NATIONAL COUNCIL OF THE EDUCATIONAL RESEARCH AND TRAINING

NATIONAL TALENT SEARCH EXAMINATION – 2010

SCHOLASTIC APTITUDE TEST
(For student of Class VIII)

Time: 90 Minutes   Max Marks: 100

INSTRUCTIONS TO CANDIDATES

**Read the following instructions carefully before you answer the question.**

1. Answer are to be given on a **SEPARATE ANSWER-SHEET**.
2. Write your **eight-digit Roll Number** very clearly on the **test-booklet** and **answer**-sheet as given in your letter/admission card.
3. Write down the **Booklet Number** in the appropriate box on the answer-**sheet**.
4. There are 100 questions in this test. These questions are in Science, Mathematics and Social Sciences.
5. Please note and follow the instructions given on the answer-sheet for writing the answers.
6. **For questions 1-90, put a cross mark (X) on the number of the correct alternative on the answer-sheet against the corresponding question number. For questions 91-100, write the answers in the given space.**
7. All questions are compulsory.
8. Every correct answer will be awarded one mark.
9. **Rough work can be done anywhere in the booklet but not on the answer-sheet/loose paper.**
10. Please return the Test-booklet and Answer-sheet to the invigilator after the test.

PLEASE TURN OVER THE PAGE AND START YOUR WORK

1.   When a small amount of garden soil is put into a glass jar containing water, stirred and allowed to stand for two hours, the layers from top to bottom would be:
        1. Debris, water, sand and clay   2. Humus, water, clay and sand
        3. Debris, clay, gravel and sand   4. Humus, clay, gravel and sand

Soln. **2**
        In water, particles settle more quickly the bigger they are. The components of garden soil are sand, clay and humus and as per the relative size, humus is the smallest particle and sand is the largest particle so when we put such soil in water containing glass jar, the lightest part humus floats over water and the heavier sand settle at the bottom.
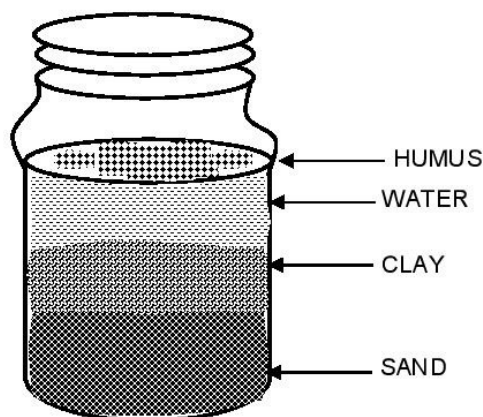
2.   Which of the following is an example of a single cell that does not function as a full-fledged organism?
        a. White blood cell (WBC)
        b. *Amoeba*
        c. WBC and *Amoeba*
        d. *Paramecium*

        1. b only   2. b, d
        3. a only   4. c, d

Soln. **3**
        WBCs are blood corpuscles and are not able to survive independently unlike *Amoeba* and *Paramecium*, which are acellular protozoans.

3.   Meena had a big farm. On Sunday she went to her farm and was surprised to see a house being constructed and a wooden almirah being made out of a tree.
        This may be considered as
        a. reforestation
        b. desertification
        c. deforestation
        d. drought

Which of the following is correct?

1. a, b
2. a, d
3. c alone
4. a alone

Soln. **3**

As the land was used for construction of house and the trees are cut for timber, it is an example of deforestation.

4. Read the following.
   a. Malaria is transmitted by a virus.
   b. Cholera is caused by *Mycobaterium*
   c. *Salmonella typhi* spreads through soil and water.
   d. *Varicella* causes chicken pox.
   Which of the following is true.

   1. a, c
   2. b, d
   3. c, d
   4. a, b

Soln. **3**

→ Malaria is transmitted by female *Anopheles* mosquito.

→ Cholera is caused by *Vibrio cholera,* a bacterium.

→ Typhoid fever is spread by food and water contaminated by urine and/or faeces of infected individuals. Polluted water is the most common source of contamination.

