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STATE LEVEL SCIENCE TALENT SEARCH EXAMINATION - 2013

SOLUTIONS FOR CLASS : 8

Mathematics

1. (B) Let the least number to be subtracted be x.

So, $(13-x):(18-x)=(35-x):(51-x)$

$\Rightarrow (13-x)(51-x)=(35-x)(18-x)$

$\Rightarrow 663-13x-51x+x^2=630-18x-35x+x^2$

$\Rightarrow 18x+35x-13x-51x=630-663$

$\Rightarrow -11x=-33$

$\Rightarrow x=3$

2. (D) (i) $(3x-y)^2-(5x^2-2xy)=9x^2-6xy+y^2-5x^2+2xy=4x^2-4xy+y^2$

(ii) $(2x-y)^2=4x^2-4xy+y^2$

(iv) $(2x+3y)^2-8y(2x+y)=4x^2+9y^2+12xy-16xy-8y^2=4x^2-4xy+y^2$

3. (C) $2\times 2\pi r=352$

$\Rightarrow 4\times\frac{22}{7}\times r=352$

$\Rightarrow r=\frac{352\times 7}{4\times 22}$

$\Rightarrow r=28$ cm

4. (C) $\sqrt{12}\times\sqrt{15}=\sqrt{2^2\times 3\times 3\times 5}$

$=2\times 3\sqrt{5}$

$=6\times(2.236)$

$=13.416$

≈ 13.4

5. (C) $\frac{19^{97}(19+342)}{19^{99}}=\frac{19^{97}\times 19^2}{19^{99}}=1$

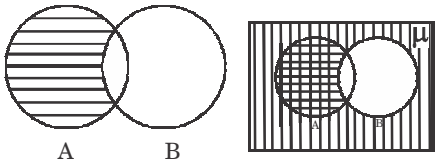
6. (D) $1+3=2^2$

$1+3+5=3^2$

$1+3+5+.....+4023=2012^2$

$\Rightarrow 2^2\times 1006^2$ or 4×1006^2

7. (D)



A – B $\qquad$ A $\cap$ B'

$A-B=A\cap B'$

8. (B) A day's work of C $=\frac{1}{3}-\left(\frac{1}{6}+\frac{1}{8}\right)$

$=\frac{1}{3}-\frac{7}{24}=\frac{1}{24}$

A's wages : B's wages : C's wages

$=\frac{1}{6}:\frac{1}{8}:\frac{1}{24}$

$=4:3:1$

$\therefore$ C's share $=\frac{1}{8}\times$ ₹ 3200 = ₹ 400

9. (C) Let the required number of days be x.

Less spiders $\rightarrow$ More days (Indirect proportion)

Less webs $\rightarrow$ Less days (Direct proportion)

$\therefore$ Spiders 1 : 7
Webs 7 : 1 $\qquad$: : Days $7:x$

$\therefore 1\times 7\times x=7\times 1\times 7\Rightarrow x=7$

10. (A) $a^3-b^3=117;\ a-b=3$

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

$\Rightarrow 3^3=117-3ab(3)$

$\Rightarrow 9ab=117-27$

$\Rightarrow 9ab=90$

$\Rightarrow ab=10$

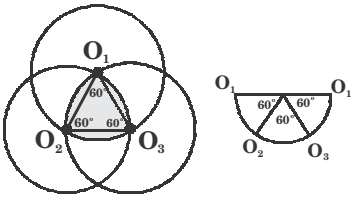
Using identity, $(a + b)^2 = (a - b)^2 + 4ab$,

$(a + b)^2 = 3^2 + 4 \times 10 = 49$

$\Rightarrow a + b = \sqrt{49} = \pm 7$

11. (C) $\overline{O_1O_2} = \overline{O_2O_3} = \overline{O_1O_3} = r = \frac{d}{2} = 10$ cm

$\overset{\frown}{O_1O_2} + \overset{\frown}{O_2O_3} + \overset{\frown}{O_1O_3}$ (each measuring 60°) = arc which subtends 180° = a semicircle.



$\Rightarrow$ perimeter of the shaded area = circumference of a semicircular arc

$= \pi r$

$= 3.14 \times 10 = 31.4$ cm

12. (B) $a \div b < a < b < a + b$ [$\because 0 < a < 1 < b$]

Also $a \times b < b$

Hence, $a + b$ has the largest value.

