



SCIENCE APTITUDE TEST CLASS - 9 SOLUTIONS

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PART - I : MENTAL ABILITY

1.

Sol. (c) East

Direction Sense

Rahul walks 20 m towards East.

- He turns left → from East, left is North.
- He walks 15 m towards North.
- Then he turns right from North, right is East.

Therefore, Rahul is now moving towards East.

2.

Sol. (b) Husband

Kavya says: "His wife is the only daughter of my father."

The only daughter of Kavya's father is Kavya herself.

Therefore, the man's wife is Kavya.

Hence, the man is Kavya's husband.

3

Sol. (c) 26

Find the differences:

- $1^2 + 1 = 2$
- $2^2 - 1 = 3$
- $3^2 + 1 = 10$
- $4^2 - 1 = 15$
- $5^2 + 1 = 26$

4.

Sol. (b) Unwilling

The word "Reluctant" means: unwilling or hesitant to do something.

For example: He was reluctant to speak.**Meaning:** He was unwilling to speak.

5.

Sol. (a) P

Given: A, B, D, H, ?

Look at the positions of the letters:

- A = 1
- B = 2
- D = 4
- H = 8

The positions are multiplied by 2:

 $1 \rightarrow 2 \rightarrow 4 \rightarrow 8 \rightarrow 16$

The 16th letter is P.

Therefore: A, B, D, H, P

6.

Sol. (a) 8

7.

Sol. (a) 11616125

Given: MANGO = 13114715

Let's convert each letter into its alphabetical position:

- M = 13
- A = 1
- N = 14
- G = 7
- O = 15

Therefore:

MANGO → 13 1 14 7 15

Now:

APPLE

- A = 1
- P = 16
- P = 16
- L = 12
- E = 5

Therefore:

APPLE → 1 16 16 12 5

Combining them: 11616125

8.

Sol. (a) 2, 3, 4, 1

Arrange the following in the correct order:

1. Newspaper
2. News collection
3. Editing
4. Printing

First, news is collected.

Then the news is edited. After editing, it is printed. Finally, it becomes a newspaper.

Therefore: 2 → 3 → 4 → 1

9.

Sol. (b) 5

Find the leap years from 2001 to 2020.

A year divisible by 4 is generally a leap year.

The leap years are:

- 2004
- 2008
- 2012
- 2016
- 2020

Total: 5 leap years

10.

Sol. (c) 7GT

Given: 1AZ, 3CX, 5EV, ?, 9IR, 11KP, 13MN

Let's separate the three patterns.

First numbers: 1, 3, 5, 7, 9, 11, 13

So the missing first number is: 7

Second letters :

A, C, E, G, I, K, M

So the missing second letter is: G

Third letters: Z, X, V, T, R, P, N

The letters decrease by 2: $Z \rightarrow X \rightarrow V \rightarrow T \rightarrow R \rightarrow P \rightarrow N$

So the missing third letter is: T Therefore the missing term is: 7 GT

11.

Sol. (a) 21

3, 5, 7, 9

 $a = 3, d = 2$

$$a_{10} = a + 9d = (3) + 9(2) = 21$$

12.

Sol. (a) Saturday

Find the 20th day's weekday:

The problem states the 20th day is the "4th day before Monday".

Monday-4 days = Thursday

Therefore, the 20th of the month is a Thursday.

Calculate the 1st of the month:

To find the day on the 1st, find the total number of days difference:

$$20 - 1 = 19 \text{ days}$$

Now, divide by 7 to find the remaining "odd days":

$$19 \div 7 = 2 \text{ weeks with a remainder of 5 odd days}$$

Count backward:

Count back 5 days from Thursday (or forward 2 days, since $(7 - 5 = 2)$):

Thursday - 5day = Saturday

13.

Sol. (a) 8

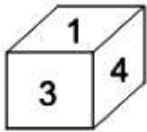
$$34 + 12 + 15 + 20 = 81 = (9)^2$$

$$15 + 16 + 6 + 12 = 49 = (7)^2$$

$$15 + 8 + 20 + 21 = 64 = (8)^2$$

14.

