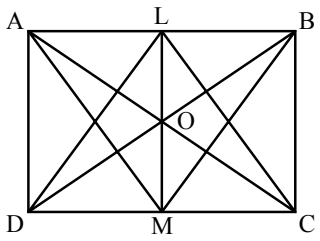
# MATHEMATICS

**1.** Consider the given figure in which ABCD is a rectangle and LM || AD and L is mid-point of AB.




If the areas of the triangles LDC, BMC and AMC are denoted by x, y and z respectively, then

(A) x = y = z (B) x = 2y = 2z (C) y = 2x = 2z (D) z = 2x = 2y

**2.** If a, b, c are sides of a triangle and $a^2 + b^2 + c^2 = ab + bc + ca$ then the triangle is

(A) isosceles (B) right angled (C) obtuse (D) equilateral

**3.** If pqr = 1, the value of $\frac{1}{\left[1+p+q^{-1}\right]}+\frac{1}{\left[1+q+r^{-1}\right]}+\frac{1}{\left[1+r+p^{-1}\right]}$ will be equal to

(A) 1 (B) 0 (C) – 1 (D) – 2

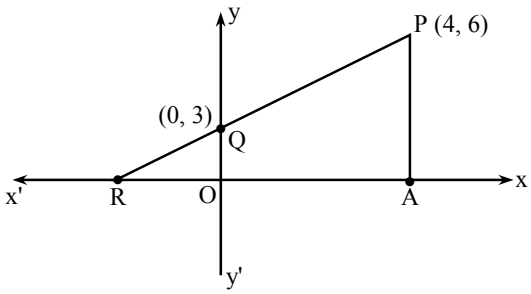
**4.** If $x^2 = y + z$, $y^2 = z + x$, $z^2 = x + y$, then what is the value of $\frac{1}{x+1}+\frac{1}{y+1}+\frac{1}{z+1}$ ?

(A) 1 (B) 0 (C) –1 (D) 2

**5.** If a + b + c = 0, then $a^2 + ab + b^2$ is equal to

(A) $b^2 - bc + c^2$ (B) $c^2 - ab$ (C) $b^2 + bc + c^2$ (D) 0

**6.** In the adjoining figure, P and Q have coordinates (4, 6) and (0, 3) respectively. Find the area of quadrilateral OAPQ.

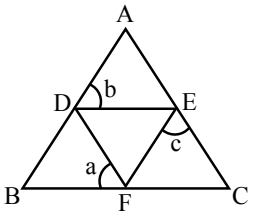



(A) 16 sq. units (B) 18 sq. units (C) 9 sq. units (D) 24 sq. units

**7.** ABC is a triangle in which ∠B = 2∠C and D is a point on BC such that AD bisects ∠BAC and AB = CD. Then ∠BAC is equal to

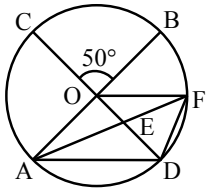
(A) 27° (B) 72° (C) 36° (D) 70°

**8.** In the diagram AB and AC are the equal sides of an isosceles triangle ABC, triangle DEF is an equilateral triangle and $\angle BFD = a$, $\angle ADE = b$, $\angle FEC = c$ then the value of a is



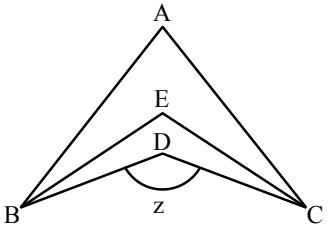

(A) $\frac{b-c}{2}$ (B) $\frac{2b+c}{2}$ (C) $\frac{b+c}{2}$ (D) $\frac{2b-c}{2}$

**9.** In the figure, O is the centre, AB and CD are diameters. $\angle COB = 50°$. If E is the mid-point of AF, then $\angle ADF$ is



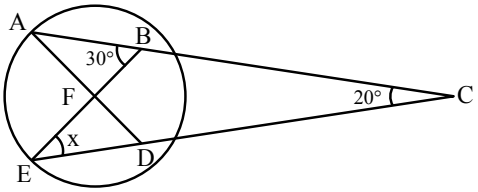

(A) 130° (B) 100° (C) 110° (D) 120°

**10.** In the figure (not to scale) $\angle ABE = \angle ECD$ and $\angle EBD = \angle ACE$. If $\angle BAC = 80°$ and $\angle BEC = 100°$, $\angle BDC = z$. Then the value of z is




(A) 80° (B) 100° (C) 110° (D) 120°

**11.** The value of x in the given figure is




(A) 30° (B) 20° (C) 10° (D) 40°

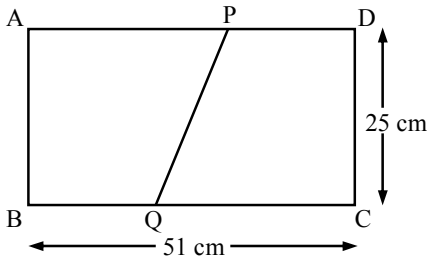
**12.** If $y^2 = 3 + 2\sqrt{2}$, then the value of $y + \frac{1}{y}$ is

(A) $\sqrt{\frac{3}{2}}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{\sqrt{2}}{2}$ (D) $\frac{4}{\sqrt{2}}$

**13.** The value of $\frac{(0.137)^3 + (0.113)^3}{(0.137)^2 - (0.137)(0.113) + (0.113)^2}$ is

(A) $\frac{1}{3}$ (B) $\frac{1}{2}$ (C) $\frac{1}{4}$ (D) $\frac{3}{2}$

**14.** The dimensions of a rectangle ABCD are 51 cm × 25 cm. A trapezium PQCD with its parallel sides QC and PD in the ratio 9 : 8, is cut off from the rectangle as shown in the figure. If the area of the trapezium PQCD is $\frac{5}{6}$ th part of the area of the rectangle ABCD, then the length of QC is




(A) 45 cm (B) 40 cm (C) 35 cm (D) 50 cm

**15.** From a point in the interior of an equilateral triangle, perpendiculars are drawn on the three sides. The length of the perpendiculars are 14 cm, 10 cm and 6 cm. Then the area of the equilateral triangle is

(A) $330\sqrt{3}$ (B) $200\sqrt{3}$ (C) $300\sqrt{3}$ (D) $230\sqrt{3}$

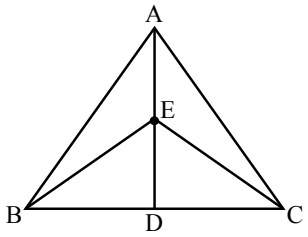
**16.** The distance of the point (5, –4) from the x axis is

(A) – 5 units (B) – 4 units (C) 1 unit (D) 4 units

**17.** ABC is a right angled triangle with ∠BAC = 90°. AH is drawn perpendicular to BC. If AB = 60 cm and AC = 80 cm, then BH is equal to

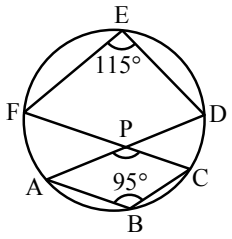
(A) 36 cm (B) 32 cm (C) 24 cm (D) 30 cm

**18.** In a triangle ABC, E is the mid-point of median AD. If area of ΔABC is $40\sqrt{3}$ square units then the area of ΔBED is