13. (A) Difference $= P\left(\frac{R}{100}\right)^2$

$\Rightarrow 96 = 15000\left(\frac{R}{100}\right)^2$

$\Rightarrow \frac{96 \times 10}{15} = R^2$

$\Rightarrow R = 8\%$

14. (B) $2^x - 2^{x-1} = 4 \Rightarrow 2^x - \frac{2^x}{2} = 4$

$\Rightarrow 2^x\left(1 - \frac{1}{2}\right) = 4$

$\Rightarrow 2^x = 8$ or $x = 3$

$\therefore 2^x + 2^{x-1} = 8 + 4 = 12$

15. (D) $n(A \times B) = n(A) \times n(B)$

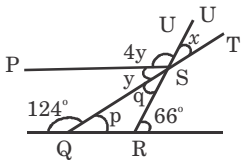
16. (C) $x^4 + 4x^3 + 4x^2 + 75$

$= (x^2 + 2x)^2 + 75$

$= 44^2 + 75$

$= 1936 + 75 = 2011$

17. (D)



$p = 180^\circ - 124^\circ = 56^\circ$

$q = x$ [vertically opp. $\angle$s]

$\Rightarrow p + q = 66^\circ$

$\Rightarrow q = x = 10^\circ$

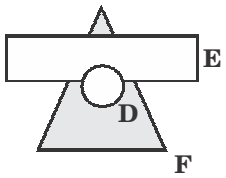
18. (A) $x^{3/2} - xy^{1/2} + x^{1/2}y - y^{3/2}$

$= x\left(x^{1/2} - y^{1/2}\right) + y\left(x^{1/2} - y^{1/2}\right)$

$= (x + y)\left(x^{1/2} - y^{1/2}\right)$

$\therefore \frac{x^{3/2} - xy^{1/2} + x^{1/2}y - y^{3/2}}{x^{1/2} - y^{1/2}} = x + y$

19. (C)



$D \cup E$

$(D \cup E)'$

20. (D) No triangle can have sides with lengths 1001, 1010, 1, but there is one with side-lengths 1010, 1010 and $\boxed{2}$.

21. (B) $x^2 + 4xy + 4y^2 + x + 2y$

$= (x + 2y)^2 + (x + 2y)$

$= (x + 2y)[(x + 2y) + 1]$

Absolute difference = 1

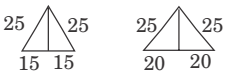
22. (C) Let the total original sale be 100.

Then, original number of visitors = 100

New number of visitors $= \frac{120}{0.75} = 160$

$\therefore$ Increase % = 60%

23. (C)



Altitudes in A and B are respectively 20 cm and 15 cm.

$\therefore$ The area of ΔA is $\frac{1}{2}(30)(20) = 300$ cm^2, and

The area of ΔB is $\frac{1}{2}(40)(15) = 300$ cm^2

So, the two areas are equal.

24. (B) **Note:** Can be tried in various methods. Here is one of the methods.

Width of rectangle = diagonal of one shaded square = $8\sqrt{2}$ units

Length of rectangle = 2[length of diagonal]

$= 2\left[8\sqrt{2}\right] = 16\sqrt{2}$ units

Area of rectangle = lb = $8\sqrt{2} \times 16\sqrt{2}$

= 256 sq. units

25. (C) $y^2 + 1 = z^2 - 100 \Rightarrow z^2 - y^2 = 101$

$\Rightarrow (z + y)(z - y) = 101 \times 1$

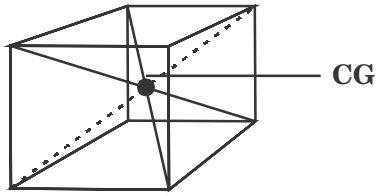
$z + y = 101$

$z - y = 1$

$2z = 102 \Rightarrow z = 51$, $y = 50$ and $x = 49$

Physics

26. (D) The centre of gravity of a solid cube lies at the point of intersection of its main diagonals.



27. (B) In addition to planets, very small planets are called asteroids. Many of them are found in between the planets Mars and Jupiter, which also move around the sun.

