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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 8
Question Paper Code : UN470

KEY

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

SOLUTIONS

MATHEMATICS

01. (A) $\underbrace{2021^{2021} + 2021^{2021} + 2021^{2021} + \cdots + 2021^{2021}}_{2021 \text{ times}}$

$= 2021 \times 2021^{2021}$

$= 2021^{2022}$

02. (C) $4^2 + 9.6^2 = 16 + 92.16$

$= 108.16$

$= (10.4)^2$

$\Rightarrow$ 4, 9.6, 10.4 are pythagorus triplets

03. (D) $6x^2 - x - 12 = 6x^2 - 9x + 8x - 12$

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

$12x^2 + x - 20 = (3x + 4)(4x - 5)$

$8x^2 - 22x + 15 = (2x - 3)(4x - 5)$

$\therefore$ Required square root

$\sqrt{(3x+4)^2 (2x-3)^2 (4x-5)^2}$

$= (3x + 4)(2x - 3)(4x - 5)$

$= (6x^2 - x - 12)(4x - 5)$

04. (A) Vertical cross section of cylinder is a rectangle

05. (D)
$$\sqrt{\frac{a}{b}+\frac{b}{a}-2}=\sqrt{\left(\sqrt{\frac{a}{b}}\right)^2+\left(\sqrt{\frac{b}{a}}\right)^2-2\sqrt{\frac{a}{b}\times\frac{b}{a}}}$$

$$=\sqrt{\left(\sqrt{\frac{a}{b}}-\sqrt{\frac{b}{a}}\right)^2}=\left(\sqrt{\frac{a}{b}}-\sqrt{\frac{b}{a}}\right)$$

06. (B) Given $\dfrac{x_1 z_1^{\,2}}{y_1}=\dfrac{x_2 z_2^{\,2}}{y_2}$

$$\Rightarrow \frac{10\times 14^2}{4}=\frac{x\times 7^2}{16}$$

$$x=\frac{10\times 4\times 49}{4}\times\frac{16}{49}=160$$

07. (A) $(x^2 + 3x - 5)(x^2 + 1)$
$= x^2(x^2 + 1) + 3x(x^2 + 1) - 5(x^2 + 1)$
$= x^4 + x^2 + 3x^3 + 3x - 5x^2 - 5$
$= x^4 + 3x^3 - 4x^2 + 3x - 5$

08. (C) $\left[15625\times -729\right]^{\frac{1}{3}}=\left[25^3\times(-9)^3\right]^{\frac{1}{3}}$

$$=(25^3)^{\frac{1}{3}}\times(-9)^{3\times\frac{1}{3}}$$

$$= 25\times -9$$

$$= -225$$

09. (C) Profit = 20% of $SP=\dfrac{20}{100}\times SP=\dfrac{1}{5}SP$

$$CP = SP - Profit = SP-\frac{1}{5}SP=\frac{4}{5}SP$$

Profit percentage on $CP=\dfrac{Profit}{CP}\times 100$

$$=\frac{\dfrac{1}{5}SP}{\dfrac{4}{5}SP}\times 100 = 25\%$$

10. (C) $6x^2-2x+\dfrac{1}{6}=6x^2-x-x+\dfrac{1}{6}$

$$=6x^2-\frac{2x}{2}-\frac{3x}{3}+\frac{1}{6}$$

$$=2x\left(3x-\frac{1}{2}\right)-\frac{1}{3}\left(3x-\frac{1}{2}\right)$$

$$=\left(3x-\frac{1}{2}\right)\left(2x-\frac{1}{3}\right)$$

11. (D) $\sqrt[3]{\sqrt{531441}}=\sqrt[3]{729}=9$

12. (A) Let the numbers be 'x'
Given $20 \times 20 = 16x$

$$\therefore \frac{\cancel{20}^{5}\times\cancel{20}^{5}}{\cancel{16}_{4}}=x$$

$x = 25$ days

13. (B) Radius of Upper semicirle (R) = 14 cm
$\therefore$ Area of Upper semicirle

$$=\frac{1}{2}\times\frac{22}{7}\times 14\times 14\ \text{cm}^2$$

= 308 cm²
Radius of small semicircle = 7 cm
$\therefore$ Area of small semicircle

