UNIFIED COUNCIL

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SLSTSE

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STATE LEVEL SCIENCE TALENT SEARCH EXAMINATION

CLASS - 9

Question Paper Code : US757

KEY

1. C	2. D	3. A	4. A	5. D	6. B	7. A	8. C	9. B	10. A
11. A	12. B	13. B	14. A	15. A	16. A	17. B	18. C	19. D	20. A
21. B	22. D	23. A	24. C	25. C	26. A	27. C	28. B	29. B	30. B
31. D	32. C	33. B	34. D	35. A	36. B	37. A	38. C	39. A	40. D
41. B	42. C	43. C	44. B	45. A	46. C	47. B	48. B	49. B	50. A
51. C	52. B	53. B	54. A	55. B	56. A	57. B	58. A	59. B	60. C

SOLUTIONS

MATHEMATICS

1. **(C)** $2\sqrt[4]{81} - 7\sqrt[3]{343} + 15\sqrt[5]{32} + \sqrt{225}$

$= 2\sqrt[4]{3^4} - 7\sqrt[3]{7^3} + 15\sqrt[5]{2^5} + \sqrt{15^2}$

$= 2\left(3^4\right)^{1/4} - 7\left(7^3\right)^{1/3} + 15\left(2^5\right)^{1/5} + 15$

$= 2 \times 3 - 7 \times 7 + 15 \times 2 + 15$

$= 6 - 49 + 30 + 15 = 2$

2. **(D)** Every natural number is a rational number. Every whole number is a rational number. Every integer is a rational number

3. **(A)** Let $f(x) = ax^4 + bx^3 + cx^2 + dx + e$

As $(x^2 - 1)$ is a factor of $f(x)$ we have

$x^2 - 1 = (x + 1)(x - 1)$ hence $f(1) = 0$ and $f(-1) = 0$

$f(1) = a + b + c + d + e = 0$ ..... (1)

and $f(-1) = a - b + c - d + e = 0$

$\Rightarrow a + c + e = b + d$

Substitute this value in equation (1)

$a + c + e + b + d + 0$

$b + d + b + d = 0$

$2(b + d) = 0$

$\Rightarrow b + d = 0$

4. **(A)** Given $f(x) = (x-1)^7$

$(x-1)$ is a factor of $(x-1)^7$

$\therefore$ $f(1) = 0$

$\therefore$ $a_7 + a_6 + a_5 ..... + a_1 + a_0 = 0$

5. **(D)** If $c = -40$ then $f = -\dfrac{40 \times 9}{5} + 32 = -72 + 32 = -40$.

At $(-40, -40)$ both c & f are equal

6. **(B)** $(-5, 4)$ lies in Q_2 and 5 units from Y-axis and 4 units from X-axis

7. **(A)** $\dfrac{18}{5} = 3.6,\ \dfrac{27}{4} = 6.75,\ \dfrac{15}{4} = 3.75,\ \dfrac{53}{10} = 5.3$

$\therefore$ Ascending order of data is

$$\frac{18}{5}, \frac{15}{4}, \frac{53}{10}, \frac{27}{4}$$

$$\therefore \text{Median} = \frac{\left(\frac{15}{4} + \frac{53}{10}\right)}{2} = \frac{1}{2}\left[\frac{75 + 106}{20}\right] = \frac{181}{40}$$

8. **(C)** In ΔABD, $BD = AD \Rightarrow \angle DAB = \angle D = 35°$

$\therefore \angle b = \angle D + \angle DAB = 70°$

Similarly $\angle C = 46° + 46° = 92°$

In ΔABC, $70° + 92° + \angle a = 180°$

$\angle a = 18°$

9. **(B)** 'D' is equidistant from vertices

$\therefore$ 'D' is circumcentre & AB diameter

$\therefore \angle BCA = 90°$ [$\because$ Angle in a semicircle]

