UDAAN

A QUEST FOR SCIENCE ASPIRANTS

SCIENCE APTITUDE TEST

CLASS 10

ANSWER KEY WITH SOLUTIONS

DATE : 19.01.25

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PART - I : MENTAL ABILITY

1.

Sol: (a)

P sits two seats to the left of R, and Q sits two seats to the right of R. We can represent this information in the diagram below.

2.

Sol: (b)

The group of crow is called Murder while the group of deer is called herd

3.

Sol: (b)

Step 1: Count the days in each month from April to December 2003

April: 30 - 1 (April 1 is Monday) = 29 days.

May: 31 days.

June: 30 days.

July: 31 days.

August: 31 days.

September: 30 days.

October: 31 days.

November: 30 days.

December: 25 days (up to 25th December).

Total number of days from 1st April to 25th December:

29 + 31 + 30 + 31 + 31 + 30 + 31 + 30 + 25 = 268 days.

Step 2: Divide the total days by 7 to find the remainder

268 ÷ 7 = 38 weeks and 2 days (remainder)

The remainder, 2, means 25th December 2003 will fall 2 days after Monday, which is Wednesday.

4.

Sol: (d)

Using formula for clock angle

? =Mod of 11/2 M-30H

For 3:40 Put M =40 H=3 Ans 130

5.

Sol: (d)

The top face is same in both figures rotate dice twice in clockwise or anticlockwise keeping top face as it is.

Ans is 6

6.

Sol: (d)

As shown in fig. the man initially faces in the direction OP. On moving clockwise, he faces in the direction OX. On further moving anticlockwise, he faces in the direction OY. Finally, on moving anticlockwise, he faces in the direction OZ, which is South-east

7.

Sol: (b)

The Tall person is second from right.

8.

Sol: (a)

Person to the left of weak person is intelligent

9.

Sol: (b)

Fat person is sitting at the centre

10.

Sol: (c)

All are perfect squares except 120 option (c)

11.

Sol: (b)

The bikes which are manufactured only in the years 2002 and 2003 is the region common to the square and rectangle but not to the circle or the triangle. In the figure shown we can say that B is the required region. Choice (B)

12.

Sol: (c)

The bikes which are manufactured in all the given four years is the region which is common to the triangle, square, rectangle and circle. Here, in the above figure A represents that region. Choice (C)

13.

Sol: (a)

The bikes which are manufactured only in the year 2003 is the region which belongs to only rectangle but does not belong to any other figure. So from the above diagram S is the required region. Choice (A)

14.

Sol: (d)

The bikes which are manufactured only in the year 2001 and 2004 is the region common to the triangle and circle but having nothing common to the rectangle and square. In the figure shown that region is represented by square the letter Y. Choice (D)

15.

Sol: (d)

The bikes which are manufactured in 2001, 2002 and 2003 but not in 2004 is the region which is common to the square, rectangle and triangle but having nothing in common with the circle. From the figure shown we can say that Z is the required region. Choice (D)

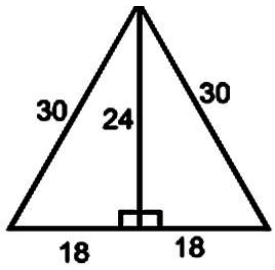
PART - II : MATHEMATICS

1.

Sol: (b)

2.

Sol: (d)

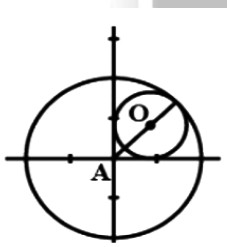


$$\Delta = \frac{1}{2} \times 36 \times 24 = 432$$

$$R = \frac{abc}{4.\Delta} = \frac{30 \times 30 \times 36}{4 \times 432} = 18.75$$

3.

Sol: (d)



Construct: Join center of outer circle to point of contact of the two circles.
Let O be the center of smaller circle
Let A be the center of larger circle
Let r be the radius of smaller circle, and R be the radius of larger circle.

