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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

CLASS - 6

Question Paper Code : 1P114

KEY

1. B	2. D	3. C	4. A	5. C	6. D	7. C	8. D	9. B	10. C
11. D	12. D	13. C	14. D	15. D	16. B	17. C	18. C	19. A	20. B
21. B	22. D	23. A	24. D	25. C	26. C	27. D	28. D	29. C	30. B
31. D	32. C	33. B	34. B	35. A	36. C	37. C	38. D	39. B	40. D
41. C	42. D	43. A	44. A	45. B	46. C	47. C	48. A	49. C	50. B
51. B	52. B	53. A	54. B	55. B	56. A,C	57. B	58. B	59. A	60. B

SOLUTIONS

MATHEMATICS

1. (B) 274

02. (D) Total pencils bought by both = shilpa's pencils + 4 times silpa's pencils.

= 5 times shilpa's pencils

$\therefore$ No. of pencils bought by shilpa = $\frac{30}{5} = 6$

$\therefore$ No. of pencils bought by Devi = $4 \times 6 = 24$

03. (C) Let the four consecutive multiples of 7 be

$a = 7n$, $b = 7(n + 1)$

$c = 7(n + 2)$, $d = 7(n + 3)$

Now calculate

$c - a = 7(n + 2) - 7n = 14$

$d - b = 7(n + 3) - 7(n + 1) = 14$

So,

$[(c - a)(d - b) = 14 \times 14 = 196$

04. (A) Total length of rope = $36\frac{1}{3}m = \frac{109}{3}$

Sum of lengths of three parts =

$\left(12\frac{2}{5}+13\frac{1}{2}+5\frac{4}{15}\right)$m

$=\left(\frac{62}{5}+\frac{27}{2}+\frac{79}{15}\right)$m

$=\left(\frac{372+405+158}{30}\right)$m

$=\frac{935}{30}$m

Length of rope left out $=\left(\frac{109}{3}-\frac{935}{30}\right)$m

$=\left(\frac{1090-935}{30}\right)$m

$=\frac{155}{30}$m $=\frac{31}{6}$m $=5\frac{1}{6}$m

05. (C) Fifth prime number = 11

6th composite number = 12

∴ Required sum = 11 + 12 = 23

06. (D) Given $2l = l + 4b$

$\Rightarrow$ $2l - l = 4b$

$l = 4b$

Given $2l = 32$ cm

$l = \frac{\cancel{32}^{16}}{\cancel{2}}$ cm

∴ $4b = 16$ cm

$b = \frac{\cancel{16}^{4}}{\cancel{4}}$cm

Shaded area = $lb = 16 \text{ cm} \times 4 \text{ cm} = 64 \text{ cm}^2$

07. (C) Charge for first km = ₹ 25

Charge of each next km = ₹ 18

∴ Total charge of a trip of 10 km

= ₹ 25 + ₹ 18 × 9

= ₹ 25 + ₹ 162

= ₹ 187

08. (D) $3 \times 5 + 7 \times 9 = 15 + 63 = 78$

09. (B) Let varma's weight 3 months back be x kg

Given $x-5\frac{1}{2}\text{kg}+2\frac{1}{4}\text{kg}-3\frac{3}{4}\text{kg}=95\text{kg}$

$\therefore x=95\text{kg}+5\frac{1}{2}\text{kg}-2\frac{1}{4}\text{kg}+3\frac{3}{4}\text{kg}$

x = 102 kg

10. (C) Given E = 3 & B + C + D = 21 & A = 6

∴ A + B + C + D + E = 6 + 21 + 3 = 30

11. (D) Perimeter = 2(l + b) = 2(5 cm + 5 cm)

= 2 × 10 cm = 20 cm

12. (D) $\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3}$

$= 7 \times \frac{1}{3}$

13. (C) $\text{LHS}=\left[\frac{\cancel{9}^{3}}{7}\times\frac{1}{\cancel{3}}+\frac{\cancel{15}^{3}}{\cancel{8}_{2}}\times\frac{\cancel{4}}{\cancel{5}}-\frac{\cancel{27}^{3}}{\cancel{14}_{7}}\times\frac{\cancel{2}}{9}\right]$

$=\left[\frac{\cancel{3}}{\cancel{7}}+\frac{3}{2}-\frac{\cancel{3}}{\cancel{7}}\right]=\frac{3}{2}$

14. (D) Number of tiles requires = $\frac{44 \text{ m} \times 52 \text{ m}}{8 \text{ cm} \times 8 \text{ cm}}$

$=\frac{\cancel{4400}^{550} \times \cancel{5200}^{650} \text{ cm}^2}{1\cancel{8} \text{ cm} \times 1\cancel{8} \text{ cm}^2}$

= 357500

15. (D) $\frac{3}{4}=0.75, \frac{8}{9}=0.88, \frac{2}{3}=0.66, \frac{4}{5}=0.8$

$\therefore \frac{8}{9}-\frac{2}{3}=\frac{8-6}{9}=\frac{2}{9}$

16. (B) Required solution

$=\frac{1}{2}\times\left(\frac{3}{2}\times\frac{2}{3}\right)\left(\frac{4}{3}\times\frac{3}{4}\right)\left(\frac{5}{4}\times\frac{4}{5}\right)....\left(\frac{98}{97}\times\frac{97}{98}\right)\left(\frac{99}{98}\times\frac{98}{99}\right)\times\left(\frac{100}{99}\right)$

