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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

Paper Code: UN436 (UPDATED)

Solutions for Class : 7

MATHEMATICS

1. **(A)** $\frac{2(x+4)+3(1+2x)}{4}=0$

$2x + 8 + 3 + 6x = 0$

$8x = -11$

$x = -\frac{11}{8}$

2. **(D)** All the given statements are correct.

Consider $\frac{4}{5}$.

(A) Since $\frac{4}{5}+0=\frac{4}{5}$, is the additive identity of rational numbers.

(B) Since $\frac{4}{5}\times 1=\frac{4}{5}$, 1 is the multiplicative identity of rational numbers.

(C) Since 0 + 0 = 0, 0 is the additive inverse of 0.

3. **(D)** $x - 10° + 190° - x = 180°$

4. **(B)** Since XP is the median, P is the midpoint of YZ. So, YP = PZ.

5. **(D)** 1.23456789... is neither terminates nor repeates.

6. **(A)** $\frac{3}{4}$ × S.P = 90% of C.P

(Since loss = 10%)

$\Rightarrow$ S.P = 120% of C.P

$\Rightarrow$ S.P = 1.2 of C.P

$\therefore$ Profit % $=\frac{1.2C.P-C.P}{C.P}\times 100\%$

$= 0.2 \times 100 = 20\%$

7. **(B)** Number of 1s = 1

Number of 2s = 14

Number of 3s = 12

Number of 4s = 3

$\therefore$ Mode of the given data is 2.

8. **(B)** $4^{3.5} : 2^5 = (2^2)^{3.5} : 2^5$

$= 2^7 : 2^5$

$= 2^5 \times 2^2 : 2^5$

$= 4 : 1$

9. **(D)** A triangle is classified as isosceles based on its two equal sides.

10. **(C)** In Δ PRS, given PR = RS

$\Rightarrow \angle S = \angle RPS = 28°$

$\angle QPS = 90° + 28° = 118°$

In Δ PQS $x + 118° + 28° = 180°$

$x + 146° = 180°$

$x = 34°$

11. **(D)** The smallest negative integer does not exist.

12. **(C)** Given profit = ₹ 175

Let CP be ₹ x.

Given 14% of x = ₹ 175

$\frac{14}{100}\times x = ₹\ 175$

x = ₹ 1250

$\therefore$ CP = ₹ 1250

SP = CP + P = 1250 + 175 = 1425

13. **(D)** We can construct equilateral triangle. [∵ Three acute angles are given means their sum need to be 180°]

14. **(B)**
$$\begin{array}{rl} & x^4 + 8x^2y^2 + y^4 \\ (-) & x^4 - 4x^2y^2 + y^4 \\ & - \ + \quad - \\ \hline & 12x^2y^2 \end{array}$$

15. **(C)** Bases are coprimes then powers to be equated to zero.

$\therefore x + 5 = 0$

$x = -5$

16. **(D)** Let the number of matches lost be x.
The number of matches won = x + 4.

Total matches played = x + x + 4

= 2x + 4

We have,

$$x + 4 = \frac{3}{5}(2x + 4)$$

$$\Rightarrow 5x + 20 = 6x + 12$$

$$\Rightarrow x = 8$$

$\therefore$ Total matches played

= 2x + 4

= 2(8) + 4 = 20

17. **(C)** $$x^2 + 4 + \frac{1}{x^2-4} = \frac{x^4-16+1}{x^2-4}$$

$$= \frac{x^4-15}{x^2-4}$$

18. **(A)** When considering congruent triangles, the order is very important.

Therefore, $\Delta ABF \cong \Delta EDF$.

19. **(B)** $$\frac{2^{2018}+2^{2017}}{2^{2017}+2^{2016}} = \frac{2^{2017}(2+1)}{2^{2016}(2+1)}$$

$= 2^{2017-2016} = 2$

20. **(C)** CP of each apple be ₹ x.

CP of 110 apples = 110x.