28. (D) When a spiral spring is pulled, a rarefaction is produced.

29. (A) During a circular motion, the body possesses constant speed but has a varying velocity as it changes its direction continuously.

30. (D) In a spherical mirror, when the convex surface (i.e., 'X') is silvered, then the concave surface (i.e., Y) acts as a reflecting surface and it becomes a concave mirror.

31. (B) Common balance – To measure the mass of an object.

32. (D) A very large concave mirror having a diameter of 125 cm was used in the construction of an astronomical telescope which is arranged in the Rangapur Observatory near Hyderabad.

33. (B) Sound waves are longitudinal waves.

34. (C) As the ball goes up, its speed decreases. As it comes down, its speed increases due to acceleration of gravity. Thus, the ball decelerates while going up.

35. (B) $\frac{C}{100} = \frac{F-32}{180} = \frac{104-32}{180} = \frac{72}{180}$

or $C = \frac{720}{18} = 40\,^{\circ}C$

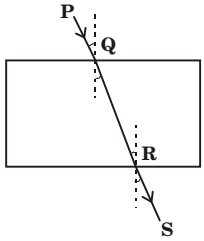
36. (D) Pressing our palm on a table, walking on the ground and swimming in water are examples of action - reaction forces.

37. (D) When an object is placed between two plane mirrors arranged parallel to each other, an infinite number of images are formed due to multiple reflections. At each reflection, a part of the light energy is absorbed due to which distant images become fainter and lack clarity.

38. (B) When a steel bar is magnetised by any method, it does not lose its magnetism easily. It retains magnetic properties induced in it for a long period of time as it has high magnetic retentivity. It can become a permanent magnet.

39. (B) 'X' in the given figure indicates Torricellian vacuum. It is named as Torricelli as he discovered it.

40. (A) From the given figure,



PQ – Incident ray

QR – Refracted ray

RS – Emergent ray

41. (A) If the centre of gravity of a body with large base area is at a very low height, the stability of the body will be more compared to the same body with greater height. So, the body is in stable equilibrium.

42. (D) Condensation is a process of converting a substance from gaseous state to liquid state.

43. (C) Large meteorites create craters on the surface of the earth, after collision.

44. (C) Flute and harmonium are wind instruments.

45. (A) Inertia is the property by virtue of which a body is unable to change by itself the state of rest only. They do not change their state of rest unless acted upon by an unbalanced external force on it i.e. net force $\neq 0$.

46. (C) As the metal bar moves away from the magnet, it can be concluded that metal bar is a magnet as two like poles of a magnet repel with each other.

47. (A) Boyle's law states that, at constant temperature, the volume of a given mass of a gas is inversely proportional to its pressure.

$V \alpha \frac{1}{P} (T = \text{Constant})$

(or) PV = Constant.

48. (D) Artificial magnets can be made by four methods:

Single touch, double touch, electrical and induction.

49. (A) Velocity and acceleration are vector quantities as they have both magnitude and direction.

50. (B) Fall in temperature = Initial temperature of boiling water – Final temperature of water.

The relation between centigrade and fahrenheit temperature is given by

$$\frac{C}{5} = \frac{F-32}{9}$$

$$C = \frac{F-32}{9} \times 5 = \frac{140-32}{9} \times 5$$

$$= \frac{\cancel{108}^{12}}{\cancel{9}} \times 5 = 60^{\circ}$$

Fall in the temperature.

$= 100^{\circ} - 60^{\circ} = 40^{\circ}$ C

Chemistry

51. (A) $2Mg + O_2 \rightarrow 2MgO$

It is a chemical combination reaction because magnesium wire combines with oxygen from the atmosphere for burning.

52. (B) Nitrogen gas is collected by downward displacement of water.

53. (D) Boiling of an egg is a chemical change. A chemical change is permanent and cannot be easily reversed. i.e, the original substances are not obtained merely by reversing the conditions of the change.

54. (A) In a chemical change, the total mass of reactants before the chemical reaction is equal to the total mass of products after the chemical reaction. Hence, all chemical reactions follow the law of conservation of mass.

55. (C) Sulphur is soluble in carbon disulphide (solvent).

56. (D) Carbonate (CO_3^{-2}) is a bivalent radical.