Then AB = OB = r Thus, by pythagoras theorem, $AO = \sqrt{2} \times r$

Now $AE = R = AO + OE = \sqrt{2} \times r + r$

$$R = (\sqrt{2} + 1) \times r$$

$$r = \frac{R}{(\sqrt{2+1})}$$

$$R = 1$$

So, $$r = \frac{1}{(\sqrt{2+1})}$$

4.

Sol: (d)

In ΔQAB,

OA = OB (radius of circle).

Thus, $\angle OAB = \angle OBA = 40^0$. [Isosceles triangle property].

Similarly, $\angle OBC = \angle OCB = 30^0$ and, $\angle OCD = \angle ODC = 50^0$ and, $\angle ODA = \angle OAD = x$.

Sum of angles of the quadrilateral = 360°.

Then, $\angle OAB + \angle OBA + \angle OBC + \angle OCB + \angle OCD + \angle ODC + \angle ODA + \angle OAD = 360^0$

$\Rightarrow 2(40^0 + 30^0 + 50^0 + x) = 360^0$

$\Rightarrow 120^0 + x = 180^0$

$\Rightarrow x = 60^0$

Thus, angle $\angle OAD = 60^0$

5.

Sol: (b)

GIVEN: A number is selected from the numbers 3,5,5,7,7,7,9,9,9,9

TO FIND: Probability that the selected number is the average of the numbers

Total numbers are 10

Average of numbers

$$= \frac{3+5+5+7+7+7+9+9+9+9}{10} = \frac{70}{10} = 7$$

Total numbers of numbers which are average of these numbers are 3

We know that $\text{PROBABILITY} = \frac{\text{Number of favourable event}}{\text{Total number of event}}$

Hence Probability that the selected number is the average of the numbers is $\frac{3}{10}$.

6.

Sol: (d)

The correct option is (d) 7:9

Let a be the side of three equal cubes.

$\therefore$ Surface area of 3 cubes = $3 \times 6a^2 = 18a^2$

Now, length of so formed cuboid = 3a

Breadth = a

Height = a

$\therefore$ Surface area = 2(lb + bh + hl)

$= 2[3a \times a + a \times a + a \times 3a]$

$= 2[3a^2+a^2+3a^2] = 2 \times 7a^2 = 14a^2$

$\therefore$ Ratio of the surface areas of cuboid and theee cubes = $14a^2 : 18a^2 = 7:9$

7.

Sol: (b)

Radius of a spherical bullet = 2 cm Volume of the spherical bullet = $(4/3)\pi r^3$.

$V = (4/3) \times (22/7) \times 2 \times 2 \times 2\ cm^3$

$V = 704/21 cm^3$

Let n be the number of bullets.

Volume of the n bullets = volume of cube $n \times (704/21)$ =85184 cm^3.

$n = (85184 \times 21)/704$

n = 2541 bullets.

$\therefore$ 2541 spherical solid bullets can be made out of a solid cube

8.

Sol: (a)

According to given statements,

ΔACB and ΔECD, are the similar triangles by AA criterion.

Therefore, their sides are in proportion,

So, $\frac{AC}{EC} = \frac{CB}{CD} = \frac{BA}{DE} \quad \Rightarrow \frac{8+b}{10} = \frac{12}{8} = \frac{9}{a}$

On solving these, we get, b = 7 and a = 6

Therefore, a + b = 13

9.

Sol: (d)

Area of shaded region = Area of semicircle CABC - Area of triangle ABC

$= \pi\frac{a^2}{4} - \frac{a^2}{2}$ ..... (Since ABC is a right angled triangle, with base and height both

(Radius of circle is $\frac{a}{\sqrt{2}}$) $= = \frac{a^2}{2}\left(\frac{\pi}{2} - 1\right)$

10.

Sol: (b)

If a point lies on a line, it satisfies the equation of that line. Here, we will check points (7,2) and (-1,0) satisfies which equation given in options. Hence, (7,2) and (-1,0) lies on the line 4y = x + 1.

11.

Sol: (a)

We know that the diagonals of a parallelogram bisect each other.

So, coordinates of the mid-point of diagonal AC are same as the coordinates of the mid-point of diagonal BD.

