SCHOLARSHIPS worth ₹2 Crore

UDAAN

A QUEST FOR SCIENCE ASPIRANTS

SCIENCE APTITUDE TEST

CLASS - 9

SOLUTIONS

TEST CODE - 28

IIT Ashram
JEE MAIN | JEE ADVANCED | GUJCET | FOUNDATION

Drs' Ashram
NEET | GUJCET | FOUNDATION

ALKAPURI (H.O.) : UG – 1 to 2, Concorde Complex, Above PNB, R.C. Dutt Rd., Alkapuri, Vadodara.

M : 9081062221, 9033063029.

MANJALPUR - IIT ASHRAM : SF-1 TO 12, Kabir Plaza, Beside Kabir Complex, Above IDBI Bank, Infront of Army Camp Manjalpur, Nr. Gupta Hospital, Bhavan's Makarpura Road, Manjalpur . **M : 9033063027 / 9033063028**

ANAND - IIT ASHRAM : 2nd Floor, HR Stone Building, Beside Croma Showroom, A.V. Road, Nr. Town Hall, Anand. **M: 9227777098, 8460009041.**

Bhayli - IIT ASHRAM : Akshar Pavilion, 3rd floor, Tower A, Nilamber Circle, Main rd, Bhayli, Vadodara, Gujarat 391410. **M : 6358891896, 9081062221**

PART - I : MENTAL ABILITY

1.

Sol. (b) Friday

365 days = 52 weeks + 1 day

2.

Sol. (a) 725618

HOSPITAL $\rightarrow$ 32574618

POSTAL $\rightarrow$ 725618

3.

Sol. (a) 27

Total number of triangles = 27

4.

Sol. (a) 3

Given: $A^- = C^+ - D^- - E^+ = F^-$

$|B^+$

$\Rightarrow$ Number of females = 3

5.

Sol. (a) 133

Reverse the ABCD..... and number it

A - 26, B - 25.....,Z - 1

Sum of number assign + number of letters in the given word.

6.

Sol. (c) 81

Next number is 1.5 times or

16 + 8 (half of 16)= 24

$\Rightarrow$ 24 + 12 (half of 24) = 36

$\Rightarrow$ 36 + 18 (half of 36) = 54

$\Rightarrow$ 54 + 27 = 81

7.

Sol. (b) 20

46 A 2C 21D 8BB

= 46 ÷ 2 + 21 - 8 × 3

= 23 + 21 - 24

= 44 - 24 = 20

8.

Sol. (d) 42

Huma $\rightarrow$ Palak $\rightarrow$ Rishabh

33 32 31

10

$\Rightarrow$ N = L + R - 1 = 10 + 33 - 1 = 42

9.

Sol. (a) 13

10.

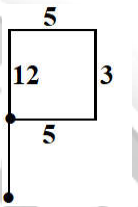
Sol. (d) Uncle

11.

Sol. (c) 13

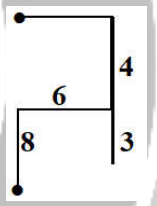
12.

Sol. (b) 9 km



13.

Sol. (b) 12 km North



14.

Sol. (c) One

56218643 $\rightarrow$ 47309752

15.

Sol. (b) X

P X S Z R A

Z S

PART - II : MATHEMATICS

1.

Sol. (b) 13:11

Age of Ram = 5x

$\Rightarrow$ Age of son = 4x

$\Rightarrow (5x)(4x) = 320$

$\Rightarrow 20x^2 = 320$

$x^2 = \frac{320}{20} = 16 \Rightarrow x = 4$

$\Rightarrow$ Ratio $= \frac{5x+6}{4x+6} = \frac{5\times4+6}{4\times4+6} = \frac{26}{22} = \frac{13}{11}$

2.

Sol. (d) 80 percent

Marks obtained= 74 + 42 + 124 + 73 + 47 = 360

Totel Marks = 100 + 50 + 150 + 100 + 50 = 450

%. Marks $= \frac{360}{450}\times100 = 80\%$

3.

Sol. (c) 20

$x + y = 21$ $\qquad x^2 + y^2 = 401$

$(x + y)^2 = 21^2$

$x^2 + y^2 + 2xy = 441$

$401 + 2xy = 441$

$2xy = 441 - 401$

$2xy = 40$

$xy = \frac{40}{2} = 20$

4.

Sol. (a) 57

$\angle ADB = 180^0 - 119^0 = 61^0$

$\angle A + \angle ADB + \angle ABD = 180^0$

$62^0 + 61^0 + \angle ABD = 180^0$

$123^0 + \angle ABD = 180^0$

$\angle ABD = 180^0 - 123^0 = 57^0$

5.