Sol. (c)



15.

Sol. (a) 0

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



PART - II : MATHEMATICS

1.

Sol. (c) 7

For the midpoint, take the average of the y-coordinates: $k = \frac{4 + 10}{2} = 7$

2.

Sol. (a) (5,-3)

Reflection in $y = x$ interchanges x and y .

$(-3, 5) \rightarrow (5, -3)$.

3.

Sol. (a) $\frac{12}{7}$

LCM of the numerators = $\text{LCM}(2, 4, 6) = 12$.

HCF of the denominators = $\text{HCF}(7, 21, 35) = 7$.

Therefore $\text{LCM} = \frac{12}{7}$.

4.

Sol. (a) 0.25

Write them as fractions: $0.75 = \frac{75}{100}$ and $1.25 = \frac{125}{100}$.

$\text{HCF}(75, 125) = 25$

$\text{LCM}(100, 100) = 100$

HCF is $\frac{25}{100} = 0.25$

5.

Sol. (c) Not defined

The zero polynomial has no non-zero term, so its degree is not defined.

6.

Sol. (d) none

$$\left(x + \frac{1}{x}\right)^3 = x^3 + \frac{1}{x^3} + 3(x)\left(\frac{1}{x}\right)\left(x + \frac{1}{x}\right)$$

$$\therefore (5)^3 = x^3 + \frac{1}{x^3} + 3(5) \quad \therefore x^3 + \frac{1}{x^3} = 125 - 15 \quad \therefore x^3 + \frac{1}{x^3} = 110$$

7.

Sol. (a) 360Let the number be x .

$$\Rightarrow 40\% \text{ of } x - 25\% \text{ of } x = 54 \quad \Rightarrow \frac{15x}{100} = 54 \quad \Rightarrow x = 54 \times \frac{100}{15} = 360.$$

8.

Sol. (c) 24

For an A.P., consecutive differences must be equal:

$$\Rightarrow 2(3x) = x + 1 + 4x + 2$$

$$\Rightarrow 6x = 5x + 3.$$

$$\Rightarrow x = 3$$

$$\therefore a_1 = x + 1 = 3 + 1 = 4$$

$$\therefore a_2 = 3x = 3(3) = 9$$

$$\therefore d = a_2 - a_1 = 9 - 4 = 5$$

$$\therefore a_5 = a + 4d = 4 + 4(5) = 24$$

9.

Sol. (b) 48°

supplement.

$$\Rightarrow \text{Let the angle be } x^\circ.$$

$$\Rightarrow \text{Complement} = (90 - x)^\circ, \text{ supplement} = (180 - x)^\circ.$$

$$\Rightarrow 6(90^\circ - x) = 2(180^\circ - x) - 12$$

$$\Rightarrow 540^\circ - 6x = 348^\circ - 2x$$

$$\Rightarrow 192^\circ = 4x$$

$$x = 48^\circ.$$

10.

Sol. (b) 6.4 cm

cm respectively. Find AD.

$$\text{Area using side AB} = 8 \times 4 = 32 \text{ cm}^2.$$

The same area using side AD is $AD \times 5$.

$$\text{So } AD \times 5 = 32 \Rightarrow AD = 32/5 = 6.4 \text{ cm.}$$

11.

Sol. (b) 25

$$999 + 25 = 1024 \quad \Rightarrow \quad \sqrt{1024} = 32$$

12.

Sol. (d) $6\sqrt{3}\text{cm}^2$ Area of Hexagon = Area of $\triangle ABC - 3 \times (\text{Area of a corner triangle})$ Area of large triangle $\triangle ABC$ ($s = 6 \text{ cm}$):

$$\text{Area}_{ABC} = \left(\frac{\sqrt{3}}{4} \right) \times 6^2 = 9\sqrt{3} \text{ cm}^2$$

Area of one corner triangle ($s_{\text{corner}} = 2 \text{ cm}$):

$$\text{Area}_{\text{corner}} = \left(\frac{\sqrt{3}}{4} \right) \times 2^2 = \sqrt{3} \text{ cm}^2$$

$$\text{Area of Hexagon} = 9\sqrt{3} - 3\sqrt{3} = 6\sqrt{3}\text{cm}^2$$

13.