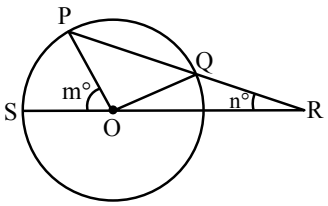

(A) $20\sqrt{3}$ sq. units (B) $10\sqrt{3}$ sq. units (C) $30\sqrt{3}$ sq. units (D) $15\sqrt{3}$ sq. units

**19.** In the following figure, if ∠ABC = 95°, ∠FED = 115°. Then the ∠APC is equal to



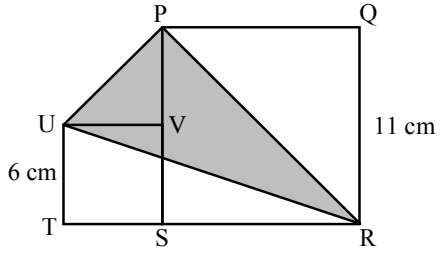

(A) 120° (B) 150° (C) 135° (D) 155°

**20.** In the given figure O is the centre of the circle. If OQ = QR, then the value of m° is




(A) 3n° (B) n° (C) 2n° (D) 4n°

**21.** In the figure UVST and PQRS are squares. The length of the smaller square is 6 cm and the length of the larger square is 11 cm. The area of the shaded part is




(A) 363.5 $cm^2$ (B) 60.5 $cm^2$ (C) 121 $cm^2$ (D) 66 $cm^2$

**22.** Three circles of radius a, b, c touch each other externally. The area of the triangle formed by joining their centres is

(A) $\sqrt{(a+b+c)(abc)}$ (B) $(a+b+c)\sqrt{ab+bc+ca}$

(C) $\sqrt{ab+bc+ca}$ (D) $ab+bc+ca\sqrt{abc}$

**23.** $(2x-3y)^3+(3y-4z)^3+(4z-2x)^3$ can be factorised into which one of the following?

(A) (2x + 3y + 4z) (2x – 3y – 4z) (B) 3 (2x – 3y) (3y – 4z) (2z – x)

(C) (2x – 3y) (3y – 4z) (4z – 2x) (D) 6 (2x – 3y) (3y – 4z) (2z – x)

**24.** If $x+\frac{1}{x}=-2$ then $x^5+\frac{1}{x^5}$ equals to

(A) – 1 (B) 2 (C) – 2 (D) 1

**25.** The value of $\frac{1}{1-\sqrt{2}}-\frac{1}{\sqrt{2}-\sqrt{3}}+\frac{1}{\sqrt{3}-\sqrt{4}}-\frac{1}{\sqrt{4}-\sqrt{5}}+\frac{1}{\sqrt{5}-\sqrt{6}}-\frac{1}{\sqrt{6}-\sqrt{7}}+\frac{1}{\sqrt{7}-\sqrt{8}}-\frac{1}{\sqrt{8}-\sqrt{9}}$ is

(A) 2 (B) – 2 (C) 3 (D) – 3

# CHEMISTRY

**26.** Which of the following correctly represents 360 g of water?

(i) 2 moles of $H_2O$ (ii) 20 moles of water

(iii) $6.022 \times 10^{23}$ molecules of water (iv) $1.2044 \times 10^{25}$ molecules of water

(A) (i) (B) (i) and (iv) (C) (ii) and (iii) (D) (ii) and (iv)

**27.** Two substances, A and B were made to react to form a third substance, $A_2B$ according to the following reaction:

$$2A + B \longrightarrow A_2B$$

Which of the following statements concerning this reaction are **incorrect**?

(i) The product $A_2B$ shows the properties of substances A and B.

(ii) The product will always have a fixed composition.

(iii) The product so formed cannot be classified as a compound.

(iv) The product so formed is an element.

(A) (i), (ii) and (iii) (B) (ii), (iii) and (iv) (C) (i), (iii) and (iv) (D) (ii), (iii) and (iv)

**28.** A solution contains 40 g of common salt in 320 g of water. Calculate the concentration in terms of mass by mass percentage of the solution.

(A) 12.5% (B) 8% (C) 10% (D) 11.1%

**29.** A mixture of sulphur and carbon disulphide is :

(A) heterogeneous and shows Tyndall effect

(B) homogeneous and shows Tyndall effect

(C) heterogeneous and does not show Tyndall effect

(D) homogeneous and does not show Tyndall effect

**30.** In which of the following conditions, the distance between the molecules of hydrogen gas would increase?

(i) Increasing pressure on hydrogen gas contained in a closed container.

(ii) Some hydrogen gas leaking out of the container.

(iii) Increasing the volume of the container of hydrogen gas.

(iv) Adding more hydrogen gas to the container without increasing the volume of the container.

(A) (i) and (iii) (B) (i) and (iv) (C) (ii) and (iii) (D) (ii) and (iv)

**31.** Which one of the following would increase on raising the temperature?

(A) Rate of diffusion, rate of evaporation, and rate of condensation

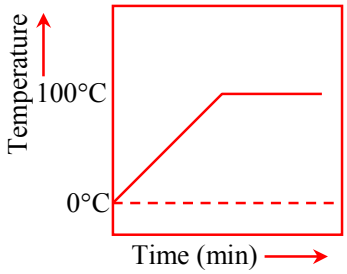
(B) Rate of evaporation, rate of condensation and solubility of gas in liquid

(C) Rate of evaporation, rate of diffusion and solubility of solid in liquid

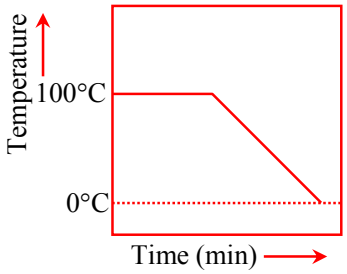
(D) Rate of evaporation, rate of diffusion and solubility of gas in liquid

**32.** A student heats a beaker containing ice and water. He measures the temperature of the content of the beaker as a function of time. Which of the following figure would correctly represent the result?

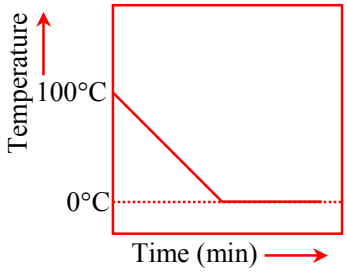
(A)



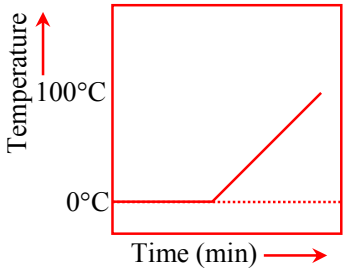

(B)




(C)




(D)




**33.** If the formula of the compound is $X_2(SO_4)_3$. Which possible metal is X?

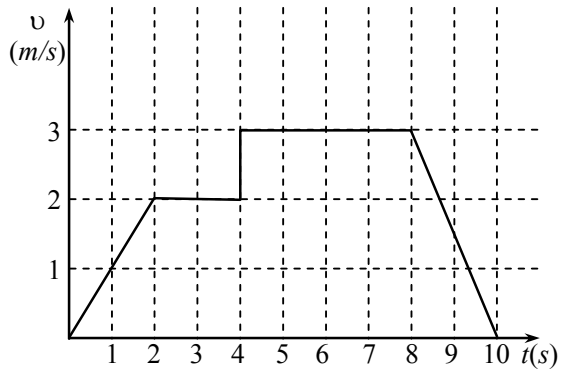
(A) Na (B) Mg (C) Al (D) Pb

# PHYSICS

**34.** A parachutist after bailing out falls 50 *m* without friction. When parachute opens, it decelerates at 2 $m/s^2$. He reaches the ground with a speed of 3 *m/s*. At what height, did he bail out

