



UNIFIED COUNCIL

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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 9

Question Paper Code : UN446

KEY

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

SOLUTIONS

MATHEMATICS

1. (D) $LHS = \sqrt{11+3+2+2\sqrt{2} \times \sqrt{3} + 2\sqrt{2} \times \sqrt{11} + \sqrt{11} \times \sqrt{3}}$
 $= \sqrt{(\sqrt{11})^2 + (\sqrt{3})^2 + (\sqrt{2})^2 + 2\sqrt{2} \times \sqrt{3} + 2\sqrt{2} \times \sqrt{11} + 2\sqrt{11} \times \sqrt{3}}$
 $= \sqrt{(\sqrt{11} + \sqrt{3} + \sqrt{2})^2}$
 $= \sqrt{11} + \sqrt{3} + \sqrt{2}$

2. (A) Let $x = \sqrt{12 - \sqrt{12 - \sqrt{12 - \dots \infty}}}$
 Squaring on both sides
 $x^2 = 12 - \sqrt{12 - \sqrt{12 - \sqrt{12 - \dots \infty}}}$
 $x^2 = 12 - x$

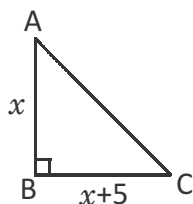
$x^2 + x - 12 = 0$
 $x^2 + 4x - 3x - 12 = 0$
 $(x + 4)(x - 3) = 0$
 $x = -4$ (OR) $x = 3$
 $\therefore \sqrt{12 - \sqrt{12 - \sqrt{12 - \dots \infty}}} = 3$

3. (A) $\frac{a^3 + b^3 + c^3 - 3abc}{ab + bc + ca - a^2 - b^2 - c^2}$
 $= \frac{(a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)}{(ab + bc + ca - a^2 - b^2 - c^2)}$
 $= -(a+b+c)$
 $= -(-5 - 6 + 10) = 1$

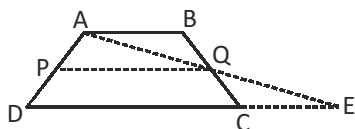
4. (B) $2x + 3y = 16 \rightarrow (1)$
 $4x - 2y = 4 \rightarrow (2)$
 $\text{eq (1)} \times 2 \Rightarrow 4x + 6y = 32$
 $\frac{4x - 2y = 4}{8y = 28} \rightarrow (1)$

5. (D) Distance between PQ = $|5 - 1| = 4$ units
 \therefore 'R' is 4 units away froms horizontally
 $\therefore R = (6, 3)$

6. (B) Let the altitude by x cm
 Given $\frac{1}{2}(x)(x+5) = 63$
 $x^2 + 5x = 126$
 $x^2 + 5x - 126 = 0$
 $x^2 + 14x - 9x - 126 = 0$
 $(x+14)(x-9) = 0$
 $x = 9$ (OR) $x = |-14|$



7. (D)



Const: Join PQ and extend DC upto E.
 Extend AQ upto E.

Proof: $\triangle ABQ \cong \triangle ECQ$

[\therefore ASA congruency]

$\therefore AQ = QE$ and $AB = CE$.

In $\triangle ADE$, P and Q are midpoints of AD and AE.

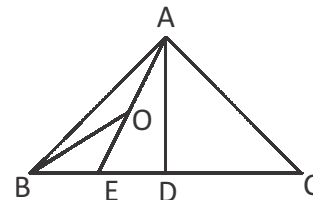
$$\therefore PQ = \frac{1}{2} ED$$

$$= \frac{1}{2} (EC + CD)$$

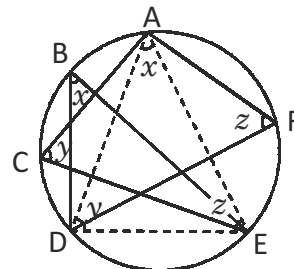
$$PQ = \frac{1}{2} (AB + CD)$$

8. (A) Non terminating repeating decimals fraction denominator (in its lowest form) is having any prime number other than 2 and 5.