Sol. (d) $-7(80\sqrt{3} + 1)$

$$x = 7 - 4\sqrt{3} \text{ and } y = 7 + 4\sqrt{3}$$

$$xy = (7 - 4\sqrt{3})(7 + 4\sqrt{3})$$

$$7^2 - (4\sqrt{3})^2 = 49 - 48 = 1$$

$$x + y = 14 \text{ and } x - y = -8\sqrt{3}$$

$$5x^2 - 7xy - 5y^2 = 5(x^2 - y^2) - 7xy = 5(x + y)(x - y) - 7xy$$

$$= 5(14)(-8\sqrt{3}) - 7(1) = -560\sqrt{3} - 7 = -7(80\sqrt{3} + 1)$$

14.

Sol. (c) 3If $x\%$ of $y = 1\%$ of z , $y\%$ of $z = 1\%$ of x , and $z\%$ of $x = 1\%$ of y , find $xy + yz + zx$.

$$\text{Given: } xy/100 = z/100$$

$$\Rightarrow xy = z \dots (1)$$

$$\text{Similarly, } yz = x \dots (2)$$

$$\text{and } zx = y \dots (3)$$

Multiplying equations (1), (2), and (3):

$$(xy)(yz)(zx) = xyz$$

$$\Rightarrow x^2y^2z^2 = xyz$$

Assuming nonzero positive values: $xyz = 1$ From the given relations, $x = y = z = 1$.Therefore, $xy + yz + zx = 1 + 1 + 1 = 3$.

15.

Sol. (c) $(16\sqrt{3} - 12) \text{ cm}^2$

A shopkeeper claims to sell an equilateral triangle of side 8 cm but actually sells an isosceles triangle with sides 5 cm, 5 cm, and 6 cm. Find the cloth saved per flag.

Step 1: Area of the equilateral triangle

$$\text{Area} = \left(\frac{\sqrt{3}}{4}\right) \times a^2 = \left(\frac{\sqrt{3}}{4}\right) \times 8^2 = 16\sqrt{3} \text{ cm}^2$$

Step 2: Area of the isosceles triangle

The altitude divides the 6 cm base into two equal parts of 3 cm each.

Using Pythagoras' theorem: $h^2 + 3^2 = 5^2$

$$h^2 = 25 - 9 = 16 \Rightarrow h = 4 \text{ cm}$$

$$\text{Area} = \frac{1}{2} \times 6 \times 4 = 12 \text{ cm}^2 \quad \therefore (16\sqrt{3} - 12) \text{ cm}^2$$

16.

Sol. (d) $\left(\frac{7}{2}, \frac{9}{4}\right)$

Find the midpoint of the line segment joining the points $(-1, 3)$ and $(8, 3/2)$.

Midpoint formula: $M = ((x_1 + x_2)/2, (y_1 + y_2)/2)$

$$\text{x-coordinate} = (-1 + 8)/2 = 7/2$$

$$\text{y-coordinate} = (3 + 3/2)/2 = (9/2)/2 = 9/4$$

Therefore, $M = (7/2, 9/4)$

17.

Sol. (d) $\frac{1}{2}\sqrt{d^2 - I^2}$

The centre of a circle is O. AB and CD are chords of lengths d and I, respectively. If P is the midpoint of CD, find OP

AB passes through the centre O, so AB is the diameter. Hence radius $r = d/2$. Since P is the midpoint of chord CD, $CP = I/2$.

In right-angled triangle OPC:

$$OC^2 = OP^2 + CP^2$$

$$\Rightarrow (d/2)^2 = OP^2 + (I/2)^2 \quad \Rightarrow \quad OP^2 = d^2/4 - I^2/4 = (d^2 - I^2)/4$$

$$\text{Therefore, } OP = \frac{1}{2}\sqrt{d^2 - I^2}$$

18.