Sol. (b) 1.97

$[\{-0.4 + (4.6)^2 + (2.3)^2\} \div 5] - 3.34$

$=[(-0-4 + 21.16 + 5.29) \div] - 3.324$

$= [(-0.4 + 26.45) \div 5] - 3.24$

$= [26.05 \div 5] - 3.24$

$= 5.21 - 3.24 = 1.97$

6.

Sol. (a) 158 m

Diagonal $= l^2 + b^2$

$65^2 = 63^2 + b^2$

$b^2 = 65^2 - 63^2 = (65+63).(65-63)$

$=128\times2=256$

$\Rightarrow b = 16m$

Perimeter $= 2(l + b)$

$= 2(63 + 16) =$

$=2\times79 = 158$ m

7.

Sol. (c) 90^0

$\angle COE = 180^0 - 100^0 = 80^0$

$\angle CDE = \frac{\angle COE}{2} = \frac{80^0}{2} = 40^0$

$\angle CEA = \frac{\angle AOC}{2} = \frac{100^0}{2} = 50^0$

$\therefore \angle CDE + \angle CEA = 40^0 + 50^0 = 90^0$

8.

Sol. (b) greater than the third side

9.

Sol. (d) 2(8x + 10

Area $= 16x^2 + 40x + 25 = (4x + 5)^2$

Side = 4x + 5

pesimeter: 4 (4x + 5)

= 16x + 20 = 2(8x + 10)

10.

Sol. (c) 48 cm

$r^2 + AP^2 = R^2$

$10^2 + AP^2 = 26^2$

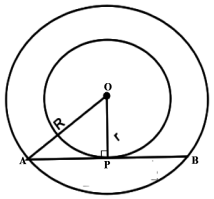
$100 + AP^2 = 676$

$AP^2 = 676 - 100$

$AP^2 = 576$

$AP = 24$ cm

$\therefore AB = 2\,AP = 2 \times 24 = 48$ cm



11.

Sol. (a) 30

$AP^2 + OP^2 = r^2$

$AP^2 + 10^2 = (5\sqrt{13})^2$

$AP^2 + 100 = 25 \times 13$

$AP^2 = 325 - 100$

$\therefore$ AP = 15cm

$AB = 2AP = 5 \times 15 = 30$cm

12.

Sol. (d) 82^0

Sum of angles in a triangle = 180^0

Calculation:

$P - Q = 20$

$\Rightarrow P = Q + 20^0$

$Q - R = 26^0$

$\Rightarrow Q = R + 26^0$

Substitute Q in $P = Q + 20^0$:

$\Rightarrow P = (R + 26^0) + 20^0$

$\Rightarrow P = R + 46^0$

Sum of angles in a triangle:

$\Rightarrow P = (R + 26^0) + 20^0$

$\Rightarrow P = R + 46^0$

Sum of angles in a triangle:

$\Rightarrow P + Q + R = 180^0$

$\Rightarrow (R + 46^0) + (R + 26^0) + R = 180^0$

$\Rightarrow 3R + 72^0 = 180^0$

$\Rightarrow 3R = 108^0$

$\Rightarrow R = 36^0$

So,

$P = R + 46^0 = 36 + 46 = 82^0$

13.

Sol. (a) equilateral triangle

14.

Sol. (a) Isosceles triangle

15.

Sol. (b) 80^0

$7x + 8x + 3x = 180^0$

$18x = 180^0$

$\therefore$ largest angle = $8x = 8 \times 10 = 80^0$

16.

Sol. (c) $x^2 + 10x + 25$

$$\frac{x^3 + 15x^2 + 75x + 125}{x^2 - 25}(x-5)$$

$$= \frac{x^3+5x^2+10x^2+50x+25x+125}{(x+5)(x-5)}(x-5)$$

$$= \frac{x^2(x+5)+10x(x+5)+25(x+5)}{x+5}$$

$$= \frac{(x+5)(x^2+10x+25)}{x+5}$$

$= x^2 + 10x + 25$

17.

Sol. (a) 0

$m + n = 24$

$m + n = 16 + 8$

$(m-16) + (n - 8) = 0$

$a + b = 0$

$\therefore a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

$= 0\,(a^2 - ab + b^2)$

18.

Sol. (a) 0.48

$a = 0.58, b = 0.1$

$$\frac{a^3 - b^3}{a^2 + ab + b^2} = \frac{(a-b)(a^2 + ab + b^2)}{a^2 + ab + b^2}$$

$= a - b = 0.58 - 0.1 = 0.48$

19.

Sol. (d) None of these

Area of Traperium $= \frac{1}{2} \times (a + b) \times h$

$\Rightarrow 900 = \frac{1}{2} \times (3x + 2x) \times 30$

$\Rightarrow 900 = (5x) \times 15$

$\Rightarrow 900 = 75x$

$\therefore x = \frac{900}{75} = 12cm$

a + b = 3x + 2x = 5x = 5 × 12 = 60 cm

20.