(A) 293 *m* (B) 111 *m* (C) 91 *m* (D) 182 *m*

**35.** A particle starts from the origin at time $t = 0$ and moves along the positive *x*-axis. The graph of velocity with respect to time is shown in figure. What is the position of the particle at time $t = 5s$




(A) 6 *m* (B) 9 *m* (C) 3 *m* (D) 10 *m*

**36.** The mass of ship is $2\times10^7 kg$. On applying a force of $25\times10^5 N$, it is displaced through 25 *m*. After the displacement, the velocity acquired by the ship will be

(A) $12.5m/s$ (B) $5m/s$ (C) $3.7m/s$ (D) $2.5m/s$

**37.** A gun fires a bullet of mass 50 *g* with a velocity of $30m\sec^{-1}$. Because of this the gun is pushed back with a velocity of $1m\sec^{-1}$. The mass of the gun is

(A) 15 *kg* (B) 30*kg* (C) 1.5*kg* (D) 20*kg*

**38.** A man getting down a running bus falls forward because

(A) Due to inertia of rest, road is left behind and man reaches forward

(B) Due to inertia of motion upper part of body continues to be in motion in forward direction while feet come to rest as soon as they touch the road

(C) He learns forward as a matter of habit

(D) Of the combined effect of all the three factors stated in (a), (b) and (c)

**39.** A man pushes a wall and fails to displace it. He does

(A) Negative work (B) Positive but not maximum work

(C) No work at all (D) Maximum work

**40.** A rifle bullet loses $1/20^{th}$ of its velocity in passing through a plank. The least number of such planks required just to stop the bullet is

(A) 5 (B) 10 (C) 11 (D) 20

**41.** A particle is acted upon by a constant power. Then, which of the following physical quantity remains constant

(A) Speed (B) Rate of change of acceleration

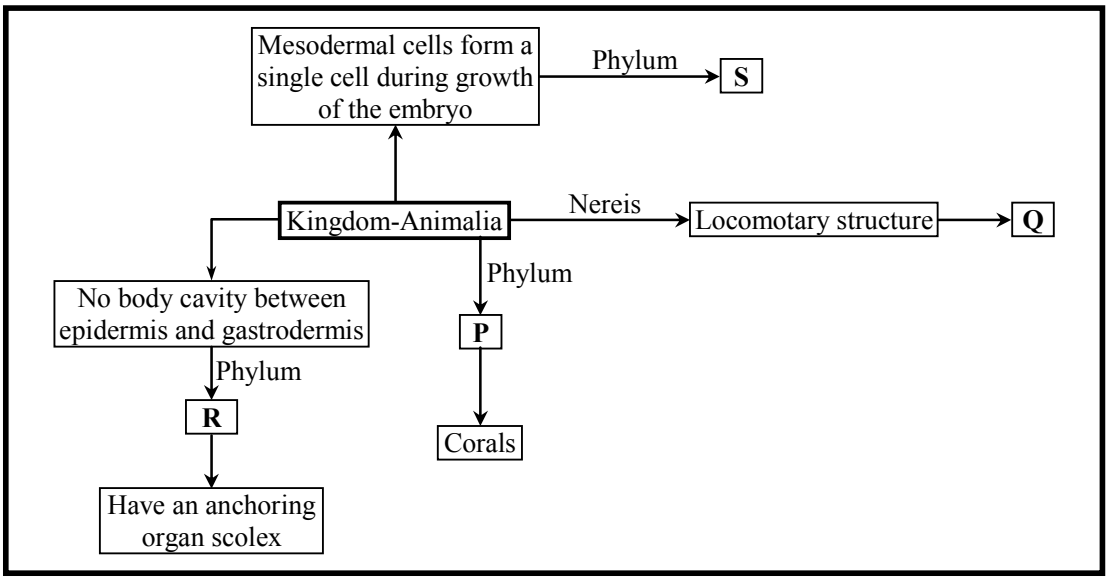
(C) Kinetic energy (D) Rate of change of kinetic energy

**42.** If mass of a body is *M* on the earth surface, then the mass of the same body on the moon surface is

(A) $M/6$ (B) Zero (C) *M* (D) None of these

# BIOLOGY

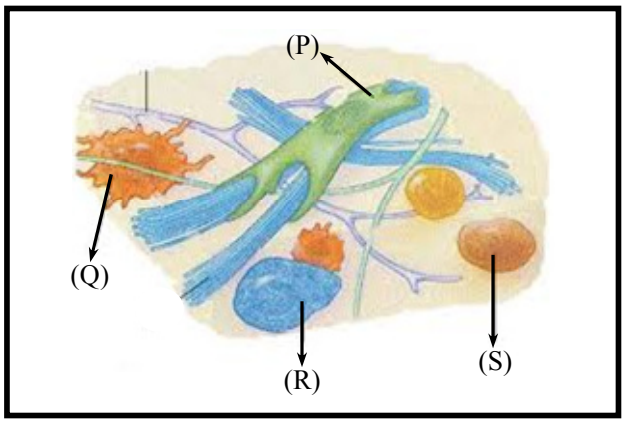
**43.** The flow chart given below shows some characteristics and examples of animals of kingdom-Animalia.




Identify the phylum **(P), (R), (S)** and also identify the structure **(Q).**

| | **(P)** | **(Q)** | **(R)** | **(S)** |
|---|---|---|---|---|
| (A) | Porifera | Parapodia | Coelenterata | Annelida |
| (B) | Coelenterata | Palamnaeus | Nematoda | Porifera |
| (C) | Coelenterata | Parapodia | Platyhelminthes | Mollusca |
| (D) | Mollusca | Parapodia | Platyhelminthes | Mollusca |

**44.** Given below is the diagramatic sketch of a certain type of connective tissue. Identify the parts labelled **P, Q, R,** and **S** and select the right option about them.




| | **(P)** | **(Q)** | **(R)** | **(S)** |
|---|---|---|---|---|
| (A) | Fibroblast | Mast Cell | Macrophage | Plasma Cell |
| (B) | Fibroblast | Plasma Cell | Mast Cell | Macrophage |
| (C) | Fibroblast | Macrophage | Plasma Cell | Mast Cell |
| (D) | Fibroblast | Macrophage | Mast Cell | Plasma Cell |

**45.** How many mitotic divisions must occur in a cell to form 1024 cells?

(A) 10 (B) 512 (C) 256 (D) 20

**46.** Which of the following statement is not correct?

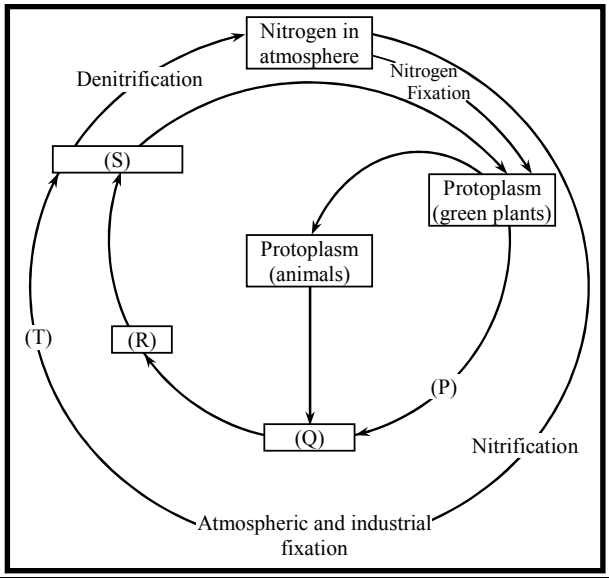
(A) Lysosomes are filled with digestive enzymes.

