



**UNIFIED COUNCIL**

An ISO 9001:2000 Certified Organisation



## NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION - 2011

### SOLUTIONS FOR CLASS : 7

#### Mathematics

1. (B)  $\frac{31}{4} = 7.75$   
 $\therefore$  lies between 7 and 8

2. (B)  $x = -12, y = -3, z = 6$   
 $x - y - z = -12 - (-3) - (6)$   
 $= -12 + 3 - 6$   
 $= -15$

3. (C)  $6^2 = 36$   
 $5^2 + 4^2 = 25 + 16 = 41$   
 $6^2 \neq 5^2 + 4^2$

4. (B) median =  $\frac{n}{2}, \frac{n}{2} + 1$  terms =  $5^{\text{th}}, 6^{\text{th}}$  terms  
 median = average of  $5^{\text{th}}, 6^{\text{th}}$  terms  
 $\frac{2x + 2x + 4}{2} = 64$   
 $\frac{4x + 4}{2} = 64$   
 $2x + 2 = 64$   
 $2x = 62$   
 $x = 31$

5. (C)  $\frac{a+b-(a+b+c)}{c} + \frac{a+c-(a+b+c)}{b}$   
 $+ \frac{c+b-(a+b+c)}{a} + \frac{4(a+b+c)}{a+b+c}$   
 $= -\frac{c}{c} - \frac{b}{b} - \frac{a}{a} + 4$   
 $= -3 + 4 = 1$   
 $\therefore x = a + b + c$

6. (D)  $AD \parallel BC$   
 $\therefore \angle DAC = \angle ACB$   
 $x + 10 = y$   
 $x - y = -10$

7. (D) Dividing both sides by  $1995^2 \times 1996^2 \times 1997^2$ ,  
 We get  
 $n^2 = 2^2 \times 2^2 \times 2^2$  since  $n > 0$ ,  
 $n^2 = (8)^2$   
 $\therefore n = 8$

8. (D)  $x = \frac{-5}{16} + \frac{7}{10}$   
 $= \frac{-25 + 56}{80} = \frac{31}{80}$

9. (D)  $x = 40^0$   
 $y = 180 - 80 = 100$   
 $z = y = 100$   
 $\therefore x + y + z = 240 \neq 220$

10. (C)  $\frac{a}{a+1} + \frac{b}{b+1} = \frac{ab+a+b+1}{ab+a+b+1} = 1$

11. (C) old ratio  $\rightarrow 8 : 9$   
 new ratio  $\rightarrow 4 : 3 \Rightarrow 8 : 6$   
 Mr. Y  $\rightarrow$  old ratio  $\rightarrow 9$   
 Mr. Y  $\rightarrow$  new ratio  $\rightarrow 6$   
 $9 - 6 = 3 \rightarrow 30 \text{ marks}$

8 units  $\rightarrow \frac{30}{3} \times 8 = 80 \text{ marks}$

12. (C) Area of shaded part in EAB  
 $= 2 \left[ \left( \frac{1}{4} \times \frac{22}{7} \times 7 \times 7 \right) - \left( \frac{1}{2} \times 7 \times 7 \right) \right] = 28 \text{ cm}^2$

Area of shaded part in BCD  
 $= 2 \left[ \left( \frac{1}{4} \times \frac{22}{7} \times 10 \times 10 \right) - \left( \frac{1}{2} \times 10 \times 10 \right) \right] = 57 \frac{1}{7} \text{ cm}^2$