9. (C) Area of $\triangle AOB = 2$ area of $\triangle BOE$
 $= 2 \times 2 \text{ cm}^2 = 4 \text{ cm}^2$
 Area of $\triangle ABD = 2$ (Area of $\triangle ABE$)
 $= 12 \text{ cm}^2$
 Area of $\triangle ABC = 2$ (Area of $\triangle ABD$) = 24 cm^2



10. (B) Join AD, DE and EA



$$\angle ACE = \angle ADE = y$$

$$\angle EBD = \angle EAD = x$$

$$\angle AFD = \angle AED = z$$

$$\therefore \angle ACE + \angle EBD + \angle AFD$$

$$= x + y + z = 180^\circ$$

11. (C) Given $AB = 20$ mts, $CD = 28$ mts, $AD = 17$ mts

Const:- $AE \perp CD \Rightarrow CE = AB = 20$ mts

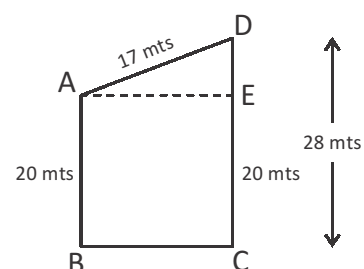
$$\therefore DE = 28 \text{ mts} - 20 \text{ mts} = 8 \text{ mts}$$

in $\triangle AED$, $\Rightarrow AD^2 = AE^2 + ED^2$

$$(17 \text{ mt})^2 = AE^2 + (8 \text{ mts})^2$$

$$AE = 15 \text{ mts}$$

$$\therefore BC = AE = 15 \text{ mts}$$



12. (D) All are algebraic expressions are not polynomials

13. (B) $\angle A + \angle C = 180^\circ$ & $\angle B + \angle D = 180^\circ$

$$2x + 4 + 2y + 10 = 180^\circ$$

$$2x + 2y = 166^\circ$$

$$x + y = 83^\circ \quad \rightarrow (1)$$

$$y + 3^\circ + 4x - 5^\circ = 180^\circ$$

$$4x + y = 182^\circ \quad \rightarrow (2)$$

solving (1) & (2) $x = 33^\circ$ & $y = 50^\circ$

$$\therefore \angle A = 2x + 4^\circ = 69^\circ$$

$$\angle B = y + 3 = 53^\circ$$

$$\angle C = 2y + 10 = 110^\circ$$

$$\angle D = 4x - 5^\circ = 127^\circ$$

14. (D) Each interior angle of a regular pentagon

$$= \frac{(2n-4) \times 90^\circ}{n} = \frac{6 \times 90^\circ}{5} = 108^\circ$$

In $\triangle ADE$, $AE = ED \Rightarrow \angle EAD = \angle EDA$

But $\angle EAD + \angle EDA + \angle E = 180^\circ$

$$\angle EAD + \angle EDA = 180^\circ - 108^\circ$$

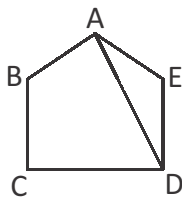
$$2\angle EDA = 72^\circ$$

$$\angle EDA = 36^\circ$$

$$\Rightarrow \angle ADE = 36^\circ$$

$$\therefore \angle ADC = 108^\circ - 16^\circ = 72^\circ$$

$$\therefore \angle ADE \div \angle ADC = 36^\circ : 72^\circ = 1 : 2$$



15. (D) $a^2 + 6ab + 9b^2 + b^2 + 2bc + c^2 + 4c^2 - 16c + 4^2 = 0$

$$(a + 3b)^2 + (b + c)^2 + (2c - 4)^2 = 0$$

Sum of three perfect squares is zero then each term must be zero

$$\therefore a = -3b, b = -c, 2c = 4$$

$$a = 6, b = -2, c = 2$$

$$\therefore a - b + c = 6 + 2 + 2 = 10$$

16. (A) $\angle B + \angle A = 112^\circ \quad \rightarrow (1)$

$$\angle B - \angle A = 22^\circ \quad \rightarrow (2)$$

Solving (1) & (2) $\angle B = 67^\circ, \angle A = 45^\circ$

$$\text{But } \angle A + \angle B + \angle C = 180^\circ$$

$$112^\circ + \angle C = 180^\circ$$

$$\angle C = 180^\circ - 112^\circ = 68^\circ$$

$\therefore \angle C$ is biggest angle as AB is biggest side

17. (B) Const: Extend AD upto E.