(B) Lysosomes are membrane bound structures.

(C) Enzymes filled in lysosome are made by RER.

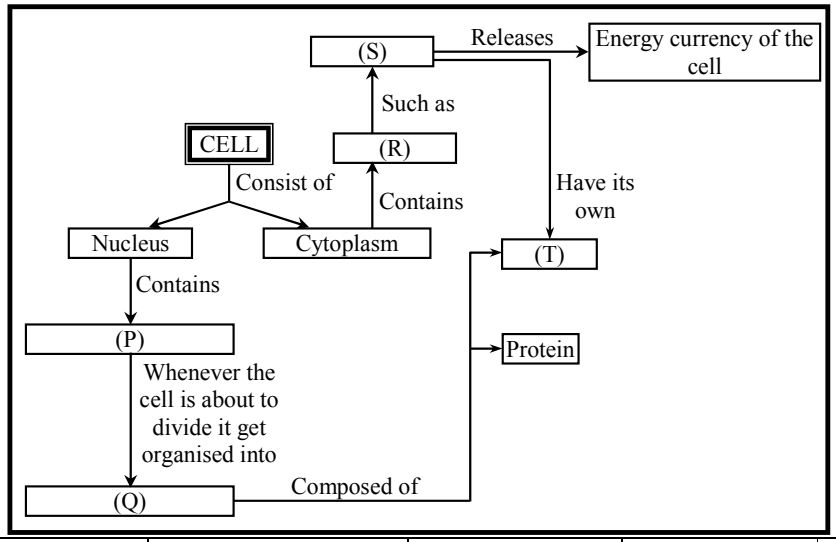
(D) Lysosomes are formed by the process of packaging in the endoplasmic reticulum.

**47.** Given below is nitrogen cycle in nature. Carefully observe the cycle and fill in the blanks (P), (Q), (R), (S) and (T).




| | (P) | (Q) | (R) | (S) | (T) |
|---|---|---|---|---|---|
| (A) | Ammonia | Ammonification | Nitrates | Nitrites | Denitrification |
| (B) | Ammonification | Ammonia | Nitrates | Nitrites | Nitrification |
| (C) | Ammonification | Ammonia | Nitrites | Nitrates | Nitrification |
| (D) | Ammonification | Ammonia | Nitrites | Nitrates | Denitrification |

**48.** Observe the flow chart carefully and identify (P), (Q), (R), (S) and (T) from the options provided.




| | (P) | (Q) | (R) | (S) | (T) |
|---|---|---|---|---|---|
| (A) | DNA | Chromosomes | Lysosome | Ribosome | Enzyme |
| (B) | Nuclear membrane | Nucleolus | Vacuole | Food vacuole | RNA |
| (C) | Chromatin threads | Chromosomes | Cell Organelles | Mitochondria | DNA |
| (D) | Chromosomes | Chromatin threads | Cell Organelles | Mitochondria | DNA |

**49.** Which among the following statement is true in case of Japanese encephalitis?

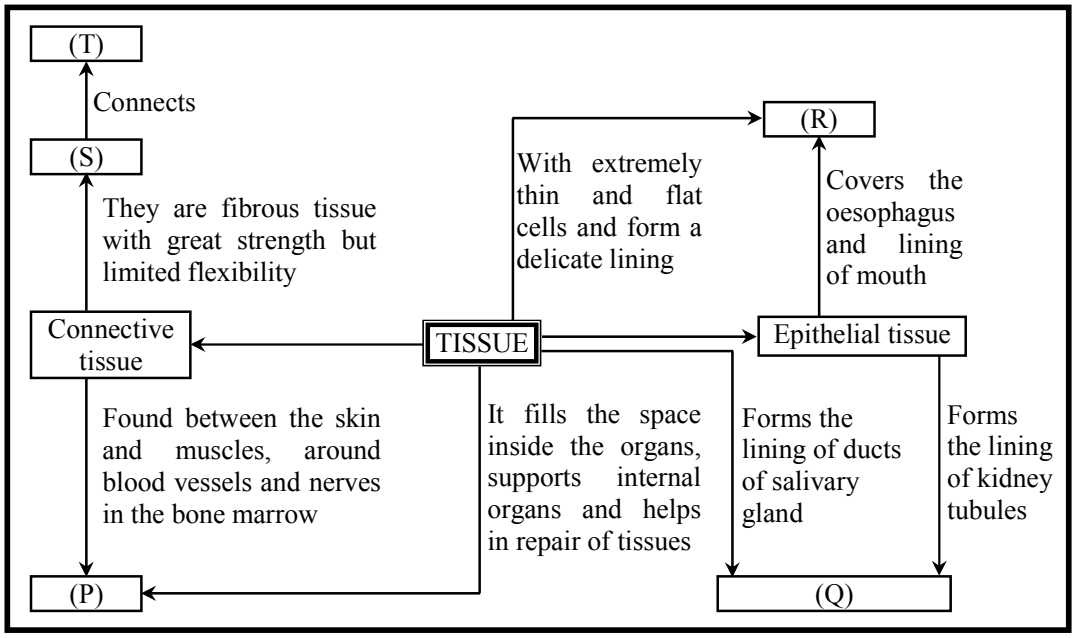
(A) The virus causing Japanese encephalitis enters into the body through air and it goes on to infect the liver resulting in jaundice.

(B) The virus causing Japanese encephalitis enters into the body through air and it goes on to infect the lungs resulting in cough and breathlessness.

(C) The bacteria causing Japanese encephalitis enters into the body through a mosquito bite and it goes on to infect the brain resulting in headaches, vomiting, fits or unconsciousness.

(D) The virus causing Japanese encephalitis enters into the body through a mosquito bite and it goes on to infect the brain resulting in headaches, vomiting, fits or unconsciousness.