Since, the midpoint of the line segment joining the two points (x_1, y_1) and (X_2, Y_2) is

$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$\left(\frac{6+9}{2}, \frac{1+4}{2}\right) = \left(\frac{8+p}{2}, \frac{2+3}{2}\right) \quad \Rightarrow \left(\frac{15}{2}, \frac{15}{2}\right) = \left(\frac{8+p}{2}, \frac{5}{2}\right)$

$\Rightarrow \frac{15}{2} = \frac{8+p}{2} \qquad \Rightarrow 15 = 8 + p \qquad \Rightarrow P = 7$

12.

Sol: (c)

first term = a

second term = b

common difference d = second term – first term = b – a

Last term l = 2a

$\Rightarrow a + (n - 1)\, d = 2a \quad \Rightarrow (n - 1)(b - a) = a$

$\Rightarrow n(b - a) = a + (b - a) \quad \Rightarrow n = \dfrac{b}{(b-a)}$

Therefore, number of terms $n = \dfrac{b}{b-a}$

Step 2: Solve for the sum of the series

Sum of the series in Arithmetic progression $S = \dfrac{a+1}{2}$

$= \dfrac{b}{2(b-a)}(a + 2a) \quad \Rightarrow S = \dfrac{3ab}{2(b-a)}$

13.

Sol: (b)

$\tan(A + B) = \sqrt{3}$

$\Rightarrow \tan(A + B) = \tan 60^0$

$\Rightarrow (A + B) = 60^0 \ldots$ (i)

$\tan(A - B) = \dfrac{1}{\sqrt{3}}$

$\Rightarrow \tan(A - B) = \tan 30^0$

$\Rightarrow (A - B) = 30^0 \ldots$ (ii)

Adding (i) and (ii); we get, $A + B + A - B = 60^0 + 30^0$

$2A = 90^0$

$A = 45^0$

Putting the value of A in equation (i), $45^0 + B = 60^0$

$\Rightarrow B = 60^0 - 45^0$

$\Rightarrow B = 15^0$ Thus, $A = 45^0$ and $B = 15^0$

14.

Sol: (a)

Given, $\alpha+\beta = 90^0$ and alpha $= 2\beta$

$\Rightarrow 2\alpha + \beta = 90^0$

$\Rightarrow 3\alpha = 90^0$

$\Rightarrow \beta = 30^0$ but $\alpha + \beta = 90^0$

$\alpha + 30^0 = 90^0$

$\alpha = 60^0$

$\Rightarrow \cos^2\alpha + \sin^2\beta = \cos^2 60^0 + \sin^2 30^0$

$= \left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^2 = \frac{1}{2}$

15.

Sol: (a)

Nature of the roots for a quadratic equation $a^2 + bx + c = 0$ can be determined by its Discriminant, D $= b^2 - 4ac$

Here, $D = p^2 - 4q$

Since, the roots are not real Therefore, $D < 0 = p^2 - 4q < 0$

$= p^2 < 4q$

16.

Sol: (b)

17.

Sol: (b)

Let the number of books bought be x. Then,

Cost of x books = Rs 80 $\Rightarrow$ Cost of one book $= \text{Rs}\frac{80}{x}$

If the number of books bought is x + 4 then

Cost of one book $= \text{Rs}\frac{80}{x+4}$

It is given that the cost of one book is reduced by one rupee.

$\frac{80}{x} - \frac{80}{x+4} = 1$

$80\left(\frac{1}{x} - \frac{1}{x+4}\right) = 1$

$80\left\{\frac{x+4-x}{x(x+4)}\right\} = 1$

$\frac{320}{x^2+4x} = 1$

$\Rightarrow$ $x^2 + 4x = 320$

$\Rightarrow$ $x^2 + 4x - 320 = 0$

$\Rightarrow$ $x^2 + 20x - 16x - 320 = 0$

$\Rightarrow$ $x(x + 20) - 16(x + 20) = 0$

$\Rightarrow$ $(x + 20)(x - 16) = 0$

$\Rightarrow$ x = - 20 or, x=16

$\Rightarrow$ x = 16 [x cannot be negative]

Hence, the number of books is 16

18.

Sol: (a)

Mean of 5 numbers = 18

$\therefore$ Total = 18 × 5 = 90

By excluding one number, the mean of remaining 5-1=4 numbers =16

$\therefore$ Total=16 × 4 = 64

$\therefore$ Excluded number = 90 - 64 = 26

19.

