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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

Paper Code: **UN436 (UPDATED)**

Solutions for Class : 8

MATHEMATICS

1. (C) $\frac{a-b}{c} = \frac{a}{c} - \frac{b}{c}$

2. (A) $a^2 - (b^2 + 2bc + c^2) = a^2 - (b+c)^2$
 $= (a + b + c) (a - b - c)$

3. (B) Let the C.P. of the article for Ravi be ₹ x.

S.P. for Ravi = C.P. × $\frac{100 + g}{100}$

= ₹ $\frac{106}{100}x$

∴ C.P. for Sudhir = ₹ $\frac{106x}{100}$

S.P. of Sudhir = ₹ $\frac{106x}{100} \times \frac{95}{100}$

C.P. of Gopal = ₹ $\frac{106x}{100} \times \frac{95}{100}$

We have, $\frac{106x}{100} \times \frac{95}{100} = 2014$

⇒ x = ₹ 2000

4. (C) $3x^3$ and $4x^3$ are like terms

5. (D) $x - \frac{1}{x} = \sqrt{6}$

Squaring on both sides, we get

$\left(x - \frac{1}{x}\right)^2 = (\sqrt{6})^2$

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

⇒ $x^2 + \frac{1}{x^2} = 6 + 2 = 8$

6. (D) Sides ratio =

$\frac{1}{2} : \frac{1}{3} : \frac{1}{4} = \frac{1}{2} \times 12 : \frac{1}{3} \times 12 : \frac{1}{4} \times 12$

= 6 : 4 : 3

= 6x : 4x : 3x

Given $6x + 4x + 3x = 52$ cm

$13x = 52$ cm

x = 4 cm

3x = 12 cm

7. (A) As shown in the figure, since P is the midpoint of AB and AB = 2AD, we have AB = 2AP = 2AD

or AP = AD.

i.e., triangle ADP is an isosceles triangle. If $\angle ADP = x^\circ$ and $\angle APD = x^\circ$, then $\angle A = 180^\circ - 2x^\circ$.

Since $\angle B$ is adjacent to $\angle A$, in ABCD

$\angle B = 180^\circ - (180^\circ - 2x) = 2x$.

In $\triangle CBP$, $x^\circ + x^\circ + 2x^\circ = 180^\circ$ (Angle sum property)

⇒ $4x^\circ = 180^\circ \Rightarrow x^\circ = 45^\circ$

∴ $\angle CPD = 180^\circ - 2x^\circ$
 $= 180^\circ - 2 \times 45^\circ = 90^\circ$

8. (A) Let principal be Rs x.

A = 2x

SI = A - P = 2x - x = x

But SI = $\frac{PTR}{100}$

x = $\frac{x \times 8 \times R}{100}$

R = $\frac{100}{8} = \frac{25}{2} = 12\frac{1}{2}\%$

9. (B) Area of parallelogram
 = Base \times Height
 \Rightarrow Base \times 10 = 120 cm² (Given)
 \therefore Base = 12 cm
10. (C) $\sqrt{\frac{0.16}{0.4}} = \sqrt{\frac{0.16}{0.40}} = \sqrt{\frac{16}{40}} = \sqrt{\frac{4}{10}}$
 $= \sqrt{0.4} = \sqrt{0.40}$
 $= \sqrt{\frac{40}{100}} = \frac{\sqrt{40}}{10} = \frac{6.3}{10} = 0.63$
11. (D) Given $4x - 7 = 2x + 5$
 $2x = 12$
 $x = 6$
 $\therefore 2x + 5 = 2(6) + 5 = 12 + 5 = 17$ cm
12. (C) $a^3 b^3 - b^3 c^3 = b^3 (a^3 - c^3)$
 $= b^3 (a-c) (a^2 + ac + c^2)$
13. (A) Given $3a + 2b + c = 22$
 $b + c = 8$ and $c = 6$
 Therefore, $b = 8 - c = 8 - 6 = 2$
 and $a = \frac{22 - c - 2b}{3}$
 $= \frac{22 - 10}{3} = \frac{12}{3} = 4$
 Hence $a + b + c = 4 + 2 + 6 = 12$
14. (D) $SA = 2(lb + bh + hl)$
 $= 2(3 \times 2 + 2 \times 1.5 + 1.5 \times 3) m^{+2}$
 $= 2(6 + 3 + 4.5) m^{+2}$
 $= 2 \times 13.5 m^{+2}$
 $= 27 m^{+2}$
15. (C) By folding the given net, the cube in option (C) can be formed.
16. (D) Originally, let there be x men. Less men
 \Rightarrow more days.
 $\therefore (x-10) : x :: 100 : 110$
 $\Rightarrow (x-10) \times 110 = x \times 100$
 $\Rightarrow 10x = 1100 \Rightarrow x = 110$
17. (D) Third number $(x^2 + y^2 + z^2) - [4x^2 - 5y^2 + z^2 + (-3x^2 + 4y^2 + 2z^2)]$
 $= x^2 + y^2 + z^2 - [x^2 - y^2 + 3z^2]$
 $= x^2 + y^2 + z^2 - x^2 + y^2 - 3z^2$
 $= 2y^2 - 2z^2$

