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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

Paper Code: **UN439** **(UPDATED)**

MATHEMATICS   <u>Solutions for Class : 7</u>

1. **(C)** $-5\,°F - 4\,°F + 2\,°F - 6\,°F = -13\,°F$

2. **(C)** $\dfrac{1}{3} \times \dfrac{x}{3} = \dfrac{x}{9}$

3. **(B)** Cost of each mt

$$= ₹ \dfrac{\left(\dfrac{385}{3}\right)}{\left(\dfrac{7}{2}\right)} = ₹\dfrac{385}{3} \times \dfrac{2}{7} = ₹\dfrac{110}{3}$$

4. **(C)** For $\triangle ABC \cong \triangle PQR$, b = q, a = p and $\angle CAB = \angle RPQ$ are to be satisfied.

5. **(C)** $\dfrac{x}{3} - \dfrac{2x}{5} - \dfrac{2x}{3} = -\dfrac{11}{30}$

$$\dfrac{5x - 6x - 10x}{15} = -\dfrac{11}{30}$$

$$-11x = -\dfrac{11}{30} \times 15$$

$$x = \dfrac{1}{2}$$

6. **(B)** Substitute n = 1 in each of the options and check which expression gives the first term (i.e., 5) in the pattern.

7. **(B)** $\angle A = \angle a = 50°$

$\angle a + \angle c = 180°$

$\angle c = 130°$

$\angle b = \angle c = 130°$

8. **(A)** Given the temperature at 12 noon is 10 °C.

The temperature decreases at the rate of 2 °C per hour until mid night.

From 12 noon to 9 p.m. it is 9 hours.

$\Rightarrow$ Temperature decrease

$= 9 \times (-2\,°C) = -18\,°C$

$\therefore$ Temperature at 9 p.m

$= 10\,°C + (-18\,°C) = -8\,°C$

9. **(B)** $(0.25)^2 = 0.125 \times x$

$$\dfrac{0.25 \times 0.25}{0.125} = x$$

$$\dfrac{25 \times 25}{1250} = x$$

$$\dfrac{1}{2} = x$$

x = 0.5

10. **(D)** The reciprocal of 1 is $\dfrac{1}{1} = 1$ and that of -1 is $\dfrac{-1}{1} = 7$.

0 has no reciprocal as $\dfrac{1}{0}$ is not defined.

Consider $\dfrac{1}{2}$ and $\dfrac{-3}{5}$.

Their product is $\dfrac{1}{2} \times \dfrac{-3}{5} = \dfrac{-3}{10}$

Which is a rational number.

All the given statements are true.

11. **(D)** The sum of any two sides is greater than the third side.

Since AB + BC < AC, no striangle is formed.

12. (D) $\angle DEF = 180° − 124° = 56°$

$\therefore \angle DCE = \angle DEC = 56°$ [$\because DC = DE$]

But $\angle BCA + 72° + 56° = 180°$

$\therefore \angle BCA = 52°$

$\therefore \angle A = \angle BCA = 52°$

In $\triangle ABC$, $52° + 52° + y = 180°$

$y = 76°$

13. (D) $1.2x + 0.3 = 2x − 3.7$

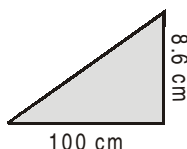$1.2x − 2x = −3.7 − 0.3$

$−0.8x = −4$

$x = \dfrac{−4}{−0.8} = \dfrac{40}{8} = 5$

14. (B) $x = \dfrac{2}{9} \times 351 = 78$

$y = 351 − 78 = 273$

$xy = 78 \times 273 = 21294$

15. (B) No. of pages left $= \left(1 − \dfrac{3}{5}\right) \times$ total pages

$= 80$

$\therefore$ Total number of pages $= 80 \times \dfrac{5}{2} = 200$

16. (A) Base = 100 cm

Height = 8.6 cm

100 cm

Area $= \dfrac{1}{2} \times b \times h$

$= \dfrac{1}{2} \times 100 \times 8.6$

$= 430$ sq cm

17. (B) CP = CP of 40 mts thread

P = CP of 8 mts thread

Profit% =

$\dfrac{P}{CP} \times 100 = \dfrac{CP \text{ of 8 mts thread}}{CP \text{ of 4 mts thread}} \times 100 = 20\%$
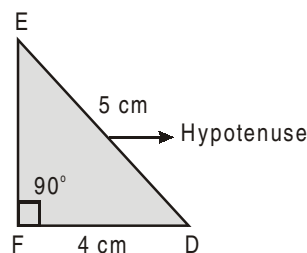
18. (C) Let the weight of copper and zinc in the alloy be 7x kg and 8x kg respectively.

