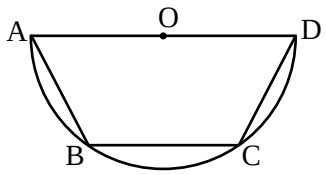
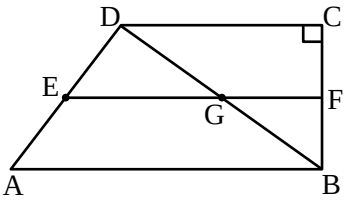
MATHEMATICS

1. ABCD is a quadrilateral whose vertices are on a semicircle such that AB = BC = CD = 8 cm and AD is the diameter of the circle having centre O. Area of the quadrilateral ABCD is:



(a) $64\,cm^2$ (b) $48\,cm^2$ (c) $64\sqrt{3}\,cm^2$ (d) $48\sqrt{3}\,cm^2$

2. ABCD is a trapezium in which $AB \| CD$ and $\angle BCD = 90°$. BD is a diagonal and E is the mid-point of AD. If $EF \| AB$, EF = 16 cm and BC = 5 cm then area of the trapezium ABCD is:



(a) $30\,cm^2$ (b) $40\,cm^2$ (c) $80\,cm^2$ (d) $160\,cm^2$

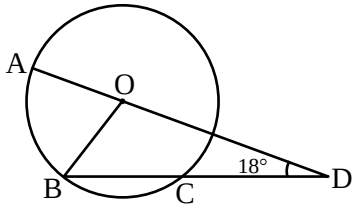
3. If the decimal form of $\frac{n}{33}$ is $3\cdot\overline{m\,5}$, where n and 33 are co-prime and $0 \le m \le 9$ then the maximum value of m + n is:

(a) 131 (b) 124 (c) 139 (d) 129

4. The volume of a solid sphere is $288\pi\ cm^3$. A horizontal plane cuts the sphere at a distance of 3 cm from the centre so that the ratio of the curved surface area of the two parts of the sphere is 3 : 1. The total surface area of the bigger part of the sphere is:

(a) $36\ \pi$ (b) $108\ \pi$ (c) $135\ \pi$ (d) $144\ \pi$

5. In the given figure A, B and C are three points on a circle whose centre is O. The lines AO and BC are produced to meet at D. If CD = OA and $\angle ADB = 18°$ then $\angle AOB$ is:

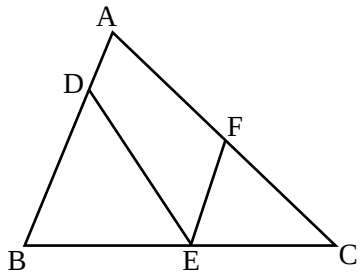


(a) 54° (b) 60° (c) 70° (d) 36°

6. When a polynomial P(x) is divided by (x – 1) the remainder is 3. When P(x) is divided by (x – 3), the remainder is 5. If r(x) is the remainder when P(x) is divided by (x – 1) (x – 3), then the value of r (–3) is:

(a) 4 (b) –2 (c) –4 (d) –1

7. In the given figure, D, E and F are points on the sides AB, BC and CA respectively such that BD = BE and CE = CF. If ∠BAC = 38°, then ∠DEF is:



(a) 72° (b) 71° (c) 76° (d) 75°

8. A cone has its height equal to one-third of its diameter. If the height measures p cm, then its volume, in terms of p is:

(a) πp^3 cm^3 (b) $\frac{1}{4}\pi p^3$ cm^3 (c) $\frac{1}{2}\pi p^3$ cm^3 (d) $\frac{3}{4}\pi p^3$ cm^3

9. If $x = \sqrt{\frac{\sqrt{5}+1}{\sqrt{5}-1}}$, then find the value of $7x^2 - 7x$.

(a) 7 (b) 6 (c) 5 (d) 4

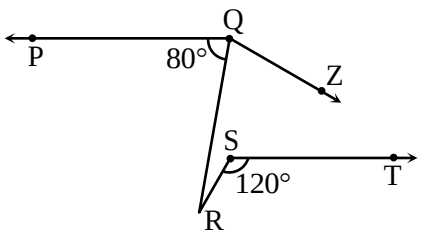
10. Simplify: $\left(2^{1/2} \times 4^{3/4} \times 8^{5/6} \times 16^{7/8} \times 32^{9/10} \times 64^{11/12} \times 128^{13/14} \times 256^{15/16}\right)^{5/16}$

(a) 1 (b) 512 (c) 1024 (d) 2048

11. If $a + b + c = 2$, $a^2 + b^2 + c^2 = 30$ and $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = -1.3$, then $a^3 + b^3 + c^3 =$

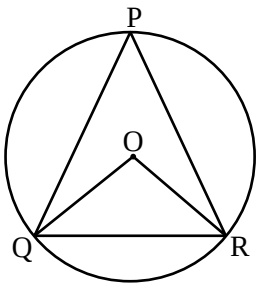
(a) 8 (b) 116 (c) 60 (d) 91

12. In the given figure, PQ$\|$ST and ∠RQZ = 2∠QRS. Find ∠RQZ.



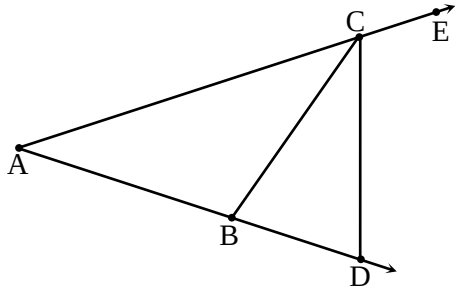
(a) 30° (b) 40° (c) 50° (d) 60°

13. In the given figure, O is the centre of the circle. ∠OQP = 30° and ∠ORP = 25°. Find ∠ORQ.



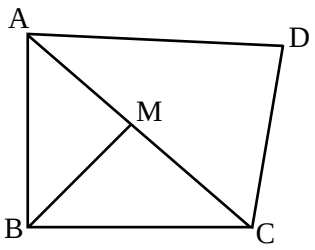
(a) 25° (b) 35° (c) 45° (d) 55°

14. In the given figure, sides AB and AC of ΔABC are produced to D and E respectively. If AB = BC = CD and ∠DCE = 105°, then ∠CDB is:



(a) 60° (b) 65° (c) 70° (d) 75°

15. In the given figure ABCD is a quadrilateral in which ∠ABC = 90° and M is the mid-point of AC. If BM = 20 cm, AD = 32 cm and CD = 24 cm, then the area of ΔADC is:



(a) 384 cm^2 (b) 640 cm^2 (c) 520 cm^2 (d) 434 cm^2

16. If x + y + z = 0, then $\left(\frac{y-z-x}{2}\right)^3+\left(\frac{z-x-y}{2}\right)^3+\left(\frac{x-y-z}{2}\right)^3=?$

(a) 3xyz (b) 2xyz (c) xyz (d) 0

17. ABCD is a parallelogram. P is any point on the side AB such that DP and CP are angle bisectors of ∠ADC and ∠BCD respectively. Then DC is equal to:

(a) CB (b) 2CB (c) 3CB (d) 4CB

18. If graph of the linear equation 2x + y = 6 intersect the x axis and y axis at A and B respectively then the length of AB = ?