Total area of shaded parts =  $28 + 57 \frac{1}{7} \text{ cm}^2$

Total area of shaded parts =  $28 + 57 \frac{1}{7}$   
 $= 85 \frac{1}{7} \text{ cm}^2$

$$13. \quad (B) \quad \text{Rate} = \frac{100 \times S.I}{P \times T}$$

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

$$14. \quad (C) \quad \frac{5}{3} \times \frac{7}{5} \times \frac{9}{7} \times \dots \times \frac{1001}{999} = \frac{1001}{3}$$

$$15. \quad (A) \quad 9y - x + 2x - y - 1 + 3x - 2$$

$$4x + 8y - 3$$

$\therefore$  perimeter of the triangle is  
(4x + 8y - 3) cm

$$16. \quad (C) \quad \frac{7}{10} \rightarrow 0.700$$

$$\frac{3}{1000} \rightarrow 0.003$$

$$\frac{9}{1000} \rightarrow 0.009$$

$$\underline{\underline{0.712}}$$

$$17. \quad (C) \quad 38 - \frac{10}{5}$$

$$38 - 2 = 36$$

$$18. \quad (D) \quad \text{Let three largest consecutive multiples of 7 be, } 7x, 7x + 7 \text{ and } 7x + 14$$

$$7x + 7x + 7 + 7x + 14 = 777$$

$$x = 36$$

$$7x + 14 = 7 \times 36 + 14 = 266$$

Note : verifying from options is advised

$$19. \quad (D)$$

$$20. \quad (C) \quad \frac{(\alpha_1 + \alpha_2 + \dots + \alpha_n)}{n} + P$$

$$P + P = 2P$$

$$21. \quad (B) \quad \frac{19^{97}(19 + 342)}{19^{99}} = \frac{19^{97} \times (361)}{19^{99}}$$

$$\frac{19^{99}}{19^{99}} = 1$$

$$22. \quad (C)$$

$$23. \quad (D)$$

$$24. \quad (C) \quad CP = ₹42$$

$$\text{Profit} = 14 \frac{2}{7} = \frac{100}{7}\%$$

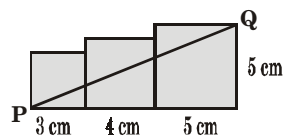
$$\text{Profit} = \frac{100}{7} \times \frac{1}{100} \times 42 = \text{Rs. } 6$$

$$SP = CP + \text{profit}$$

$$= 42 + 6$$

$$= ₹48$$

$$25. \quad (C)$$



Since PQ is hypotenuse of a right triangle with legs 5 and 12

$$(\text{hypotenuse})^2 = (5)^2 + (12)^2 = 25 + 144 = 169$$

$$AB = \sqrt{169} = 13 \text{ cm}$$

### Physics

$$26. \quad (D) \quad \text{Time taken to oscillate from P to Q(T)}$$

$$= 0.5 \text{ s}$$

$$1 \text{ oscillation} = PQ + QR + RQ + QP = 4T$$

$$= 4 \times 0.5 = 2 \text{ s}$$

$$\text{Time taken to make 5 oscillations}$$

$$= 5 \times 2 \text{ s} = 10 \text{ s}$$

$$27. \quad (B) \quad \text{Thermometer in option (B) indicates } 37^\circ\text{C or } 98.4^\circ\text{F. Hence, it shows normal human body temperature.}$$

$$28. \quad (A) \quad \text{When wires touch directly a short circuit leads to excessive current flow. Secondly, on connecting many devices to a single socket, excessive current is drawn by the connected devices.}$$

$$29. \quad (A) \quad \text{When light falls on a wooden chair, light gets reflected from the chair to our eyes.}$$

$$30. \quad (C) \quad \text{Convection is a mode of transmission of heat by which the particles of the medium collect heat from the source and carry this heat to other parts by moving away. Hence, air conditioners for cooling the room are placed at the window level so that hot or warm air rises while cold air settles down.}$$

$$31. \quad (C) \quad \text{The bulbs does not glow due to break in the circuit}$$

$$32. \quad (D) \quad \text{Speed} = \frac{\text{distance}}{\text{time}}. \text{ As time w.r.t distance travelled is very less in option (D), it has the greatest speed.}$$

$$33. \quad (B) \quad \text{In a plane mirror, object distance = image distance}$$