10. **(A)** Given DP = BQ and DP // BQ

$\therefore$ DPBQ is a parallelogram

$\therefore \angle DPB = \angle BQD$

$\Rightarrow \angle APD = \angle CQB \quad \rightarrow (1)$

In ΔADP and ΔCBQ

$\angle APD = \angle CQB$ [$\because$ angle & eq (1)]

$\overline{DP} = \overline{BQ}$ (side)

$\angle ADP = \angle QBC$ [$\because$ angle & given]

$\therefore \Delta ADP \cong \Delta CBQ$ [$\because$ ASA congruency]

11. **(A)** In a quadrilateral ABCD,

$\angle A + \angle B + \angle C + \angle D = 360°$

$\therefore \quad \angle A + \angle B + 3\angle A + 4\angle A = 360°$

$8\angle A + \angle B = 360°$

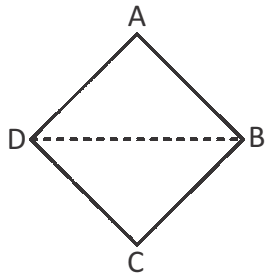
$8 \times 38° + \angle B = 360°$

$\angle B = 360° - 304° = 56°$

12. **(B)** In ΔABD, $AB = AD$ & $\angle A = 60°$

$\therefore$ ABD is an eqilateral triangle

$\therefore \quad BD = AB = 6$ cm



13. **(B)** Given diagonal = $4\sqrt{5}$ cm and breadth = $2\sqrt{5}$ cm

$$\therefore \text{length} = \sqrt{d^2 - b^2}$$

$$= \sqrt{\left(4\sqrt{5}\right)^2 - \left(2\sqrt{5}\right)^2}$$

$$= \sqrt{80 - 20}$$

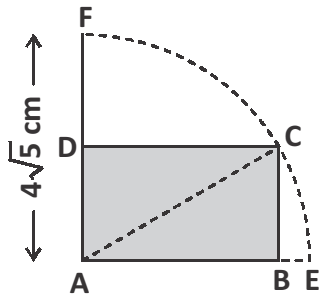
$$= \sqrt{60}$$

$$= 2\sqrt{15} \text{ cm}$$

$$\therefore \text{Area} = l \times b = 2\sqrt{5} \times 2\sqrt{15} \text{ cm}^2$$

$$= 4 \times 5 \times \sqrt{3} \text{ cm}^2$$

$$= 20\sqrt{3} \text{ cm}^2$$



14. **(A)** Given diagonal d = 6 cm,

$h_1 = 2.6$ cm and $h_2 = 1.4$ cm.

$$\text{Area} = \frac{1}{2} d(h_1 + h_2)$$

$$= \frac{1}{2} \times 16 \times (2.6 + 1.4) = 8 \times 4 = 32 \text{ cm}^2$$

15. **(A)** Angles in the same segment are equal.

$\Rightarrow \angle BAD = \angle BCD = 30°$

In ΔCBP, $\angle C + \angle B + \angle P = 180°$

$\Rightarrow \angle CBP = 105°$

16. **(A)** Construction :- Notice a point 'D' on major arc.

Join BD & BC

Proof :- ABDC is a cyclic quadrilateral

$\therefore \angle A + \angle D = 180°$

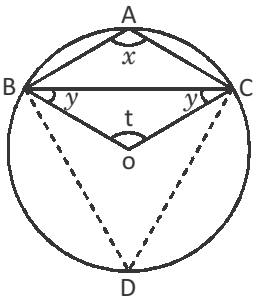
$\angle D = 180° - x$

But $\angle BOC = 2\angle D = 2(180° - x) = 360° - 2x$

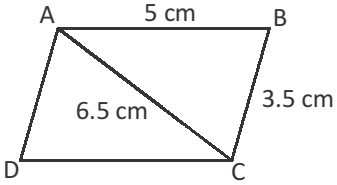
In ΔBOC, $y + y + 360° - 2x = 180°$

$2y = 2x - 180° \Rightarrow y = x - 90°$

$\therefore x - y = 90°$



17. **(B)**



Given In ΔABC,

AB = C = 5 cm

BC = a = 3.5 cm

AC = b = 6.5 cm

$S = \frac{a+b+c}{2} = \frac{15\text{ cm}}{2} = 7.5\text{ cm}$

Area of ΔABC

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{7.5\text{ cm} \times 2.5\text{ cm} \times 4\text{ cm} \times 1\text{ cm}}$