(a) 9 units (b) 6 units (c) $3\sqrt{5}$ units (d) $4\sqrt{3}$ units

19. If a, b, c and d all are positive real numbers such that b > a, d > c then the area of quadrilateral formed by straight lines x = a, x = b, y = c and y = d is:

(a) $\frac{1}{2}(a+b)(c+d)$ (b) $\frac{1}{2}(b-a)(d-c)$ (c) (a + b) (c + d) (d) (b – a) (d – c)

20. If $x^2+y^2+z^2=2(x-y-z)-3$ then the value of 2x – 3y + 4z is:

(a) –1 (b) –2 (c) 1 (d) 2

21. The given table shows the marks obtained by 80 students in a class test with maximum marks 60.

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	above 50
Number of students	6	13	x	y	16	4

A student of the class is selected at random. The probability that he gets less than 50% marks is $\frac{9}{20}$.

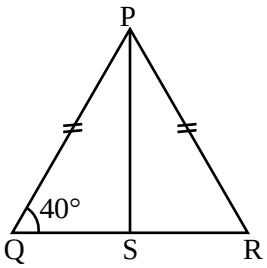
Then value of y is:

(a) 24 (b) 17 (c) 23 (d) 19

22. How many meters of cloth, 5 m wide, will be required to make a conical tent, the radius of whose base is 7 m and height is 24 m? (Take $\pi = 22/7$)

(a) 120 m (b) 110 m (c) 100 m (d) 105 m

23. In the given figure PS is the median, PQ = PR and $\angle Q = 40°$ then $\angle RPS$ is:



(a) 60° (b) 30° (c) 40° (d) 50°

24. $(27)^{0.23}\times(3)^{0.31}$ is equal to:

(a) 1 (b) 2 (c) 3 (d) 9

25. Solve the following:

$$\frac{(0.13)^2+(0.21)^2}{(0.39)^2+(0.63)^2}-\frac{(0.25)^3+(0.43)^3-(0.68)^3}{3\times(0.25)\times(0.43)\times(0.68)}$$

(a) $\frac{10}{9}$ (b) $\frac{-2}{3}$ (c) $\frac{1}{9}$ (d) $\frac{-8}{9}$

CHEMISTRY

26. Match column I with column II and choose the correct option from the code given below.

	Column I		**Column II**
P	Electron	(i)	Helium nucleus
Q	Proton	(ii)	Hydrogen atom
R	Neutron	(iii)	Helium atom
S	Alpha particle	(iv)	Hydrogen ion
		(v)	Hydrogen nucleus
		(vi)	Positive charge

(a) P-ii, iii, v; Q-i, ii, iii, iv, v, vi; R-i, iii, S-iv, vi (b) P-i, ii, iii, iv; Q-i, ii, iii, iv, v; R-i, ii, iii; S-i, vi

(c) P-ii, iii; Q-i, ii, iii, iv, v, vi; R-i, iii; S-i, vi (d) P-i, ii, iii; Q-i, ii, iii, iv, v; R-i, ii, iii; S-i

27. The number of neutrons in 360g of water is $P\times10^{24}$ and number of protons in 11.2L of oxygen gas at S.T.P is $Q \times 10^{24}$. What is the value of P/Q?

[Given: Volume of 1 mole of any gas at STP = 22.4L, Avogadro's no. = 6×10^{23}]

(a) 3.33 (b) 2 (c) 10 (d) 20

28. An element X exists in nature as three isotopic forms. Their percentage of abundance, along with their atomic mass, is given in the table below. What is the average atomic mass of the element X?

Isotope	**Abundance (%)**	**Atomic mass**
X^{220}	12.78	220.0u
X^{218}	13.00	218.0u
X^{221}	74.22	221.0u

(a) 220.38u (b) 220.48u (c) 220.68u (d) 220.88u

29. Which of the following statements about colloids is incorrect?

P. A colloid is a homogenous mixture.

Q. They settle down when left undisturbed

R. Centrifugation technique cannot be used to separate the colloidal particles.

S. Face cream is a colloid in which the dispersed phase is gas and the dispersing medium is liquid.

T. Automobile exhaust is an aerosol in which the dispersed phase is liquid and the dispersing medium is gas.

(a) P, Q and R (b) P, R and S (c) Q, R and T (d) All are incorrect

30. **Assertion (A)**: On adding dilute sulphuric acid to a mixture of iron and sulphur, hydrogen sulphide gas is obtained.

Reason (R): Hydrogen sulphide is a colourless gas with the smell of rotten egg.

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true and R is not the correct explanation of A

(c) A is true but R is false

(d) A is False but R is true

31. Some fibres along with their ***nature, type and uses*** are arranged in the table given below. Choose the correct option from the following.

	Fibre	***Nature***	***Type***	***Uses***
(a)	Cotton	Natural	Non-Biodegradable	Textile materials
(b)	Rayon	Man-made	Biodegradable	Blankets
(c)	Nylon	Natural	Biodegradable	Ropes
(d)	Polyester	Man-made	Non Biodegradable	Bottles

32. Which of the following chemical substance is used in making fire extinguisher?

(a) Sodium Sulphate (b) Sodium Nitrate (c) Sodium Bicarbonate (d) Sodium Phosphate

33. Considering the following statements, which of the following set of statements is correct?

(I) The Bose-Einstein Condensate is formed by cooling a gas of extremely high density, to super low temperature.

(II) A solution of copper sulphate does not show Tyndall effect.

(III) A mixture of acetone and water can be separated by using a separating funnel.

(IV) In water purification system, a sedimentation tank is used to sediment the suspended impurities.

(V) Air is a heterogeneous mixture and can be separated into its components by fractional distillation.