Sol: (c)

AD = BC

AB = DC

$3x + 2y - 11 = x + y + 4$

$5x + 2y + 2 = 2x + 5y - 7$

$2x + y = 15$.....eq(1) multiplied by 3

$3x - 3y = -9$.....eq(2)

on adding both equations we get

$6x + 3y = 45$

$3x - 3y = -9$

_____

$9x = 36$

$x = 4$

puting x=4 in eq(1)

$2 \times 4 + y = 15$

$y = 7$

$AB = 5x + 2y + 2$

$= 5 \times 4 + 2 \times 7 + 2 = 20 + 14 + 2 = 36$

$BC = x + y + 4$

$= 4 + 7 + 4 = 15$

So, perimeter = 2 (36 + 15) = 102

Area = $36 \times 15 = 540$

Diagonal=$\sqrt{15^2 + 36^2} = \sqrt{1521} = 39$

Hence Answer is C

20.

Sol: (d)

In ΔADC,

$AD^2 + AC^2 = CD^2$

$9^2 + AC^2 = 15^2$

$AC^2 = 225 - 81$

AC = 12m

In ΔBEC,

$EC^2 = BC^2 + BE^2$

$15^2 = 12^2 + BC^2$

$225 - 144 = BC^2$

BC = 9m

Width of the road = AC + BC = 12 + 9 = 21m

21.

Sol: (a)

When AD is perpendicular to BC in a right triangle: $AD^2 = BD \times CD$

This comes from the property of similar triangles: $\Delta ABD \sim \Delta ADC \sim \Delta ABC$.

Explanation:

1. From similarity: $\frac{AD}{BD} = \frac{CD}{AD}$

2. Cross-multiplying: $AD^2 = BD \times CD$

Answer (a) is correct.

22.

Sol: (d)

Given, $f(x) = x^2 + x - 6$

Then $f(t) = t^2 + t - 6$

Also given $f(t - 5) = 0$

Then $f(t - 5) = (t - 5)^2 + (t - 5) + 6 = 0$

$\Rightarrow t^2 - 10t + 25 + t - 5 - 6 = 0$

$\Rightarrow t^2 - 9t + 14 = 0$

$\Rightarrow t^2 - 7t - 2t + 14 = 0$

$\Rightarrow t(t - 7) - 2(t - 7) = 0$

$\Rightarrow (t - 2)(t - 7) = 0$

Thent 2 or t = 7

23.

Sol: (b)

Given $2x + 3y = 7$ ..... (i)

and $3x + 2y = 3$ ..... (ii)

On subtracting (i) from (ii) we get

$x - y = -4$

Hence, the Answer is – 4

24.

Sol: (a)

Here $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ hence unique solution

25.

Sol: (a)

If $\alpha\beta$ be the zeros of the quadratic polynomial, as given sum of it's zeros 5 and product of it's zeros ?14

then $\alpha + \beta = 5$ and $\alpha\beta = -14$

$K(x - \alpha)(x - \beta)$ is the quadratic polynomial.

$K(x^2 - 5x - 14)$ if k =2 then option is Answer

26.

Sol: (a)

Here, the marks which can be obtained lies between 0 and 100.

$\Rightarrow S=\{0,1,2,3,.....,100\}$

$\therefore n(S)=101$

Let A be the event that one can get 75 marks.

Then, P(A)=n(A) / n(S)=1/ 101

Hence, the answer is 1/101.

27.

Sol: (b)

Total number of elementary events = 5

$x^2 < 2$ when x= –1,0,1

Therefore, favourable number of elementary events = 3

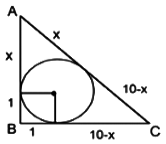
Hence, $P(x^2 < 2) = 3/5$

28.

Sol: (a)

Tangents drawn from external points are of equal length

The correct option is (b) 22 cm



Perimeter = 22 cm

Shortcut Semi-perimeter = r +H

29.