$= 5\sqrt{3}\text{ cm}^2$

$\therefore$ Area of parallelogram ABCD

= 2 Area of ΔABC

$= 2 \times 5\sqrt{3}\text{ cm}^2$

$= 10\sqrt{3}\text{ cm}^2$

18. **(C)** Given $2a - b + 5 = a + b$

$a - 2b = -5 \quad \rightarrow (1)$

Given $a + b = 2b - a + 2$

$2a - b = 2 \quad \rightarrow (2)$

Solving (1) & (2) we get a = 3 & b = 4

$\therefore$ Side of equilateral triangle = a + b = 7 units

$\therefore$ Area = $\frac{\sqrt{3}}{4}$ (side)^2 = $\frac{\sqrt{3}}{4} \times 49$ units^2

19. **(D)** Volumes ratio fo cylinder, cone and hemisphere

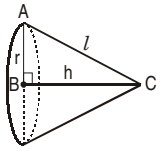
$= \pi r^2 h : \frac{1}{3}\pi r^2 h : \frac{2}{3}\pi r^3$

$= \pi r^2 \times r : \frac{1}{3}\pi r^2 \times r : \frac{2}{3}\pi r^3$

$= \pi r^3 : \frac{1}{3}\pi r^3 : \frac{2}{3}\pi r^3$

$= 3 : 1 : 2$

20. **(A)** Given, h = 16 cm and l = 20 cm.



$\therefore r = \sqrt{l^2 - h^2} = \sqrt{20^2 - 16^2}$ cm

= 12 cm

$\therefore$ Volume = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 12^2 \times 16\text{ cm}^3$

$= \frac{16896}{7}\text{ cm}^3 = 2413\text{ cm}^3$

21. **(B)** Diameter of each semicircle

$= \frac{42\text{cm}}{3} = 14\text{ cm}$

Radius of each semicircle = 7 cm

$\therefore$ Area of 3 circle

$= 3 \times \pi r^2 = 3 \times \frac{22}{7} \times 7 \times 7\text{ cm}^2$

$= 462\text{ cm}^2$

Area of rectangle = 42 cm × 14 cm = 588 cm^2

Area of shaded region

= Rectangle area – circle area

= 588 cm^2 – 462 cm^2 = 126 cm^2

22. **(D)** Let the length of the rectangle be 'x' units, and the breadth be 'y' units.

Then in the first case,

$(x+2)\times(y+2)=xy+76$

i.e., $2x + 2y + 4 = 76$

i.e., $x + y = 36$

23. **(A)** Substituting the values 5, – 6 in the given polynomial result in 0. So, the required zeros are 5 and (– 6).

24. **(C)** On Y-axis all x-coordinates are zero

$\therefore\ 2(o) + 3y = 9$

$3y = 9$

$y = 3$

$2x + 3y = 9$ line cuts Y-axis at (0, 3)

25. **(C)** Let the number of coins be x

Given $x \times ₹1 + x \times ₹0.50 + x \times ₹0.25 + x \times ₹0.10 + x \times ₹0.05 = 380$

$x\,[₹1 + ₹0.50 + ₹0.25 + ₹0.10 + ₹0.05] = 380$

$x \times ₹1.90 = ₹380$

$$\therefore\ x = \frac{₹\,380}{₹\,1.90} = \frac{38000}{190} = 200$$

PHYSICS

26. **(A)** The centripetal force is due to the gravitational pull of the earth on the satellite which makes the satellite to move in a circular orbit. The net force on the satellite is the same as the gravitational pull F only.