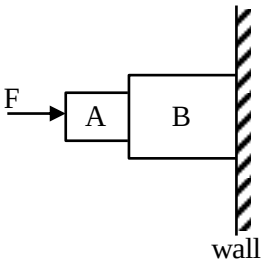
(a) I, II, IV, V (b) II, III, V (c) I, II, III, IV (d) II only

PHYSICS

34. A bus travels, first one-third of the distance at a speed of 10 km/h, the next one fourth at 20 km/h and the remaining at 40 km/h. The average speed of the bus is nearly:

(a) 9 km/h (b) 16 km/h (c) 18 km/h (d) 48 km/h

35. The figure below shows two blocks A and B pushed against the wall with the force F. The wall is smooth but the surfaces of A and B which are in contact are rough. Which of the following is true for the system of blocks to be at rest against the wall?



(a) F should be equal to weight of A and B (b) F should be less than the weight of A and B

(c) F should be more than the weight of A and B (d) System cannot be in equilibrium (at rest)

36. Friction does not depend upon which of the following factors?

(a) The nature of the surface (b) The normal reaction

(c) The roughness of the surface (d) The area of contact

37. A block of wood is kept on the floor of a stationary elevator. The elevator begins to descend with an acceleration of 12 m/s^2. If g = 10 ms^{-2}, then the displacement of the block during first 0.2 s, after the start, is:

(a) 0.02 m (b) 0.2 m (c) 0.1 m (d) 0.04 m

38. The acceleration due to gravity on the planet A is 9 times the acceleration due to gravity on planet B. A man can jump to a height of 2 m on the surface of A. What is the height of jump by the same person on the planet B?

(a) 2/9 m (b) 18 m (c) 6 m (d) 2/3 m

39. A rope is used to lower vertically a block of mass M by a distance x with a constant downward acceleration, $\frac{g}{2}$. The work done by the rope on the block is:

(a) $-Mgx$ (b) $\frac{-Mgx^2}{2}$ (c) $\frac{-Mgx}{2}$ (d) $-Mgx^2$

40. A piece of ice is floating in a jar containing water. When the ice melts, then the level of water:

(a) rises (b) falls

(c) remains unchanged (d) rises or falls depending upon the mass of ice

41. Pressure applied to an enclosed fluid is transmitted undiminished to every portion of the fluid and walls of the containing vessel. This law was first formulated by:

(a) Bernoulli (b) Archimedes (c) Boyle (d) Pascal

42. Light of different colours propagates through a medium:

(a) with the speed of medium . (b) with different speed.

(c) with the speed of sound. (d) having the equal speed.

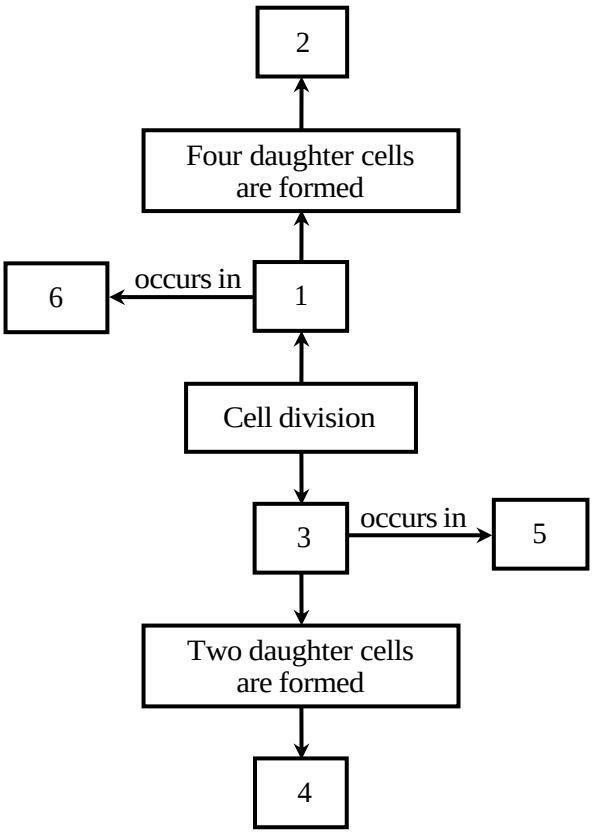
BIOLOGY

43. In photosynthetic prokaryotic bacteria chlorophyll is associated with:

(a) Mesosomes (b) Plastids

(c) Membranous vesicles (d) Cytoplasm

44. Analyse the given flow chart and choose the correct option:



	1	2	3	4	5	6
(a)	Mitosis	Chromosome number is same as that of the parent cell	Meiosis	Chromosome number is half of the parent cell	Somatic cell	Germ cell
(b)	Meiosis	Chromosome number is same as that of the parent cell	Mitosis	Chromosome number is half of the parent cell	Somatic cell	Germ cell
(c)	Meiosis	Chromosome number is half of the parent cell	Mitosis	Chromosome number is same as that of the parent cell	Somatic cell	Germ cell
(d)	Meiosis	Chromosome number is half of the parent cell	Mitosis	Chromosome number is same as that of the parent cell	Germ cell	Somatic cell

45. As per the given characters which option is/are correct?

Characters:

- ❖ Has differentiated plant parts.
- ❖ With vascular tissue.
- ❖ Does not produce seeds.

(a) Cycas (b) Funaria (c) Marsilea (d) Chara

46. There is some information regarding some cell organelles:

(1) This structure permits the cells of fungi to withstand hypotonic media without bursting.

(2) This structure may be responsible for making complex sugars from simple sugars in some cases.

(3) This organ acts as a passageway for intra cellular transport and as a manufacturing surface.

Choose the correct option as per the given information:

(a) (1) – Cell Wall, (2) – Golgi Apparatus, (3) – Endoplasmic Reticulum

(b) (1) – Cell Membrane, (2) – Golgi Apparatus, (3) – Ribosome

(c) (1) – Cell Membrane, (2) – Endoplasmic Reticulum , (3) – Ribosomes

(d) (1) – Cell Wall, (2) – Endoplasmic Reticulum , (3) – Golgi Apparatus

47. Which option is correct regarding changes in female at puberty?

(1) ovulation

(2) enlargement of breasts

(3) broadening of shoulders

(4) hair grows under the arms and in the pubic region

(a) 1, 2, 3 (b) 2, 3, 4 (c) 1, 3, 4 (d) 1, 2, 4

48. Examples of external fertilization are:

(1) Test tube babies (2) Fertilization in dogs

(3) Fertilization in hen (4) Fertilization in starfish

(a) Both 1 and 2 (b) Both 2 and 3 (c) Both 3 and 4 (d) Both 1 and 4

49. Cork cells are:

(a) lignified (b) suberised (c) cutinised (d) pectinised

50. Features of tissues:

(1) This tissue is uninucleate, cylindrical, involuntary.