Sol: (d)

Vol of sphere = $4\pi/3\ (r^3)$

Let Initial radius is r and new radius is r/2

Initial vol = $4\pi/3\ (r^3)$

New Vol = $4\pi/3\ \pi(r/2)3 = 1/8\ \{4\pi/3\ (r^3)\}$

Hence 1/8 times

30.

Sol: (c)

Let the radius of original circle = r

$\therefore$ Area of original circle $= \pi r^2$

But, the radius of the circle is increased by 20%

$\therefore$ Radius of new circle $R = \frac{20r}{100} + r = 1.2r$

Area of new circle = πr^2

$= \pi(1.2r)^2 = 1.44 = \pi r^2$

Increased area $= 1.44\pi r^2 - \pi r^2 = 0.44\pi r^2$

Percentage increase in area $= \frac{0.44\pi r^2}{\pi r^2} \times 100 = 44\%$

31.

Sol: (a)

$C = 2\pi r$

$A = \pi r^2$ on dividing

C/A =2/r given r=5 hence 2:5

32.

Sol: (b)

In a right angled triangle radius if circle inscribed is R= (P + B - H) /2

Using the concept : Length of tangents drawn from a point are of equal length

Hence 2cm is answer

33.

Sol: (c)

Let A = (- 2, 0) B = (2, 3) and C = (1, - 3)

Now,

$AB = \sqrt{(-4)^2+(-3)^2} = 5$

$BC = \sqrt{(1)^2+(6)^2} = \sqrt{37}$

$AC = \sqrt{(-3)^2+(3)^2} = 3\sqrt{2}$

As $AB \neq BC \neq AC$ and $BC^2 \neq AB^2 \neq AC^2$, so the triangle is scalene.

34.

Sol: (a)

Centroid of triangle having vertices A(x1, y1) B(x2, y2) & C(x3, y3) is given by

$(x_1 + x_2 + x_3)/3, (y_1 + y_2 + y_3)/3$

Putting values in formula we get x = 2 and y = 5

35.

Sol: (d)

$a_{20} - a_{25} = (a + 19d) - (a + 24d) = -5d$

$-5d = 15$

$d = -3$

36.

Sol: (a)

Numerator $\sin^4x - \cos^4x = (\sin^2x - \cos^2x)(\sin^2x + \cos^2x)$

Denominator $= (\sin^2x - \cos^2x)$

Hence we left with $(\sin^2x + \cos^2x)$ which is equal to 1

37.

Sol: (b)

$(\sin^2\theta + \cos^2\theta) = 1$ence angles must be equal

$\frac{x}{2} = \frac{x+30}{3}$ on solving x = 60

38.

Sol: (d)

Given $(\tan\theta + \cot\theta) = 3$

On squaring both side

$\tan^2\theta + \cot^2\theta + 2 = 9$

$\tan^2\theta + \cot^2\theta = 7$

39.

Sol: (a)

40.

Sol: (a)

Using the concept derived from similarity

$AB^2 = AC.AD$

$(3)^2 = AD.5$

$AD = 1.8$

PART - III : PHYSICS & CHEMISTRY

1.

Sol: (c) $\frac{M_2F}{M_1+M_2}$

For the first block

$\xrightarrow{F}\boxed{M_1}\xleftarrow{f_c}$ (where F is the applied force and f_C is the contact force between M_1 and M_2)

$F - f_c = M_1a$.....(1)

Next, for the second block

$\xrightarrow{F_c}\boxed{M_2}$

$f_c = M_2a$.....(2)

On adding (1) & (2) we get

$$a = \frac{F}{m_1+m_2}$$

Substituting for a in (2) we get

$$f_c = \frac{M_2F}{M_1+M_2}$$

2.

Sol: (d) $\frac{u}{\sin\theta}$

As light is going from medium x to y and critical angle is defined, thus, x is denser medium and y is rarer medium.

Let the speed of light in medium y be v.

From Snell's Law.

$$\frac{\sin i_c}{\sin 90^0} = \frac{u}{v} \qquad \Rightarrow \frac{\sin i_c}{1} = \frac{u}{v} \qquad \therefore v = \frac{u}{\sin\theta}$$

3.

