



UDAAN

A QUEST FOR SCIENCE ASPIRANTS

SCIENCE APTITUDE TEST

CLASS 9

ANSWER KEY WITH SOLUTIONS

DATE : 19.01.25

IIT Ashram
IIT JEE | NEET | GUJCET | FOUNDATION (6 to10)



Drs' Ashram
IIT JEE | NEET | GUJCET | FOUNDATION (6 to10)

HO : UG-1 & 2, Concorde Complex, Above PNB Bank, R. C. Dutt Road, Alkapuri, Vadodara - 390 007. M.: 90330 63029 / 98980 35772

MANJALPUR - 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 : 9033063024 / 9033063027**

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

M: 9227777098, 8460009041.

Bhayli : Akshar pavilion, 3 rd floor, tower A, nilamber circle, main rd, Bhayli, Vadodara, Gujarat 391410.

M : 6358891896, 9081062221

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

PART - I : MENTAL ABILITY

1.

Sol: (d) 35

2.

Sol: (c) 0

3.

Sol. (c) In the first column, $7^2 + 2^2 = 53$
 In the second column, $9^2 + 3^2 = 90$
 So, missing number, $11^2 + 2^2 = 125$

4.

Sol. (d) As per the question
 824517284842282698454832843183
 Thus, four such numbers are there

5.

Sol. (c) Number of students behind Anil in rank = $(31-7) = 24$
 So, Anil is 25th from the bottom.
 of students behind Sunil in rank
 = $(31-11) = 20$
 So, Sunil is 21st from the bottom.

6.

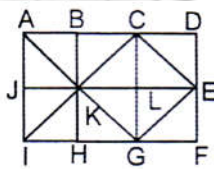
Sol. (b) According to the given statement
 $E < D < A < B < C$

7.

Sol. (d) All others are the drinks.

8.

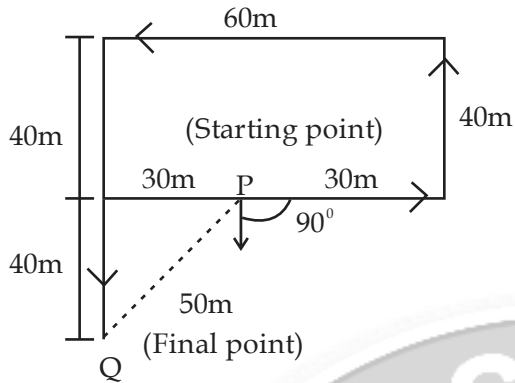
Sol. (c) The figure may be labelled as shown :



The squares composed to two components each, are ABKJ, BCLK, CDEL, LEFG, KLGH and JKHI. Thus, there are $6 + 1 + 2 = 9$ squares in the given figure.

9.

Sol. (c)



According to the statement
Hence, the answer is 50 m

10.

Sol. (a)

The required region is the one common to the rectangle, square, circle and the triangle i.e., 7.

11.

Sol. (d)

India Gate is in Delhi, Rock garden is in Chandigarh.

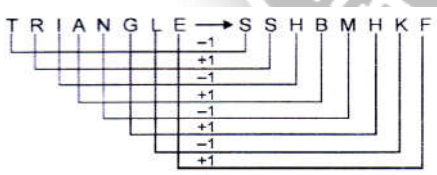
12.

Sol. (b)

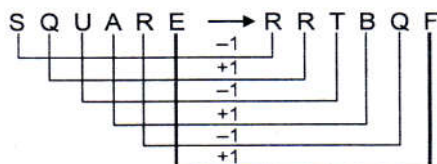
'Stethoscope' is used by the Doctor as a tool to perform his work. Similarly a 'Painter' uses a 'Brush' as a tool to perform his work. Hence, the answer is (B).

13.

Sol. (c)



Similarly,



14.

Sol. (a) Rajesh is the husband of woman's father sister.

15.