Then, $8x = 9.6 \Rightarrow x = \dfrac{9.6}{8} = 1.2$

$\therefore$ Weight of copper in the alloy = 7x kg.

$= (7 \times 1.2)$kg = 8.4 kg

Hence, the weight of copper in the alloy is 8.4 kg.

19. (D) $\triangle DEF$ is as shown in the figure.

By Pythagoras' theorem,

$EF = \sqrt{DE^2 − DF^2}$

$= \sqrt{25 − 16} = \sqrt{9} = 3$ cm

By angle sum property,

$\angle D + \angle E = 180° − \angle F$

$= 180° − 90° = 90°$

20. (C) Arranging the given data in ascending order, we have, 33, 35, 41, 46, 55, 58, 64, 77, 87, 90 and 92.

The sixth entry is 58.

$\therefore$ Median is 58.

21. (C) A right angled triangle is the one classified on the basis of angles of a triangle.

22. (D) Remaining part $= 1 − \left(\dfrac{1}{3} + \dfrac{1}{6}\right) = \dfrac{1}{2}$

Average rate % per annum (R)

$= \left(\dfrac{1}{3} \times 3\right) + \left(\dfrac{1}{6} \times 6\right) + \left(\dfrac{1}{2} \times 8\right) = 6\%$

S.I   = ₹ 600

T = 2 years, P = ?

$I = \dfrac{PTR}{100}$

$\Rightarrow P = \dfrac{100 \times I}{TR} = \dfrac{100 \times 600}{2 \times 6}$

= ₹ 5000

23. (B) $x^4 + 4x^2y^2 - 7x^2y^2 - 28y^4 = x^4 - 3x^2y^2 - 28y^4$.

24. (C) Let the number be x.

$\Rightarrow$ Other number = 2x - 3

As per the problem,

$(x + 2x - 3) + 7 = 37$

$\Rightarrow \quad 3x = 33$

$\Rightarrow \quad x = 11$

$\therefore$ The two numbers are 11 and 19.

25. (A) $\triangle$ PQR is equilateral.

$\therefore$ Each of its angles is $60°$.

In $\triangle$ PRS, PR = RS

$\Rightarrow x + y + y = 180°$

Also, $x = 180° - 60° = 120°$

$\Rightarrow y = \dfrac{180° - 120°}{2} = 30°$

PHYSICS

26. (D) When wires are wound around an iron bar and electricity is passed through the wire, the iron bar becomes a magnet.

27. (B) Given, Distance = 450 m

Time = 9 sec

Speed = ?

$$\text{Speed} = \dfrac{\text{Distance}}{\text{Time}} = \dfrac{450}{9\,\text{sec}} = 50 \text{ m/s}$$

28. (D) When the snow absorbs heat, it melts. Snow is water in the solid state. When water on the wet floor absorbs heat and evaporates, the floor becomes dry.

29. (C) Angle of incidence = angle between the incident ray and normal = 50°

Angle of reflection = angle between the reflected ray and normal = 50°

As per the laws of reflection $\lfloor i = \lfloor r$. So, angle of incidence and angle of reflection = 50° = 50°
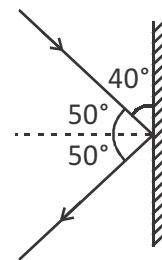
30. (C) The time taken by a freely suspended pendulum to complete one oscillation is called time period.

31. (C) The iron nail moves towards electro-magnet P as it has more coils of wire around it than electromagnet Q. Thus, it exerts a stronger magnetic force than electromagnet Q.

32. (A) When the end M of a metal rod given in the figure is heated the drop w placed at 5 cm takes 2 minutes to fall off. Hence, for a drop at 10 cm to fall off, it takes 2 × 2 = 4 minutes.

Thus, the time taken by drops x, y, z are 4 minutes, 6 minutes and 10 minutes respectively.

33. (C) Distance covered by the bus at 9.30 a.m. = 60 km

Distance covered by the bus at 10.00 a.m. = 80 km

$\therefore$ Distance covered by the bus at 9.45 a.m.

$= \dfrac{60 + 80}{2} = 70 \text{ km}$

34. (A) As per the laws of reflection, the angle of incidence equal to the angle of reflection. Therefore, when the angle of incidence decreases by 10°, the angle of reflection will also decrease by 10°.

35. (B) Electrical appliances shown in options (A), (C) and (D) use the magnetic effects of current. An electric bulb converts the electric energy to light energy.