27. **(C)** Taking motion for first ten seconds, here, $u = 0$, $a = ?$, $v = 27.5\ m/s^{-1}$; $t = 10\ s$, $s = s_1$

As $v = u + at$; so, $27.5 = 0 + a \times 10$

or $a = 2.75\ m\ s^{-2}$

$$s_1 = \frac{1}{2}at^2 = \frac{1}{2}\times 2.75\times 10^2 = 137.5\ m$$

Taking motion for 20 seconds,

$$s_2 = \frac{1}{2}\times 2.75\times 20^2 = 550.0\ m$$

Distance covered in next 10 seconds

$= 550 – 137.5 = 412.5\ m$.

28. **(B)** K.E. $= \frac{1}{2}\times 0.2\times 0.2\times 0.2 = 0.004\ J$

29. **(B)** $P = hdg = 0.76 \times (13.6 \times 1000) \times 9.8 = 1.01 \times 10^5\ N\ m^{-2}$

30. **(B)** Mass is a measure of inertia of an object. Inertia depends on the mass of an object. An object having more mass has more inertia. Object Q of 34 kg has more inertia than object P of 6 kg.

31. **(D)** $u = \sqrt{2gh} = \sqrt{2\times 10\times 20} = 20\ m/s$

Time of ascent = Time of descent

$$= \sqrt{\frac{2h}{g}} = \sqrt{\frac{2\times 20}{10}} = 2\ s$$

$\therefore$ Time of flight (T) = 2 + 2 = 4 s

32. **(C)** Displacement of an object can be positive, zero or negative. Distance is always positive but not displacement.

33. **(B)** More work is done when a body is lifted vertically upwards.

34. **(D)** Given dimensions or volume of a room

$= 3\ m \times 4\ m \times 5\ m = 60\ m^3$

Density of air at NTP $= 1.3\ kg\ m^{-3}$

Mass of air in the room = volume × density

$= 60\ m^3 \times 1.3\ kg\ m^{-3} = 78\ kg$

35. **(A)** Let v_1 be the velocity of the cannon after it is shot. The initial momentum of system is zero.

The final momentum of the system

$= m_1v_1 + m_2v_2$

From the conservation of linear momentum,

$m_1v_1 + m_2v_2 = 0$

$m_1v_1 = – m_2v_2$

$v_1 = – m_2v_2/m_1$

Substituting the given values in the above equation, we get

$$v_1 = -\frac{(300\ kg) \times (400\ m/s)}{12000\ kg} = -10\ m/s$$

Thus, the velocity of cannon is 10 m/s after it is shot.

Here '–' sign indicates that the cannon moves in a direction opposite to the motion of the bullet.

CHEMISTRY

36. **(B)** Gram formula weight or weight of 1 mole of Na_2CO_3 = 106 g

Gram formula weight of methyl alcohol or weight of one mole of CH_3OH = 32 g

Number of moles of Na_2CO_3 produced per month = $\frac{424\times10^6}{106} = 4\times10^6$ moles.

Number of moles of CH_3OH produced per month = $\frac{320\times10^6}{32} = 10\times10^6$ moles

Hence, methyl alcohol is produced more than sodium carbonate in terms of number of moles.

37. **(A)** Sodium chloride being a solid has strongest force of attraction in between the particles.

38. **(C)** Milky glass is a solid-in-solid colloid.

Shaving cream is a liquid-in-gas colloid.

Milk of magnesia is a liquid-in-solid colloid.

Cheese is a solid-in-liquid colloid.

39. **(A)** The isotopes of the same element have the same number of protons and electrons, but different number of neutrons. So, element with 17 protons and electrons and 20 neutrons is an isotope of this element.

40. **(D)** Carbon dioxide and nitrous oxide have the same formula unit mass.