(2) This tissue is uninucleate, with pointed ends, involuntary.

(3) This tissue is very elastic, has considerable strength and joins two bones.

(4) Nerve impulses are conducted towards cell body by this tissue.

As per the given features choose the correct option:

(a) (1) – Smooth muscles, (2) – Cardiac muscles, (3) – Tendon, (4) – Axon

(b) (1) – Smooth muscles, (2) – Striated muscles, (3) – Ligaments, (4) – Dendrite

(c) (1) – Cardiac muscles, (2) – Smooth muscles, (3) – Ligaments, (4) – Dendrite

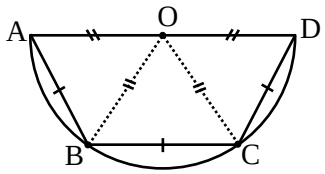
(d) (1) – Cardiac muscles, (2) – Striated muscles, (3) – Tendon, (4) – Axon

* * * * *

DETAIL SOLUTION OF SET-A

MATHEMATICS

1. (d)



Join OB and OC.

Now, OA = OB = OC = OD = radius

$\Delta OAB \cong \Delta OBC \cong \Delta OCD$ (SSS)

$\therefore \angle AOB = \angle BOC = \angle COD = \theta$ (say)

Then, $\angle AOB + \angle BOC + \angle COD = 180°$

$\Rightarrow \theta + \theta + \theta = 180° \Rightarrow 3\theta = 180° \Rightarrow \theta = 60°$

Now, $\angle OAB + \angle OBC + \angle AOB = 180°$

$\Rightarrow 2\angle OAB = 180° - \angle AOB = 180° - 60°$

$\Rightarrow \angle OAB = 60° = \angle OBC$

$\because \angle OAB = \angle OBA = \angle AOB = 60°$

$\therefore \Delta OAB$ is equilateral

Similarly, ΔOBC and ΔOCD will also be equilateral triangle

Now, area of quadrilateral ABCD = ar(ΔOAB) + ar(ΔOBC) + ar(OCD)

$$= \frac{\sqrt{3}}{4}\times 8^2 + \frac{\sqrt{3}}{4}\times 8^2 + \frac{\sqrt{3}}{4}\times 8^2$$

$$= 3\times\frac{\sqrt{3}}{4}\times 64 = 48\sqrt{3}\ \text{cm}^2$$

2. (c)

In ΔDAB, E is mid-point of AD and $EG \| AB$ …… (given)

$\therefore$ G is mid-point of BD

Since segment joining the mid-points of two sides of a triangle is half of the third side

$\therefore \quad EG = \frac{1}{2}AB$ …(i)

Similarly, $GF = \frac{1}{2}CD$ …(ii)

From (i) and (ii), we have, $EG + GF = \frac{1}{2}AB + \frac{1}{2}CD$

$\Rightarrow \quad EF = \frac{1}{2}(AB + CD) = 16\,cm$ …(iii) ($\because$ EF = 16 cm)

Now, $ar(ABCD) = \frac{1}{2}(AB + CD) \times BC = 16 \times 5 = 80\,cm^2$

3. (a)

Let $x = 3 \cdot \overline{m\,5}$ …(i)

$\therefore \quad 100\,x = 3\,m\,5 \cdot \overline{m\,5}$ …(ii)

On subtracting (i) from (ii), we get

$99x = 3m5 - 3 = 3m2$

$\Rightarrow \quad x = \frac{3m2}{99}$

So, $\frac{3m2}{99} = \frac{n}{33}$

$\Rightarrow \quad 3m2 = 3n$ …(iii)

From (iii), it is clear that 3m2 is multiple of 3. So, m = 1, 4 or 7

For maximum of (m + n), m should be 7, then $n = \frac{3m2}{3} = \frac{372}{3} = 124$

$\therefore \quad \max(x + y) = 124 + 7 = 131$

4. (c)

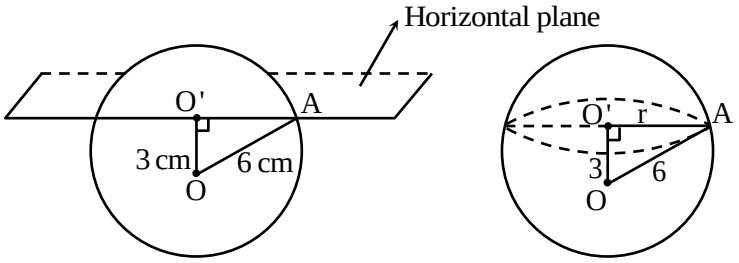
Let radius of the sphere be R.

Volume of sphere = $\frac{4}{3}\pi R^3$

$\Rightarrow \quad \frac{4}{3}\pi R^3 = 288\pi cm^3$

$\Rightarrow \quad R^3 = \frac{288 \times 3}{4} cm^3 = 72 \times 3\, cm^3$

$\Rightarrow$ R = 6 cm



Let radius of the top of the bigger part be r

then, in ΔO'OA we have

$O'O^2 + O'A^2 = OA^2$

$\Rightarrow \quad O'A^2 = OA^2 - O'O^2 = 6^2 - 3^2 = 27$

$\Rightarrow \quad O'A = 3\sqrt{3}$ cm $\quad \Rightarrow \quad r = 3\sqrt{3}$ cm

Since plane divides the surface area of the sphere in the ratio 3 : 1

$\therefore$ curved surface are of bigger part = $\frac{3}{4} \times 4\pi R^2$

$\Rightarrow$ CSA of bigger part = $\frac{3}{4} \times 4\pi \times 6^2\ cm^2$

$= 108\pi\ cm^2$

Area of top of bigger part = πr^2

$= \pi \times \left(3\sqrt{3}\right)^2\ cm^2$

$= 27\pi\ cm^2$

Therefore total surface area of the bigger part = CSA of bigger part + area of top of bigger part

= 108 π cm^2 + 27 π cm^2 =135 π cm^2

5. (a)

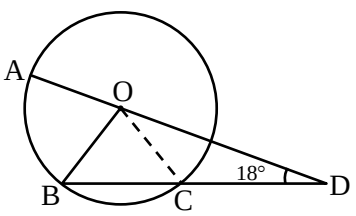
Join OC

OA = CD …(i) (given)

and OA = OC …(ii) (radius)

From (i) and (ii)

CD = OC



Now, in ΔOCD,

$CD = OC \Rightarrow \angle CDO = \angle COD = 18°$

$\therefore \angle OCB = \angle CDO + \angle COD = 18° + 18° = 36°$ (exterior angle of ΔOCD)

But $OB = OC$ (radius)

$\therefore \angle OBC = \angle OCB = 36°$

Now, $\angle AOB = \angle OBD + \angle ODB$ (exterior angle of ΔOCD)

$\Rightarrow \angle AOB = \angle OBD + \angle ODC = 36° + 18° = 54°$

6. (d)

We know that if P(x) is divided by (x – a) then remainder is P(a)

$\therefore P(1) = 3$ and $P(3) = 5$

Degree of (x – 1) (x – 3) is two.