Given SP of 100 apples = 110x

SP of each apple = $\frac{110x}{100}$

Profit = SP – CP = $\frac{11x}{10} - x = \left(\frac{x}{10}\right)$

$$\text{Profit\%} = \frac{\text{profit}}{CP} \times 100$$

$$= \frac{\left(\frac{x}{10}\right)}{x} \times 100 = 10\%$$

21. **(C)** Product of given decimals = 1.5008

One decimal = 0.56

The other decimal = 1.5008 ÷ 0.56

$$= \left(\frac{1.5008}{0.56} \times \frac{100}{100}\right)$$

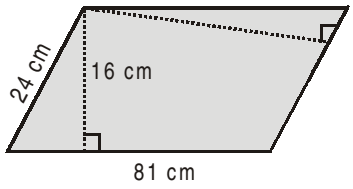
$$= \frac{150.08}{56} = 2.68$$

22. **(B)** 360 ÷ 5 = 72

72 × 2 = 144

180 – 144 = 36

23. **(C)** We have,



81 × 16 = 24 × x

$$x = \left(\frac{81 \times 16}{24}\right) = 54 \text{ cm}$$

$\therefore$ The altitude corresponding to shorter side = 54 cm

24. **(B)** x – 8° = 65° x = 73°

y + 3° = 25° y = 22°

25. **(C)** S.I = ₹ 31.50

$$T = 1\frac{1}{4} \text{ years} = \frac{5}{4} \text{ years}$$

$$R = 5\frac{1}{4}\% = \frac{21}{4}\%$$

$$\Rightarrow 31.50 = P \times \frac{5}{4} \times \frac{21}{400}$$

$$\Rightarrow P = ₹31.50 \times \frac{4 \times 400}{5 \times 21}$$

$\therefore$ P = ₹ 480

PHYSICS

26. **(C)** The flask with air and alcohol in it would overflow first. This is because the flask contains air which expands much more than liquids for the same temperature change.

27. **(B)** The distance travelled by the vehicles is recorded by an odometer.

28. **(D)** Electricity is caused by the movement of electric charges. These electric charges carry an amount of electrical energy, which can be converted into other forms of energy. Electricity is produced in power stations and supplied to our homes.

29. **(B)** A hot air balloon rises up because the hot air in the balloon is less dense than the cooler air surrounding it.

30. **(A)** The symbol for a series combination of cells is

31. **(A)** $\text{Speed} = \frac{\text{Words typed}}{\text{Time}} = \frac{1800}{30 \text{ minutes}}$

= 60 words per minute

32. **(A)** Light cannot pass through metals as they are opaque.

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

34. **(C)** Here, radius r = 1.5 cm, Time taken by second's hand of a watch to go once around the circle, t = 60

From,

$$v = \frac{s}{t} = \frac{2\pi r}{t} = 2 \times \frac{22}{7} \times \frac{1.5}{60} = 0.16 \text{ cm s}^{-1}$$

35. **(D)** A driver uses a convex mirror as rear view mirror because of two reasons:

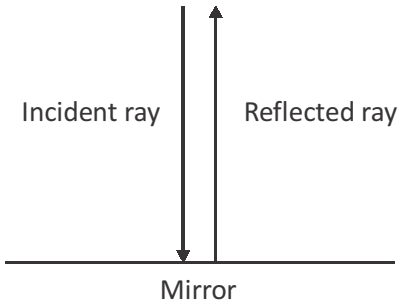
(i) A convex mirror always produces an erect image of the objects.

(ii) The image formed in a convex mirror is highly diminished or much smaller than the object, due to which a convex mirror gives a wide field of view.

36. **(C)** Silver is the best conductor of electricity. However, it is very expensive. Copper is the second best conductor of electricity. It is relatively cheap, hence, it is most commonly used to make electrical wires.

37. **(D)** Irrespective of the position of the object, a convex mirror always forms a virtual, erect and diminished image of an object.