In $\triangle ABD$, $AD = BD \Rightarrow \angle ABD = \angle BAD = x$

$$\therefore \angle BDE = 2x$$

Similarly $\angle CDE = 2y$

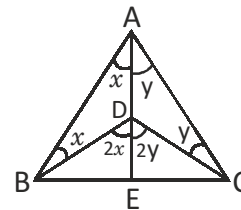
But $\angle BDE + \angle CDE = 100^\circ$

$$\Rightarrow 2x + 2y = 100^\circ$$

$$2(x + y) = 100^\circ$$

$$x + y = 50^\circ$$

$$\therefore \angle BAC = 50^\circ$$



(or)

'D' is the equidistance from the vertices A, B, C

\therefore 'D' is circumcenter

$$\therefore \angle BAC = \frac{1}{2} \angle BDC$$

$$= \frac{1}{2} \times 100^\circ = 50^\circ$$

18. (A) Volume = base area \times height

$$= \frac{1}{2} h(6 \text{ cm} + 4 \text{ cm}) \times 12 \text{ cm} = 300 \text{ cm}^2$$

$$60 h = 300 \text{ cm}^2$$

$$h = 5 \text{ cm}$$

19. (D) (1, 4) is equidistance from P & Q & QR = PQ = 5 units

20. (A) Const:- Draw DE through 'P'

Proof:- $\triangle AQB \cong \triangle CPD$

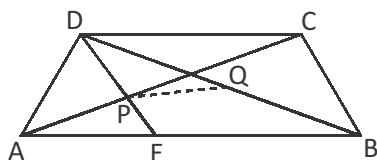
[∴ ASA congrucney]

$$\therefore DP = PE \text{ \& } AE = CD$$

In $\triangle BDE$, P & Q are mid points of DE & BD respectively

$$\therefore PQ = \frac{1}{2} BE$$

$$= \frac{1}{2} (AB - AE) = \frac{1}{2} (AB - CD)$$



$$PQ = \frac{1}{2} (AB - CD)$$

$$AB - CD = 2PQ = 2 \times 5 \text{ cm} = 10 \text{ cm}$$

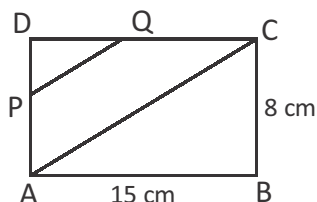
21. (A) Given $\frac{4}{3}\pi r^3 = \frac{1}{3}\pi \times 6 \times 6 \times 24 \text{ cm}^3$

$$r = 6 \text{ cm}$$

22. (C) $AC = \sqrt{AB^2 + BC^2} = 17 \text{ cm}$

$$PQ = \frac{1}{2} AC = 8.5 \text{ cm}$$

In a traingle line joining midpoit of two sides is parallel to the third side and half of third side



23. (C) 'R' is the reflection of x with respect to \overline{MN}

24. (B) Const:- Join AC

Ac meets BD at F

$$\text{Area of } \triangle ACD = \frac{1}{2} \text{ area of}$$

$$\text{parallelogram ABCD} = 18 \text{ cm}^2$$

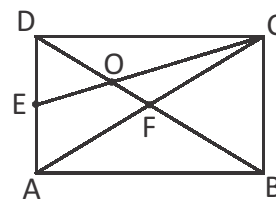
In $\triangle ACD$, AF is a median and CE is a median