Sol: (c)

Distance travelled in the n^{th} second is given by.

$$s_{nth} = u + \frac{a}{2}(2n-1)$$

Comparing with the distance given in the question.

$$\Rightarrow \quad 4+6n = u+\frac{a}{2}(2n-1)$$

$$4 + 6n = \left(u - \frac{a}{2}\right) + an$$

Comparing the like terms

$a = 6m/s_2$ $\Rightarrow \quad u - \frac{a}{2} = 4$ $\Rightarrow u - 3 = 4$

$u = 7m / s$

4.

Sol: (a)

The gravitational acceleration g for Earth is given as:

$$g = \frac{GM}{R^2} \text{ or } M = \frac{g \times R^2}{G}$$

$$\Rightarrow \text{Density } D = \frac{\text{mass}}{\text{volume}} = \frac{M}{V_e} = \frac{\frac{gR^2}{G}}{V_e}$$

(Where Ve is the volume of the earth)

$$D = \frac{g \times R^2}{G \times \frac{4}{3}\pi R^3} = \frac{3g}{4\pi GR}$$

Hence, the average density of the earth in terms of g, G and R is $\frac{3g}{4\pi GR}$

5.

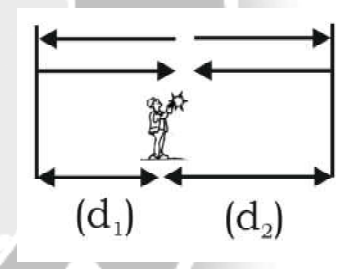
Sol: (c)

Given: t_1 (Time after which first echo is heard) = 0.6s

t_2 (Time after which second echo is heard) = 2.4s

v (Velocity of sound) = 336m / s

For an echo the total distance travelled by the sound is 2d.



$$2d = v \times t \text{ or } d = \frac{v \times t}{2}$$

Now, $d_1 = \frac{v \times t_1}{2}$ Or $d_1 = \frac{336 \times 0.6}{2} = 100.8\text{m}$

Similarly : $d_2 = \frac{336 \times 2.4}{2} = 403.2\text{m}$

$\therefore$ Total distance between two cliffs =

$d_1 + d_2 = (100.8 + 403.2)$ m = 504m.

6.

Sol: (d)

The correct option is $\frac{10}{9}$

Given:

real depth, h = 1 m

and apparent depth, y=1-0.1 = 0.9 m

We know that,

$$\text{Referactive index } (\mu) = \frac{\text{Real depth}}{\text{Apparent depth}}$$

$$\Rightarrow \quad \mu = \frac{1}{0.9} = \frac{10}{9}$$

option (d) is correct.

7.

Sol: (c)

In this case, for seeing distant objects (u = infinity) the image is formed at the far point 40 cm.

$\therefore$ v = –40cm

Hence the required focal length is

$\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$ **or** $\frac{1}{f}=\frac{1}{v}\Rightarrow$ f = v $\left(\because \frac{1}{u}=0\right)$

f = – 40 cm

Power $P=\frac{100}{f(cm)}=\frac{100}{-40}=-2.5D$

8.

Sol: (c)

When a negatively charged balloon is brought near a neutral conducting sphere, the electrons within the sphere will redistribute themselves but net charge of zero. This occurs because of the repulsive force between like charges.

As the negatively charged balloon approaches the neutral conducting sphere, the electrons in the surface of the sphere closest to the balloon will be repelled and thus move away from the balloon. This causes some of the electrons to move to the opposite surface of the sphere, creating a separation of charges within the sphere. Thus positive charges remain near the ballom and negative charges move to the opposite side.

9.

Sol: (b)

Given - Radius of circle (r) = 0.5×10^{-10} m and frequency (f) = 5×10^{15} s^{-1}

• The electric current is given as.

$\Rightarrow I=\frac{Q}{t}$, where Q = charge on 1 electron, s $Q = 1.6\times10^{-19}C$

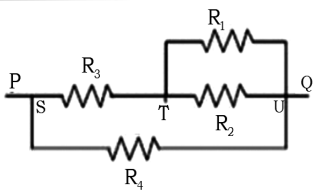
t = time taken for one revolution i.e. t = T

• As we know, reciprocal of time period gives frequency i.e. $f=\frac{1}{T}$

$\Rightarrow I=\frac{Q}{T}=Q\times f$ $\Rightarrow I = 1.6\times10^{-19}\times5\times1015 = 8\times10^{-4}$ A = 0.8mA

10.