38. **(A)** When the incident ray strikes perpendicularly on a plane mirror (i = 0°), the reflected ray will take the path of the incident ray, back to the light source. The angle between the incident ray and the reflected ray is hence 0°



39. **(D)** White walls reflect heat well and will therefore keep a building cool on a hot day.

40. **(B)** Hair dryer simply converts electrical energy into heat energy. It does not involve electromagnet in its working principle. A hair dryer is an electro-mechanical device that has an electric fan and a heating element. When air passes over nichrome wire coils that heat it and blow hot air.

41. **(C)** Conduction occurs only in solids, convection occurs only in liquids and gases, and radiation requires no medium.

42. **(D)** An electromagnet is made by winding insulated wire around a soft iron core. It behaves like a magnet as long as the current passes through it. It is a temporary magnet.

43. **(A)** The speed of water flow through the pipe can be increased by increasing the water pressure. All other mentioned changes will have no effect on the speed of water flow.

44. **(B)** A thinner capillary tube will make a mercury-in-glass thermometer more accurate.

45. **(B)** When the sunlight passes through a prism, the prism splits the sunlight into seven colours.

46. **(B)** Assume that both took 20 minutes to reach the school.

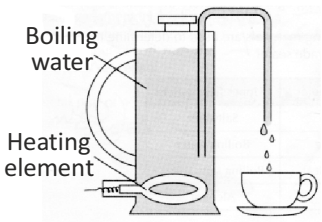
$$\text{Speed of Kiran} = \frac{\text{Distance travelled}}{\text{Time taken}} = \frac{1500}{20}$$

$= 75 \text{ m min}^{-1}$

$$\text{Sharan} = \frac{2000}{20} = 100 \text{ m min}^{-1}$$

Sharan walks 100 m min^{-1} while Kiran walks 75 m min^{-1}. Thus, Sharan walks faster than Kiran.

47. **(A)** Hot water comes out of the coffee maker because the steam formed inside expands to push the water out through the pipe.



48. **(D)** A,H,I,M,O,T,U,V,W,X,Y All these letters look similar when viewed through a plane mirror.

49. **(B)** The average speed taken by the cyclist

$$= 25 \text{ km h}^{-1} = \frac{25}{60} \text{ km min}^{-1}$$

Total distance travelled

$= P_1 = P_2 = P_3 = 4 + 5 + 6 = 15$ km

$$\text{Time taken} = \frac{\text{Distance}}{\text{Speed}}$$

$$\frac{15}{25} \times 60 = \frac{900}{25} = 36 \text{ minutes}$$

50. **(B)** An additional cell will provide more chemical energy that gets converted into electrical energy, which will make the bulb glow more brightly.

CHEMISTRY

51. **(A)** In a block of ice, the particles will have the least kinetic energy as its temperature is the lowest compared to the temperatures of substances given in options (B), (C) and (D).

52 **(A)** The centre of a cyclone is a calm area. A large cyclone is a violently rotating mass of air in the atmosphere. Around this calm and clear eye there is a cloud region of about 150 km in size. In this region there are high-speed winds (150-250 km/h) and thick clouds with heavy rain. Away from this region the wind speed gradually decreases. The formation of a cyclone is a very complex process.

53. **(B)** The natural indicator litmus is extracted from lichens.

54. **(A)** Lightning generally strikes tall buildings.

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

Option (B): It is a thermal decomposition of calcium carbonate.

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

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

56. **(C)** Carbonic acid (H_2CO_3) is present in soft drinks. The ting that is felt when soft drinks are taken is due to carbonic acid. The fizz that we see is due to dissolved carbon dioxide escaping rapidly.

57. **(C)** Water is first allowed to settle so that a sediment of impurities is formed. Then chemicals like alum and lime are added so that sediments further settle down. Then the water is filtered through sand and gravel, there by making it pure. Then it is chlorinated to make it free from germs and bacteria.

58. **(A)** Citric acid is the weakest acid because it is an organic acid which is found in citrus fruits.