18. (A) Angle of the sector representing the number of students interested in maths = 126°.
 Total numbers of students = 2000
 \therefore No. of students who like maths
 $= \frac{126^\circ}{360^\circ} \times 2000 = 700$
19. (D) Given $\frac{\sqrt{3}}{4} a^2 = 75\sqrt{3} \text{ cm}^2$
 $a^2 = 300 \text{ cm}^2$
 $a = 10\sqrt{3} \text{ cm}$
 $h = \frac{\sqrt{3}}{2} a = \frac{\sqrt{3}}{2} \times 10\sqrt{3} = 15 \text{ cm}$
 $OM = \frac{1}{3} h = \frac{1}{3} \times 15 \text{ cm} = 5 \text{ cm}$
20. (B) $\sqrt[3]{343} \times \sqrt[3]{-64} = \sqrt[3]{343 \times -64}$
 $= -\sqrt[3]{7 \times 7 \times 7 \times 4 \times 4 \times 4}$
 $= -7 \times 4 = -28$
21. (D) $\frac{x-y}{\sqrt{x}+\sqrt{y}} = \frac{(\sqrt{x})^2 - (\sqrt{y})^2}{\sqrt{x}+\sqrt{y}}$
 $\frac{(\sqrt{x}+\sqrt{y})(\sqrt{x}-\sqrt{y})}{\sqrt{x}+\sqrt{y}} = (\sqrt{x}-\sqrt{y})$
22. (D) Let the other factor be $x^2 + ax + b$.
 We have
 $(x^2 + 2x + 5)(x^2 + ax + b)$
 $= x^4 + px^2 + q$
 $x^4 + (2+a)x^3 + (2a+b+5)x^2 + (5a+2b)x + 5b = x^4 + px^2 + q$
 Comparing the coefficients of corresponding terms, we get
 $2a + b + 5 = p$ (1)
 $5b = q$ (2)
 $2 + a = 0 \Rightarrow a = -2$
 $5a + 2b = 0 \Rightarrow b = 5$
 $\therefore p = 2a + b + 5 = 2(-2) + 5 + 5 = 6$
 $q = 5b = 5(5) = 25$

23. (B) Additive inverse of 2 is -2 and its multiplicative inverse is $\frac{1}{2}$.

$$\text{So, their sum} = (-2) + \frac{1}{2} = \frac{(-3)}{2}$$

24. (D) Ratio of boys and girls = $3 : 2 = 3x : 2x$

$$\text{Total students} = 3x + 2x = 5x.$$

'25' is the only number which is multiple of 5.

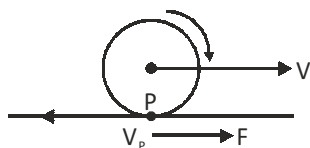
25. (B)
$$\frac{(32)^{\frac{-2}{5}}}{(125)^{\frac{-2}{3}}} = \frac{\frac{1}{4}}{\frac{1}{25}} = \frac{25}{4}$$

PHYSICS

26. (C) The speed of sound in solids (railway tracks) is more than that in air.