→ Chickenpox is a highly contagious illness caused by primary infection with varicella zoster virus

5. Weeds not only use nutrients from the soil but are also
   a. harmful for some organisms including human beings
   b. useful for the crops and harmful for human beings
   c. harmful to the crops and some animals
   d. crop specific
   Select the alternative which includes all correct statements.

   1. a, c and d
   2. b, c and d
   3. a, b and c
   4. a, b and d

Soln. **1**

Weeds are unwanted plants and are not useful for plants at all.

6. Match the items in Column I with Column II.

Column I	Column II
A. Mouth	a. Protein
B. Stomach	b. Water
C. Small Intestine	c. Starch
D. Large Intestine	d. Fat

Select the alternative which shows the correct matching.

1. A – d, B – c, C – a, D – b
2. A – c, B – d, C – b, D – a
3. A – c, B – a, C – d, D – b
4. A – b, B – a, C – d, D – c

***Soln.* 3**

→ Saliva contains Ptylin (Salivary Amylase), which digests starch.

→ Stomach glands secrete pepsin, which is a protein digesting enzyme.

→ Small intestine receives pancreatic juice which has pancreatic lipase, a fat digesting enzyme.

→ Water is being absorbed in large intestine.

7. Many breeds of sheep are available in our country and they can be distinguished by different quality of wool in different places. Keeping that in mind, match items in column I and column II.

Column I	Column II
Name of breed	State where found
I. *Lohi*	a. Uttar Pradesh
II. *Rampur Bushair*	b. Gujarat
III. *Bakharwal*	c. Rajasthan
IV. *Patanwadi*	d. Jammu and Kashmir

Select the alternative which shows the correct matching.

1. I – c, II – a, III – d, IV – b
2. I – c, II – b, III – a, IV – d
3. I – b, II – a, III – d, IV – c
4. I –b, II – c, III – d, IV – a

***Soln.* 1**

On the basis of geographical distribution of indigenous varieties of sheep:

→ *Lohi* sheep is found mainly in Rajasthan region,

→ *Rampur Bushair* in Uttarakhand and Uttar Pradesh,

→ *Bakharwal* in Jammu and Kashmir and

→ *Patanwadi* in Gujarat region.

8. Select the correct statements with respect to migration in animals.
   a. The same Siberian Crane can be seen in Bharatpur in two consecutive winters.
   b. Some fish lay eggs in rivers and the fingerlings gradually swim to sea.
   c. Some fish migrate from cold climate to a warmer climate to escape cold weather.
   d. Some butterflies migrate up to 10,000 kilometres to escape cold weather.

   Which of the following alternative has the correct statements?
   1. a and b
   2. b and c
   3. c and d
   4. a and d

***Soln.* 4**

→ Siberian Cranes are native to arctic Russia and western Siberia.

Every winter, Siberian Cranes migrate from Russia to warmer climes. In India Bharatpur Bird Sanctuary is their seasonal home.

The specie has become endangered due to the fact that it is hunted on its migratory route, which is located in Iran and Afghanistan and also due to destruction of wetlands.

In order to reach their wintering grounds in India, Siberian cranes cross over the mighty ranges of the Himalayas at the staggering cruising altitude that is meant for jetliners!

→ Some butterflies migrate in the south, central America, or they may even go to Mexico, to escape from the harsh and cold winter. In the spring they flutter back to their warm homes in the United States and Canada. One of these butterflies that migrates is **monarch.** It is the winner of long distance. The monarch can travel as far as 2000 miles, from Canada and the Northern States to California, Florida, and Mexico. The butterflies spend most of their winter time resting and saving up energy for their flight to return in the spring.

→ Many types of fish migrate on a regular basis, on time scales ranging from daily to annual, and over distances ranging from a few meters to thousands of kilometers. Fish usually migrate because of diet or reproductive needs and not to escape cold weather.