**50.** Observe the flow chart carefully and identify (P), (Q), (R), (S) and (T) from the options provided.




| | (P) | (Q) | (R) | (S) | (T) |
|---|---|---|---|---|---|
| (A) | Areolar tissue | Squamous epithelium | Cuboidal epithelium | Ligament | Bone to Bone |
| (B) | Areolar tissue | Cuboidal epithelium | Squamous epithelium | Tendon | Muscle to Bone |
| (C) | Blood | Stratified epithelium | Reticular epithelium | Ligament | Bone to Bone |
| (D) | Areolar tissue | Cuboidal epithelium | Squamous epithelium | Tendon | Bone to Bone |

* * * * *

# CLASS 9th MOVING TO CLASS 10th
# ANSWER KEY
# SET A

**MATHEMATICS**

1. (B)
2. (D)
3. (A)
4. (A)
5. (B)
6. (B)
7. (B)
8. (C)
9. (A)
10. (D)
11. (C)
12. (D)
13. (C)
14. (A)
15. (C)
16. (D)
17. (A)
18. (B)
19. (B)
20. (A)
21. (B)
22. (A)
23. (D)
24. (C)
25. (A)

**CHEMISTRY**

26. (D)
27. (C)
28. (D)
29. (D)
30. (C)
31. (C)
32. (D)
33. (C)

**PHYSICS**

34. (A)
35. (B)
36. (D)
37. (C)
38. (B)
39. (C)
40. (C)
41. (D)
42. (C)

**BIOLOGY**

43. (C)
44. (D)
45. (A)
46. (D)
47. (C)
48. (C)
49. (D)
50. (B)

# SOLUTION

## MATHEMATICS

**1. (B)**

$$x = \frac{1}{2} \times CD \times LM$$

$$y = \frac{1}{2} \times CM \times BC = \frac{1}{2} \times \left(\frac{1}{2}CD\right) \times LM = \frac{1}{2} \times \left(\frac{1}{2}CD \times LM\right)$$

$$\Rightarrow \quad y = \frac{1}{2}x$$

$$\Rightarrow \quad x = 2y \qquad \ldots(i)$$

$$z = \frac{1}{2} \times CM \times AD = \frac{1}{2}\left(\frac{1}{2}CD\right) \times LM = \frac{1}{2} \times \left(\frac{1}{2}CD \times LM\right)$$

$$\Rightarrow \quad z = \frac{1}{2}x$$

$$\Rightarrow \quad x = 2z \qquad \ldots(ii)$$

From equation (i) and (ii), we have

$\therefore \quad x = 2y = 2z$

**2. (D)**

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

multiply by 2, on both side

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

$$\Rightarrow \quad \left(a^2 + b^2 - 2ab\right) + \left(b^2 + c^2 - 2bc\right) + \left(c^2 + a^2 - 2ac\right) = 0$$

$$\Rightarrow \quad (a-b)^2 + (b-c)^2 + (c-a)^2 = 0$$

$$\Rightarrow \quad \boxed{a = b = c}$$

Since all sides of triangle are equal, hence triangle is an equilateral triangle.

**3. (A)**

$$\frac{1}{\left[1+p+q^{-1}\right]} + \frac{1}{\left[1+q+r^{-1}\right]} + \frac{1}{\left[1+r+p^{-1}\right]}$$

$$= \frac{1}{1+p+\frac{1}{q}} + \frac{1}{1+q+\frac{1}{r}} + \frac{1}{1+r+\frac{1}{p}}$$

$$= \frac{1}{1+p+\frac{1}{q}} + \frac{1}{1+q+pq} + \frac{1}{1+\frac{1}{pq}+\frac{1}{p}} \qquad (\because \quad pqr = 1)$$

$$= \frac{q}{q+pq+1} + \frac{1}{1+q+pq} + \frac{pq}{pq+1+q}$$

$$= \frac{pq+q+1}{pq+q+1}$$

$$= 1$$

**4. (A)**

$x^2 = y + z$

Add x on both side, we have

$x^2 + x = x + y + z$

$$\Rightarrow \quad x(x+1) = x + y + z$$

$\Rightarrow \quad \frac{1}{x+1}=\frac{x}{x+y+z}$

Similarly $\quad \frac{1}{y+1}=\frac{y}{x+y+z}$

& $\quad \frac{1}{z+1}=\frac{z}{x+y+z}$

$$\frac{1}{x+1}+\frac{1}{y+1}+\frac{1}{z+1}=\frac{x}{x+y+z}+\frac{y}{x+y+z}+\frac{z}{x+y+z}$$

$$=\frac{x+y+z}{x+y+z}$$

$$=1$$

**5. (B)**

If $a+b+c=0$ then $a^3+b^3+c^3-3abc=0$

$\Rightarrow \quad (a+b)\left(a^2-ab+b^2\right)+c^3=3abc$

$\Rightarrow \quad (-c)\left(a^2-ab+b^2\right)+c^3=3abc \qquad (\because \ a+b+c=0 \ \Rightarrow \ a+b=-c)$

$\Rightarrow \quad -\left(a^2-ab+b^2\right)+c^2=3ab$

$\Rightarrow \quad a^2-ab+b^2=c^2-3ab$

Add 2ab on both side, we have

$\Rightarrow \quad a^2+ab+b^2=c^2-ab$

**Alternative**

If $a+b+c=0$

$\Rightarrow a+b=-c$

Squaring on both sides, we get

$a^2+2ab+b^2=c^2$

$\Rightarrow a^2+ab+b^2=c^2-ab$

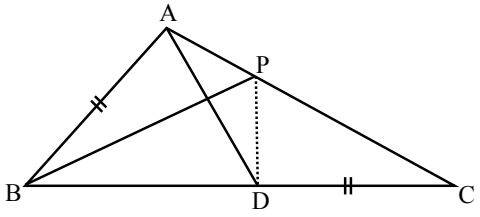
**6. (B)**

Area of quad. OAPQ $=\frac{1}{2}(OQ+AP)\times OA$

$$=\frac{1}{2}(3+6)\times 4$$

$$=18 \text{ sq. units}$$

**7. (B)**




In $\Delta ABC$,

$\angle B = 2\angle C$

let $\angle C = y$

$\therefore \quad \angle B = 2y$

AD is the bisector of $\angle BAC$

So, let $\angle BAD = \angle CAD = x$

Let BP be the bisector of $\angle ABC$. Join PD

$\Rightarrow \quad \angle ABP = \angle CBP = y$

In $\Delta BPC$,

$\angle CBP = \angle BCP = y \qquad \Rightarrow \quad BP = PC$

In $\Delta ABP$ and DCP, we have

(i) $\angle ABP = \angle DCP = y$

(ii) AB = DC (given)

And (iii) BP = PC (as proved above)

so by SAS congruence criterion, we have

$\Delta ABP \cong \Delta DCP$

$\Rightarrow \quad \angle BAP = \angle CDP$ and $AP = DP$

$\Rightarrow \quad \angle CDP = 2x$ and $\angle ADP = DAP = x$

In $\Delta ABD$,

$\angle ADC = \angle ABD + \angle BAD$

$x + 2x = 2y + x$

$\Rightarrow \quad x = y$

In $\Delta ABC$

$\angle A + \angle B + \angle C = 180°$

$2x + 2y + y = 180°$

$5x = 180° \qquad (\because \ y = x)$

$x = 36°$

Hence, $\angle BAC = 2x = 72°$

**8. (C)**

For $\Delta BDF$

External $\angle ADF = \angle B + a$

$\Rightarrow \quad b + 60° = \angle B + a \qquad (\because \ \angle EDF = 60°)$

$\Rightarrow \quad \angle B = b + 60° - a$

For $\Delta CEF$

External $\angle BFE = c + \angle C$

$\Rightarrow \quad a + 60° = c + \angle C \qquad (\because \ \angle EFD = 60°)$

$\Rightarrow \quad \angle C = a + 60° - c$

Since AB = AC

$\Rightarrow \quad \angle B = \angle C$

$b + 60° - a = a + 60° - c$

$$a = \frac{b+c}{2}$$

**9. (A)**

$\angle COB = \angle AOD = 50$ (vertically opposite angles)

