UNIFIED COUNCIL

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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION (UPDATED)

CLASS - 7

Question Paper Code : UN464

KEY

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

EXPLANATIONS

MATHEMATICS

01. (C) $\frac{\cancel{25}^{5}}{\cancel{12}_{1}} \times \frac{\cancel{28}^{1}}{\cancel{15}_{3}} \times \frac{\cancel{36}^{1}}{\cancel{35}_{1}} \times \frac{5}{\cancel{4}_{1}} = 5$

02. (D) Given series is – 17, –15, –12, –8, m, 3

–17 + 2 = –15, –15 + 3 = –12,

–12 + 4 = – 8, –8 + 5 = –3 = m

03. (B) Product of 9 negative integers is negative

Product of 10 positive integers is positive

∴ This product = negative × positive = negative

04. (B) Given $6\frac{3}{4} \times 1.6 = 1.2 + 0.9 + 1.2 + 1.5x$

$6.75 \times 1.6 = 3.3 + 1.5\,x$

$10.8 - 3.3 = 1.5\,x$

$\frac{7.5}{1.5} = x$

$x = \frac{75}{15} = 5$

05. (A) Given $\frac{x}{3} - \frac{2x}{5} = \frac{2x}{3} + \frac{77}{30}$

$\frac{5x - 6x - 10x}{15} = \frac{77}{30}$

$$-11x = \frac{77}{\cancel{30}_{2}} \times \cancel{15}^{1}$$

$$x = \frac{77}{2} \times -\frac{1}{11} = -\frac{7}{2}$$

06. (C) Given $\frac{x+6}{4} + \frac{x-7}{5} = \frac{5x-8}{2}$

$$\left(\frac{x+6}{4}\right) + \left(\frac{x-7}{5}\right) - \left(\frac{5x-8}{2}\right) = 0$$

$$\frac{5(x+6)+4(x-7)-10(5x-8)}{20} = 0$$

$5x + 30 + 4x - 28 - 50x + 80 = 0 \times 20$

$-41x = -82$

$$x = \frac{-82}{-41} = 2$$

07. (A) In the ascending order after 6th & 7th entries are changed also there will not be any change in median.

08. (C) Option (C) dotted lines is not a symmetrical line

09. (C) $(2 \times 3° - 3 \times 4°)\, 5^2 = (2 \times 1 - 3 \times 1) \times 25$

$= (-1)(25)$

$= -25$

10. (A) Given $\left(\frac{5}{3}\right)^{-4}\left(\frac{3}{5}\right)^{5} = \left(\frac{5}{3}\right)^{1.5x}$

$$\Rightarrow \left(\frac{5}{3}\right)^{-4}\left(\frac{5}{3}\right)^{-5} = \left(\frac{5}{3}\right)^{1.5x}$$

$$\Rightarrow \left(\frac{5}{3}\right)^{-4+(-6)} = \left(\frac{5}{3}\right)^{1.5x}$$

$$\Rightarrow \left(\frac{5}{3}\right)^{-9} = \left(\frac{5}{3}\right)^{1.5x}$$

$\therefore 1.5x = -9$

$$x = \frac{-9}{1.5} = -\frac{90}{15} = -6$$

11. (B) If x = a + b + c then

$$\frac{a+b-(a+b+c)}{c} + \frac{a+c-(a+b+c)}{b}$$

$$+\frac{c+b-(a+b+c)}{a} + \frac{4(a+b+c)}{(a+b+c)} = 1$$

$$\Rightarrow \frac{a+b-a-b-c}{c} + \frac{a+c-a-b-c}{b}$$

$$+\frac{c+b-a-b-c}{a} + 4 = 1$$

$$\Rightarrow -\frac{c}{c} + \frac{(-b)}{b} + \frac{(-a)}{a} + 4 = 1$$

$\Rightarrow -1 - 1 - 1 + 4 = 1$

$\Rightarrow 1 = 1$

Hence x = (a + b + c)

