UNIFIED COUNCIL
Foundation for Success

UNIFIED COUNCIL OLYMPIADS

nstse
Test • Assess • Achieve

NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

CLASS - 8

Question Paper Code : UN494

KEY

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

SOLUTIONS

MATHEMATICS

01. (A) Given $a + \frac{1}{a} = 2$

If $a = 1$, then $\frac{1}{a} = 1$

then $a + \frac{1}{a} = 1 + 1 = 2$

$\therefore \quad a - \frac{1}{a} = 1 - 1 = 0$

02. (D) LCM of ab^2, bc^2, ca^2 is $a^2b^2c^2$

03. (C) $4(x^2 + 10x + 25) - (4x^2 + 4x + 1)$

$= 3x - 15 + 180$

$4x^2 + 40x + 100 - 4x^2 - 4x - 1$

$= 3x + 165$

$36x + 99 = 3x + 165$

$33x = 66$

$x = 2$

04. (B) $\sqrt[6]{262144} = \sqrt[3]{\sqrt{262144}}$

$\sqrt[3]{512} = 8$

05. (A) -1

06. (D) Let the two numbers be a and b.

Given : $a - b = 2$ and $a^2 - b^2 = 18$

We have,

$a^2 - b^2 = (a + b)(a - b)$

$18 = (a + b)(2)$

$\Rightarrow a + b = 9$

07. (B) Let the cost price of each candel be ₹x

$\therefore$ cost price of 15 candles = ₹$15x$

selling price of 12 candle = ₹$15x$

selling price of each candle = $\frac{₹\cancel{15}^{5}x}{\cancel{12}_{4}} = \frac{₹5x}{4}$

$\therefore$ Profit = $\frac{₹5x}{4} - ₹x = \frac{₹5x - ₹4x}{4} = \frac{₹x}{4}$

Profit percentage

$$= \frac{\text{Profit}}{\text{CP}} \times 100 = \frac{\left(\frac{₹x}{4}\right)}{₹x} \times 100 = 25\%$$

(OR)

Let CP of each candle be ₹12 &

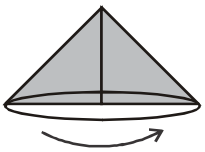
SP of each candle be ₹15

$\therefore$ Profit = ₹15 – ₹12 = ₹3

Profit percentage

$$= \frac{\text{Profit}}{\text{CP}} \times 100 = \frac{₹3}{₹12} \times 100 = 25\%$$

08. (B) Cone



09. (C) $2024^2 - 10{,}114 = 2024^2 - 10120 + 6$

$= 2024^2 - 5 \times 2024 + 6$

$= a^2 - 5x + 6$ (where $a = 2024$)

$= (a^2 - 3a - 2a + 6)$

$= a(a - 3) - 2(a - 3)$

$= (a - 3)(a - 2)$

$= (2024 - 3)(2024 - 2)$

$= 2021 \times 2022$

2022 is a factor of $(2024^2 - 10{,}114)$

10. (A) $\left(\frac{x \times 0.5}{3}\right) + 1 = 50$

$\left(\frac{0.5x}{3}\right)^2 = 50 - 1 = 49$

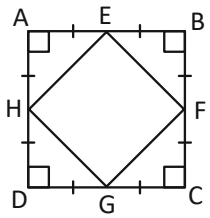
$\left(\frac{0.5x}{3}\right) = \sqrt{49}$

$\frac{0.5x}{3} = 7$

$x = \frac{7 \times 3}{0.5} = \frac{21}{0.5} = 42$

11. (A) $\Delta AEH \simeq \Delta BEF$ [$\because$ SAS Congruency]

$\therefore$ EH = EF [$\because$ CPCT]



Similarly we can prove

EF = FG = GH and EG = HF

[$\because$ side of a square]

$\therefore$ EFGH is a square

12. (A) Number of women in the room

$= \frac{3}{5} \times 120 = 72$

Number of married people $= \frac{2}{3} \times 120 = 80$

Number of unmarried people = 40

13. (A) Expenditure on food (in percentage)

= 100% – (15% + 10% + 5% + 20% + 15% + 10%)

= 100% – 75% = 25%

$\therefore$ The expenditure on food is maximum

14. (C) $2a - b + 5 = a + b$

$a - 2b = -5$

$a = -5 + 2b \quad \rightarrow \quad 1$

Given $2a - b + 5 = 2b - a + 2$

$3a - 3b = -3$

$a - b = -1$

$a = b - 1 \quad \rightarrow \quad 2$

Solving equation 1 and 2

$b - 1 = -5 + 2b$

$b - 2b = -5 + 1$

$+ b = + 4$

$b = 4$

$a = b - 1$

$a = 4 - 1$

$a = 3$

Area of equilateral triangle

$= \frac{\sqrt{3}}{4} \times \text{side}^2 = \frac{\sqrt{3}}{4}(3+4)^2 = \frac{49\sqrt{3}}{4}$