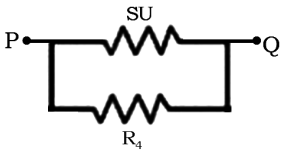
Sol: (c)



The correct option is C 2.4Ω

In the given circuit,

$TU_{eq}=\frac{(R_1\times R_2)}{(R_1+R_2)}=\frac{4\times4}{4+4}=2\Omega(\text{Parallel connection})$



SU_{eq}=(TU_{eq}+ R_3) = (2 + 4) = 6 ohm (R_3 is in series with TU_{eq}) so that, the circuit reduces to

$\text{Net R}=\frac{(SU_{eq}\times R_4)}{(SU_{eq}+R_4)}=\frac{(6\times4)}{(6+4)}=2.4\text{ohm}$

(parallel connection)

11.

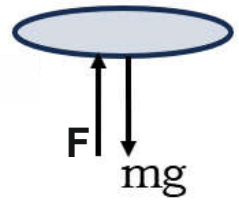
Sol: (c)

gamma rays.

Alpha and beta particles have opposite charges-they undergo deflection in opposite direction. Cosmic rays have changed particles which also get deflected by magnetic field whereas gamma rays do not possess any charge and they do not undergo deflection.

12.

Sol: (c)



Weight of the dish = mg $= \frac{10}{1000} \times 9.8$

Speed of the bullet = u

Rate of change of momentum of bullets $= \frac{m(v-u)}{t} \times n = \frac{m(u+u)}{t} \times n = \frac{2mnu}{t}$

$= \frac{2 \times 10 \times 5}{1000} u =$ applied force on the dish

Now, applied force = weight of the dish.

$\frac{2 \times 10 \times 5}{1000} u = mg \Rightarrow \frac{2 \times 10 \times 5}{1000} u = \frac{10}{1000} \times 9.8$

$\therefore$ u = 0.98m / s =98 cm/s

13.

Sol: (a)

The correct matching is a-3, b-1, c-4, d-2 (i) The blue colour of the sky - Scattering of light. (ii) The glittering of diamond-Total internal reflection. (iii) The formation of rainbow - Dispersion of light. (iv) The visibility of sun for some time even after sunset - Refraction of light.

14.

Sol: (c)

Since all the three bulbs are connected in parallel so potential difference (V) across all the bulbs is same. Power dissipated is given by $P = \frac{V^2}{R}$

Lower the resistance, higher the power dissipation. Hence higher the brightness.

Out of all the three bulbs, 100 W bulb has minimum resistance because rated voltage of all the bulbs is same and its power dissipation is maximum.

Thus, 100 W will have maximum brightness and 40 W bulb will have minimum brightness.

15.

Sol: (a) Forces both pointing into the plane of paper

Applying the Fleming's left hand rule, if we keep the index finger in the direction of the magnetic field, and the middle finger in the direction of current, which is same direction in which the proton is moving (since it is positively charged), and opposite to the direction in which the electron is moving

(since it is negatively charged), the direction in which the force is experienced by them is given by the direction of thumb, which is pointing into the plane of the paper for both the cases.

16.

Sol: (b)

The chemical formula of green layer of carbon is $CuCO_3.Cu(OH)_2$

17.

Sol: (b)

O.S. of sulphur is + 6 in $H_2S_2O_8$ $2 + 2x - 12 - 2 = 0$

$x = + 6$

18.

Sol: (c)

Digestion of food is decomposition reaction. In digestion complex compound break in to simple substances.

19.

Sol: (c)

Reactivity of metals depend on the positon of metal in the reactivity series. Na > Mg > Al

20.

Sol: (a)

In electrolysis of water, hydrogen and oxygen are evolved in 2:1 Ratio by volume at electrode.

$$2H2O(\ell) \xrightarrow{\text{Electrolysis}} 2H_2(g) + O_2(g)$$

2V 2V 1V

21.