12. (B) Required simplified value

$$= \frac{2}{3}ab - \frac{5}{7}bc - \frac{2ac}{3} - \frac{3}{2}bc + \frac{3}{5}ab + \frac{5}{2}ca$$

$$= \left(\frac{2}{3}ab + \frac{3}{5}ab\right) + \left(-\frac{5}{7}bc - \frac{3}{2}bc\right) + \left(-\frac{2ac}{3} + \frac{5ca}{2}\right)$$

$$= \left(\frac{10ab+9ab}{15}\right) + \left(\frac{-10bc-21bc}{14}\right) + \left(\frac{-4ac+15ac}{6}\right)$$

$$\left(\frac{19ab}{15} - \frac{31bc}{14} + \frac{11ca}{6}\right)$$

13. (D) $$\frac{0.5\,x}{4.5\,z^2} \times \frac{9\,yz^4}{2.5} \times \frac{15y^2z^2}{7.5x^2}$$

$$= \frac{5x}{45z^2} \times \frac{90yz^4}{25} \times \frac{150y^2z^2}{75x^3}$$

$$\frac{4\,y^3z^4}{5x^2}$$

14. (D) Given $2\pi r - r = 74$ m

$r(2\pi - 1) = 74$ m

$$r\left(2 \times \frac{22}{7} - 1\right) = 74 \text{ m}$$

$r\left(\frac{37}{7}\right) = 74 \text{ m}$

$r = 74 \text{ m} \times \frac{7}{37} = 14 \text{ m}$

$\therefore$ Circumference $= 2\pi r = 2 \times \frac{22}{7} \times 14 \text{ m}$

$= 88 \text{ m}$

15. (C) Area $= l \times b = (a^2 + b^2 + c^2 + ab - bc + ca)(a - b - c)$ units^2

$= [a^2(a - b - c) + b^2(a - b - c) + c^2(a - b - c) + ab(a - b - c)]$

$= a^3 - a^2b - a^2c + ab^2 - b^3 - b^2c - c^2a - bc^2 - c^3 + a^2b - ab^2 - abc - abc + b^2c + bc^2 + a^2c - abc - c^2a$

$= a^3 - b^3 - c^3 - abc - abc - abc - a^2b + a^2b - c^2c + a^2c + ab^2 - ab^2 - b^2c + b^2c + c^2a - c^2a - bc^2 + bc^2$

$= (a^3 - b^3 - c^3 - 3abc)$ units^2

16. (C) In ΔPQR, given $PQ = QR \Rightarrow \angle R = \angle PQR$

But in ΔPQR, $\angle P + \angle PQR + \angle R = 180°$

$70° + \angle PQR + \angle PQR = 180°$

$\Rightarrow 2\angle PQR = 180° - 70°$

$\angle PQR = \frac{110°}{2} = 55°$

$\therefore \angle RQT = 180° - \angle PQR$

$= 180° - 55°$

$= 125°$

17. (C) Let the other number be 'a'

Given $-\frac{16}{25}a = -\frac{4}{5}$

$\therefore a = -\frac{4}{5} \times -\frac{25}{16} = \frac{5}{4}$

18. (A) Let the required number be 'a'

Given $\frac{\left(-\frac{33}{8}\right)}{a} = \frac{99}{32}$

$-\frac{33}{8} \times \frac{1}{a} = \frac{99}{32}$

$-\frac{\cancel{33}}{\cancel{8}_1} \times \frac{\cancel{32}^4}{\cancel{99}_3} = a$

Required number (a) $= -\frac{4}{3}$

19. (C) Given $3A = 4B = 5C = k$

$\therefore 3A = k \Rightarrow A = \frac{k}{3}$

$4B = k \Rightarrow B = \frac{k}{4}$

$5c = k \Rightarrow C = \frac{k}{5}$

$\therefore A : B : C = \frac{k}{3} : \frac{k}{4} : \frac{k}{5}$

$= \frac{1}{3} \times 60 : \frac{1}{4} \times 60 : \frac{1}{5} \times 60$ [$\because$ LCM of 3, 4 & 5 = 60]