Sol. (a)

From the figures (i), (ii) and (iv) we find that numbers 6, 1, 5 and 2 appear on the adjacent surfaces to the number 3. Therefore, number 4 will be opposite to number 3.

PART - II : MATHEMATICS

1.

Sol. (a)

We know that

$$\sqrt{17} - \sqrt{12} = \frac{(\sqrt{17} - \sqrt{12})(\sqrt{17} + \sqrt{12})}{\sqrt{17} + \sqrt{12}}$$

$$= \frac{17 - 12}{\sqrt{17} + \sqrt{12}} = \frac{5}{\sqrt{17} + \sqrt{12}} \text{ And}$$

$$\sqrt{11} - \sqrt{6} = \frac{(\sqrt{11} - \sqrt{6})(\sqrt{11} + \sqrt{6})}{\sqrt{11} + \sqrt{6}}$$

$$= \frac{11 - 6}{\sqrt{11} + \sqrt{6}} = \frac{5}{\sqrt{11} + \sqrt{6}}$$

Now $\sqrt{17} > \sqrt{11}$ and $\sqrt{12} > \sqrt{6} \Rightarrow \sqrt{17} + \sqrt{12} > \sqrt{11} + \sqrt{6}$

$$\frac{5}{\sqrt{17} + \sqrt{12}} < \frac{5}{\sqrt{11} + \sqrt{6}} \Rightarrow \sqrt{17} - \sqrt{12} < \sqrt{11} - \sqrt{6}$$

Hence,

 $\sqrt{11} - \sqrt{6}$ is greater.

2.

Sol. (b)

As the given irrational numbers are similar, they can be added and subtracted.

Here,

$$8\sqrt{3} - 2\sqrt{3} + 4\sqrt{3} = \sqrt{3}(8 - 2 + 4) = 10\sqrt{3}$$

(using distributive law)

3.

Sol: (c)

$$\frac{5 + 2\sqrt{3}}{7 + 4\sqrt{3}} = a + b\sqrt{3}$$

The rationalising factor is $7 - 4\sqrt{3}$

Rationalising the denominator, we get

$$\frac{5 + 2\sqrt{3}}{7 + 4\sqrt{3}} = \frac{5 + 2\sqrt{3}}{7 + 4\sqrt{3}} \times \frac{7 - 4\sqrt{3}}{7 - 4\sqrt{3}}$$

$$= \frac{(5 + 2\sqrt{3})(7 - 4\sqrt{3})}{(7)^2 - (4\sqrt{3})^2} =$$

$$\Rightarrow \frac{35 - 20\sqrt{3} + 14\sqrt{3} - 24}{49 - 48} = 11 - 6\sqrt{3} \quad \Rightarrow \frac{5 + 2\sqrt{3}}{7 + 4\sqrt{3}} = 11 - 6\sqrt{3}$$

But

$$\Rightarrow \frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a+b\sqrt{3} \Rightarrow a+b\sqrt{3} = 11-6\sqrt{3}$$

On equating rational and irrational parts, we get $a = 11$, $b = -6$

4.

Sol: (c)

5.

Sol: (c)

6.

Sol: (b) -3

7.

Sol: (b)

8.

Sol: (d)

9.

Sol: (d) $3n + 10$

$$2^4 \times 2^{3n+6} = 2^m$$

$$3n + 10 = m$$

10.

Sol: (d)

$$\text{Let } f(x) = 4x^3 - 12x^2 + 14x - 3 \quad \dots (1)$$

$$\text{Divisor} = 2x - 1 = 2\left(x - \frac{1}{2}\right)$$

By remainder theorem when $f(x)$ is divided by $2\left(x - \frac{1}{2}\right)$, the remainder = $f\left(\frac{1}{2}\right)$

On putting $x = \frac{1}{2}$ in (1) we get

$$f\left(\frac{1}{2}\right) = 4\left(\frac{1}{2}\right)^3 - 12\left(\frac{1}{2}\right)^2 + 14\left(\frac{1}{2}\right) - 3$$

$$= 4 \times \frac{1}{8} - 12 \times \frac{1}{4} + 14 \times \frac{1}{2} - 3$$

$$\Rightarrow \frac{1}{2} - 3 + 7 - 3 = \frac{3}{2}$$

$$\therefore \text{Remainder} = \frac{3}{2}$$

11.