59. **(C)** Lightning conductor is a device used to protect buildings from the effect of lightning. A metallic copper rod, taller than the building is installed in the walls of the building during its construction. One end of the rod is kept out in the air and the other is build deep in the ground. The purpose of lightning rods is to provide a low-resistance path to the ground that can be used to conduct the enormous electrical currents when lightning strikes occur.

60. **(D)** Iron, oxygen and water are essential for rusting as rust is chemically hydrated iron oxide.

61. **(B)** Moving air is called wind. It flows from areas of higher pressure to areas of lower or reduced pressure.

62. **(B)** Occurrence of an earthquake is a fast change.

63. **(A)** Apple juice is acidic due to the presence of malic acid. Soap solution slaked lime and lime are basic in nature.

64. **(D)** Lightning affects radio and T.V signals resulting in the disturbance in the sound and picture clarity. It also affects the telephone wires and causes death of people when sparks of lightning fall on them.

65. **(B)** Acids change blue litmus paper red and bases change red litmus paper blue.

66. **(D)** Breaking of a glass rod is a physical and an irreversable change. It is a physical change because there is a change in size and shape of broken glass pieces. It is an irreversible change as all the broken pieces of glass rod cannot be joined to form an original glass rod.

67. **(B)** The interior of the earth is hot. Groundwater in liquid state absorbs enormous heat from the interior of the earth and gets converted into steam. This steam can rotate turbines to generate eleticity.

68. **(C)** Only combustion is a chemical change as new products are formed.

Option (A): Contraction is a physical change as it is reversible.

Option (B): Condensation is a physical change as it is reversible.

Option (D): Expansion is a physical change as it is reversible.

69. **(C)** Vinegar is acetic acid and baking soda is sodium hydrogen carbonate (a base). Whenever an acid reacts with a metal carbonate it produces carbon dioxide gas.

$CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2$

70. **(D)** Statements (A), (B) and (C) give the uses of lightning.

BIOLOGY

71. **(C)** The correct equation is

(i) + (iv) $\xrightarrow[\text{chlorophyll}]{\text{Light}}$ (iii) + (ii)

(i) Carbon dioxide, (iv) water,
(iii) Sugar and (ii) Oxygen

72. **(B)** Cuscuta absorbs the valuable nutrients from the host as it is a parasite.

73. **(C)** Cows buffaloes, goats, camel and sheep are ruminants.

74. **(B)** C → E → B → D → A

75. **(C)** Yarn is made by spinning.

76. **(D)** Red eyed frog have large eyes, exhibit camouflage and nocturnal.

77. **(A)** P-Respiration; Q-Photosynthesis; R-Respiration.

78. **(B)** Tusks are modified incisors.

79. **(C)** Stigma is the receptor of pollen.

80. **(C)** Skin and kidneys excrete excess mineral salts in the form of urea and excess water.

81. **(B)** The difference between the transport system of humans and that of plants is in humans, food and water are carried by the blood, but in plants, food is carried by phloem and water by xylem.

82. **(B)** Clay soil is suitable for making pots as it can be moulded as clay are sticky.

83. **(B)** A runner grows along the ground.

84. **(A)** If the number of platelets is too low it leads to clotting disorder. Clotting time increases.

85. **(D)** The flower with the given characteristics can pollinate by insects.

86. **(C)** Plant Z is an insectivorous plant like nepenthes. It grow in swamp.

87. **(B)**

Symbiotic relationship	–	Lichens
Parasitic plant	–	Cuscuta
Ruminant	–	Cow
Saprophyte	–	Mould

88. **(B)** The layer of oil blocks the stomata, preventing air from entering the plant. Without carbon dioxide, the plant is unable to make food. Without food, the plant wilt.

89. **(B)** 'X' in the given figure is alveoli. Alveoli helps in exchange of gases.

90. **(C)** Amoeba exhibits holozoic nutrition.

GENERAL AWARENESS

91. **(B)**	92. **(B)**	93. **(A)**
94. **(D)**	95. **(D)**	96. **(D)**
97. **(A)**	98. **(B)**	99. **(C)**
100. **(A)**		

The End