$=\frac{1}{2}\times\frac{100}{99}=\frac{50}{99}$

17. (C) LCM of 6, 8 & 10 = 120

∴ After 120 minutes ie 2 hours all the three bells toll together

18. (C) Side of a square

$$= \frac{\text{Perimeter}}{4} = \frac{512\text{ cm}}{4}$$

= 128 cm

19. (A) Cost of each bag $= \frac{`106656}{48} = `2222$

∴ Cost of 25 bags = `2222 × 25 = `55,550

20. (B) Numbers from 780 to 790 → total 11 numbers.

$$= \frac{780+790}{2} = 785$$

Sum = 785 × 11 = 8635

21. (B) 2 × 3 × 5 × 7 × 11 × 13 × ..... = 30030 ×....

∴ The units digit = zero

22. (D) It is a triangular number as well as square number

23. (A) The sum of the first 50 odd numbers

$= 50^2 = 2500$

24. (D) 136° is obtuse angle

25. (C) '6' is a perfect number.

PHYSICS

26. (C) A parallax error occurs when the line of sight is not perpendicular to the scale.

(A) Zero error → due to misaligned zero mark.

(B) Calibration error → due to faulty or worn scale divisions.

(D) Alignment error → due to incorrect placement of ruler or object.

Only (C) matches the change in reading with eye position.

27. (D) A measuring tape gives the least accurate measurement for something extremely thin like a human hair or fine wire. It has the poorest least count compared to a ruler, vernier caliper, or micrometer.

28. (D) The motion is determined by magnetic poles on the boats.

In (A) (boats 1 & 2) the facing poles are opposite (one car shows an N on the side nearest the other boat and the other shows an S on the side nearest it). Opposite magnetic poles attract, so boats 1 and 2 will be pulled closer to each other.

In (B) (boats 3 & 4) the facing poles are the same (N–N or S–S facing each other). Like magnetic poles repel, so boats 3 and 4 will be pushed away from each other.

Thus (D) is correct

29. (C) Temperature and Heat energy

(A) Compass + Runner → Velocity → Vector (magnitude + direction).

(B) Gear + Magnet → Force or torque with magnetic field → Vector (directional effect).

(C) Thermometer + Fire → Temperature / Heat energy → Scalars (only magnitude, no direction).

(D) Rocket + Clock → Acceleration or velocity-time relation → Vector (depends on direction).

30. (B) Uniform motion: Requires constant speed throughout the motion.

Non-uniform motion: Occurs when speed changes over time.

Here, during the rest period, speed is zero, while during walking it is non-zero.

Hence, over the total time of 90 minutes, the motion is non-uniform.

31. (D) This repetitive back-and-forth motion around a mean position is a textbook example of oscillatory motion.

Sewing Machine (Option D)

Circular motion: Wheel rotates.

Oscillatory motion: Shuttle hook & internal linkages oscillate.

Linear motion: Needle moves straight up and down.

Why the Other Options Are Incorrect

A) Car: Circular: Wheels rotate

Linear: Car moves along a straight path

Oscillatory: ✘ No internal part oscillates about a fixed position

B) Pendulum Clock: Oscillatory: Pendulum swings

Circular: Hands rotate

Linear: ✘ No part moves in a straight line

C) Helicopter: Circular: Rotor blades rotate

Linear: Helicopter moves forward/ backward/up

Oscillatory: ✘ No internal part oscillates about a fixed position

32. (C) Mercury expands uniformly with temperature, making it accurate for measurement. It also has high visibility (shiny, opaque), so the reading is easy to see.

33. (B) Heating a magnet weakens it because the increased thermal energy causes the microscopic magnetic domains within the material to vibrate and become misaligned or randomized.

Initially, most of the magnetic domains are aligned, creating a strong overall magnetic field that can lift 10 coins.

When heated, the domains lose their alignment, the overall magnetic field weakens, and the magnet can only lift 6 coins.

Heating a magnet above its Curie temperature will cause it to lose its magnetism permanently.

34. (B) The ribbon's approximate length is 1.15 m – 1.20 m (Option B).

Step 1: Determine the Number of Segments

The problem implies a standard textbook scenario where a ribbon folded a certain number of times results in one more segment than the number of folds (or a similar simple relationship, often 5 segments for 4 folds). Assuming the ribbon is divided into "n"+1equal parts where "n" is the number of folds, we have 4+1=5segments.

Step 2: Calculate the Total Length

The length of one folded segment is approximately 23"cm" (as it is laid along a 23 cm scale). The total length of the ribbon ("L") is the number of segments multiplied by the length of one segment.