Sol. (d) 2958

No. of boys $= \frac{34}{34 + 29} \times 5481$

$= \frac{34}{63} \times 5481 = 2958$

21.

Sol. (b) 55.56 percent

RadiUs = $r_1 = r$

volume = $V_1 = \pi r_1^2 h_1 = \pi r^2 h_1 = v$

Now, $r_2 = r \times 150\% = r \times \frac{150}{100} = \frac{3r}{2}$

Volume = $\pi r_2^2 h_2$

$\pi \left(\frac{3r}{2}\right)^2 h_2 = \pi \frac{9r^2}{4} h_2$

$= \frac{9}{4} \pi r^2 h_2 = v$

$\Rightarrow \pi r^2 h_1 = \frac{9}{4} \pi r^2 h_2$

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

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

22.

Sol. (d) p^{-24}

$([(3p^2)^3]^4) \div ([(9p^5)^2]^5) \times (81p)^2$

$= 3^{12}p^{24} \div 9^{10}p^{50} \times 81^2p^2$

$= 3^{12}p^{24} \div 3^{20}p^{50} \times 3^8p^2$

$= 3^{-8}p^{-26} \times 3^8p^2$

$= p^{-24}$

23.

Sol. (c) 41

17, 20, 21, 27, 35, 41, 42, 49, 68, 76, 95

Median = 41

24.

Sol. (b) 180Km/hr

Distance = $90 \times 20 = 1800$ km

Required speed $= \frac{1800}{10} = 180km/hr$

25.

Sol. (a) 2cm

Curved surface area of cylinder = 88 sq.cm

Height = 14 cm

$2\pi rh = 88$

$r = 88/2\pi h$

r = 1cm

Diameter = 2r = 2cm

26.

Sol. (a) 5.45%

$30\% = \frac{30}{100} = \frac{3}{10}, \quad 37.5\% = \frac{3}{8}$

Let Third number = x

fist number $= x \times \frac{13}{10} = \frac{13x}{10}$

Second number $= x \times \frac{11}{8} = \frac{11x}{8}$

Required percentage

$= \frac{\frac{11}{8} - \frac{13x}{10}}{\frac{11x}{8}} \times 100 = 5.45\%$

27.

Sol. (c)

Opposite angles are bisected by the diagonals

28.

Sol. (d)

Diagonals of PQRS are equal.

29.

Sol. (a) $\frac{108}{11}$cm

$AA \times CN = AB \times AM$

$AD \times 11 = 12 \times 9$

$AD = \frac{108}{11}$cm

30.

Sol. (d) $\Delta PQR \cong \Delta SRQ$ by SAS

PART - III : PHYSICS & CHEMISTRY

1.

Sol. (a) $\frac{\alpha\beta}{\alpha+\beta}t$

Let v_{max} be the peak velocity. Time to accelerate $t_1 = v_{max}/\alpha$. Time to decelerate $t_2 = v_{max}/\beta$

Total time $t = t_1 + t_2 = v_{max}(1/\alpha + 1/\beta)$

$t = v_{max}\frac{\alpha+\beta}{\alpha\beta} \Rightarrow v_{max} = \frac{\alpha\beta}{\alpha+\beta}t.$

2.

Sol. (a) $\rho(R^3 - r^3) = \frac{1}{2}\rho_w R^3$

By Archimedes' Principle: Weight of body = Weight of displaced fluid.

Volume of shell material $V_m = \frac{4}{3}\pi(R^3 - r^3)$.

Weight of body = $V_m\rho g. = \frac{4}{3}\pi(R^3 - r^3)\rho g$

Volume submerged $= \frac{1}{2}$(Total Outer Volume)

$= \frac{1}{2}\left(\frac{4}{3}\pi R^3\right).$

Buoyant Force $= \left(\frac{1}{2}\frac{4}{3}\pi R^3\right)\rho_w g = \frac{2}{3}\pi R^3\rho_w g$

Equating weights and canceling constants

$\left(\frac{4}{3}\pi g\right)\rho(R^3 - r^3) = \frac{2}{3}\pi R^3\rho_w g$

We get $\rho(R^3 - r^3) = \frac{1}{2}\rho_w R^3$

3.

Sol. (b) Real, inverted, and same size

Focal length f = 10 cm. Object distance u = 20 cm.

Since u = 2f, the object is placed at the Center of Curvature (C).

The image formed by a concave mirror at C is Real, Inverted, and of the same size.

4.

Sol. (b) 1 : 5

Since they are dropped from the same height h, their velocity $v = \sqrt{2gh}$ upon impact is identical.

Kinetic Energy $KE = \frac{1}{2}mv^2$.

Ratio $KE_1 : KE_2 = \frac{1}{2}Mv^2 : \frac{1}{2}(5M)v^2 = 1:5$

5.