$= 20 : 15 : 12$

20. (A) Sachin marks percentage $= \frac{435}{500} \times 100$

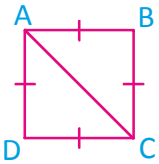
$= 87\%$

He has to increase 3% marks to get 90%

21. (D) Options A, B and C are true

22. (C) In ΔADC, $\angle D = 90°$ & $AD = DC$

$\Rightarrow \angle DAC = \angle ACD$



But $\angle DAC + \angle ACD + \angle D = 180°$

$\angle ACD + \angle ACD + 90° = 180°$

$2\angle ACD = 180° - 90° = 90°$

$\therefore \angle ACD = \frac{90}{2} = 45°$

$\therefore \angle CAB = \angle ACD = 45°$ [$\because$ Alternative angles]

$\therefore \angle ACD + \angle CAB = 45° + 45° = 90°$

23. (A) Given marks ratio of Mr. X and Mr Y = 8 : 9

$= 8x : 9x$

Given $8x : 9x - 30 = 4 : 3$

$\therefore 4(9x - 30) = 3 \times 8x$

$36x - 120 = 24x$

$36x - 24x = 120$

$12x = 120$

$x = \frac{120}{12} = 10$

$\therefore$ Marks of Mr. Y $= 9x = 9 \times 10 = 90$

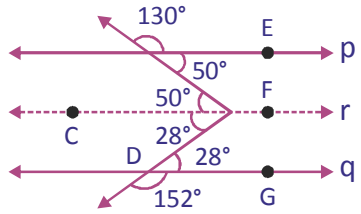
24. (B) PR is the hypotenuse of ΔPQR

$\therefore$ Hypotenuse opposite angle is right angle

$\therefore \angle Q = 90°$

25. (C) Construction :

Draw r || p through B



$\therefore \angle EAB = \angle ABC = 180° - 130° = 50°$

$\angle GDB = \angle DBC = 180° - 152° = 28°$

$\therefore x = \angle ABC + \angle CBD = 50° + 28° = 78°$

PHYSICS

26. (A) Circuit breakers shut off the current before the electricity warms up the device too much causing it to spark and start a fire.

27. (B) The time taken by a pendulum of given length to complete one oscillation is same at all times.

28. (D) Liquids expand more than solids for the same temperature change.

Option (A): Expansion only occurs when the temperature rises, not when it drops.

Option (B): Different solids expand by different amounts.

Option (C): Gases expand more than liquids for the same temperature change.

29. (A) The handle of an electric screwdriver is made up of an insulator (plastic) so that the user will not get an electric shock.

30. (B) Speed depends on both time and distance. In order to decide who travelled faster, Harish or Mohan, we have to compare the distance travelled by each in a fixed interval of time. Let's say both take 20 minutes to reach school.

$\therefore$ Speed of Harish = 7.5 m/min

$= \frac{\text{Distance travelled}}{\text{Time taken}} = \frac{150}{20}$

$\therefore$ Speed of Mohan

$\frac{\text{Distance travelled}}{\text{Time taken}} = \frac{200}{20} = 10 \text{ m/min}$

Mohan walks 10 m per minute as compared to 7.5 m distance walked by Harish.

Thus, Mohan travelled faster than Harish.

31. (C) Conduction involves solid pan in contact with touching a heated source. The correct example is the egg being fried in a pan.

Option (A) : Heat travels from the Sun by radiation to the earth.

Option (B) : Formation of sea and land breeze occurs due to convection currents in fluids.

Option (D) : Thermal currents in the oceans are caused by convection currents.

32. (C) The lamp in the circuit shown is powered by two cells. Hence, the lamp glows brightly.

33. (B) One hour = 60 minutes and one minute = 60 seconds.

So, one hour = 60 × 60 = 3600 seconds.

34. (B) Melting of ice at 0°C, is used for the lower fixed point and boiling of water at 100°C is used to determine the upper fixed point on the Celsius scale.

35. (B) When electircal energy is passed through a hair dryer, it produces heat energy and dries up the wet hair.

CHEMISTRY

36. (D) Follow the given precautions depending on the location you are if a storm is accompanied by lightning.

37. (C) Statements (A), (B) and (D) are not true about acids. Acids are sour to taste and change blue litmus paper to red.

38. (C) A chemical change always involves the formation of a new chemical substance.

Option (A) : Chemical changes are not reversible.

Option (B) : Chemical changes involve energy changes.

Option (D) : Heat and light are often given off during chemical changes.

39. (B) An acid always contains the element hydrogen.