Therefore maximum degree of remainder when P(x) is divided by (x – 1) (x – 3) is one.

General form of a degree one polynomial is ax + b.

Let Q(x) and r(x) = ax + b be the quotient and remainder when P(x) is divided by (x – 1) (x – 3)

Then, $P(x) = (x – 1)(x – 3) Q(x) + ax + b$

Now, $P(1) = 0 + a + b$

$\Rightarrow 3 = a + b$ …(i)

and $P(3) = 0 + 3a + b$

$\Rightarrow 5 = 3a + b$ …(ii)

On subtracting equation (i) from equation (ii),

$2 = 2a \Rightarrow a = 1$

Put a = 1 in (i), we get,

$3 = 1 + b \Rightarrow b = 2$

$\therefore r(x) = ax + b = x + 2$

$\Rightarrow r(–3) = –3 + 2 = –1$

7. (b)

Since BD = BE

$\therefore \angle BED = \angle BDE = \theta$ (say)

and $CE = CF$

$\therefore \angle CFE = \angle CEF = \alpha$ (say)

Now in ΔBDE, $\angle B = 180° - 2\theta$

And in ΔCEF, $\angle C = 180° - 2\alpha$

In ΔABC,

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

$\Rightarrow 38° + 180° - 2\theta + 180° - 2\alpha = 180°$

$\Rightarrow \theta + \alpha = \frac{180° + 38°}{2} = 109°$

Now, BEC is a straight line

$\therefore \angle BEC = 180°$

$\Rightarrow \theta + \angle DEF + \alpha = 180°$

$\Rightarrow \angle DEF = 180° - (\theta + \alpha)$

$\Rightarrow \angle DEF = 180° - 109° = 71°$

8. (d)

$p = \frac{2r}{3} \quad \Rightarrow \quad r = \frac{3p}{2}$

Volume of the cone = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \times \left(\frac{3p}{2}\right)^2 \times p$

$= \frac{3}{4}\pi p^3 \text{ cm}^3$

9. (a)

$x = \sqrt{\frac{\sqrt{5}+1}{\sqrt{5}-1}} = \sqrt{\frac{\sqrt{5}+1}{\sqrt{5}-1} \times \frac{\sqrt{5}+1}{\sqrt{5}+1}}$

$= \sqrt{\frac{\left(\sqrt{5}+1\right)^2}{\sqrt{5}^2 - 1^2}} = \frac{\sqrt{5}+1}{2}$

Now, $7x^2 - 7x = 7x(x-1)$

$$= 7 \times \left(\frac{\sqrt{5}+1}{2}\right)\left(\frac{\sqrt{5}+1}{2}-1\right)$$

$$= 7 \times \left(\frac{\sqrt{5}+1}{2}\right)\left(\frac{\sqrt{5}-1}{2}\right)$$

$$= 7 \times \frac{\left(\sqrt{5}^2 - 1^2\right)}{4} = \frac{7\times(5-1)}{4}$$

$= 7$

10. (c)

$$\left(2^{1/2} \times 4^{3/4} \times 8^{5/6} \times 16^{7/8} \times 32^{9/10} \times 64^{11/12} \times 128^{13/14} \times 256^{15/16}\right)^{5/16}$$

$$= \left(2^{1/2} \times \left(2^2\right)^{3/4} \times \left(2^3\right)^{5/6} \times \left(2^4\right)^{7/8} \times \left(2^5\right)^{9/10} \times \left(2^6\right)^{11/12} \times \left(2^7\right)^{13/14} \times \left(2^8\right)^{15/16}\right)^{5/16}$$

$$= \left(2^{1/2} \times 2^{3/2} \times 2^{5/2} \times 2^{7/2} \times 2^{9/2} \times 2^{11/2} \times 2^{13/2} \times 2^{15/2}\right)^{5/16}$$

$$= \left(2^{1/2+3/2+5/2+7/2+9/2+11/2+13/2+15/2}\right)^{5/16}$$

$$= \left(2^{64/2}\right)^{5/16} = 2^{32\times\frac{15}{16}} = 2^{10} = 1024$$

11. (b)

$a + b + c = 2$

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

$\Rightarrow a^2 + b^2 + c^2 + 2\left(ab + bc + ca\right) = 4$

$\Rightarrow 30 + 2(ab + bc + ca) = 4$ $\quad [\because \ a^2 + b^2 + c^2 = 30]$

$\Rightarrow \quad ab + bc + ca = -13$ $\quad \ldots(i)$

Now $\quad \frac{1}{a} + \frac{1}{b} + \frac{1}{c} = -1.3$ $\quad$ (given)

$\Rightarrow \quad \frac{ab + bc + ca}{abc} = -1.3$

$\Rightarrow \quad abc = \frac{-(ab+bc+ca)}{1.3} = \frac{-10(ab+bc+ca)}{13}$

$= \frac{-10\times(-13)}{13} = 10$ (From (i))

$\Rightarrow$ abc = 10

Now, $a^3+b^3+c^3-3abc = (a+b+c)\left[a^2+b^2+c^2-(ab+bc+ca)\right]$

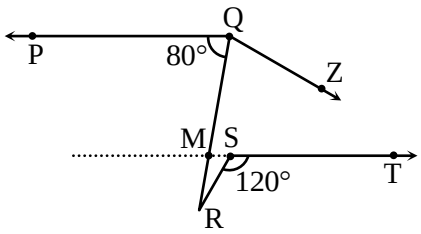
$\Rightarrow \quad a^3+b^3+c^3-3\times10 = 2\left[30-(-13)\right]$

$\Rightarrow \quad a^3+b^3+c^3 = 30+2\times43 = 30+86$

= 116

12. (b)

Produce TS such that it intersect QR at M.