$\because$ AO = OF (radii of circle)

$\therefore$ $\Delta AOF$ is a isosceles triangle

Since E is the mid-point of AF,

$\angle OEA = \angle OEF = 90°$

$\Rightarrow$ $\angle OAE = \angle OFE = 40°$

$\Rightarrow$ $\angle DOF = 50°$

$\therefore$ $\angle AOF = \angle AOD + \angle DOF = 50° + 50° = 100°$

$\therefore$ $\angle ADF = \frac{1}{2}$ (reflex ($\angle AOF$))

$= \frac{1}{2}(260°) = 130°$

**10. (D)**

Let $\angle ABE = \angle ECD = x$

and let $\angle EBD = \angle ACE = y$

$\Rightarrow$ $\angle ABD = x + y$

and $\angle ACD = x + y$

sum of the angles in a quadrilateral EBDC is 360°

$\Rightarrow$ $100° + (x + y) + \text{reflex } \angle BDC = 360°$

$(x + y) + \text{reflex } \angle BDC = 260°$ …(i)

Now sum of the angles in a quadrilateral ABDC is 360°

$80° + (x + y) + \text{reflex } \angle BDC + (x + y) = 360°$

$\Rightarrow$ $80° + 260° + (x + y) = 360°$ (from (i))

$\Rightarrow$ $(x + y) = 360° – 340°$

$\Rightarrow$ $x + y = 20°$

Reflex $\angle BDC = 260° – 20° = 240°$ (from (i))

Hence $z = 360° – \text{reflex } \angle BDC$

$= 360° – 240°$

$= 120°$

**11. (C)**

ABC is a straight line

$\angle EBC = 180° – \angle ABF$

$= 180° – 30°$

$= 150°$

In $\Delta BEC$

$x + 150° + 20° = 180°$

$\Rightarrow \quad x = 180° - 170°$

$x = 10°$

**12. (D)**

$y^2 = 3 + 2\sqrt{2}$

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

$y = \sqrt{2}+1$

$$\frac{1}{y} = \frac{1}{\sqrt{2}+1} \times \frac{\sqrt{2}-1}{\sqrt{2}-1} = \frac{\sqrt{2}-1}{2-1} = \sqrt{2}-1$$

$$y + \frac{1}{y} = \sqrt{2}+1+\sqrt{2}-1 = 2\sqrt{2} \; = \; 2\sqrt{2} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{4}{\sqrt{2}}$$

**13. (C)**

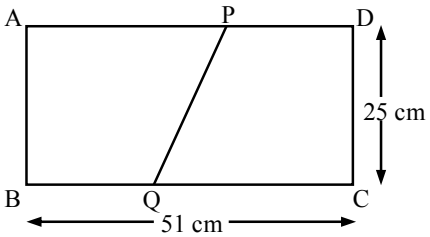
$$\frac{(0.137+0.113)+\left[(0.137)^2-(0.137)(0.113)+(0.113)^2\right]}{\left[(0.137)^2-(0.137)(0.113)+(0.113)^2\right]}$$

$= 0.250$

$$= \frac{250}{1000} = \frac{1}{4}$$

**14. (A)**

Given:




Area of trapezium PQCD = $\frac{5}{6} \times$ area of rectangle ABCD

$$\frac{1}{2}(PD + QC) \times 25 = \frac{5}{6} \times 51 \times 25$$

$$\Rightarrow \quad \frac{1}{2}(8x + 9x) = \frac{5}{6} \times 51$$

$$\Rightarrow \quad 17x = \frac{5 \times 51 \times 2}{6}$$

$$\Rightarrow \quad x = \frac{5 \times 51 \times 2}{17 \times 6}$$

$\Rightarrow \quad x = 5$

Hence length of QC = 9x

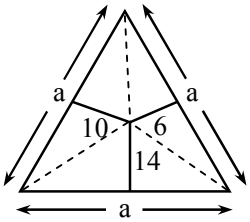
$= 9 \times 5$

$= 45$ cm

**15. (C)**

Let 'a' be the side of equilateral triangle.

Then According to the question



$$\frac{1}{2}a\times 14+\frac{1}{2}\times a\times 6+\frac{1}{2}a\times 10=\frac{\sqrt{3}}{4}a^2$$

$$\Rightarrow \quad \frac{a}{2}(14+6+10)=\frac{\sqrt{3}}{4}a^2$$

$$\Rightarrow \quad \frac{a}{2}\times 30=\frac{\sqrt{3}}{4}a^2$$

$$\Rightarrow \quad \frac{\sqrt{3}}{4}a=15$$

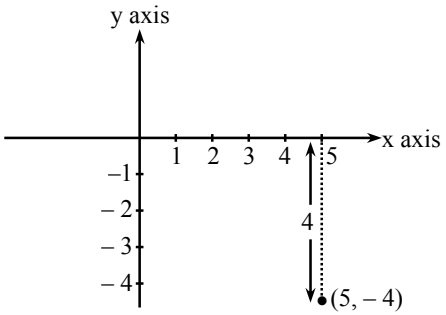
$$\Rightarrow \quad a=\frac{60}{\sqrt{3}}$$

Now area of equilateral triangle

$$=\frac{\sqrt{3}}{4}a^2$$

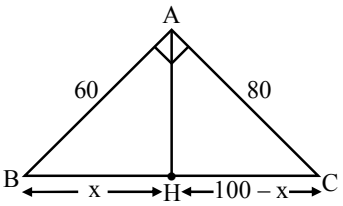
$$=\frac{\sqrt{3}}{4}\times\frac{60}{\sqrt{3}}\times\frac{60}{\sqrt{3}}=\frac{900}{\sqrt{3}}=300\sqrt{3}$$

**16. (D)**




In the above diagram the distance of the point (5, –4) from the x axis = 4 units.

**17. (A)**




$BC^2 = AB^2 + AC^2$

$$\Rightarrow \quad BC^2 = 3600 + 6400$$

BC = 100 cm

Let BH = x then HC = 100 – x

In $\Delta ABH$

$$(AH)^2 = (60)^2 - (x)^2 \qquad \ldots(i)$$

In $\Delta ACH$

$$(AH)^2 = (80)^2 - (100 - x)^2 \quad \ldots(ii)$$

From equation (i) and (ii)

$(60)^2 - x^2 = (80)^2 - (100-x)^2$

$\Rightarrow \quad (100-x)^2 - x^2 = (80)^2 - (60)^2$

$\Rightarrow \quad (100-x+x)(100-x-x) = (80+60)(80-60)$

$\Rightarrow \quad 100(100-2x) = 140 \times 20$

$\Rightarrow \quad 100 - 2x = 28$

$2x = 72$

$x = 36$

**18. (B)**

BE is median of $\Delta ABD$

$\therefore$ ar(BED) = ar(BEA) = x (say)

CE is median of $\Delta ACD$

$\therefore$ ar(AEC) = ar(CED) = y (say)

AD is median of $\Delta ABC$

$\therefore$ ar(ABD) = ar(ACD)

$\Rightarrow$ x + x = y + y

$\Rightarrow$ x = y

Now ar(ABC) = ar(ABD) + ar(ACD)

= 2x + 2y

ar(ABC) = 4x ($\because$ x = y)

$\Rightarrow$ ar(ABC) = 4 × ar(BED)

$\Rightarrow$ $\text{ar(BED)} = \frac{1}{4}\text{ ar(ABC)}$

$= \frac{1}{4} \times 40\sqrt{3} = 10\sqrt{3}$ sq. units

**19. (B)**

Construction – Join CD

Now ABCD is a cyclic quadrilateral.