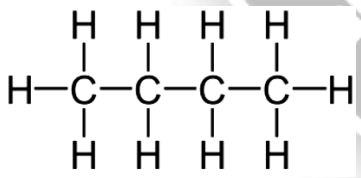
Sol: (d)

Mg and Na are obrained from electrolysis method because they are more reactive metal and have more electropositive nature.

22.

Sol: (a)

Total covalent bonds are in butane is 13



23.

Sol: (c)

Fourth mumber of alkene series in pentine C_5H_{10}.

24.

Sol: (c)

Aqueous solution of NH_4Cl is acidic because it is made by W.A. and W.B.

25.

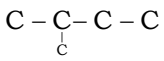
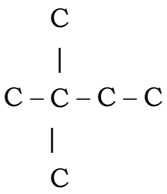
Sol: (d)

The H+ ion concentration of 0.001 M OH^- solution is $= 1\times10^{-11}M$ $H^+ = \frac{1\times10^{-14}}{1\times10^{-3}} = 1\times10^{-11}M$

26.

Sol: (c)

Total no of isomers of pentane is 3

(1) C–C–C–C–C (2)  (3) 

27.

Sol: (c) Oxidation of alcohol, carboxylic acid is formed $CH_3CH_2OH \xrightarrow{\text{acidify } K_2Cr_2O_7} CH_3COOH$

28.

Sol: (c)

The composition of Recfified spirit is 95% C_2H_5OH + 5%

29.

Sol: (c)

Roasting method in used for the conversion of metal suphide to metal oxide.

30.

Sol: (d)

$$M = \frac{\omega}{m} \times \frac{1}{vL} = \frac{40}{40} \times \frac{1}{2} = 0.5$$

PART - IV : BIOLOGY

1.

Sol: (a) $\frac{2,1,2,3}{2,1,2,3}$

The dental formula for an adult human is typically written as:

(2-1-2-3/2-1-2-3)

This means there are 2 incisors, 1 canine, 2 premolars, and 3 molars on each side of the upper and lower jaws.

2.

Sol: (a) Mucus secretion covering the epithelium

The stomach lining produces mucus, which forms a protective barrier against the harsh acidic environment (HCl) in the stomach.

3.

Sol: (c) Lysozyme

Lysozyme is an enzyme present in saliva that breaks down bacterial cell walls and helps prevent infections in the mouth.

4.

Sol: (c) Glycogen

When a person is starving, the body first uses glycogen stored in the liver and muscles to provide energy before switching to fat and then protein reserves.

5.

Sol: (c) Coordination and stability of the body will be adversely affected

If the part X refers to the cerebellum, injury would affect coordination and balance, as the cerebellum is responsible for these functions.

6.

Sol: (a) Adrenaline

Adrenaline is produced by the adrenal glands located above the kidneys. It helps in the fight-or-flight response, including converting glycogen into glucose.

7.

Sol: (a) I

In a reflex arc, the receptor (I) detects a stimulus and starts the response process.

8.

Sol; (b) P - Zygote, Q - Embryo, R - Foetus

After fertilization, the zygote undergoes cell division to form an embryo, which then develops into a foetus.

9.

Sol: (d) Q (male), S (female)

The male reproductive cells (pollen) are produced in the anther (Q), and the female reproductive cells (ovules) are in the ovary (S).

10.

Sol: (a)

Osmosis is the movement of water through a semipermeable membrane from an area of higher water concentration to one of lower concentration.

11.

Sol: (a) Enzymes packed in Lysosomes are made through RER (rough endoplasmic reticulum)

The rough endoplasmic reticulum synthesizes proteins, including enzymes, which are then processed in lysosomes.

12

Sol: (d) Golgi apparatus

The Golgi apparatus is involved in the modification and synthesis of complex carbohydrates from simpler sugars.

13.

Sol: (c) Tendons are non-fibrous tissue and fragile

Tendons are fibrous connective tissues and are strong, not fragile.

14.

Sol: (c) Areolar

Areolar tissue, a loose connective tissue, fills spaces between organs and provides cushioning and support.

15.

Sol: (a) Companion cells

Companion cells retain their nuclei to support the function of sieve tube elements in phloem transport.