$\angle SMQ = \angle PQM = 80°$ (alt interior angles)

then $\angle RMS = 180° - \angle SMQ$

$= 180° - 80° = 100°$

Now, $\angle RST = \angle SRM + \angle RMS$ (exterior angle of ΔRMS)

$\Rightarrow \quad \angle RST = \angle QRS + \angle RMS$

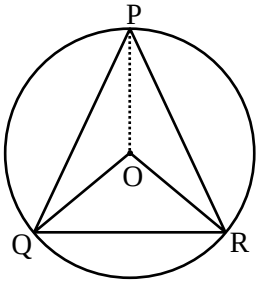
$\Rightarrow \quad 120° = \angle QRS + 100°$

$\Rightarrow \quad \angle QRS = 20°$

Now, $\angle RQZ = 2\angle QRS$ (given)

$\Rightarrow \quad \angle RQZ = 2 \times 20° = 40°$

13. (b)



Join OP

In ΔPOR, $\angle OPR = \angle ORP = 25°$ [$\because$ OP = OR]

In ΔOPQ, $\angle OPQ = \angle OQP = 30°$ [$\because$ OP = OQ]

$\therefore \quad \angle QPR = \angle OPQ + \angle OPR = 25° + 30° = 55°$

$\angle QOR = 2\angle QPR$ (Angle subtended at the centre by a chord of a circle is twice the angle subtended at the circumference in the same segment).

$\therefore \quad \angle QOR = 2 \times 55° = 110°$

In ΔQOR, $\angle ORQ = \angle RQO = \frac{1}{2}(180° - \angle QOR)$

$$= \frac{1}{2}(180° - 110°) = 35°$$

$\therefore \quad ORQ = 35°$

14. (c)

Let $\angle CAB = x$,

then $\angle BCA = x$ [$\because$ AB = BC]

$\angle CBD = 2x$ (exterior angle of ΔCAB)

$\therefore \quad \angle CDB = 2x$ ($\because$ BC = CD)

Now, $\angle DCE = \angle CAB + \angle ADC$ (exterior angle of ΔCAD)

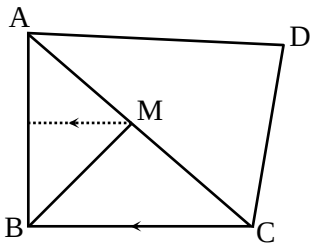
$\Rightarrow \quad \angle DCE = \angle CAB + \angle CDB$

$\Rightarrow \quad 105° = x + 2x = 3x$

$\Rightarrow \quad x = 35°$

$\therefore \quad \angle CDB = 2x = 2 \times 35° = 70°$

15. (a)



Draw MP||BC

In ΔABC,

M is mid-point of AC and MP||BC

therefore P is mid-point of AB (converse of mid-point theorem)

$\therefore \quad PA = PB$

$\angle APM = \angle ABC = 90°$ (corresponding angles)

$\because \quad MP \perp AB$

So, $\Delta APM \cong \Delta BPM$ (SAS)

$\Rightarrow \quad AM = BM$

but AM = CM ($\because$ M is mid-point of AC)

$\therefore$ AM = CM = BM = 20 cm

AC = 2 AM = 40 cm

Semi perimeter of $\Delta ADC = s = (40 + 32 + 24) = 48$ cm

ar(ΔADC) = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{48\times(48-40)\times(48-32)\times(48-24)}$

$= \sqrt{48\times8\times16\times24}$

$= \sqrt{(24\times2)\times8\times(8\times2)\times24}$

$= 24 \times 8 \times 2 = 384\ cm^2$

16. (a)

$$\left(\frac{y-z-x}{2}\right)^3+\left(\frac{z-x-y}{2}\right)^3+\left(\frac{x-y-z}{2}\right)^3$$

$$=\left(\frac{y-(z+x)}{2}\right)^3+\left(\frac{z-(x+y)}{2}\right)^3+\left(\frac{x-(y+z)}{2}\right)^3$$

$$=\left(\frac{y-(-y)}{2}\right)^3+\left(\frac{z-(-z)}{2}\right)^3+\left(\frac{x-(-x)}{2}\right)^3 \qquad [\because\ x + y + z = 0]$$

$$=\left(\frac{2y}{2}\right)^3+\left(\frac{2z}{2}\right)^3+\left(\frac{2x}{2}\right)^3$$

$= y^3 + z^3 + x^3 = 3xyz$ [$\because\ a^3+b^3+c^3 = 3abc$, if a + b + c = 0]

17. (b)

DP bisects $\angle CDA$

$\Rightarrow\ \angle CDP = \angle ADP$ …(i)

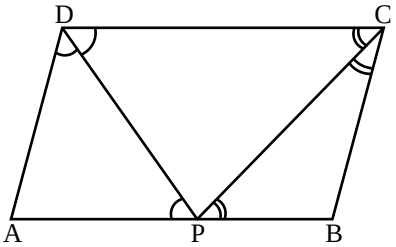
and $\angle APD = \angle CDP$ …(ii) (alt interior angles)

from (i) and (ii), $\angle ADP = \angle APD$

$\Rightarrow$ AD = AP …(iii)

Similarly, $\angle CPB = \angle PCD = \angle PCB$

$\Rightarrow$ BP = BC …(iv)



Now DC = AB (opposite sides of a parallelogram)

$\Rightarrow$ DC = AP + BP

= AD + BC [from (iii) and (iv)]

= 2BC ($\because$ AD = BC)

= 2CB

18. (c)

Any point on x-axis is in the form (a, 0) and on y-axis is in the form (0, b).

Let co-ordinates of A be (a, 0) and coordinates of B be (0, b).