9. A man was infested with germs and was taken to the hospital. On pathological tests it was found that he had
   a. low number of RBC
   b. high number of WBC and low number of RBC
   c. low number of WBC
   d. high number of platelets
   Which of the following alternative is correct?
   1. a and b   2. a and d
   3. c alone   3. d alone

Soln. **1**
   → The blood test is usually ordered for routine physical exams or when a patient is exhibiting symptoms that may indicate an infection, or inflammation. When there is an infection in the human body, the white blood cells go to work to fight off the infection and other illnesses. Therefore, an **abnormally high level of WBC** may agree with the suspicion that an infection is present and the doctor will order further tests.
   → An abnormally low level of RBC may signal to the physician that the patient may be suffering from anemia, which might have caused by any intestinal worm infestation, like Hook worm.
   → Although total WBC count falls in viral infections, but viruses are not considered as germs, which have infected the subject (man).

10. Read the following about the agents of seed dispersal.
    a. *Xanthium* and *Urena* by animals
    b. Drumstick and Maple by wind
    c. Groundnut and Areca nut by birds
    d. Madar and Sunflower by insects
    Select the alternative which includes all the correct statements.
    1. a and b   2. a and c
    3. c and d   4. b and d

Soln. **1**

→ *Xanthium strumarium* - Fruits have hooked tips therefore dispersed by attaching to the fur of mammals or feathers of birds.

→ Fruit of *Urena* are also covered with number of hooks therefore dispersed by attaching to the fur of mammals or feathers of birds.

→ Seeds and fruits dispersed by wind have wings like that of the seed of the drumstick and the seed of the Maple. Maple seeds have a one-sided wing that causes them to swirl propeller-like after they are released from a parent tree. This structure allows maple seeds to be carried by even light breezes some distance from their parent before they hit the ground.

→ Some seeds have tufts of hair like that of Madar, therefore their dispersal occurs through wind.

→ In sunflower, seed dispersal relies on seed eating birds, like the haloen and animals, and the large bright petals help to attract them.

→ Areca nut does not spread readily, likely due to lack of a suitable dispersal agent for the large fruits and seeds.

→ Groundnuts do not disperse their seeds they actively bury the fertilized flower ovary so the pod forms underground. Achory, restricting seed dispersal, is a way for the plant to take over more of a good site and protect its progeny. Both the peanut (*Arachis hypogaea*) & a clover (*Trifolium subterraneum*) use achoric seed burial.
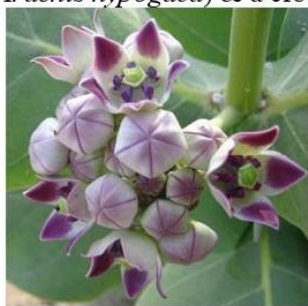
Madar

Urena

Maple

Areca Nut

Drumstick
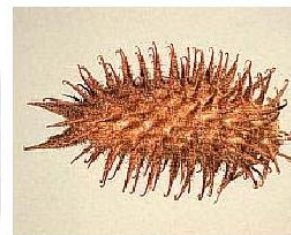
Xanthium

11. Study the following statements.
    a. Forests are complex habitats and require fertilizer use.
    b. Wild animals transfer seeds and increase forest areas.
    c. Cutting forest trees on a large scale will not disturb the decomposer cycle.
    d. Forests in our country are growing slowly.
    e. Education of people is important in forest conservation.

Select the alternative which includes all correct statements.
1. a and c
2. c and d
3. b and e
4. a and d

Soln. **3**

→ Natural habitats do not require artificial fertilizers.
→ Wild animals are also one of the modes of seed dispersal.
→ Decomposer cycles are operated by micro-organisms and are not affected by cutting forests.
→ Forests are decreasing in our country due to deforestation.

12. Read the following statements.
    a. A few rivers in India are like sewers.
    b. Some cattle may die by feeding on plastic bags.
    c. Installation of waste water treatment plants have cleaned up most of the rivers in India.
    d. Sludge is the effectively utilized in the production of biogas.
    Select the alternative which includes all correct statements.
    1. a, b and c
    2. a, b and d
    3. b, c and d
    4. a, c and d

Soln. **2**

Waste water treatment plants are for cleaning water for human consumption and is not helpful in cleaning the entire river.

13. Consider the following statements.
    a. Baking soda is an acidic salt whereas washing soda is a basic salt.
    b. The aqueous solution of common salt does not change the colour of either red litmus solution or blue litmus solution.
    c. Amla tastes sour whereas soap solution is bitter in taste.
    d. The water extract of spinach does not change the colour of red litmus solution.
    Which alternative has the correct statements?
    1. a, b and c
    2. a and c
    3. b and c
    4. b and d

Soln. **3**

(b) The aqueous solution of common salt is neutral in nature.
(c) *Amla* contains acids and soap contains base.