$\dfrac{1}{2}\times\dfrac{22}{7}\times 7\times 7\ \text{cm}^2$ = 77 cm²

$\therefore$ Area of both semicircle
= 2 × 77 cm² = 154 cm²
$\therefore$ Total area = (308 + 154) cm²
= 462 cm²

14. (C) $2r - h = \sqrt{r^2 + h^2}$
squaring on both sides
$4r^2 + h^2 - 4rh = r^2 + h^2$
$3r^2 = 4rh$

$$\frac{r}{h}=\frac{4}{3}$$

$\therefore$ r : h = 4 : 3

15. (D) Given = CP : SP = 4 : 5

4 SP = 5(CP)

$SP = \dfrac{5(CP)}{4}$

Profit = SP − CP

$= \dfrac{5CP}{4} - CP = \dfrac{CP}{4}$

Profit percentage $= \dfrac{\text{Profit}}{CP} \times 100$

$= \dfrac{\left(\dfrac{CP}{4}\right)}{CP} \times 100$

$= \dfrac{CP}{4} \times \dfrac{1}{CP} \times 100 = 25\%$

16. (A) LHS

$= \dfrac{(x-5)(x+4)}{(x+5)(x-5)} \times \dfrac{(x-2)(x+1)}{(x+4)(x-2)} \times \dfrac{x(x+5)}{(x+1)}$

$= x$

17. (B) Given $x = \dfrac{2\,ca}{\sqrt{a^2 - b^2}}$

$= \dfrac{2 \times 3.15 \times 32.5}{\sqrt{(32.5)^2 - 8^2}}$

$= \dfrac{2 \times 3.15 \times 32.5}{\sqrt{1056.25 - 64}}$

$= \dfrac{2 \times 3.15 \times 32.5}{\sqrt{992.25}}$

$= \dfrac{2 \times \cancel{3.15} \times \cancel{32.5}^{\,3.25}}{\cancel{31.5}_{\,10_{\,1}}} = 6.5$

18. (B) In △ABC, A : B = 2 : 3 = $2x : 3x$.

Given $\angle C = 2x + 3x = 5x$

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

$2x + 3x + 5x = 180°$

$10x = 180°$

$x = \dfrac{180°}{10} = 18°$

$\therefore 2x = 2 \times 18° = 36°$

19. (B) $3\sqrt{2}x^2 + \sqrt{6}x - 2\sqrt{2}$

$= 3\sqrt{2}x^2 + 2\sqrt{6}x - \sqrt{6}x - 2\sqrt{2}$

$= \left(\sqrt{3}\right)^2 \sqrt{2}x^2 + 2\sqrt{3} \times \sqrt{2}x$

$\qquad - \sqrt{2} \times \sqrt{3}x - 2\sqrt{2}$

$= \sqrt{6}x(\sqrt{3}x + 2) - \sqrt{2}(\sqrt{3}x + 2)$

$= (\sqrt{3}x + 2)(\sqrt{6}x - \sqrt{2})$

$= (\sqrt{3}x + 2)(\sqrt{2} \times \sqrt{3}x - \sqrt{2})$

$= (\sqrt{3}x + 2)(\sqrt{2})(\sqrt{3}x - 1)$

20. (A) $I = \dfrac{PTR}{100} \Rightarrow ₹252 = \dfrac{₹1600 \times 2\dfrac{3}{12} \times R}{100}$

$R = \dfrac{₹252}{₹16} \times \dfrac{12}{27} = 7$

21. (C) Given in △ABC, AB = AC

$\Rightarrow \angle B = \angle C$ .... (1)