15. (C) Given $a^2 = 9x^2 - 24x + 16$

$= (3x)^2 - 2(3x)(4) + 4^2$

$= (3x - 4)^2$

$\therefore$ $a = (3x - 4)$ units

Perimeter $= 4a = 4(3x - 4)$ units

$= (12x - 16)$ units

16. (B) $(0.11)^3 + (0.22)^3 + ... + (0.99)^3$

$= \left(\frac{11}{100}\right)^3 \left(1^3 + 2^3 + ... + 9^3\right) = 2.695$

17. (B) ₹ 1331 = ₹ 1000 $\left(1 + \frac{10}{100}\right)^n$

$\frac{1331}{1000} = \left(\frac{11}{10}\right)^n$

$\left(\frac{11}{10}\right)^3 = \left(\frac{11}{10}\right)^n$

n = 3 years

18. (C) Distance travelled in 35 minutes

$= \frac{72^{6}\ \text{KM}}{60_{5_1}\ \text{min}} \times 35^{7}\ \text{min}$

= 42 km

19. (C) $2^{30} + 2^{30} + 2^{30} + 2^{30}$

$= 2^{30}(4) = 2^{30} \times 2^2$

$= 2^{32}$

20. (A) Given $a^3 = \frac{x^3}{8}\text{cm}^3 = \left(\frac{x}{2}\text{cm}\right)^3$

$\therefore \quad a = \frac{x}{2}\text{cm}$

$\therefore$ Surface area $= 6a^2 = 6 \times \left(\frac{x}{2}\text{cm}\right)^2$

$= 6 \times \frac{x^2}{4}\text{cm}^2$

$= \frac{3x^2}{2}\text{cm}^2$

21. (B) Given $\angle A + \angle C = 2(\angle B + \angle D)$

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

$2(\angle B + \angle D) + 1(\angle B + \angle D) = 360°$

$\angle B + \angle D = \frac{360°}{3} = 120°$

$\angle A + \angle C = 2(\angle B + \angle D) = 240°$

$\angle A + 50° = 240°$

$\angle A = 240° - 50° = 190°$

22. (A) Let the present age of Vinay be x years

$\therefore$ Given $x + 4\frac{1}{2}x + x + 30 = 108$

$2x + \frac{9x}{2} = 108 - 30 = 78$

$\frac{4x + 9x}{2} = 78$

$13x = 78 \times 2$

$x = \frac{78^{6} \times 2}{13_{1}}$ = 12 years

23. (D) $\sqrt{1^3+2^3+3^3+4^3+5^3+6^3}$

$=\sqrt{1+8+27+16+125+216}$

$=\sqrt{441}$ = 21

24. (C) Given side of square = $(x + y - z)$ cm

Area of square = $(x + y - z)^2$ cm^2

= $(x^2 + y^2 + x^2 + 2xy - 2yz - 2zx)$ cm^2

25. (D) Given $\sqrt[3]{x+3}=24$

Cubing on both sides

$\left(\sqrt[3]{x+3}\right)^3=24^3$

x + 3 = 13824

x = 13824 – 3 = 13821

PHYSICS

26. (D) A sound of same pitch or frequency is played on a flute and also on a trumpet. So, the fequency of both a flute and a trumpet are the same as the pitch. The speed of sounds of a flute and a trumpet are played in the same media i.e., air. Hence, the speed of two sound waves of a flute and a trumpet are also the same.

27. (B) The direction of friction F always opposes the direction of the pulling force, P.

The weight of object, W is always acting vertically downwards from the center of gravity of the objects.

28. (B) Unlike charges attract. Like charges repel. Attraction is also possible between a charged object and an uncharged object.

29. (C) The patch of oil decreases the frictional force between the brakes and the dry road.

Time taken to slow down increases because of the decrease in frictional force.

30. (A) Bulb in the set up A glows more brightly because higher current is flowing through the circuit in set up A, as solution A is a better conductor of electricity than that of solution in B.

31. (B) For human eye, to capture the image the object must be real. All real images produced by a converging lens are inverted and diminished.

32. (C) Atmospheric pressure is due to vertical height of air (or atmosphere) above the ground. The increase in altitude or height (h) from 1st floor to 20th floor results in decrease of this vertical height *h* of air and a corresponding decrease in atmospheric pressure. The height (h) of the mercury column decreases as there is less air above the two students at 20th floor of a block of flats.

33. (D) Sea water is very salty and salt solution is a good conductor of electricity. Larger current produced by sea water produces greater magnetic field thus more deflection.

34. (D) A great amount of frictional force is required by a man walking on the road and applying brakes to a moving bicycle by a cyclist

35. (A) A plane mirror produces an image such that object distance is equal to image distance. Also the line joining the object and the image is perpendicular to the reflecting line.