14. Arrange the following in decreasing order of their acidic character.
    a. Vinegar
    b. Stomach acid
    c. Soap solution
    d. Lime water
    Select the alternative which indicates the correct order.
    1. b, a, d, c
    2. c, d, a, b
    3. b, a, c, d
    4. d, c, a, b

Soln. **3**

Vinegar is aqueous solution of CH_3COOH (Acid)

Stomach acid means HCl (Acid)

Soap solution contains NaOH (Base)

Lime water is aqueous solution of $Ca(OH)_2$ (Base)

15. Consider the following statements.
    a. Natural gas can be supplied to homes and factories through pipes.
    b. Natural gas is obtained by fractional distillation of crude oil.
    c. Natural gas is a cleaner fuel because on burning only water is produced.
    d. Natural gas is an exhaustible source of energy like fossil fuels.
    Which alternative has the correct statements?
    1. a and c
    2. b and c
    3. a and d
    4. a, c and d

Soln. **3**

16. Which of the following pollute the ground water?
    a. Release of factory wastes into rivers
    b. Use of pesticides in fields
    c. Use of chemical fertilizers
    d. Use of manure

    1. b, c and d
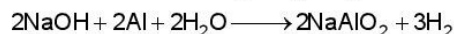   2. a, b and c
    3. a and b
    4. b and c

Soln. **2**

17. Match the following.
    i. Acrylic   a. contains repeating ester units
    ii. Cellulose   b. used for making sweaters
    iii. Polythene c. made up of large number of glucose units
    iv. Terylene   d. Used for making electrical switches
                    e. Used for manufacturing toys.
    Which of the following is the correct matching?
    1. (i) – (b), (ii) – (a), (iii) – (d), (iv) – (c)   2. (i) – (b), (ii) – (c), (iii) – (e), (iv) – (a)
    3. (i) – (d), (ii) – (b), (iii) – (e), (iv) – (a)   4. (i) – (d), (ii) – (c), (iii) – (b), (iv) – (e)

Soln. **2**

18. Which of the following metals on reacting with sodium hydroxide solution produce hydrogen gas?
    a. Cu
    b. Al
    c. Fe
    d. Zn

1. b and c   2. b and d
3. a and d   4. b only

Soln. **2**

$$2NaOH + Zn \longrightarrow Na_2ZnO_2 + H_2$$

$$2NaOH + 2Al + 2H_2O \longrightarrow 2NaAlO_2 + 3H_2$$

19. Match the following.
    i.   Sodium   a. on burning produces an acidic gas.
    ii. Phosphorus   b. Reacts neither with acids nor bases.
    iii. Copper   c. It is so soft that it can be cut with a knife.
    iv. Charcoal   d. Burns spontaneously on exposure to air.
                        e. Acquires a dull green coating on exposure to air.
    Which of the following shows the correct matching?
    1. (i) – (c), (ii) – (e), (iii) – (b), (iv) – (a)   2. (i) – (d), (ii) – (a), (iii) – (c), (iv) – (b)
    3. (i) – (d), (ii) – (e), (iii) – (c), (iv) – (b)   4. (i) – (c), (ii) – (d), (iii) – (e), (iv) – (a)

Soln. **4**

20. When a candle burns in air, two processes take place. First the change A takes place and then the change B. The following statements correspond to these changes. Choose the correct one.
    1. Process A is a chemical change.
    2. Process B is a chemical change.
    3. Both processes A and B are chemical changes.
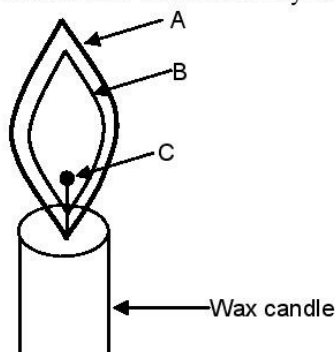   4. Process A is a chemical change whereas process B is a physical change.