27. (D) A positively-charged object can attract a negatively charged object (unlike charges attract). A positively-charged object can also attract a neutral conductor by first attracting the free electrons of the conductor nearer to the side facing the positively-charged object leaving more positive nucleus on the other side.

28. (A) So, in case of the wheel, the point P which is contact with the ground tries to go backwards due to rotation and its velocity as shown in the figure. The frictional force F will try to oppose this motion and thus, it will be in the forward direction.



29. (D) The nocturnal animals need more light to see at night. The large cornea and pupil allow more light to enter into their eyes. They also have retina with large number of rods.

30. (C) Electrolysis of molten sodium chloride gives chlorine at the anode.

31. (C) Glass has comparatively a better polished and regular surface and so, it has the least friction.

32. (D) The air rushed out of the balloon and pushed the set-up forward in direction Y. Frictional force acts in the opposite direction of motion, i.e., Z.

33. (D) Chemical reactions occur at the electrodes. The mass of any substance deposited or dissolved at any electrode during electrolysis is directly proportional to the quantity of electricity passed through the electrolyte.

34. (B) There are no nerve endings at the blind spot due to the absence of rods and cones. Hence, it is insensitive to light. Blind spot on the retina where the optic nerve enters the eye ball has no nerve endings.

35. (A) The force of attraction present between two charged bodies is called electrostatic force.

36. (B) The force applied by boy Q did not change the shape of the shuttlecock.

After boy Q hit the shuttlecock it changed its direction.

The shuttlecock did not increase its speed.

It was the net that stopped the shuttlecock and caused it to drop to the ground.

37. (A) The hearing range of human ear is 20 Hz to 20,000 Hz.

38. (B) Vinegar is a good conductor of electricity. Hence, X is vinegar.

39. (B) The electrons on the underside of the lightning cloud induce a positive charge on the Earth's surface. When the electric field is strong the electrons are being attracted to the Earth. Lightning is caused by large amount of fast moving electrons moving at high speed through the air from the cloud to the ground.

40. (D) A tuning fork always produces vibrations of the same frequency

41. (A) Iris controls the size of the pupil.
42. (A) During friction the first few steps of motion, the horse has to pull the cart harder, because the horse has to walk against limiting friction.
43. (A) First, compare P and Q. The distance moved is the same (130 cm), so the one with the higher magnitude will move faster. It is P. Next, compare R and S. The distance moved is 90 cm. The one that moved that distance in the shorter amount of time has the larger magnitude. It is R. Finally, compare P and R. They both took 7 seconds to complete. Therefore, if we look at the distance moved, the one that completed the longer distance in 7 seconds has the higher magnitude
44. (C) A neutral body does not contain protons and electrons (incorrect)
 A neutral body has equal number of protons and electrons.
 An electrical conductor has particles that are closely bonded (incorrect)
 An electrical conductor has many free electrons.
 A perfect insulator has no free electrons (Correct)
 A neutral body will not be attracted by a charged body (incorrect)
 A neutral body can be attracted by both positively charged bodies and negatively charged bodies.
45. (A) Jupiter has the maximum number of Moons.
46. (C) According to the laws of reflection, the angle of incidence is always equal to the angle of reflection.
47. (D) Due to the very high speed of meteor when it enters the earth's atmosphere, the heat produced by the friction of air is very large which causes the meteor to burn.

48. (A) Common salt is one such solid whose molecule is made up of negatively and positively charged ions. It is a non-conductor when it is in solid form.
49. (D) The three delicate bones in the middle ear are the hammer, the anvil and the stirrup
50. (B) To knock down the bottle of water, the force must be great enough to knock it over. To make the force great enough, we either have to increase the mass of the paper ball and/or roll the ball at a faster speed.