Sol. (a) $\frac{n}{12}(3n+1)$

The sum of the first n terms of an A.P. is given by:

$$S_n = \frac{n}{2}[a + a_n]$$

Given the p_{th} term is $a_p = \frac{3p-1}{6}$

Find the first term (a) by substituting $p = 1$

$$a = \frac{3(1)-1}{6} = \frac{2}{6} = \frac{1}{3}$$

Find the n th term a_n by substituting $p = n$.

$$a_n = \frac{3n-1}{6}$$

Substitute both into the sum formula: $S_n = \frac{n}{2} \left[\frac{2}{6} + \frac{3n-1}{6} \right] = \frac{n}{2} \left[\frac{3n+1}{6} \right] = \frac{n}{12}(3n+1)$

19.

Sol. (c) $\sqrt{\sqrt{2} \times 3}$

20.

Sol. (d) $(x-1)(x+3)(x-2)$

Try $x = 1$: $1 - 7 + 6 = 0$, so $(x-1)$ is a factor.

Dividing gives $x^2 + x - 6 = (x+3)(x-2)$.

Therefore $x^3 - 7x + 6 = (x-1)(x+3)(x-2)$.

21.

Sol. (d) 3

Taking denominator abc :

Expression = $(a^3 + b^3 + c^3)/abc$.

Since $a+b+c=0$, $a^3+b^3+c^3 = 3abc$.

Therefore expression = 3.

22.

Sol. (c) -2

$$\begin{aligned}
 m &= (y_2 - y_1)/(x_2 - x_1) \\
 &= (-6 - 4)/(2 - (-3)) \\
 &= -10/5 = -2.
 \end{aligned}$$

23.

Sol. (c) $\frac{3\sqrt{2}}{4}$

$$\text{Slope} = -\frac{a}{b} = \frac{-3}{-2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}}{4}$$

24.

Sol. (c) $\frac{167}{90}$

$$0.6 = \frac{3}{5}, 0.\bar{7} = \frac{7}{9} \text{ and } 0.4\bar{7} = \frac{43}{90}$$

Taking denominator 90:

$$\frac{3}{5} + \frac{7}{9} + \frac{43}{90} = \frac{54}{90} + \frac{70}{90} + \frac{43}{90} = \frac{167}{90}.$$

25.

Sol. (a) $\frac{1}{4500}$

$$\frac{2}{9000} = \frac{1}{4500}$$

26.

Sol. (c) $\frac{n(n+1)}{\sqrt{2}}$ The terms are $\sqrt{2}, 2\sqrt{2}, 3\sqrt{2}, 4\sqrt{2}, \dots$ So the nth term is $n\sqrt{2}$.

$$\text{Sum of } n \text{ terms} = \sqrt{2} \left[\frac{n(n+1)}{2} \right] = \frac{n(n+1)}{\sqrt{2}}.$$

27.

Sol. (b) 35

$$a_n = S_n - S_{n-1}$$

$$S_n = 2n^2 + 5n.$$

$$S_{n-1} = 2(n-1)^2 + 5(n-1) = 2n^2 + n - 3.$$

$$\text{Thus } a_n = (2n^2 + 5n) - (2n^2 + n - 3) = 4n + 3.$$

$$4n + 3 = 143 \Rightarrow n = 35.$$

28.

Sol. (c) 17, 21

$$a = -11, d = 4$$

$$-11 + (n-1)4 = 49 \Rightarrow 4(n-1) = 60 \Rightarrow n = 16$$

There are two middle terms: 8th and 9th

$$a_8 = -11 + 7 \times 4 = 17; a_9 = 21$$

29.

Sol. (b) 120°

In triangle ABC, $AB = AC$ and $\angle A = 30^\circ$, so $\angle B = \angle C = \frac{180^\circ - 30^\circ}{2} = 75^\circ$

At C, $BC = CD$.