Since point A(a, 0) lies on 2x + y = 6

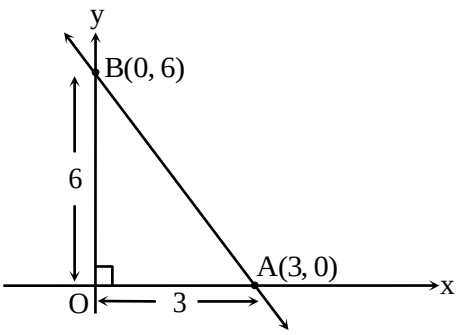
$\therefore$ 2a + 0 = 6 $\Rightarrow$ a = 3

So, co-ordinates of A are (3, 0)

Also B(0, b) lies on 2x + y = 6

$\therefore$ 2 × 0 + b = 6 $\Rightarrow$ b = 6

So, co-ordinates of B are (0, 6)



Now, In ΔOAB,

$OA^2 + OB^2 = AB^2$

$\Rightarrow$ $6^2 + 3^2 = AB^2$

$\Rightarrow$ $AB^2 = 45$

$AB = \sqrt{45}$

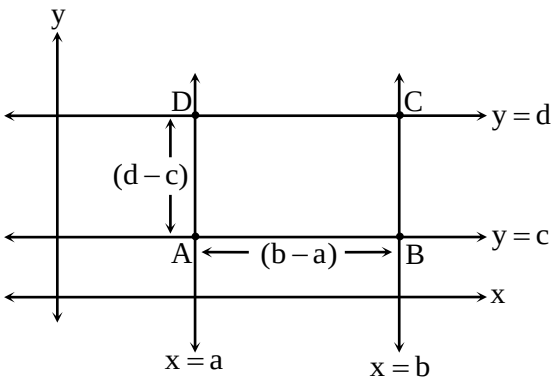
$= 3\sqrt{5}$ units

19. (d)

x = a and x = b are straight lines parallel to y-axis.

y = c and y = d are straight lines parallel to x-axis.

Point of intersection of these lines form a rectangle ABCD



Clearly, length and width of rectangle are respectively (b – a) and (d – c)

$\therefore$ Required area = (b – a) (d – c)

20. (c)

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

$\Rightarrow \quad (x^2 - 2x) + (y^2 + 2y) + (z^2 + 2z) = -3$

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

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

It is possible only when x = 1, y = –1 and z = –1

$\therefore$ required value = 2x – 3y + 4z

$= 2 \times 1 - 3 \times (-1) + 4 \times (-1)$

$= 2 + 3 - 4 = 1$

21. (a)

Maximum marks is 60

$\therefore \quad 50\%$ marks $= 60 \times \frac{50}{100} =$ 30 marks

Therefore less than 50% marks = less than 30 marks

Total number of students = 80

Number of students scoring less than 30 marks = 6 + 13 + x = 19 + x

$\therefore \quad$ Probability (less than 50% marks) $= \frac{19 + x}{80}$

But this probability is equal to $\frac{9}{20}$ (given)

$\therefore \quad \frac{19 + x}{80} = \frac{9}{20}$

$\Rightarrow$ 19 + x = 36 $\Rightarrow$ x = 17

Now, Total no. of students = 80

$\Rightarrow$ 6 + 13 + x + y + 16 + 4 = 80

$\Rightarrow$ 39 + x + y = 80

$\Rightarrow$ $39 + 17 + y = 80$

$\Rightarrow$ $y = 24$

22. (b)

Let L be the length of the cloth required to make a conical tent.

Slant height of cone = $\ell = \sqrt{h^2 + r^2}$

$= \sqrt{24^2 + 7^2}$

$= 25$ m

According to question,

Area of cloth = curved surface area of conical tent

$\Rightarrow L \times 5 = \pi r \ell$

$\Rightarrow L \times 5 = \frac{22}{7} \times 7 \times 25$

$\Rightarrow L = \frac{22}{7} \times 7 \times 25 \times \frac{1}{5} = 110$ m

23. (d)

PS is median, therefore QS = SR

$\Delta PQS \cong \Delta PRS$ (SSS)

$\Rightarrow \angle Q = \angle R = 40°$

and $\angle QPS = \angle RPS = \frac{\angle QPR}{2}$

In ΔPQR, $\angle QPR + \angle Q + \angle R = 180°$

$\Rightarrow \angle QPR + 40° + 40° = 180°$

$\Rightarrow \angle QPR = 100°$

$\therefore \angle RPS = \frac{\angle QPR}{2} = \frac{100°}{2} = 50°$

24. (c)

$(27)^{0.23} \times (3)^{0.31} = (3^3)^{0.23} \times (3)^{0.31}$

$= (3)^{0.69} \times (3)^{0.31}$

$= (3)^{1.00} = 3^1 = 3$

25. (a)

$$\frac{(0.13)^2+(0.2)^2}{(0.39)^2+(0.63)^2}=\frac{(0.13)^2+(0.21)^2}{9\left[(0.13)^2+(0.21)^2\right]}=\frac{1}{9}$$

Let a = 0.25, b = 0.43, c = – 0.68

Here a + b + c = 0.25 + 0.43 – 0.68 = 0

$\therefore \quad a^3+b^3+c^3=3abc$

So, $\frac{(0.25)^3+(0.43)^3-(0.68)^3}{3\times(0.25)\times(0.43)\times(0.68)}=\frac{3\times(0.25)\times(0.43)\times(-0.68)}{3\times(0.25)\times(0.43)\times(0.68)}$

$$=\frac{-3\times(0.25)\times(0.43)\times(0.68)}{3\times(0.25)\times(0.43)\times(0.68)}=-1$$

Therefore required value = $\frac{1}{9}-(-1)$

$$=\frac{1}{9}+1=\frac{10}{9}$$

CHEMISTRY

26. (c)

***Explanation*:**

P- Electron → Hydrogen atom has electron. Helium atom has electron.

Q- Proton → Since proton is present in nucleus, all the species given in column-II has proton and it carries positive charge.

R- Neutron → Helium nucleus has neutron in it. Helium atom has neutron in it.

S- Alpha Particle → Helium nucleus is called as Alpha Particle and carries positive charge.

27. (d)

***Explanation*:**

In 360 g of water :-

No. of moles of water = $\frac{\text{Given mass}}{\text{Molar mass}}$

No. of moles of water = $\frac{360}{18}$ [$\because$ molar mass of H_2O = 18 g]

= 20 mole

Total number of H_2O molecule = $20 \times 6 \times 10^{23}$

We know that 1 molecule of H_2O contains only 8 neutron because hydrogen atom do not contains any neutron in it.

$\therefore$ Total number of neutron in the given H_2O molecule = $8 \times 20 \times 6 \times 10^{23}$

$= 96 \times 10^{24}$

$= P \times 10^{24}$

In 11.2 L of oxygen at S.T.P.

No. of moles of oxygen gas = $\frac{\text{Given Volume}}{\text{Molar Volume}}$

$= \frac{11.2}{22.4} = \frac{1}{2}$ mole

No. of oxygen molecules $= \frac{1}{2} \times 6 \times 10^{23}$

$= 3 \times 10^{23}$

We know that 1 molecule of oxygen gas has 16 proton in it.