Sol: (c) 15 cm

$$V = 9000 \text{ cm}^3$$

$$\ell \times b = 2x$$

$$b \times h = 3x$$

$$h \times \ell = 4x$$

$$(\ell b h)^2 = (2 \times 3 \times 4) x^3$$

$$9000^2 = 24x^3$$

$$x = 150 \quad \Rightarrow 4x \times b = 9000$$

12.

Sol: (b)

$$(x-1)(x+1)(x^2+1)(x^4+1)$$

$$\text{We have, } (x-1)(x+1)(x^2+1)(x^4+1)$$

$$= (x^2-1)(x^2+1)(x^4+1) \quad [\because (x-1)(x+1) = x^2-1]$$

$$= ((x^2)^2-1^2)(x^4+1) \quad [\because (x^2-1)(x^2+1) = (x^2)^2-1^2]$$

$$= (x^4-1)(x^4+1)$$

$$= (x^4)^2 - 1^2 = x^8 - 1$$

13.

Sol: (c)

We know that

$$(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab+bc+ca)$$

$$\Rightarrow (a+b+c)^2 = 250 + 2 \times 3$$

$$\Rightarrow (a+b+c)^2 = 256$$

$$\Rightarrow (a+b+c)^2 = (\pm 16)^2$$

$$\Rightarrow a+b+c = \pm 16$$

[Taking square root of both sides]

14.

Sol: (a) 4

15.

sol: (b) OX'

16.

Sol: (c) The ordinate is negative below x-axis.

17.

Sol: (c)

$$(2, 1) \text{ satisfied } 2y = x$$

18.

Sol: (d)

$$\frac{4}{3}\pi(3)^3 = \frac{4}{3}\pi(1.5)^3 + \frac{4}{3}\pi(2)^3 + \frac{4}{3}\pi r_3^3$$

$$27 = 3.375 + 8 + r_3^3$$

$$r_3^3 = 15.625$$

19.

Sol: (c) - 12

20.

Sol: (a)

Let number be $36x, 36y$

$$\text{LCM} = \frac{12960}{36} = 360$$

$$\therefore xy = 10 = 2 \times 5$$

$$\therefore (2, 5) \text{ or } (5, 2) \text{ Two pair}$$

21.

Sol: (d)

Income of

$$P = 3x,$$

Expense of $P = 5y$

$$3x - 5y = 200$$

$$2x - 3y = 200$$

$$\therefore y = 200$$

$$\therefore x = 400$$

$$\therefore P = 3 \times x = 3 \times 400 = 1200$$

$$Q = 2x$$

$$Q = 3y$$

22.

Sol: (a)

by defination

23.

Sol: (b)

by defination

24.