57. (A) Volumetric composition is taking the constituents of hydrogen and oxygen to form water in terms of volume.

58. (D) At the transition temperature of 96° C, the two forms of sulphur rhombic and monoclinic exist in equilibrium state.

59. (C) For rusting of iron to take place, oxygen from air and water are necessary.

60. (D) The total mass of reactants before the chemical reaction.

= Mass of N_2 + Mass of O_2

$= (2 \times 14) + (2 \times 16)$

$= 28 + 32 = 60$

61. (B) When hard water is used in boilers, scales are formed on its walls due to the deposition of insoluble salts as residue.

62. (B) Generally, physical changes are reversible. During a physical change, there is no change in the composition of substances.

63. (C) The symbol of Palladium is Pd.

64. (D) HgO, $KClO_3$, $NaNO_3$ are the compounds used to prepare oxygen.

65. (C) $2Mg + O_2 \rightarrow 2MgO$

Molecular weight of $2Mg = 2 \times 24 = 48$

Molecular weight of $O_2 = 2 \times 16 = 32$

48 g of Mg reacts with 32 g of oxygen

120 g of Mg reacts with ? g of oxygen

$$= \frac{\cancel{120}^{40} \times \cancel{32}^{2}}{\cancel{48}_{3_1}} = 80 \text{ g}$$

120 g of Mg reacts with 80 g of oxygen.

66. (C) Alum is added to the sedimentation tank for settling of fine mud particles, sand and suspended impurities in water during its purification.

67. (A) A chemical decomposition reaction is used to prepare oxides.

68. (A) According to the law of multiple proportion, two elements can combine to form one or more compounds as below.

(i) Hydrogen combines with oxygen to produce water (H_2O) and hydrogen peroxide (H_2O_2)

(ii) Carbon and oxygen combine to form carbon monoxide (CO) and carbondioxide (CO_2)

The weight of elements that separately combine with a fixed weight of another element bears a simple integral ratio.

69. (C) Weight of H_2 in H_2O_2 = 2

Weight of O_2 in H_2O_2 = 32

Ratio = 2 : 32 = 1 : 16.

70. (D) Sulphur is used in the manufacture of sulphuric acid, fire works and fungicides.

Biology

71. (B) Mushroom, Chlamydomonas, Bacterium Virus.

72. (D) ICRISAT International Crops Research Institute for Semi Arid Tropics.

73. (A) Species → Genus → Family → Order → Class → Phylum → Kingdom.

74. (C) In human beings the colour of the skin and hair is determined by the pigment called melanin. People not having this pigment have white skin and are called albinos. It protects the skin from the bad effects of UV rays present in the sunlight.

75. (B) Viper's venom contains haemolytic toxins. Haemolytic toxins rupture the walls of the blood vessels and blood cells.

76. (C) Different types of bacteria have different shapes – some are comma shaped and some are spiral or cork screw shaped.

77. (C) Dr. Y. Subba Rao – Tetracycline

M.S. Swaminathan – Green Revolution

P. Maheshwari – In vitrofertilisation

Louis Pasteur – Pasteurisation

78. (C) Boiling of milk to higher temperatures and cooling it can keep the milk for longer periods without spoiling.

79. (B) Ferns are pteridophytes. Pteridophytes reproduce by spores.

80. (C) The relation between biology and chemistry is studied in biochemistry.

81. (D) Useful microorganisms are used in making bread, producing antibiotics and decomposition of waste material.

82. (D) Measles disease is also called rubeola disease. It is a viral disease.

83. (D) Sweet taste receptors are located at the tip of the tongue i.e. at the part labelled as 'S'.

84. (B) Auditory nerve communicates the information from ears to the brain.

85. (C) Cinchona officinalis secrete a drug called quinine. Quinine is used to cure malaria.

86. (B) Female insects when mature release a specific chemical compound into air called pheromones. It is used for attracting their mates during reproduction.

87. (C) A frog is an amphibian. It has no fins and no. gills. It lays eggs in water. It has webbed feet to hop on land and swim in water.

88. (C) Zeamays is the scientific name of maize.

89. (D) In the given figure the part labelled as 'X' is retina. It is the actual sensory part of the eye.

90. (D) Silk is made up of a protein called fibroin.