CHEMISTRY

51. (D) Both nitrogen dioxide and sulphur dioxide dissolve in rain water to form acid rain, which reacts with marble and limestone of buildings thus corroding them.
52. (A) Copper being more reactive than silver, displaces silver and the solution turns blue due to the formation of copper nitrate.
53. (A) Wood can be replenished easily by growing more trees.
54. (D) The availability of hydrogen is less and also forms an explosive mixture with air or oxygen and causes explosion if it leaks out. Its storage and transport are difficult.
55. (D) Nylon is the first, fully, synthetic fibre prepared from coal, air and water.
56. (B) During fractional distillation, crude petroleum that is obtained from the earth's crust is heated to a temperature of about 400-500 °C. The different constituents present start separating out at different heights of the fractionating column depending upon their boiling points.
57. (D) Oxides of sulphur and nitrogen are present in acid rain.
58. (B) Kerosene is mainly used as a fuel in jet engines.
59. (D) The correct matching is :
 a – 4, b – 1, c – 2, d – 3
 (i) Silk - Saree
 (ii) Nylon - Rope
 (iii) Acrylic - Sweater
 (iv) Plastic - Bottle

60. (B) Phosphorus is stored in water because it reacts with air at room temperature.
61. (A) The burning of synthetic polymers release smoke and toxic gases which pollute the environment.
62. (B) Global warming causes glaciers to melt, which may lead to a rise in the sea level and thus submerge low lying areas.
63. (D) Potassium lies at the top of the activity series and it is the most reactive metal.
64. (D) Esters are responsible for the characteristic smell of fruits.
65. (B) Fractional distillation is carried out in a petroleum refinery.
66. (A) Sodium is soft and can be cut with a knife.
67. (D) The nylon thread is stronger than the cotton thread.
68. (D) Fire brigades pour water on the fire. Water cools the combustible material so that its temperature is brought below its ignition temperature. This prevents the fire from spreading. Water vapour also surrounds the combustible material, and thus helping in cutting off the supply of air. So, the fire is extinguished.
69. (B) Aluminium reacts with air to form a layer of Al_2O_3 which acts as a protective layer.
- $$4Al + 3O_2 \rightarrow 2Al_2O_3$$
70. (B) When coal is heated in the absence of air, coke, coal gas and coal tar are produced.

BIOLOGY

71. (B) Estrogen and progesterone are found only in females.
72. (D) P - Chlamydomonas, Q - Euglena and R - Mold P and Q are able to move about and are autotrophs. R is a saprotroph.
73. (B) 'P' is binary fission and 'Q' is budding. Binary fission and budding are asexual reproduction.
74. (B) Rhizobium bacteria fixes atmospheric nitrogen in soil.
75. (C) Organelle chloroplast converts light energy to chemical energy during the process of photosynthesis. It has chlorophyll to trap sunlight during photosynthesis.
76. (D) All the given options makes soil infertile barren and cause pollution.
77. (B) Nucleus is the controlling centre of the cell.
78. (B) Erythrocytes are red blood cells that contain an iron containing pigment called haemoglobin that help in transport of gases.
79. (A) Shedding of old skin and grow into a new adult is called moulting. Nymph of cockroach undergoes moulting.
80. (B) Chloroplasts trap light energy during photosynthesis.
81. (C) 'P' is chlamydomonas. Chlamydomonas is an alga and autotroph .
82. (A) Raising egg laying birds are called layers.
83. (B) Meiotic cell division take place in reproductive cells to reduce the number of chromosomes to half or haploid. Haploid gametes fuse to form a diploid gamete.
84. (D) A in the given diagram represent pupa.
85. (B) Beans is a leguminous plant. It contains root nodules with rhizobium bacteria that help in nitrogen fixation.
86. (D) The microorganism in the given figure is an autotrophic alga.
87. (A) Iris of human eye, uterus and bronchia are similar as they contain smooth muscles.
88. (C) Care and management of silk is called sericulture.
89. (D) Pea are pulses.
90. (D) The image in option (D) shows fertilisation of gametes, it is a part of sexual reproduction. It results in the formation of zygote.

GENERAL AWARENESS

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