Option (A) : Acids are often colourless liquids but some can be solids.

Option (C) : Acids have a pH value below 7. The pH value of 7 is for neutral substances.

Option (D) : Most of the acids contain the element oxygen but not all. An example is hydrochloric acid HCl.

40. (C) The reaction between iron nail with tap water and oxygen forms rust (Iron oxide) that causes the iron nail to turn reddish brown. It is a chemical change. Rest of the changes are physical in nature involving change of state only.

41. (B) When baking soda is added to a cake mixture, it becomes porous.

42. (B) There was an increase in the temperature of the solution due to the release of heat. In exothermic reactions heat is released.

43. (A) Sodium hydroxide and hydrochloric acid react to form sodium chloride and water which is a neutralisation reaction.

Option (B) : This is the thermal decomposition of calcium carbonate.

Option (C) : This is the burning (combustion) of hydrogen gas.

Option (D) : This is the burning (combustion) of methane gas.

44. (C) Statements (A),(B) and (D) are correct. Digestion of food is a chemical change and melting of wax is a physical change So, both are not similar types of changes.

45. (C) Warm air is lighter than cold air because the air in contact with the hot surface of the earth gets heated up, so it expands and becomes lighter.

BIOLOGY

46. (D) The exposed parts of the leaf were able to receive sunlight to make food. Iodine turns blue black in the presence of starch.

The covered part of the leaf was unable to receive sunlight. No food was made in this part, so iodine remained brown.

47. (D) The diagram represents the use of food by the body to release energy. In this process, the body takes in oxygen and gives out carbon dioxide.

48. (D) Drumstick and Dandelion seeds are light and are wind-pollinated. Both will germinate to form flowering plants. Both are dispersed by wind.

49. (C) Fats are emulsified by bile juice. Breaking down of the large fat droplets into small micelles is called emulsification.

50. (B) Pitcher plant can be found in nutrient poor wet lands. In order to obtain enough nutrients for healthy growth, the plants may have adaptations to trap animals.

The pitcher plants have modified leaves to create pitfall traps.

The plants will then secrete digestive juice to digest the insects and absorb the nutrients.

51. (A) Structure 1 is stigma. Stigma receive pollen grains in the process of pollination.

52. (C) Kidneys, ureters and urinary bladder work together to maintain the chemical balance of blood.

53. (C) The role of these organisms in the woodland ecosystem is to break down the dead plant and animal matter.

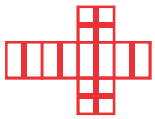
54. (D) Peristalsis is the wave-like muscular contractions of the walls of the oesophagus that enable food to be pushed down.

55. (C) Penguins have a thick layer of feathers to trap air to reduce heat loss from their bodies to the cold surroundings. Air is a poor conductor of heat.

Wet feathers are not good at keeping the birds warm. Hence, penguins have a layer of fat or blubber beneath their skin to keep them warm when swimming in water.

Penguins huddle together without moving for days when the temperature is very low. This behaviour adaptation helps the birds to keep warm and also conserves energy as they do not need to move about to keep warm.

CRITICAL THINKING

56. (C) 

57. (D) 365 hours

Total time = 365 × 24 hours

Time for work = 365 × 24 / 2 = 365 × 12

Time for sleeping = 365 × 24 / 3 = 365 × 8

Time for cooking = 365 × 24 / 8 = 365 × 3

Time for exercising = total time – time for work – time for sleeping – time for cooking.

= 365 × 24 – 365 × 12 – 365 × 8 – 365 × 3 hrs

= 365 × 24 – (365 × 12 + 365 × 8 + 365 × 3) hrs

= 365 × 24 – (365 (12 + 8 + 3)) hrs

= 365 × 24 – (365 x 23) hrs

= 365 (24 – 23) hrs

= 365 hrs

58. (C) c+e 

59. (B) Thursday: as 2004 is a leap year which has two odd days.

∴ 30 June 2004 = Wednesday

∴ 30 June 2005 = Thursday

60. **(A)**

DAY	MON	TUE	WED	THUR	FRI
SHOES	BLUE	BLACK	BROWN	GREY	BLUE

He wears black only on Tuesday

He wears blue on Friday

Brown on a day just before grey

Blue on 2 days