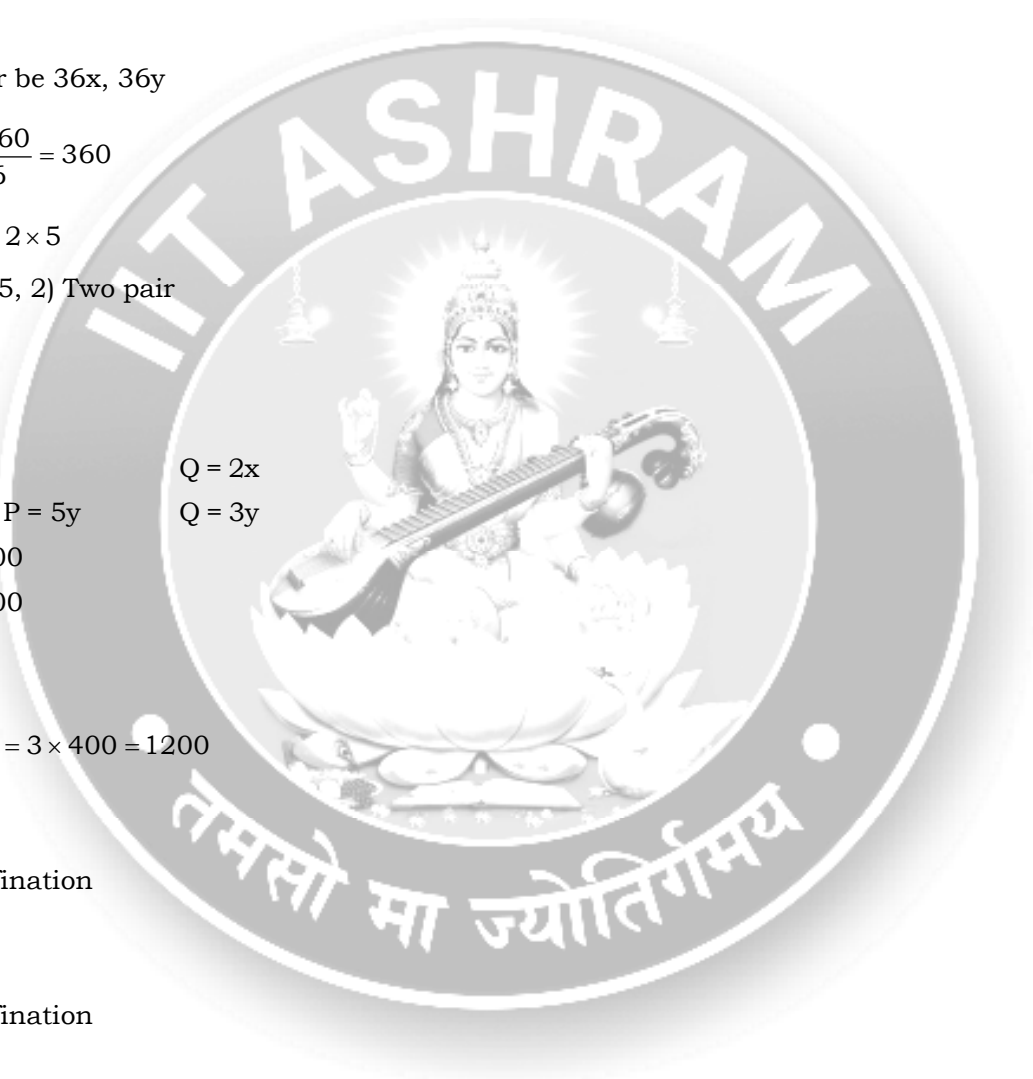
Sol: (c)

$$\angle TPS = \frac{1}{2}(65 - 33) = 16$$

25.

Sol: (b)

by defination



26.

Sol: (b)

$$5C + 120 = 180$$

$$\therefore C = 12$$

$$3b = 5C$$

$$b = \frac{5 \times 12}{3} = 20^\circ$$

$$4a + 120 = 180^\circ$$

$$a = 15^\circ$$

$$a + b - C = 15 + 20 - 12 = 23^\circ$$

27.

Sol: (b)

$$\angle AEF = 180 - 90 - 30 = 60^\circ$$

$$\angle BEC + \angle ECD = 180^\circ$$

$$\therefore \angle ECD = 120^\circ$$

28.

Sol: (a)

$$a + b = 180$$

$$a - b = 40$$

$$a = 110^\circ, b = 70^\circ$$

29.

Sol: (b)

By theorem

30.

Sol: (a)

$$a + b + c = 90 \dots\dots\dots (1)$$

$$\frac{1}{2}ab = 270 \dots\dots\dots(2)$$

$$c^2 = a^2 + b^2 \dots\dots\dots(3)$$

From eq (1), (2) and (3)

$$c = 39 \text{ cm}$$

31.