$\therefore a = 75^\circ$ and the right triangle BCD has $BC = CD$, so it is isosceles right-angled.

$\therefore b = 45^\circ$.

$$a + b = 75^\circ + 45^\circ = 120^\circ.$$

30.

Sol. (c) $\frac{21}{2} \text{ cm}^2$

$$\text{Square area} = 7^2 = 49 \text{ cm}^2.$$

$$\text{Quadrant area} = \frac{1}{4} \pi 7^2 = \frac{49\pi}{4}$$

$$\text{Shaded area} = 49 - \frac{49\pi}{4} \left(\text{Using } \pi = \frac{22}{7} \right) \Rightarrow 49 - 38.5 = 10.5 = \frac{21}{2} \text{ cm}^2.$$

PART - III : PHYSICS & CHEMISTRY

1.

Sol. (d) none of these

Circumference = 720 m. Position at 30s: The horse finishes 1.5 rounds in 30 seconds, placing it diametrically across the circle from its origin point.

Displacement: Net displacement is equal to the circle's diameter

Diameter = circumference / π = 720 / π = 229.2 m approx.

Average Velocity = Displacement/Time = 229.2 m/ 30 s = 7.64 m/s

2.

Sol. (b) Isaac Newton

Dispersion is the splitting of white light into its component colours when passing through a prism. Sir Isaac Newton famously performed this experiment using a glass prism in 1666 to prove that white light is a mixture of different colours.

3.

Sol. (d) Both a & b

The speed of sound in air increases with temperature. So, temperature directly affects how fast the sound travels and changes the measured time.

The speed of sound is independent of its frequency (pitch) and loudness (amplitude) in a given uniform medium.

4.

Sol. (b) Normal force between contact surfaces

Kinetic friction is given by $f_k = \mu_k N$.

Friction does not depend on temperature. It depends upon the normal reaction (force) between the surfaces in contact.

5.

Sol. (c) $8H/9$ m

Since $u = 0$,

Total distance fallen : $H = \frac{1}{2}gT^2$

Distance fallen at $t = \frac{T}{3}$:

$$d = \frac{1}{2}g\left(\frac{T}{3}\right)^2 = \frac{1}{9}\left(\frac{1}{2}gT^2\right) = \frac{H}{9}$$

Position from ground: Height - distance fallen = $H - \frac{H}{9} = \frac{8H}{9}$ m

6.

Sol. (a) It will be maximum in the middle of the movement.

During simple harmonic oscillation, potential energy reaches its maximum value at the highest and lowest stretching limits (where speed momentarily hits zero). Kinetic energy peaks where velocity is at its maximum, which happens directly at the mean position of the oscillations.

7.

Sol. (d) I, II and IV are correct

Statement I: True. The force of gravity is vertical, but the displacement is horizontal so the work done is zero. (Work = $FS \cos \theta$, since $\theta = 90^\circ$, $\cos \theta = 0$)

Statement II: True. Centripetal force acts perpendicular to the orbital path.

Statement III: False. Gravity and movement are downward (same direction), making work positive.

Statement IV: True. Work has magnitude but no directional component.

8.

Sol. (c) Assertion true, Reason false

Weight depends on gravity, $W = mg$. Gravity varies across different planets.

Therefore, the Assertion is True.

Mass measures the amount of matter. Mass remains constant everywhere.

Therefore, the Reason is False.

9.

Sol. (c) 120 s

Total Distance : 300 m + 1500 m = 1800 m

Speed (in m/s) = $54 \times \frac{5}{18} = 15 \text{ m/s}$

Time = $\frac{\text{Distance}}{\text{Speed}} = \frac{1800}{15} = 120 \text{ s}$.

10.

Sol. (b) 1.35 ms^{-1}

Wavelength (λ): 15cm = 0.15m

Frequency (f): 9 Hz

Velocity (v): $v = f \times \lambda = 9 \times 0.15 = 1.35 \text{ ms}^{-1}$

11.