Given DP||AC

$\Rightarrow \angle DPB = \angle C$ .... (2)

$\therefore$ In △BDP, $\angle B = \angle DBP \Rightarrow BD = DP$

Similarly in △PCE, $\angle C = \angle EPC$

$\Rightarrow PE = EC$

AD + DP + PE + EA = AD + DB + EC + EA

= AB + AC

22. (D) Given $6a^2 = 337.5$ cm^2

$a^2 = \dfrac{337.5}{6}$ cm^2 = 56.25 cm^2

$a^2 = (7.5 \text{ cm})^2$ $\quad [\because\ 7^2 < 56.25 < 8^2]$

a = 7.5 cm

Volume = (7.5 cm)^3 = 421.875 cm^3

23. (B) Area = length × breadth

$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

24. (A) Given $(9x - 7)(x + 6) = (3x - 4)(3x + 5)$

$$9x^2 + 54x - 7x - 42$$

$$= 9x^2 + 15x - 12x - 20$$

$$47x - 42 = 3x - 20$$

$$47x - 3x = 42 - 20$$

$$44x = 22$$

$$x = \frac{22}{44} = \frac{1}{2}$$

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

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

$$= \sqrt{441} = 21$$

PHYSICS

26. (C) Decreasing amplitude means sound becoming quieter. The correct order of decreasing amplitude of sounds is the jet engine, rock concert, telephone ringing and whispering as given below :

Jet engine – 140 dB

Rock concert – 120 dB

Telephone Ringing – 70 dB

Whispering – 30 dB

27. (B) When F_1 is greater than F_2, the wooden box will move towards the right. When both F_1 and F_2 are the same, the wooden box will remain at the same position. When F_2 is greater than F_1, the wooden box will move towards the left.

28. (A) As the metal rod is an earthed conductor, it cannot be charged by friction. The rest however are insulators which can be charged by friction.

29. (A) Friction is the relative force between two bodies in contact, which causes the decrease in the movement of a body or sometimes may even prevent the motion.

30. (B) Distilled water, glucose, alcohol and glycerine are non-electrolytes. Due to the absence of positive and negative ions, they do not conduct electricity. Solutions of acids, bases and salts conduct electricity. Solutions of common salt and caustic soda conduct electricity.

31. (D) Cataract occurs in old age due to the given characteristics.

32. (A) As height increases, air pressure decreases. The figures in ascending order of heights is sea beach, high building and mountain top. Hence, ascending order of air pressure is (i) mountain top , (ii) high building and (iii) sea beach .

33. (D) Zinc is better than tin for protecting iron from rusting because, zinc being highly electropositive can prevent rusting even when the layer is broken.

34. (D) Holding a glass, writing on a paper and sitting on a chair are the activities which are not possible without friction.

35. (B) As per the laws of reflection of light $\angle i = \angle r$. If the angle of incidence is 25° the angle of reflection is also 25°32.

CHEMISTRY

36. (D) All the given statements are correct about coal and LPG.

37. (B) Statements (A), (C) and (D) are true of sodium. Sodium dissolves in water to form a base called sodium hydroxide. Bases turn red litmus paper to blue.

38. (A) Biogas is obtained from plant and animal wastes while wood is obtained from cutting down the trees. Statements (B), (C) and (D) are not correct.

39. (D) Nylon thread is stronger than the cotton thread.

40. (B) Sodium and potassium are metals. They are soft and can be cut with a knife.

41. (B) The correct procedure for lighting a bunsen burner is to close the air-hole, light a match stick and then turn on the gas.

42. (A) Nylon is a strongest fibre even stronger than a thin steel wire as it can withstand maximum weight. Wool is stronger than cotton. Wool fibres can withstand minimum weight but cotton fibres cannot withstand weight and break easily.

43. (A) When nitrogen gas is passed over a corrosive metal like iron under specific conditions, its corrosion can be prevented.