Sol: (c) $4\sqrt{3}$

The possible combination of length would be

(2, 5, 5), (3, 4, 5), (4, 4, 4)

$$\therefore \text{Area} = \frac{\sqrt{3}}{4} \times 4 \times 4 = 4\sqrt{3} \text{cm}^2$$

32.

Sol: (d) rectangle

ACBD is a rectangle



33.

Sol: (c) 31 : 35

$$2x + 5 = y + 1, \quad 3x - 4 = y + 5$$

$$\therefore x = 13, \quad y = 30$$

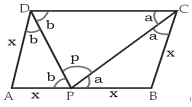
$\therefore AB : BC$

$$2x + 5 : 3x - 4$$

$$31 : 35$$

34.

Sol: (a) 90°



$$2a + 2b = 180^\circ \dots\dots\dots(1)$$

$$a + b + p = 180^\circ \dots\dots\dots(2) \text{ linear pair}$$

\therefore from eqⁿ (1) and (2)

$$\angle CPD = 90^\circ$$

35.

Sol: (a)

As $\triangle POR \cong \triangle MON$

$\therefore PR = MN$ (CPCT)

36.

Sol: (a)

Let $PB = x$

$$AP \times PB = CP \times DP$$

$$(16 - x) \times x = 6 \times 8$$

$$\therefore AP = 12$$

37.

Sol: (a)

$$\angle OCD = 52^\circ \text{ (by theorem of circle)}$$

38.