Sol. (b) I and III only

Oxygen has 8 neutrons.

Hydrogen has 0 neutrons.

So total neutrons = 8 only.

12.

Sol. (c) Most non-metals are dull, but iodine exhibits metallic lustre due to its crystal structure

13.

Sol. (a) 100 mL water in a Petri dish

A Petri dish provides the largest surface area among the given containers. Since the rate of evaporation increases with increasing surface area, water evaporates fastest from the Petri dish.

14.

Sol. (c) A-Q, B-P, C-R, D-S

Coalification → Formation of coal from dead plants

Fractional distillation → Separation of petroleum fractions

Incomplete combustion → Produces CO gas

Natural gas → Found above petroleum layer

15.

Sol. (b) 31.25%

Take 100 g solution.

Solute = 20 g

Volume of solute

= Mass/Density

= $20/0.8 = 25$ mL

Volume of solution

= $100/1.25 = 80$ mL

$$V/V\% = \frac{25}{80} \times 100 = 31.25\%$$

16.

Sol. (d) Cold water dissolves more oxygen, so fish get more oxygen for respiration.

17.

Sol. (c) Solid dispersed in gas

Tiny solid particles are dispersed in air.

18.

Sol. (a) By distillation

Acetone and water have different boiling points, so they are separated by distillation.

19.

Sol. (c) Atom with 17p and 18e has -1 charge, so not neutral. Gain of electron forms negative ion.

20

Sol. (d) The assertion is false because colloidal particles are generally stable and do not settle down on standing. The reason is true because colloidal particles usually carry the same type of electric charge, causing mutual repulsion, which prevents them from aggregating and keeps the colloid stable.

PART - IV : BIOLOGY

1.

Sol. (b) Protein synthesis

The rough endoplasmic reticulum (RER) has ribosomes attached to its surface. Ribosomes are the sites of protein synthesis. If the RER is damaged, protein synthesis will be directly affected. (Lipid synthesis is done by the smooth ER).

2.

Sol. (b) It has lost water

Flaccidity in a plant cell occurs when it loses water (plasmolysis) due to being placed in a hypertonic solution. The cell membrane pulls away from the cell wall, and the plant loses its rigidity.

3.

Sol. (a) Stop growing in length

The apical meristem is located at the tips of roots and shoots and is responsible for the primary growth (increase in length) of the plant. If it is damaged, the plant will stop growing in length.

4.

Sol. (c) Sclerenchyma

Sclerenchyma cells are characterized by being long, elongated, having tapering ends, and possessing thick lignin walls with no intercellular spaces. They are dead at maturity and provide mechanical support.

5.

Sol. (c) Connective tissue

Connective tissues (such as bone, cartilage, blood, and areolar tissue) have cells that are widely spaced, and the space between them is filled with a large amount of intercellular matrix (which can be solid, semi-solid, or liquid).

6.

Sol. (c) Parenchyma

Parenchyma is a simple living tissue that stores food and water. In desert plants (like cacti), the parenchyma cells in the stem are specialized to store large amounts of water.

7.

Sol. (b) Goiter

Iodine is essential for the thyroid gland to produce thyroxine. A deficiency of iodine leads to the abnormal enlargement of the thyroid gland, which is called goiter.

8.

Sol. (c) Body cell (somatic cell)

Dolly the sheep was cloned using a somatic cell (a mammary gland cell) from the parent sheep. The nucleus from this body cell was transferred into an enucleated egg cell.

9.

Sol. (b) Fertilization

The fallopian tubes (oviducts) are the site where fertilization (the fusion of sperm and egg) occurs. If they are blocked, the sperm cannot reach the egg, so fertilization is directly prevented. (Ovulation and menstruation still occur).

10.

Sol. (c) Overactivity of sebaceous glands

During adolescence, hormonal changes cause the sebaceous glands (oil glands) in the skin to become overactive. They produce excess sebum, which can block the pores of the skin, leading to the growth of bacteria and the formation of pimples.