∴ 'O' is centroid of $\triangle ACD$

$$\therefore \text{Area of } \triangle CDE = \frac{1}{2} \text{ area of } \triangle ACD = 9 \text{ cm}^2$$

$$\text{Area of } \triangle COD = \frac{2}{3} \text{ of area of}$$

$$\triangle CDE = \frac{2}{3} \times 9 \text{ cm}^2 = 6 \text{ cm}^2$$

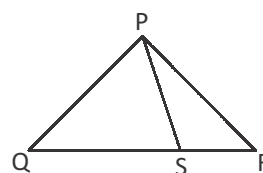


25. (C) In $\triangle PRS$, $\angle PSQ > \angle R$

$$\Rightarrow \angle Q > \angle R$$

[∴ Given $\angle PSQ = \angle PQR$]

$$\Rightarrow PR > PQ$$



PHYSICS

26. (C) On the Earth, $W = mg$

$$120 \text{ N} = m \times 10 \text{ N/kg}$$

$$m = 12 \text{ kg}$$

$$\text{On the Moon, } W = mg = 12 \text{ kg} \times 1.6 \text{ N/kg} = 19.2 \text{ N}$$

The weight of the boots on the Moon is 19.2 N.

27. (D) The gravitational forces are conservative forces. Work done does not depend neither upon the path taken by suitcase nor on the time taken in moving suitcase from one position to the other in doing the work.

28. (C) $S = (v^2 - u^2) / 2a$ is independent of mass. Hence, both will stop at the same distance. Both a motorcycle and a car are moving with same velocity and on applying brakes, they stop with equal retardation, then both the motorcycle and a car will stop at the same distance.

29. (A) The balloon will move down with an acceleration of 1.6 m/s^2 , as moon has no atmosphere and no upward thrust acts on balloon due to the lack of atmosphere.

30. (D) Work done = Gain in PE
= weight x distance (vertical height)

$$= (60 \times 10) \text{ N} \times (20 \times 0.15) \text{ m} = 1800 \text{ J}$$

$$\text{Power} = 1800 \text{ J}/10 \text{ s} = 180 \text{ W}$$

31. (B) $F = G \frac{m_1 m_2}{r^2}$, thus on increasing masses and reducing distance r , force of gravitational attraction F will increase.

32. (D) Initial speed of ball (u) = -10 m/s

Final speed of ball (v) = 10 m/s

$$\text{Mass (m)} = \frac{250}{1000} = 0.25 \text{ kg}$$

$$\text{Time (t)} = 0.01 \text{ s}$$

$$v = u + at, 20 = at$$

$$a = 2000 \text{ m/s}^2$$

$$F = m \times a = 0.25 \times 2000 = 500 \text{ N}$$

33. (C) When a particle is moving with uniform acceleration, let v be the velocity of particle at a distance s , then average

$$\text{velocity} = \frac{0+v}{2} = v/2$$

$$\text{Time taken, } t_1 = \frac{s}{(v/2)} = \frac{2s}{v}$$

When a particle moves with uniform velocity,

$$\text{Time taken, } t_2 = \frac{2s}{v}$$

When a particle moves with uniform retardation,

$$\text{Time taken, } t_3 = \frac{3s}{(0+v)/2} = \frac{6s}{v}$$

$$\text{Total time} = t_1 + t_2 + t_3$$

$$= \frac{2s}{v} + \frac{2s}{v} + \frac{6s}{v} = \frac{10s}{v}$$

$$\therefore v_{av} = \frac{s+2s+3s}{10s/v} = \frac{6v}{10} \text{ or } \frac{v_{av}}{v} = \frac{6}{10} = \frac{3}{5}$$

34. (D) Examples given in options (A), (B) and (C) are related to the concept of inertia. The fragrance of a perfume diffuses into a living room is due to diffusion i.e., motion of particles from one place to another.

35. (B) $E_1 = \text{P.E.} + \text{K.E.}$

$$= \text{PE} + \frac{1}{2} \text{PE} = \frac{3}{2} \text{PE} = \frac{3}{2} mgh$$

$$E_2 = \text{P.E.} + \text{K.E.} = \text{PE} + 2 \text{PE} = 3 \text{PE}$$

$$= 3 mgh'$$

$$\text{As } E_2 = E_1$$

$$\therefore 3 mgh' = \frac{3}{2} mgh ; h' = \frac{h}{2}$$

CHEMISTRY

36. (C) Formula mass of K_2CO_3 = Mass of 2K atoms + Mass of one C atom + Mass of 3 O atoms.

$$= 2 \times 39 + 12 + 3 \times 16$$

$$= 78 + 12 + 48 = 138 \text{ u}$$

37. (D) The melting point of the mixture X and Y is lower than that of compounds X and Y and the melting point range is also broader. This is an indication that compounds X and Y are not the same. If they are, they should also melt at the same range of $130\text{-}131^\circ\text{C}$ temperature.