36. (A) Amount of heat absorbed by a body depends upon its material and color. Dark colored bodies are good absorbers and good emitters of heat radiations as compared to light colored bodies. Therefore, the water in black tin will be hotter than water in white tin.

37. **(A)** A convex mirror always forms an erect, virtual and diminished image of an object.

38. **(A)** The flow of current through appliance X is 0.7 amperes, 1 A fuse is suitable for it.

   The flow of current through appliance Y is 1.8 amperes, 2 A fuse is suitable for it.

39. **(B)** As the temperatures of iron ball and water are equal, there will be no flow of heat.

40. **(D)** In the given disc, only six colours are used for painting instead of seven, indigo is missing. Moreover, colours used for painting the disc are different from the colours of a pure spectrum.

41. **(B)** Number of revolutions, the spin drier makes in 60 seconds = 600 revolutions.

   Number of revolutions, the drier will make in 80 seconds.

   i.e., 1 minute 20 second

   $$= \frac{600}{60} \times 80 = 800 \text{ revolutions.}$$

42. **(D)** When the flask is placed into the basin of hot water, the flask gains heat from the hot water and expands. This causes the drop of ink to drop slightly.

   The air in the flask then gains heat and expands. The expanded air pushes the drop of ink up the tube.

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

44. **(D)** In lateral inversion, the right side of the object will be on the left side of the image.

45. **(A)** Bus X Speed $= \dfrac{\text{Distance}}{\text{Time}}$

   $$= \frac{360}{5h} \text{km} = 72 \text{ km h}^{-1}$$

   Bus Y, Speed $= \dfrac{\text{Distance}}{\text{Time}}$

   $$= \frac{476 \text{km}}{7h} = 68 \text{ km h}^{-1}$$

   $\therefore$ Bus X travels faster than bus Y.

46. **(A)** A bullet shot from a gun represents motion in a straight line.

   A tree swaying and the motion of strings on guitar are examples of oscillatory motion.

   Child on a merry-go-round represents circular motion.

47. **(A)** Air is trapped in between the two blankets. As air is a bad conductor of heat, the heat is retained inside the blanket, thus, preventing the cold air to enter inside it.

48. **(D)** As per the image of a clock as seen in a plane mirror, the correct time is 9.25.

49. **(D)** Heat always flows from a hotter region to a colder region.

   (i) At first, the hot chocolate will lose heat to the water, so the temperature of the hot chocolate will drop and the temperature of the water will increase. Small amount of heat is lost to the surroundings. Hence, there is a decrease of temperature by 5°C.

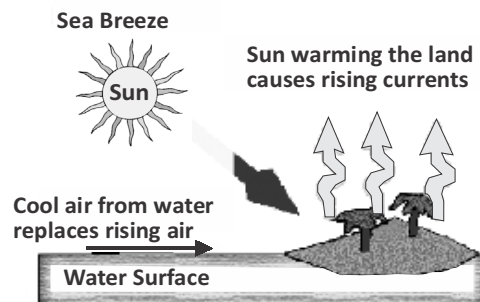   (ii) The hot chocolate and water will eventually have the same temperature as the surrounding air after 2 hours.

50. **(A)** An electromagnet consists of a core of soft iron wrapped around with a coil of insulated copper.

CHEMISTRY

51. **(D)** Soft drink in a straw is at low pressure when compared with the high pressure outside the straw. Soft drink in a glass has same pressure as outside air pressure. Pressure in air is not uniform on the earth due to unequal heating on the earth. Air pressure is low at places where the atmospheric pressure is lower than that place and vice-versa.

Air enclosed or present in a closed bottle before closing exert more pressure on the walls of the bottle due to random and repeated collisions with neighbouring air molecules and thus increase pressure. Pressure is highest in a bottle or any container which is closed.

52. **(C)** The liquefied petroleum gas is in liquid state because of high pressure. On opening the cylinder valve, the pressure is released and the gas comes out. However, if this gas is collected and pressurised, we will get back LPG. Processes given in options(A), (B) and (D) are undergoing chemical changes as new products are formed.

53. **(A)** Quick lime is the common name of calcium oxide CaO.

54. **(C)** The photographs taken by the satellites helps in detecting a cyclone well in advance.

55. **(D)** Ammonium hydroxide being a base is used as a window cleaner.

56. **(A)** Burning of wood - chemical change.

Formation of days and nights - periodic change.

Curdling of milk - slow change

Melting of ice - physical change.

57. **(C)** As per the given information, the basic resource is water.