$\therefore$ $\angle ADC = 180° - 95° = 85°$

EDCF is a cyclic quadrilateral

$\therefore$ $\angle FCD = 180° - 115° = 65°$

Now $\angle APC$ is an exterior angle of $\Delta PDC$.

$\therefore$ $\angle APC = 85° + 65°$

$= 150°$

**20. (A)**

In $\Delta OQR$

OQ = QR

$\therefore$ $\angle QOR = \angle QRO = n°$

Now $\angle OQP = n° + n° = 2n°$ (exterior angle)

OQ = OP (radii of circle)

$\therefore$ $\angle OPQ = \angle OQP$ (angles opposite to equal sides)

$\Rightarrow$ $\angle OPQ = 2n°$

Now $\angle POS$ is an exterior angle of $\Delta POR$

$\Rightarrow$ $\angle POS = \angle OPQ + \angle PRO$

$\Rightarrow \quad m^\circ = 2n^\circ + n^\circ = 3n^\circ$

**21. (B)**

Area of shaded part

= (area of square PQRS) + (area of trapezium STUP) – (area of triangle UTR) – (area of triangle PQR)

$$= (11)^2 + \left(\frac{1}{2}(11+6)\times 6\right) - \frac{1}{2}\times 6\times 17 - \frac{1}{2}\times 11\times 11$$

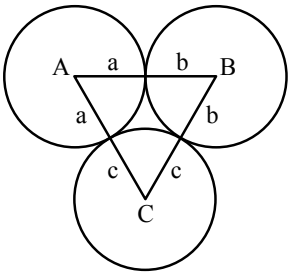
$$= 121 + \frac{1}{2}\times 17\times 6 - \frac{1}{2}\times 17\times 6 - \frac{121}{2}$$

$$= 121 - \frac{121}{2}$$

$$= \frac{121}{2}$$

$$= 60.5 \text{ cm}^2$$

**22. (A)**




$\therefore$ area of $\Delta ABC$

$$= \sqrt{S(S-AB)(S-BC)(S-CA)}$$

Where $S = \frac{1}{2}(AB + BC + CA)$

$$= \frac{1}{2}(a+b+b+c+c+a)$$

$$= a + b + c$$

$\therefore$ area of $\Delta ABC$

$$= \sqrt{(a+b+c)[(a+b+c)-(a+b)][(a+b+c)-(b+c)][(a+b+c)-(c+a)]}$$

$$= \sqrt{(a+b+c)(abc)}$$

**23. (D)**

Since $(2x - 3y) + (3y - 4z) + (4z - 2x) = 0$

Therefore

$$(2x-3y)^3 + (3y-4z)^3 + (4z-2x)^3$$

$$= 3(2x-3y)(3y-4z)(4z-2x)$$

$$= 6(2x-3y)(3y-4z)(2z-x)$$

**24. (C)**

$$x + \frac{1}{x} = -2$$

$\Rightarrow \quad x^2 + 2x + 1 = 0$

$\Rightarrow \quad (x+1)^2 = 0$

$\Rightarrow \quad x = -1$

Now, $x^5 + \frac{1}{x^5} = (-1)^5 + \frac{1}{(-1)^5} = -1 - 1 = -2$

**25. (A)**

$$\frac{1}{1-\sqrt{2}} - \frac{1}{\sqrt{2}-\sqrt{3}} + \frac{1}{\sqrt{3}-\sqrt{4}} - \frac{1}{\sqrt{4}-\sqrt{5}} + \frac{1}{\sqrt{5}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{9}}$$

$$= -\frac{1}{\sqrt{2}-1} + \frac{1}{\sqrt{3}-\sqrt{2}} - \frac{1}{\sqrt{4}-\sqrt{3}} + \frac{1}{\sqrt{5}-\sqrt{4}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{9}-\sqrt{8}}$$

$$= -\frac{\sqrt{2}+1}{2-1} + \frac{\sqrt{3}+\sqrt{2}}{3-2} - \frac{\sqrt{4}+\sqrt{3}}{4-3} + \frac{\sqrt{5}+\sqrt{4}}{5-4} - \frac{\sqrt{6}+\sqrt{5}}{6-5} + \frac{\sqrt{7}+\sqrt{6}}{7-6} - \frac{\sqrt{8}+\sqrt{7}}{8-7} + \frac{\sqrt{9}+\sqrt{8}}{9-8}$$

$$= -\sqrt{2} - 1 + \sqrt{3} + \sqrt{2} - \sqrt{4} - \sqrt{3} + \sqrt{5} + \sqrt{4} - \sqrt{6} - \sqrt{5} + \sqrt{7} + \sqrt{6} - \sqrt{8} - \sqrt{7} + \sqrt{9} + \sqrt{8}$$

$$= \sqrt{9} - 1$$

$$= 3 - 1 = 2$$

# CHEMISTRY

**26. (D)**

(i) 2 moles of $H_2O = 2 \times 18g = 36g$

(ii) 20 moles of $H_2O = 20 \times 18g = 360$ g

(iii) $6.022 \times 10^{23}$ molecules of $H_2O$ = 1 mole of $H_2O$ = 18 g

(iv) $1.2044 \times 10^{23}$ molecules of $H_2O = \frac{1.2044 \times 10^{25}}{6.022 \times 10^{23}}$ moles $= 20 \times 18g = 360g$

**27. (C)**

The product $A_2B$ has properties different from those of substances A and B, it is a compound and hence, cannot be classified as an element.

**28. (D)**

Mass of solute (salt) = 40 g

Mass of solvent (water) = 320 g

We know,

Mass of solution = mass of solute + mass of solvent

= 40 g + 320 g

= 360 g

$$\text{Mass percentage of solution} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

$$= \frac{40}{360} \times 100 = 11.1\%$$

**29. (D)**

Sulphur dissolves in carbon disulphide to form a true solution and it is homogeneous and does not show Tyndall effect.

**30. (C)**

Leaking out of some gas and increasing the volume of the container, increase the distance between the molecules of the gas.

**31. (C)**

On raising temperature, rate of evaporation, rate of diffusion and solubility of solid in liquid increases.

**32. (D)**

Since ice and water are in equilibrium, the temperature would be zero. When we heat the mixture, energy supplied is utilized in melting the ice and the temperature does not change till all the ice melts because of latent heat of fusion. On further heating, the temperature of the water would increase. Therefore, the correct option is (D).

**33. (C)**

In $X_2(SO_4)_3$, total charge on three sulphate ions = 3 × (–2) = –6.

$X_2(SO_4)_3$ is a neutral compound, therefore, total charge on 2 X-atoms = +6.