$L = 5 \times 23\ cm = 115\ cm$

Step 3: Convert to Meters and Select the Correct Option

Convert the length from centimeters to meters using the conversion factor 100 cm = 1 m.

$$L = \frac{115\ cm}{100} = 1.15\ m$$

This value falls within the range of option (B) 1.15 m – 1.20 m.

The ribbon's approximate length is in the range of 1.15 m – 1.20 m

35. (A) The strength of a magnet is directly related to the amount of iron filings it attracts.

When a magnet is cut into two halves, each half becomes a smaller, weaker magnet, but the total magnetism remains nearly the same.

Original Y attracted 80 g; after cutting, both halves together attract about 70 g (35 g + 35 g) – still greater than X (50 g) and Z (30 g).

Hence, Y remains the strongest, followed by X, then Z.

CHEMISTRY

36. (C) When sunlight falls on water bodies, water evaporates to form water vapour. Water vapour becomes light as it goes up. Small droplets of water join together and condense to form bigger drops in the clouds. Once the clouds become heavy, they fall as rain.

37. (C) Tin, being a metal is hard, opaque and has lustre.

38. (D) The water puddle seen on the ground in the morning disappeared by evening because of evaporation and the seepage of water into the ground.

39. (B) Oil does not mix with water. It floats on water.

40. (D) Conduction is not a part of water cycle.

41. (C) Aquatic animals and plants use the oxygen dissolved in water for respiration.

42. (D) Container S (a flask) has the smallest surface area of water exposed to the atmosphere. Thus, the rate of evaporation will be the slowest in flask S.

43. (A) Wood is opaque whereas glass is transparent.

44. (A) In a cloud, the size of the droplets of water increases. They become heavier and fall as rain.

45. (B) The amount of space that matter occupies is called volume. Mass is the quantity of matter contained in a body.

Weight is the force of gravity acting on an object having mass. Density is the mass of a substance per unit volume.

BIOLOGY

46. (C) Bryophyte (e.g., moss)

Bryophytes are non-flowering, seedless plants that grow in moist environments. They reproduce via spores and lack vascular tissue.

47. (C) To minimize heat loss

Penguins live in extremely cold habitats. Their feathers trap air and their fat acts as insulation, both reduce heat loss and helps to maintain body temperature.

48. (A) Xylem – water transport

Xylem is responsible for transporting water from roots to the leaves. If the Xylem is blocked water cannot reach the leaves. Even through the roots are in water causing in the leaves to wilt.

49. (C) Each plant is adapted to survive in different environmental conditions.

Cactus and deodar have different shapes because they live in very different places and need different features to survive in those conditions.

50. (B) Amphibian

Amphibians start life breathing with gills in water and later grow lungs to live on land, showing their ability to live in both environments.

51. (B) Process Z is photosynthesis.

Plants including carnivorous plants and non-flowering plants can carry out photosynthesis.

Plants carry out photosynthesis because they have chlorophyll, the green pigment that traps light energy from the Sun. The light energy is required to combine carbon dioxide and water into sugar and oxygen. [Animals and fungi do not carry out photosynthesis because they do not have chlorophyll.]

52. (B) Whale

Whales are warm-blooded mammals that breathe air using lungs, live in water, and give birth to live young.

53. (A) Dicot plants like hibiscus show reticulate (net-like) venation, while monocots like banana and grass show parallel venation in their leaves.

54. (B) Metamorphosis involves dramatic body changes. Frogs transform from tadpoles to adults with different structures, while cats grow gradually without such extreme transformations.

55. (B) Q is the plant. Plant is an autotroph.

CRITICAL THINKING

56. (A,C) Explanation: Directly meshed gears rotate in opposite directions, while gears connected by a non-crossed belt rotate in the same direction.

- Gear 1 (counter-clockwise) drives Gear 2 (counter-clockwise, same direction via belt).
- Gear 2 drives Gear 3 (clockwise, opposite direction via mesh).
- Gear 3 drives Gear 4 (counter-clockwise, opposite direction via mesh).
- Gear 4 drives Gear 5 (counter-clockwise, same direction via belt).
- Gear 5 drives Gear 6 (clockwise, opposite direction via mesh).

57. (B) Previous years with three equal digits: 2000, 2011, 2022.

If born in 2000, age in 2022 = 2022 - 2000 = 22.

58. (B) The initial balance shows that two dark grey flowers are equal in weight to two light grey flowers and one dark grey flower.

- By removing one dark grey flower from both sides, it is established that one dark grey flower has the same weight as two light grey flowers.
- Therefore, a single dark grey flower is heavier than a single light grey flower.
- (I) is incorrect because the dark grey flower is heavier, not lighter.
- (II) is correct because the light grey flower is lighter than the dark grey flower.
- (III) is correct because the light grey flower is lighter than the dark grey flower.
- (IV) is correct because the dark grey flower is heavier than the light grey flower.
- (V) is incorrect because they are not equal in weight.
- (VI) is incorrect because two light grey flowers equal one dark grey flower, so they are not heavier.

59. (A) From I $\rightarrow$ Meera = 2008 - 4 years earlier No—older by 4 $\Rightarrow$ born in 2004. II alone needs the current year, so it's not enough.

60. (B)