Sol. (b) $5\ m/s^2$

Weight W = mg = 9.8 N. Given g = 9.8 m/s^2,

mass $m = \frac{9.8}{9.8} = 1kg$.

From Newton's second law: F = ma $\Rightarrow$ 5 = 1 × a $\Rightarrow$ a = 5 m/s^2

6.

Sol. (c) 8 times

Gravitational force $F \propto \frac{m_1 m_2}{r^2}$.

New force

$$F' \propto \frac{(2m_1)m_2}{(r/2)^2} = \frac{2m_1m_2}{r^2/4} = 8\frac{m_1m_2}{r^2} = 8F.$$

7.

Sol. (b) Decrease

The speed of sound (v) increases as temperature increases $\left(v \propto \sqrt{T}\right)$.

Time for echo $t = \frac{2d}{v}$. If v increases (denominator increases), the time t decreases.

8.

Sol. (c) Momentum

Impulse I = F × Δt = Δp (Change in momentum).

Therefore, the unit of Impulse (N · s or kg ·m/s) is the same as that of Momentum

9.

Sol. (a) 225 J

Work done against gravity W = mgh

W = 15 kg × 10 m/s^2 × 1.5 m = 225 J.

10.

Sol. (b) Variable acceleration

In uniform circular motion, speed is constant, but velocity changes direction continuously.

Since velocity changes, there is an acceleration (centripetal) directed towards the center. Because the direction of this acceleration vector changes continuously as the object moves, it is variable acceleration.

11.

Sol. (c) 40

$^{70}_{30}n \rightarrow n = A - Z = 70 - 30 = 40$

12.

Sol. (d) Both (a) and (c)

(cd) both (a) and (c), Rutherford model is related to explanation of discovery of nucleus and also give the new information of electrons, that and motion of electrons. Those revolve around the nucleus like planet of solar system. 102g.

13.

Sol. (d) 108 g

The mass of Al in Al_2O_3 is 54 g.

The mass of Al in 204 g Al_2O_3 is:

$$\frac{54}{102} \times 204 = 108g$$

14.

Sol. (d) 22 g

C	+ O_2	CO_2
12g	32g	44g
6	32	?

6 gm carbon required,

16 gm O_2 $\rightarrow$ 22.9 gm of CO_2

6 + 16 = 22.9gm

15.

Sol. (b) Gas dispersed in liquid.

Shaving cream is a foam, which is a type of colloidal solution where gas is dispersed in a liquid.

16.

Sol. (a) 72

$$\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}} \Rightarrow \frac{6}{r_2} = \sqrt{\frac{M_2}{2}}$$

MA = 36 × 2 = 72

17.

Sol. (b) Beeswax

Bee wax is not a byproduct of petroleum.

18.

Sol. (c)

Coke is a purest form of carbon.

19.

Sol. (b) Sn > Pb > Cu > Hg

Arrangement of reactivity:

Sn > Pb > Cu > Hg

20.

Sol. (a) $\frac{p}{\sqrt{d}}$

According to Graham's law of diffusion, the rate of diffusion of a gas is directly proportional to its pressure (P) and inversely proportional to the square root of its density.

PART - IV : BIOLOGY

1.

Sol: (a) A and R are true; R is the correct explanation

Lack of nucleus provides extra space for haemoglobin, increasing oxygen-carrying capacity.

2.

Sol: (b) 1, 2, 3

Pesticides kill pests, not weeds. Weedicides kill weeds.

3.

Sol: (c) Cardiac muscle is voluntary.

Cardiac muscle is involuntary, not voluntary.

4.

Sol: (b) A-1, B-3, C-4, D-2

The adrenal gland secretes adrenaline, also known as the stress hormone, because it helps the body respond to emergency situations by increasing heartbeat, alertness, and energy. The pituitary gland, called the master gland, releases the growth hormone, which is essential for the normal growth and development of the body. The thyroid gland produces thyroxine, a hormone that regulates the body's metabolism, controls energy production, and maintains body temperature. The pancreas secretes insulin, a hormone that helps regulate the level of sugar in the blood by allowing cells to absorb glucose. Therefore, the correct matching is A-1, B-3, C-4, D-2.

5.

Sol: (c) Nucleus

The nucleus controls all cell activities and contains DNA.

6.

Sol: (c) Conserve biodiversity and natural habitats

Biosphere reserves protect the entire ecosystem-plants, animals, and microorganisms-along with their natural habitats.

7.

Sol: (b) Epithelial

Epithelial tissue covers internal and external body surfaces.

8.

Sol: (b) Testes

Testes produce sperm and testosterone.

9.

Sol: (c) Yeast

Yeast produces CO_2 during fermentation $\rightarrow$ dough rises.

10.

Sol: (c) Sanctuary

Wildlife sanctuaries protect animals in their natural habitat.