58. **(A)** During the day time, the surface of land becomes warmer as compared to the sea. Thus, warm air moves up. The cool sea breeze moves into occupy its place.

Sea Breeze

Sun warming the land causes rising currents

Cool air from water replaces rising air

Water Surface

59. **(C)** Vinegar is acetic acid. Acids must be stored in glass bottles. If they are stored in metal containers/bottles, they react with metals to form new products that corrode and change the actual properties of respective acids.

60. **(A)** Copper sulphate on reaction with iron, changes its colour from blue to green. It is a chemical change.

61. **(B)** Carbon forms two oxides CO and CO_2, CO_2 on hydrolysis gives carbonic acid $CO_2 + H_2O \rightarrow H_2CO_3$. CO is neutral. Carbon is the non-metal.

62. **(C)** A glass bottle after it breaks undergoes a change only in its size and shape, but not in its composition. So, it is a physical change.

63. **(C)** Air on the surface of the earth gets heated up due to sunlight. It becomes lighter and goes up. It gets cooled and comes down. Thus, convectional currents occur on the earth.

64. **(A)** Statements I and II are correct.

(I) Ozone protects us from sun's harmful radiations.

(II) Ozone absorbs the UV radiations from the sun and breaks down to oxygen.

(III) Ozone acts as a protective shield not oxygen.

65. **(A)** Sea and land breezes are caused because of the uneven heating of the earth through convection currents.

66. **(D)** When dissolved in water, toothpaste, milk of magnesia and shower cream turn red litmus paper to blue.

67. **(B)** Precipitation of rain and snow is only a change of state and no new substance is formed. It is a physical change.

68. **(A)** Reduced pressure conditions cause the flow of air from high pressure region to low pressure regions.

69. **(C)** Ground water is recharged by the process of infiltration.

70. **(D)** Ascorbic acid (vitamin C) is present in citrus fruits and green leafy vegetables.

BIOLOGY

71. **(B)** Hydrilla plant release oxygen gas during photosynthesis. Oxygen oxidises food to produce energy.

72. **(D)** Pitcher plant / venus fly trap / bladder wort.

Pitcher plant found in Khassia hills of Meghalaya is an endangered plant producing pitchers as modified leaf lamina. They attract and kill their prey, but passively through their attractive colours. They also produce sugary nectar and sweet scents. From this relationship the plants primarily gain nitrogen and phosphorous to supplement there nutrient requirement for growth.

73. **(D)** Silk fibre is made up of sericin and fibroin.

74. **(A)** Oesophagus connect the mouth to the stomach.

75. **(B)** The given information in statement 2 & 3 is true about stomach.

76. **(C)** Hump is a part of camel shrinks and retains its size depending on consumption of food.

77. **(B)** When muscles do not get sufficient O_2, glucose anaerobically convert into lactic acid.

78. **(C, D)**
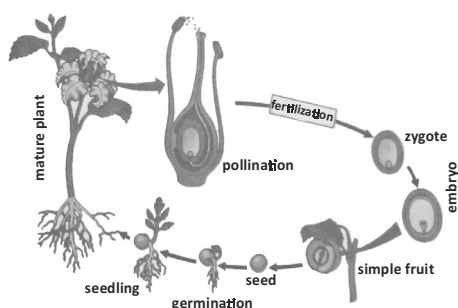
79. **(D)** – Malphigian tubules.

80. **(D)** Phloem lies below the bark hence when a rubber tapper makes a shallow cut in the bark, only sap flows from it.

81. **(C)** Earthworm live in the soil and make soil fertile by its castings and make the soil porous.

82. **(C)** Spirogyra reproduce by fragmentation.

83. **(B)** A normal resting person, usually has a pulse rate between beats 72 - 80 per minute.

84. **(D)** The functions of the beak of the bird toucan helps to pluck fruits catch insects and keep the bird cool.

85. **(C)** The hair and mucus in our nostrils help to filter out dust particles.

86. **(C)** P - Circulatory; Q - Excretory; R - Respiratory

87. **(B)** As the food-carrying tubes are removed, the food made by the leaves is unable to be transported downwards beyond X. As a result, the food accumulates at X, causing X to bulge.

88. **(D)** The diagram shows a villus. It is richly supplied with blood vessels and it increases surface area for better absorption of digested food.

89. **(B)** Saliva contains amylase and which breaks down the starch in bread to maltose, disaccharide which tastes sweet.

90. **(A)** If the stigma is removed, there is no place for the pollen grains to land on. Hence, the pollen grains from the anther will not be able to reach the ovum in the ovary. Thus, fertilisation will not take place.

GENERAL AWARENESS

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

The End