According to the given figure,

distance of object at A = distance of image at A = x

distance of object at B = distance of image at B = y

and  $x > y$

Hence, distance of object at B > distance of object at A

$$34. \quad (C) \quad \text{An accumulator is a secondary cell and can be recharged while a dry cell is a primary cell that is not rechargeable.}$$

35. (C) Violet suffers greatest deviation.  
Red suffers least deviation.  
Hence, ascending order of deviation of spectrum of colours is: Red, orange, yellow, green, blue, indigo, violet.
36. (B) P is made of soft iron hence, behaves as a temporary magnet. On opening the switch, P loses its magnetism and no nails remain attracted to it. Q is made of steel core which acts as a permanent magnet. On opening the switch, Q still retains the magnetism and all the 4 nails remain attached to Q.

37. (A) When two bodies differ in temperature then on connecting them heat flows from a body at higher temperature to an identical body at lower temperature.
38. (C) When the switch is in the 'OFF' position as in option (C), the circuit is incomplete. It is said to be open. No current flows through any part of the circuit.
39. (D) The flow of electricity in a conducting wire is due to phenomenon of conduction of electrons.
40. (B) Concave mirrors help ENT doctors to see the images of the internal parts of the body clearly because a concave mirror can form a magnified, virtual image of an object.
41. (A)  $\text{Average speed} = \frac{\text{total distance travelled}}{\text{total time taken}}$
42. (D) The correct figure is given in option (D). The battery must be formed by connecting cells as follows:

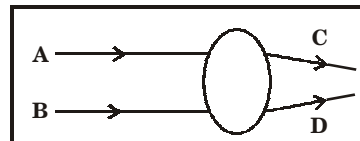


43. (B)  $\text{Speed} = 14 \text{ km h}^{-1}$   
Distance to be completed = 42 km  
 $\text{Time} = \frac{\text{distance}}{\text{speed}} = \frac{42}{14} = 3 \text{ hours}$
44. (A) The object shown is an hour glass which is used to measure time.
45. (B) If the reflecting surface is curved outwards, then the mirror formed will be convex.



46. (A) In a distance time graph, steeper the line, greater is the speed of the moving body, as the slope is greater of a steeper line i.e. difference of distance for a given time interval is greater.

47. (B) Silver receives heat from the sun by the radiations of sunlight, due to this silver gets hot. By convection and conduction silver does not receive heat.
48. (B) On reversing the current in the wire, i.e. from north to south the needle points in the north east direction.
49. (A) Since the light rays converge after the incident rays fall on the lens. It is a converging or convex lens.



50. (A) The particles in the substance cannot vibrate freely hence, conduction of heat is not possible through them.

### Chemistry

51. (C) While whipping of egg white, air is forced into the egg white (a fluid) but no new substances are formed. Hence, it is a physical change.
52. (A) Bases are slippery to touch. As NaOH is the base, she must have dropped NaOH on her hands.
53. (D) Wind speed, temperature and humidity are responsible for development of cyclones.
54. (B) Amount of rainfall at a place depends on geographic location.
55. (B) Only the form of the substance is changed. So, this change is a physical change and is also reversible.
56. (B) Tornado is a violent funnel shaped wind that reaches from the sky to the ground.
57. (B) The conversion of liquid to vapour is only the change in state a physical change. Burning of kerosene is a chemical change as kerosene contains hydrocarbons on burning it gives  $\text{CO}_2$  and water vapour as byproducts.
58. (A) As the liquid turns blue litmus to red, it is an acid. Apart from that, acids react with magnesium to produce hydrogen gas.
59. (A) Due to chemical change of copper with air and moisture, a green patina of copper carbonate is formed.
60. (C) Melting is converting a solid state of a substance into its liquid state. It is a physical change as there is no change in molecular composition.
61. (C)  $\text{Ca(OH)}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + 2\text{H}_2\text{O}$   
white ppt

It is an exothermic reaction and the test tube containing lime water becomes hot.