Option (A) $CaCl_2$ = 40 + 71 = 111

K_2CO_3 = (39 × 2)+12+(16 × 3)

= 78 + 12 + 48 = 138

Option (B) CaO = 40 + 16 = 56

HCl = 1 + 35.5 = 36.5

Option (C) CO = 12 + 16 = 28

NH_3 = 14 + 3 = 17

Option (D) CO_2 = 12 + 16 × 2 = 44

N_2O = (14 × 2) + 16 = 44

41. **(B)** The water molecule 'X' at the surface of beaker can easily escape to form water vapour.

42. **(C)** Helium - 2

Magnesium - 2,8,2

Sulphur - 2, 8, 6

$\therefore$ 2, 2, 6 are the number of valence electrons present in helium, magnesium and sulphur respectively.

43. **(C)** The weights of both mixtures and compounds is equal to the sum of the weights of their components. This is a characteristic feature of both mixtures and compounds.

44. **(B)** n = 0.25 moles = $\frac{1}{4}$ mole

Mass (m) = 6 g

Molecular weight (M) = $\frac{m}{n}$

i.e., magnesium = $\frac{6}{(1/4)} = 24g$

45. **(A)** The correct matching is

a - 4, b - 1, c - 2, d - 3

(a) Evaporation - Liquid to gas at any temperature

(b) Boiling - Liquid to gas at a fixed temperature

(c) Sublimation - Solid to gas

(d) Hoar frost - Gas to solid

BIOLOGY

46. **(C)** The energy obtained from the green plant when it is consumed by a deer helps to maintain body heat by the oxidation of food.

47. **(B)** A snake is a teritary consumer.

48. **(B)** The rate of photosynthesis is higher if the plants receive more sunlight

If there are more plants, more carbon dioxide will be taken in and more oxygen will be produced when plants carry out photosynthesis in the presence of light.

[During the day plants produce more oxygen than they need for respiration, so they give off oxygen.]

49. **(B)** Plants can make their own food, so they are food producers. All other organisms depend on plants directly or indirectly or food.

When plants make food, they replenish oxygen in the surroundings.

All living things (including plants) respire and produce carbon dioxide all the time.

50. **(A)** Smoke from vehicles and factories may contain harmful substances that can dissolve in rainwater to form acid rain

Acid rain can react with metals and stones, causing buildings and statues to corrode. It can also harm or kill trees in forests and organisms in water. Besides, it can contaminate our water supplies.

51. **(C)** Agriculture field torching (slash and burn agriculture in neighbouring states cause smog.

52. **(B)** Mitochondria release energy, they are called as power houses of the cell.

53. **(B)** Organelles labelled 2 is mitochondria. Mitochondria is responsible for cellular respiration. It is called power house of the cell.

54. **(A)** Transpiration in plants occurs at stomata.

55. **(B)** Plant cells have cell wall.

CRITICAL THINKING

56. **(A)** $5 + 3 + 4 = 12$

$160 \div 12 = 13$ R 4

$\underbrace{R_1\ R_2\ R_3\ R_4\ R_5}_{\text{red}}\ \underbrace{R_6\ R_7\ R_8}_{\text{white}}\ \underbrace{R_9\ R_{10}\ R_{11}\ R_{12}}_{\text{black}}$

The last bead is red

$13 \times 5 + 4 = 69$

There are 69 red beads

57. **(B)** $30 + 31 + 30 = 91$

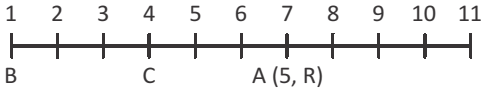
Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
R3	R4	R5	R6	R0	R1	R2

$91 \div 7 = 13$ R 0

30^{th} of August was a Thursday in that year

58. **(A)** In fig, (X), the dot is contained in the region common to the triangle and the square only. Out of the four alternatives, only fig. (1) contains a region common to the triangle and the square only

59. **(B)**



60. **(C)**

THE END