$\therefore$ Charge on one X-atom = $+\frac{6}{2} = +3$

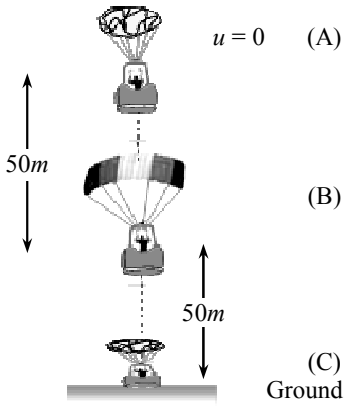
Hence, valency of metal atom X = 3

Therefore, X can be aluminium.

# PHYSICS

**34. (A)**

After bailing out from point A parachutist falls freely under gravity. The velocity acquired by it will 'υ'




From $\upsilon^2 = u^2 + 2as = 0 + 2 \times 9.8 \times 50 = 980$

[As $u = 0, = 9.8 m/s^2, s = 50m$ ]

At point *B*, parachute opens and it moves with retardation of $2m/s^2$ and reach at ground (Point *C*) with velocity of $3m/s$

For the part '*BC*' by applying the equation $\upsilon^2 = u^2 + 2as$

$\upsilon = 3m/s, u = \sqrt{980} m/s, a = -2m/s^2, s = h$

$\Rightarrow (3)^2 = \left(\sqrt{980}\right)^2 + 2 \times (-2) \times h \Rightarrow 9 = 980 - 4h$

$\Rightarrow h = \frac{980 - 9}{4} = \frac{971}{4} = 242.7 \cong 243m.$

So, the total height by which parachutist bail out $= 50 + 243 = 293\,m.$

**35. (B)**

*S* = Area under graph

$= \left(\frac{1}{2} \times 2 \times 2\right) + (2 \times 2) + (3 \times 1) = 9m$

**36. (D)**

Here : Mass of ship $m = 2\times10^7\,kg$.

Force $F = 25\times10^5\,N$

Displacement $s = 25m$

According to the Newton's second law of motion

$F = ma$

$\Rightarrow\ a = \dfrac{F}{m} = \dfrac{25\times10^5}{2\times10^7} = 12.5\times10^{-2}\,m/s^2$

The relation for final velocity is

$\upsilon^2 = u^2 + 2as \Rightarrow \upsilon^2 = 0 + 2\times\left(12.5\times10^{-2}\right)\times 25$

$\Rightarrow \upsilon = \sqrt{6.25} = 2.5m/s.$

**37. (C)**

$$m_G = \frac{m_B\upsilon_B}{\upsilon_G} = \frac{50\times10^{-3}\times30}{1} = 1.5\,kg$$

**38. (B)**

**39. (C)**

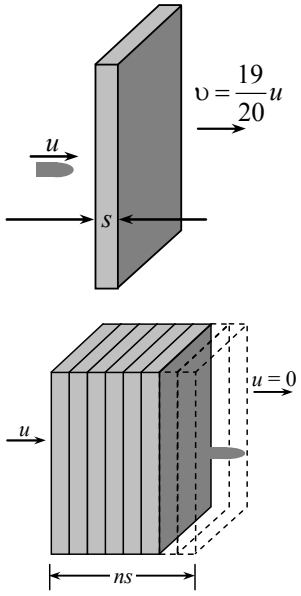
There is no displacement.

**40. (C)**

Let the thickness of one plank be $s$

if bullet enters with velocity $u$ then it leaves with velocity

$$\upsilon = \left(u - \frac{u}{20}\right) = \frac{19}{20}u$$




From $\upsilon^2 = u^2 - 2as$

$$\Rightarrow\left(\frac{19}{20}u\right)^2 = u^2 - 2as \Rightarrow \frac{400}{39} = \frac{u^2}{2as}$$

Now if the $n$ planks are arranged just to stop the bullet then again from

$\upsilon^2 = u^2 - 2as$

$0 = u^2 - 2ans$

$$\Rightarrow n = \frac{u^2}{2as} = \frac{400}{39}$$

$\Rightarrow n = 10.25$

As the planks are more than 10 so we can consider $n = 11$.

**41. (D)**

By definition, $P = \dfrac{dw}{dt} = \dfrac{dk}{dt} = \text{constant}.$

**42. (C)**

Mass does not vary from place to place.

# BIOLOGY

**43. (C)**

(P) $\rightarrow$ Corals are examples of phylum coelenterata.

(Q) → Nereis belongs to phylum-Annelida. The locomotory structure in Nereis is parapodia.

(R) → Phylum-coelenterata and platyhelminthes have no body cavity between epidermis and gastrodermis.

Scolex is found in tapeworm, which belongs to phylum platyhelminthes.

(S) → Mesodermal cells form a single cell during growth of the embryo in annelida, mollusca and arthropoda.

**44. (D)**

P → Fibroblast

Q → Macrophage

R → Mast Cell

S → Plasma Cell

**45. (A)**

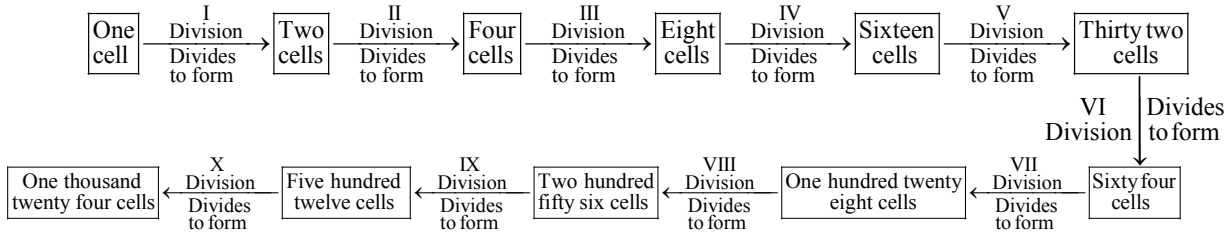
In the process of mitosis, each cell called mother cell divides to form two identical daughter cells. The daughter cells have the same number of chromosomes as mother cell.

Since,

In mitosis 1 cell divides to form 2 daughter cells.

So,

1024 cells will be formed by 10 mitotic divisions as,




**46. (D)**

Lysosomes are formed by Golgi apparatus.

**47. (C)**

Ammonification → Ammonia → Nitrites → Nitrates → Nitrification

(P) (Q) (R) (S) (T)

**48. (C)**

P → Nucleus contains thread-like structures called as chromatin threads, and whenever the cell is about to divide chromatin threads organized into chromosomes.

Q → Chromosomes are composed of DNA and protein.

R → Cytoplasm contains cell organelles, such as mitochondria.

S → Mitochondria releases energy in the form of ATP (Adenosine triphosphate), molecules. ATP is known as the 'energy currency of the cell'.

Mitochondria is also known as semi-autonomous cell organelle as they have their own, DNA and ribosomes.

T → DNA.

**49. (D)**

Japanese encephalitis or brain fever is a viral disease, which is spread through a mosquito bite and infect the brain.

**50. (B)**

P → Aerolar tissue is a type of connective tissue which is found between the skin and muscles, around blood vessels and nerves in the bone marrow. It fills the space inside the organs, support internal organs and helps in repair of tissues.

Q → Cuboidal epithelium forms the lining of kidney tubules and lining of ducts of salivary glands.

R → Squamous epithelial tissue is with extremely thin and flat cells and form a delicate lining and covers the oesophagus and lining of mouth.

S → Tendons are fibrous connective tissue with great strength but limited flexibility and they connects muscle to bone.

T → Muscle to bone.

* * * * *