44. (B) Spontaneous combustion of a material or a material that suddenly bursts into flames. Examples : Phosphorus, piles of hay, straw, manure etc., (takes place without any external source of heat).

45. (D) All the given advantages of gaseous fuels are safe for cooking at home.

BIOLOGY

46. (A) Structure P is the nucleus of a cell.
    1   nucleus
    2   cell membrane
    3   cell wall
    4   cytoplasm

47. (B) E.O. Wilson

48. (B) In the given figure, X is Paramecium and Y is Euglena. Both of them are protozoans and unicellular. Englena shows mixotrophic nutrition

49. (A) Crop X is a leguminous crop like pea. Leguminous crop has the ability to fix atmospheric nitrogen in soluble form in soil.

50. (D) Moulting is the process of periodic shedding or casting of outermost dead skin layer. In insects like silkworm, cockroach etc., moulting is essential for their growth. Moulting is also observed in snakes. In birds and mammals, seasonal loss of hair, fur and feathers is also known as moulting.

51. (A) In the figure given option A are RBC's. RBC cells are disc shaped and an iron containing protein called haemoglobin. Haemoglobin helps in transport of oxygen.

52. (A) The change from larva to adult is called metamorphosis. In frog, metamorphosis from tadpole to adult frog is controlled by thyroxine hormone secreted by thyroid gland.

53. (C) The given organism is chlamydomonas.

54. (B) Yeast is a fungus.

55. (D) P – Hoe: It is a simple tool which is used for removing weeds and for loosening the soil. It consists of long rod made up of wood or iron. A strong, broad and bent plate of iron is fixed to one of its ends which works like a blade.

    Q – Cultivator: It is attached to a tractor. Such tractor-driven cultivators save labour and time.
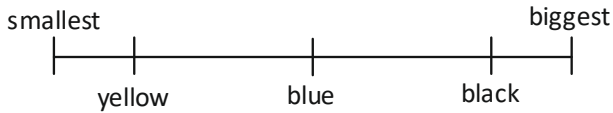
R – Seed drill: It is a funnel with a long and hollow stem. Farmer pours seeds into the funnel and the seeds go down the stem, one by one to get into the soil.

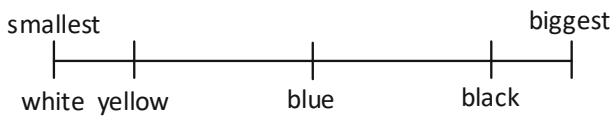S – Sickle: Cutting of crops (harvesting) is done by sickle (S) manually.
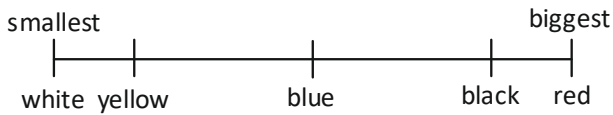
CRITICAL THINKING

56. (D)   Some pointers are rays

57. (A)   Starts from the last clue.

```
smallest                           biggest
|——————|————————|———————|
     yellow      blue      black
```

Continue with the second clue.

```
smallest                           biggest
|———|———————|————————|———————|
white yellow      blue       black
```

Continue with the first and third clues.

```
smallest                                biggest
|———|———————|————————|———————|
white yellow       blue       black   red
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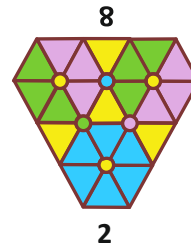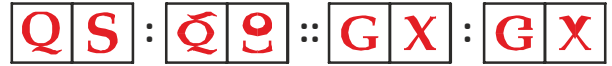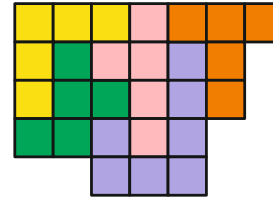
The red box is the biggest while the white box is the smallest

58. (D)   2 and 8

59. (A)

60. (C)

The End