62. (B) A physical change is a temporary change in the state, colour, appearance etc, of a substance. It does not cause change into a different substance.
63. (A) The flooded land is covered with salt that decreases the fertility of soil.
64. (B) X is an acid which gives a colourless solution, on addition of phenolphthalein indicator. Y is a base which gives pink colour solution, on addition of phenolphthalein indicator.
65. (B)  $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2 \uparrow$   
Due to evolution of  $\text{CO}_2$  gas the flame gets extinguished as  $\text{CO}_2$  is a non supporter of combustion.
66. (D) Acids reacts with metals and liberates hydrogen gas.
67. (D) Salinity increases the rusting phenomenon. So, the air around is humid and salt in water speeds up the process of rusting.
68. (B) Due to uneven heating on the earth, winds currents are generated.
69. (A) Ground near a water body will have more moisture.
70. (C) Monsoon winds are the winds from oceans that carry water and bring rain.
78. (B) Starfish feeds on animals covered by hard shells of calcium carbonate. After opening the shell, the starfish pops out its stomach through its mouth to eat the soft animal inside the shell. The stomach than goes back into the body and the food is slowly digested.
79. (B) The caterpillar eats the leaves of mulberry tree and grows in size whereas its skin does not increase in size, shape of length. So it sheds skin (moulting)
80. (C) Ingestion  $\rightarrow$  digestion  $\rightarrow$  Absorption  $\rightarrow$  Assimilation  $\rightarrow$  Egestion.
81. (D) The rearing of silkworms for obtaining silk is called sericulture. The larvae of silkworm feed only on mulberry leaves. Growing of mulberry trees is called moriculture. The scientific name of mulberry is *Morus alba*.
82. (D) In organisms called lichens, a chlorophyll containing partner, which is an algae and a fungus live together. The fungus provides shelter, water and minerals to the algae, in return, the algae provides food which it prepares by photosynthesis.
83. (C) In the absence of oxygen glucose is breakdown to pyruvate and then to lactic acid. Due to the accumulation of lactic acid we have muscle clamps.

### **Biology**

71. (D) Decomposers decompose the dead and decay organic matter into minerals.
72. (D) Dispersal of fruits and seeds is necessary to distribute them to a large area. If all the seeds fall at one place they cannot germinate, they will not get sufficient water, air and space to grow.
73. (B) Fragmentation is a mode of a sexual reproduction. When water and nutrients are available algae grow and multiply rapidly by the process of fragmentation.
74. (C) Mucor undergoes asexual reproduction by spores, xanthium develops from seeds and potato reproduces by eyes.
75. (B) The swelling is due to the removal of phloem tissue the removal of phloem blocks downward movement of food from leaves to the roots.
76. (B) During exhalation gas 'P' carbon dioxide is expelled from the alveolus.
77. (A) In multi cellular organisms like man there is an efficient system which carries the blood from the heart to different parts of the body and brings it back to the heart is called circulatory system.
84. (D) Thick white fur helps them in camouflage with the snowy surrounding.
85. (C) Minerals and vitamins are a large group of substances that help many reactions and activate the conversion of complex food into simple food these are protective food.
86. (D) Platelets help in clotting of the blood.
87. (B) The mode of nutrition in which the organisms like fungi digest the dead and decaying organic matter outside of the body by secreting enzymes and then absorb the nutrients in solution form is called saprotrophytic nutrition.
88. (C) Tentacles around the mouth help the hydra catch aquatic organisms and push them into the mouth. They also inject a poisonous fluid to paralyse the prey.
89. (D) In the given figure W represents ovule. Ovules contain the female reproductive cells or female gametes.
90. (B) Root hairs absorb water and mineral salts from the soil and then it follows the sequence of as follows.  
Root hair  $\rightarrow$  Root  $\rightarrow$  xylem  $\rightarrow$  leaf