38. (B) Chromatography is a technique of separating two or more different substances present in the same solution and that they are soluble in the same solvent but their solubilities are different. The different extent of solubility allows different substances to travel at different distances on the chromatograph paper.

39. (D) Five bromine molecules (Br_2) contain 10 atoms.

Option (A): Six hydrogen molecules (H_2) contain 12 atoms.

Option (B): Four water molecules (H_2O) contain 12 atoms.

Option (C): Four carbon dioxide molecules (CO_2) contain 12 atoms.

40. (B) Solids cannot flow easily as their particles are held at fixed positions. Properties given in options (A), (C) and (D) belong to solids whereas property given in option (B) belongs to liquids.

41. (B) Steel is an alloy which is a mixture. It

BIOLOGY

- does not have a fixed melting or boiling point.
42. (A) 2.4 g of magnesium uses 1.6 g (4.0 – 2.4) of oxygen. So, 1.2 g of magnesium would use 0.8 g of oxygen.
43. (A) The particles in a solid are held together in fixed positions due to strong force of attraction between the particles. The particles in a liquid are not held together in fixed positions due to comparatively less strong force of attraction between the particles. The particles in a liquid can slide over one another easily. The particles in a gas are free to move in any direction as the force of attraction between the particles is negligible. Hence, the movement of particles is different as it is minimum in solids, more in liquids and maximum in gases.
44. (C) Mass of solute (salt) = 50 g
Mass of solvent (water) = 350 g
Total mass of solution = 400 g
Mass percentage of solution by mass
- $$= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$
- $$= \frac{50}{400} \times 100 = 12.5\%.$$
45. (D) Equal volumes of all gases under similar conditions of temperature and pressure contain the same number of molecules. So, under the same conditions of temperature and pressure, if volume of the gas is decreased, the number of molecules will also decrease. Hence, 5 litres of hydrogen contains the greatest number of molecules and 1 litre of sulphur dioxide contains the least number of molecules.
46. (C) The splitting of a cell to form two new cells is called cell division.
Mitosis is a process of nuclear division in eukaryotic cells that occurs when a parent cell divides to produce two identical daughter cells.
The number of cells doubles after each generation of cell division is 16 cells.
47. (C) Structure X is a chloroplast that contains chlorophyll, the green pigment that captures light energy for making food and gives leaves their green colour.
48. (B) Photosynthesis and respiration of plants cause the amount of oxygen and carbon dioxide inside the greenhouse to vary.
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) In a 4-link food chain, the biomass of the food producers is much higher than the biomass of each population of food consumers. The population of the tertiary food consumers (highest predators) in the 4-link food chain will have the least biomass.
50. (C) Wildlife, oxygen and water are renewable natural resources
Petroleum and coal are fossil fuels. Fossil fuels are non-renewable natural resources.
51. (A) Substance X is lignin prevents the collapse of xylem vessel.
52. (B) Mitochondria are the power houses of cells. They are present more where the muscles require large amounts of energy.
53. (B) Golgi complex modify, sort and package proteins.

54. (D) Sun → plant → herbivore → carnivore.

55. (A) Pollen grains or haploids.

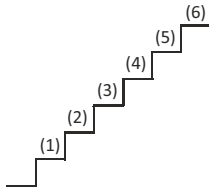
CRITICAL THINKING

56. (D)

57. (A) Because the first two statements are true, raspberries are the most expensive of the three.

58. (A) As Kaushal position from the left end is 11.

59. (B)



To reach step (1) : 1 way

To reach step (2) : 2 ways

To reach step (3) : 3 ways

To reach step (4) : 5 ways

We have shown that this is a fibonacci numbers.

1, 2, 3, 5, 8, 13, ...

He can complete the climbing in 13 ways.

60. (D) Gorbl means fan; flur means belt; pixn means ceiling; arth means tile; and tusi means roof. Therefore pixnarth is the correct choice.