CHEMISTRY

36. (C) The decreasing order of reactivity of given metals is potassium, sodium, calcium, magnesium, aluminium, zinc, iron, lead, copper, silver.

37. (B) Petroleum is present in layer Y. X is natural gas and Z is water.

38. (D) The given fuels in the increasing order of their calorific values is : (ii),(iii),(i),(iv).

Wood — 17000 to 22000 kJ/kg

Coal — 25000 to 33000 kJ/kg

Petrol — 45000 kJ/kg

Natural gas — 50000 kJ/kg

39. (A) As per the given figures and statements, only statement (A) is true. City 'R' recycles 85% of its plastic wastes.

40. (A) X cannot react with water, hence, it is below Ca in the reactivity series. X can react with acid; hence, it is above Cu in the reactivity series. XO cannot react with H_2; hence, it is either Zn or below Zn in the reactivity series. XO can react with C; hence, it is Zn or below Zn in the reactivity series. From all the possible options. Zn is the only possible metal.

41. (D) Carbon dioxide is the fourth most abundant gas found in air. It can react with water to form a weak acid, carbonic acid. This in turn causes the slight acidic property of rain water. Carbon dioxide is a non-pollutant gas that helps plants to carryout photosynthesis.

42. (D) Biodegradable rubbish buried in the ground decomposes to become nutrients that do not pollute the environment. Burning of trees in the forests produces carbon dioxide, ash and smoke that pollute the environment. Using treated waste from sewage plants to fertilise roadside trees is not a form of pollution, as harmful substances have been removed from the waste. Turning waste water into drinkable water is not a form of pollution.

43. (A) The physical properties that should be considered to select materials for building the body of a ship are it should be strong, have low density (to float) and corrosion resistant (preferably an alloy).

44. (A) Product 'P' is coal gas which is obtained during the processing of coal to get coke. It was used for street lighting. But nowadays, it is used as a source of heat (fuel) in many industries located near the coal processing plants.

45. (B) Persons sleeping in a closed room where coal is burnt is fatal because a poisonous gas, carbon monoxide is released. If this gas is inhaled, it can kill them.

BIOLOGY

46. (D) The advantages of levelling of soil are

(i) Levelling helps to prevent soil erosion caused by wind or air.

(ii) It helps in sowing the seeds uniformly and thus helps the plants to grow uniformly too.

(iii) It helps in proper irrigation by allowing the water to get distributed uniformly throughout the soil.

47. (B) Fungi undergo saprophytic or parasitic or symbiotic mode of nutrition. These microbes do not have chlorophyll, hence they are unable to make their own food and depend on other organism for sustenance. Saprophytic ones obtain their food from dead and decaying organic matter, e.g., bread mould. The example of the symbiotic relationship is the lichens i.e., relationship between algae and fungi.

The parasitic nutrition is found in cuscuta.

48. (D) Conservation programs help to

(i) protect the ecosystem from destruction.

(ii) prevent the depletion of natural resources.

(iii) maintain the population of endangered plant and animal species.

49. (B) X – Ribosome makes protein and

Y – Nucleus stores genetic information.

50. (D) The correct sequence of reproduction is

Fertilization $\rightarrow$ Zygote $\rightarrow$ Foetus $\rightarrow$ Well developed baby

51. (A) A pituitary gland is the master gland.

52. (D) The process is an asexual reproduction. This protuberance develops into hypostome, tentacles and basal disc. A full grown bud detaches from parent body and grows into an adult.

53. (B) Organelle labelled 2 is mitochondria.

Mitochondria produces energy.

54. (C) Amphibians species face threat of extinction.

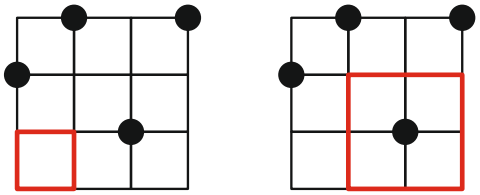
55. (B) Pathogen are disease causing organisms.

CRITICAL THINKING

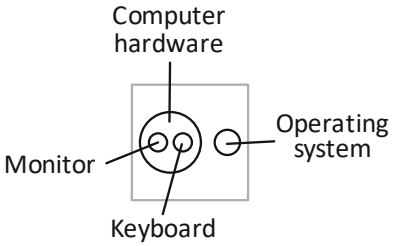
56. (A)

57. (B) Krishna is sitting to the left of Kishore, so his seat is 254. Raj is sitting to the left of Krishna, so his seat would be 253.

58. (C)



59. (A) Computer hardware, monitor, keyboard are the physical tangible parts or components of a computer but operating system is a system software.



60. (C) From I, the capacity of each tank is 500 liters. Hence, the total capacity of 10 tanks can be found. From II, $7x - 5x = 350$ where x is the capacity of each tank. This also provides the capacity of each tank and hence the total capacity. The correct answer is (C) Either I or II is sufficient.

The End