Sol: (d) 32 sq.units

$$PQ = 2 \times 4 = 8 \text{ unit}$$

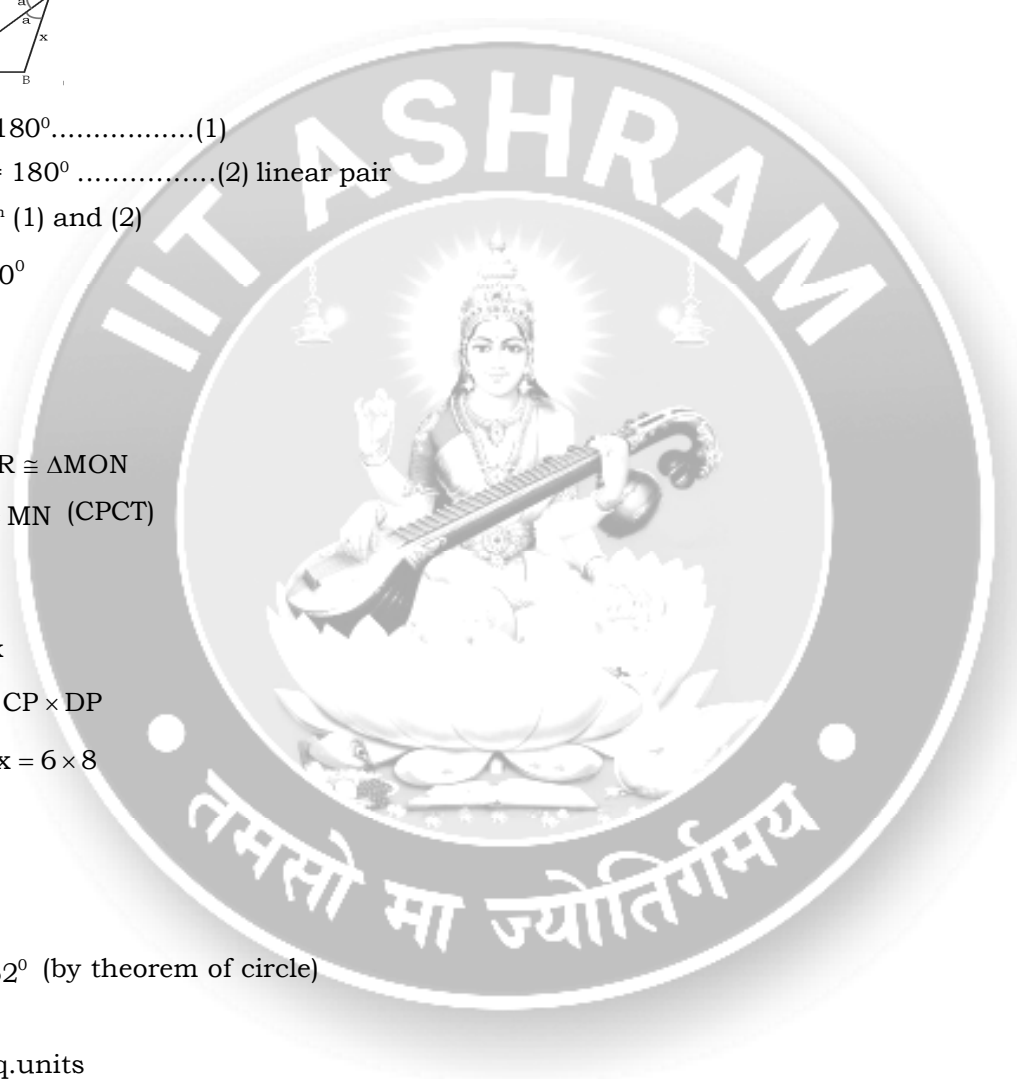
$$PS = 2 \times 2 = 4 \text{ unit}$$

$$\text{Ans} = 8 \times 4 = 32 \text{ Sq.unit}$$

39.

Sol: (c) 84000

$$\begin{aligned} \text{No of lead} &= \frac{9 \times 11 \times 12}{\frac{4}{3} \times \frac{22}{7} \times \frac{0.3}{20} \times \frac{0.3}{20} \times \frac{0.3}{20}} = 84000 \end{aligned}$$



40.

Sol: (c) 49 : 9

$$V_1 : V_2$$

$$\frac{1}{3} \pi r_1^2 h_1 : \frac{1}{3} \pi r_2^2 h_2$$

$$7 \times 7 \times h : 3 \times 3 \times h$$

$$49 : 9$$



PART - III : PHYSICS & CHEMISTRY

1.

Sol: (c)

The velocity of parrot with respect to train will be

$$v = 8 + 4 = 12 \text{ m/s.}$$

(As the frame of reference (train) and parrot are moving in opposite direction, we will add both the velocities).

Now the problem has been converted to one body problem

A parrot with velocity 12m/s has to cover a distance of 120 m.

Now, $t = s/v$

$$t = 120/12$$

$$t = 10\text{s}$$

2.

Sol: (b)

It is given that a sledge has a mass

$$m = 25 \text{ kg}$$

It is being pulled with a horizontal force across a level ground.

The force due to friction tries to resist the motion. Hence, we should subtract frictional force from the horizontal force to get the net force.

$$\Rightarrow F = F_h - f$$

$$\Rightarrow F = 60 - 20$$

$$\Rightarrow F = 40\text{N}$$

(This is the net force on the sledge)

$$\text{Now, } F = ma \Rightarrow a = \frac{F}{m}$$

$$\Rightarrow a = \frac{40}{25} \Rightarrow a = 1.6\text{m/s}^2$$

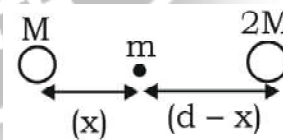
3.

Sol: (a)

For equilibrium of small mass m ,

$$F_1 = F_2$$

Using formula for gravitational force for F_1 and F_2 we get



$$\frac{GMm}{x^2} = \frac{G(2M)m}{(d-x)^2} \Rightarrow (d-x)^2 = 2x^2 \Rightarrow d-x = \sqrt{2}x$$

$$\Rightarrow d = (\sqrt{2} + 1)x \Rightarrow x = \frac{d}{(\sqrt{2} + 1)}$$

4.