$\therefore$ Total number of proton in 3×10^{23} molecules of oxygen gas = $16 \times 3 \times 10^{23}$

$= 48 \times 10^{23}$

$= 4.8 \times 10^{24}$

$= Q \times 10^{24}$

$\therefore$ P = 96

Q = 4.8

$\therefore$ $\frac{P}{Q} = \frac{96}{4.8} = 20$

28. (b)

***Explanation*:**

Average atomic mass of an element = (Atomic mass of Isotope 1) × % Abundance + (Atomic mass of Isotope 2) × % Abundance + …….

$\therefore$ Average atomic mass of an element X

$= 220 \times \frac{12.78}{100} + 218 \times \frac{13.00}{100} + 221 \times \frac{74.22}{100}$

= 220.48u

29. (d)

***Explanation*:**

P- A colloid is a heterogeneous mixture.

Q- They do not settle down when left undisturbed.

R- Centrifugation technique can be used to separate the colloidal particles.

S- Face Cream is a colloid in which dispersed phase is liquid and dispersing medium is liquid.

T- Automobile exhaust is an aerosol in which dispersed phase is solid and dispersing medium is gas.

{*Class 9th NCERT page no. 18*}

30. (d)

***Explanation*:**

Assertion (A): On adding dilute sulphuric acid to a mixture of ion and sulphur, hydrogen gas is obtained not hydrogen sulphide.

Hence Assertion is incorrect.

Reason (R): Hydrogen sulphide is a colourless gas with smell of rotten egg which is correct.

{*Class 9th NCERT page no. 26*}

31. (d)

***Explanation*:**

- Cotton is a natural fibre but it is biodegradable and it can be used as textile materials.
- Rayon is a man-made fibre but it is Non-biodegradable and it can be used to makes blankets.
- Nylon is a man-made fibre which is non-biodegradable and can be used in making rope.
- Polyester is a man-made fibre and non-biodegradable in nature and can be used in making bottles.

{*Class 8th NCERT Chapter- Synthetic, Fibres and Plastics*}

32. (c) {*Class 8th NCERT Page no. 69*}

33. (d)

***Explanation*:**

(I) The Bose-Einstein condensate is formed by cooling a gas of extremely low density, to super law temperature.

{*Class 9th NCERT page- 10*}

(II) A solution of copper sulphate show Tyndall effect. Therefore statement is correct.

{*Class 9th NCERT page- 17, Figure no. 2.3(a)*}

(III) A mixture of acetone and water can be separated by distillation.

{*Class 9th NCERT page- 21, Figure no. 2.9*}

(IV) In water purification system Loading tank is used to sediment the suspended impurities.

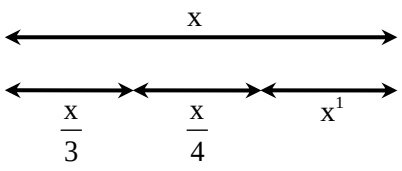
{*Class 9th NCERT page- 24, Figure no. 2.13*}

(V) Air is homogeneous mixture and can be separated into its components by fractional distillation.

{*Class 9th NCERT page- 22, topic- 2.3.7*}

PHYSICS

34. (c) average speed = $\frac{\text{total distance}}{\text{total time}}$



$x^1 + \frac{x}{3} + \frac{x}{4} = x$

$$x^1 = x - \frac{x}{3} - \frac{x}{4} = \frac{12x - 4x - 3x}{12} = \frac{5x}{12}$$

$$\text{Average speed} = \frac{x}{\frac{x}{3\times10} + \frac{x}{4\times20} + \frac{5x}{12\times40}}$$

$$= \frac{x}{\frac{16x + 6x + 5x}{480}} = \frac{x}{27x} \times 480$$

$$= \frac{480}{27} \text{ km / hr}$$

Which is near to 18 km/hr

35. (d) For A and B to be stationary, friction on both A and B must act upward. But we know action and reaction acts on different bodies and direction must be opposite to each other. So it is not possible to hold A and B at rest.

36. (d) Friction does not depend on area of contact

37. (b) Acceleration of elevator is greater than g. So, contact between elevator and block will be not there and block starts moving downward with acceleration g.

$$s = ut + \frac{1}{2}at^2$$

$$s = 0 + \frac{1}{2} \times 10 \times 0.2 \times 0.2 \qquad g \downarrow \downarrow +$$

$$= \frac{0.4}{2} = 0.2 \text{ m}$$

38. (b) $g_A = 9\, g_B$

For A,

$$v^2 - u^2 = 2as$$

$$0^2 - u^2 = 2(-g_A) \times 2 \qquad \downarrow \text{-ve}$$

$$-u^2 = -(2\, g_A) \times 2$$

$$u^2 = 4\, g_A \qquad \ldots(i)$$

For B,

$$v^2 - u^2 = 2as$$

$$0^2 - u^2 = 2(-g_B)(s_B)$$

$$u^2 = 2\, g_B (s_B) \qquad \ldots(ii)$$

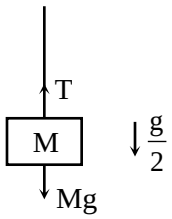
(ii) ÷ (i)

$$1 = \frac{4\,g_A}{2\,g_B(s_B)}$$

$$s_B = 2\left(\frac{g_A}{g_B}\right)$$

$= 2 \times 9 = 18$ m

39. (c) $Mg - T = \frac{Mg}{2}$



$$T = \frac{Mg}{2}$$

$$W = FS\cos\theta$$

$$= \frac{Mg}{2} x \cos 180$$

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

40. (c) If ice is floating,

Buoyancy = weight of ice

Weight of water displaced = weight of ice

Weight of water displaced = weight of water after melting

So, displaced water is equal to extra water added, so level will remain same.

41. (d) Pascal law: extra pressure applied to an enclosed fluid is transmitted undiminished to every portion of the fluid and walls of the containing vessel.

42. (b) Since wavelength of different colour is different and refractive index depends on wavelength so, light of different colour propagates with different speed through medium. This is also the reason behind dispersion of light.

BIOLOGY

43. (c) (*Class-9th NCERT, Page no. 62*)

44. (c) (*Class-9th NCERT, Page no. 66*)

45. (c) (*Class-9th NCERT, Page no. 86, 87, 88*)

46. (a) (*Class-9th NCERT, Page no. 61, 64, 66*)

47. (d) (*Class-8th NCERT, Page no. 116, 117*)

48. (d) (*Class-8th NCERT, Page no. 103*)

49. (b) (*Class-9th NCERT, Page no. 72*)

50. (c) (*Class-9th NCERT, Page no. 76*)

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