, which connect bones to muscles.

4.

Sol. (d) Covering and lining surfaces

Epithelial tissue covers and lines various body surfaces, providing protection and serving as a barrier.

5.

Sol. (b) To produce offspring with genetic variations

Reproduction generates genetic diversity, essential for the adaptation and survival of species.

6.

Sol. (a) Asexual reproduction

Asexual reproduction can involve the formation of spores, leading to genetically identical offspring.

7.

Sol. (a) Nitrogen

Nitrogen is one of the essential nutrients required for plant growth, mainly for the formation of proteins and chlorophyll.

8.

Sol. (c) Weeding

Weeding is the process of removing unwanted plants (weeds) from a cultivated area to reduce competition for nutrients and space.

9.

Sol. (c) Testosterone

Testosterone is the male sex hormone responsible for the development of secondary sexual characteristics in boys.

10.

Sol. (b) 13-19 years

Puberty typically begins between the ages of 13 -19 in humans, leading to physical and hormonal changes.

11.

Sol. (a) Bacteria

Certain bacteria, such as streptomyces, are used in the production of antibiotics.

12.

Sol. (b) Producing alcohol and carbon dioxide

Yeast is used in fermentation processes to produce alcohol and carbon dioxide from sugars.

13.

Sol. (b) Mycobacterium tuberculosis

Tuberculosis is caused by the bacterium Mycobacterium tuberculosis.

14.

Sol. (c) Vascular tissue

Vascular tissue, including xylem and phloem, is responsible for the transport of water and nutrients in plants.

15.

Sol. (c) Adaptation to changing environments

Sexual reproduction leads to genetic diversity, enhancing the adaptability of a species to different environments.