Sol: (a)

The correct option is (a) 60 kg

Weight of man = weight of liquid displaced $m \times g = m_l \times g$

\therefore Mass of man = Mass of liquid displaced

Volume of water displaced = $(l \times b \times d) = (3 \times 2 \times 0.01) \text{ m}^3 = 0.06 \text{ m}^3$.

Mass of man = Volume of water displaced \times Density of water = $(0.06 \times 1000) \text{ kg} = 60 \text{ kg}$

5.

Sol: (c)

Work done by the brakes i.e

force * displacement = change in kinetic energy (using work energy theorem) i.e

$$-F * d = K_f - K_i$$

$$F * d = \frac{1}{2}mu^2 \quad (k_f = 0)$$

Since both the vehicles have the same kinetic energy and are subject to the same force(F) the distance covered by both lorry and car will be the same. Thus both will stop at the same distance.

6.

Sol: (a)

Work done against friction = work done by force of 100 N (force needed to overcome friction)

$$W = F \times D = 100 \times 3 = 300J$$

Hence, work done against friction when the box moves a horizontal distance of 3m is 300J.

7.

Sol: (a)

The correct option is (b) $\frac{\lambda}{2}$

The distance between two consecutive compressions or rarefactions is called wavelength. It is denoted by symbol λ . Thus, the distance between a compression and the next rarefaction will be

$$\frac{\lambda}{2}$$

8.

Sol: (b)

$$T = 0.2s$$

At $t = 0s$ there is a crest,

We know from the question that next crest will occur 0.02s. And hence, the trough occur at the

$$\text{mean of two crests i.e. time of trough} = \frac{0.0 + 0.02}{2} = 0.01\text{sec}$$

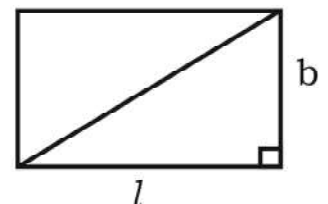
9.

Sol: (a)

$$\text{distance travelled} = l + b, \quad \text{displacement} = \sqrt{l^2 + b^2}$$

$$\text{Ratio} = \frac{\text{Average speed}}{\text{Average velocity}} = \frac{\frac{s}{t}}{\frac{t}{s}} = \frac{\frac{12+5}{t}}{\frac{t}{\sqrt{12^2 + 5^2}}}$$

$$= \frac{12+5}{\sqrt{12^2 + 5^2}} = 17/13$$



10.

Sol: (c)

According to Newton's third law of motion, the force with which the earth is attracted towards the apple is equal to the force with which earth attracts the apple. However, the mass of the earth is extremely large as compared to that of apple. So acceleration of the earth is very small and is not noticeable.

11.

Sol: (d)

When you push a lawn roller, the force is applied downward, which increases the normal reaction force. This increases the frictional force, making it harder to move the roller. When you pull a lawn roller, the force is applied upward, which reduces the normal reaction force and frictional force. This reduces the force opposing the motion, making pulling easier.

12.

Sol: (c)

The ratio of wavelength is = 5:3

Let the frequency of the first wave is f_1 and the frequency of the second wave is f_2 .

Let the wavelength of the first wave is λ_1 and the wavelength of the second wave is λ_2 .

Let the speed of both the waves be c .

$$f_1 = \frac{c}{\lambda_1}, \quad f_2 = \frac{c}{\lambda_2}$$

$$\therefore \frac{f_1}{f_2} = \frac{\lambda_2}{\lambda_1} = \frac{3}{5}$$

Hence, the ratio of frequency is 3:5.

13.

Sol: (d)

$$p = mv$$

$$p' = (2m) \times (2v) = 4mv$$

$$p' = 4p$$

$$\frac{\Delta p}{p} \times 100 = \frac{4p - p}{p} \times 100 = 300\%$$

14.

Sol: (d)

The goalkeeper pulls his hands backwards after holding the ball to decrease the rate of change of momentum by increasing the time.

By doing this, less force is exerted on his hands (\therefore Force is directly proportional to the rate of change of momentum).

15.

Sol: (c)

Since in uniform motion body moves with constant velocity, average and instantaneous velocities have same value.

16.

Sol: (b) Low humidity, high temperature

Explanation: Evaporation is faster at high temperature (more kinetic energy) and low humidity (higher evaporation gradient).

17.

Sol: (c) Hydrogen

Hydrogen has the smallest molecular mass and will diffuse fastest according to Graham's Law of Diffusion.

18.

Sol: (c) Its properties vary with composition.

Explanation: Air is a mixture because its components (like oxygen, nitrogen, etc.) can vary in proportion

19.

Sol: (c) Homogeneous mixture of two metals

Explanation: Brass is an alloy of copper and zinc, which forms a homogeneous mixture.

20.

Sol: (c) calcium chloride

Explanation: Calcium Chloride is a compound because it contains chemically bonded elements in a fixed ratio.

21.

Sol: (a) Petrol

Petrol has a very low ignition temperature, making it highly flammable.

22.

Sol: (a)

23.

Sol: (b) Stone

Stone does not catch fire, as it does not have combustible properties.

24.

Sol: (b) Sodium zincate

25.

Sol: (a) Zinc oxide

26.

Sol: (a) Gain one electron

27.

Sol: (b) Sodium

28.

Sol: (b)

Number of neutrons
= Mass number – Atomic number
= 37 - 17 = 20.

29.

Sol: (d)

All these ions (Mg^{2+} , Na^+ , F^-) have 10 electrons, like as neon

30.

Sol: (b)

Ammonium ion (NH_4^+) has a net charge of +1 due to the loss of one electron.

PART - IV : BIOLOGY

1.
Sol: (c) Mitochondria
Mitochondria are present in both plant and animal cells, where they generate energy.
2.
Sol: (b) Proteins and phospholipids
The plasma membrane is composed of a phospholipid bilayer interspersed with proteins, which aid in transport and communication.
3.
Sol: (b) Protein synthesis
Ribosomes are the sites of protein synthesis in the cell.
4.
Sol: (b) Skeletal muscle
Skeletal muscles are attached to bones and are responsible for voluntary movements.
5.
Sol: (b) Xylem
Xylem transports water and minerals from roots to other parts of the plant.
6.
Sol: (b) Collenchyma
Collenchyma has thickened walls that provide mechanical support to growing parts of the plant.
7.
Sol: (a) Both statements are true.
Mixed cropping involves cultivating multiple crops together, which ensures nutrient diversity in the soil and minimizes the risk of total crop failure due to pests or diseases.
8.
Sol: (b) Compost
Compost is an organic manure made by decomposing plant and animal waste.
9.
Sol: (b) Rice
Rice is a major crop of the Kharif season, sown during the rainy season.
10.
Sol: (b) Fungi
Antibiotics like penicillin are produced by fungi.
11.
Sol: (c) Bacteria
Tuberculosis is caused by the bacterium *Mycobacterium tuberculosis*.
12.
Sol: (b) Habitat destruction
Habitat destruction harms wildlife, while the other options are conservation measures.
13.
Sol: (b) Gamete formation → Fertilization → Zygote formation → Embryo development
Gametes are formed first, followed by their fusion (fertilization), leading to zygote formation and subsequent embryo development.

14.

Sol: (c) A is true, but R is false.

Menstruation is not caused by fertilization; it occurs when the egg released during the menstrual cycle is not fertilized, leading to the shedding of the uterine lining.

15.

Sol: (c) Testosterone

Testosterone, produced by the testes, triggers the development of secondary sexual characteristics in boys (d) Both A and R are true, but R is not the correct explanation of A.