Soln. **4**

21.
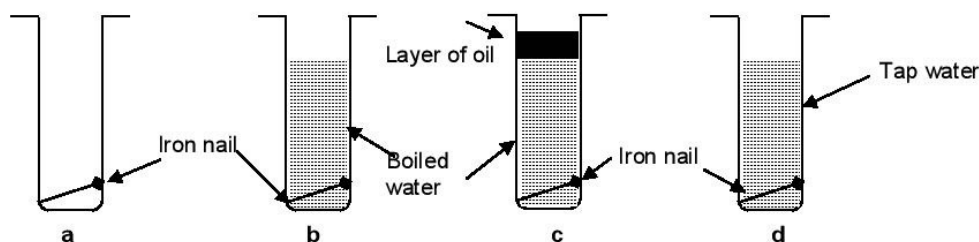
In which test tubes, the rusting of iron nail will take place?
    1. a and d   2. a, b and d
    3. b and c   4. b, c and d

Soln. **1**

Rusting of iron takes place only in presence of oxygen and water vapour. In figure (c) rusting is not possible.

22. The different zones of a candle flame are marked by the letters A, B and C.

Which of the following is correct?
1. B is the hottest part of the flame.
2. C is moderately hot.
3. A is the hottest part of the flame.
4. A is moderately hot whereas C is the coldest part.

Soln. **3**

23. Read the following statements.
   a. Water is the best extinguisher for fires involving inflammable materials.
   b. Carbon dioxide is used to extinguish fires involving oil and petrol.
   c. Water is not suitable for fires involving electrical equipments.
   d. Fires caused by short-circuit should be immediately put off by sprinkling water on it.

   Which alternative has the correct statements?
   1. b and c   2. c and d
   3. a and b   4. b and d

Soln. **1**

24. Rooms are fitted with ventilators to let the air move around. The phenomenon involved in this process is
   1. Conduction   2. Convection
   3. radiation   4. diffusion

Soln. **2**

25. Which of the following places in India is most likely to experience cyclones?
   1. Delhi   2. Mumbai
   3. Puri   4. Bhopal

Soln. **3**

26. A car travels at a speed of 80 km/hr for 15 minutes and then at a speed of 40 km/hr for next 15 minutes. The average speed of the car is
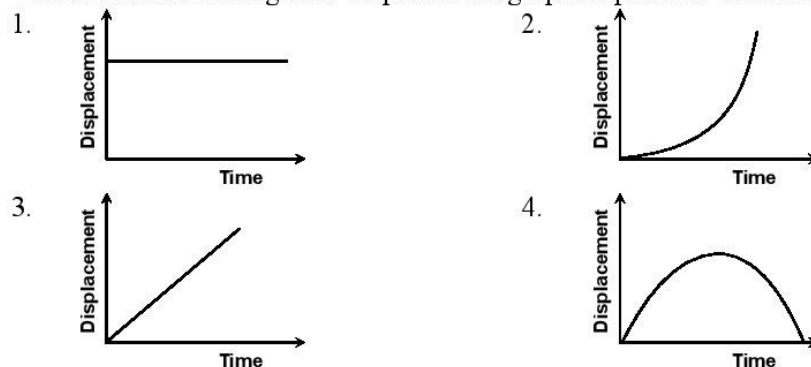   1. $15.7\,ms^{-1}$
    2. $16.7\,ms^{-1}$
    3. $17.7\,ms^{-1}$
    4. $18.7\,ms^{-1}$

Soln. **2**

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}} = \frac{80 \times \dfrac{1}{4} + 40 \times \dfrac{1}{4}}{\dfrac{2}{4}} = 30 \times 2 = 60\,km\,/\,hr$$

$$= 60 \times \frac{5}{18} = \frac{50}{3}\,m\,/\,s = 16.7\,m/s$$

27. Which of the following time-displacement graphs represents a uniform motion?

1.

2.

3.

4.

Soln. **3**

28. Match the items in Column - I with those in Column - II

	Column I		Column II
1.	Electric Fuse	A	Chemical Effect
2.	Relay	B	Electric Discharge
3.	CFL	C	Magnetic Effect
4.	Button Cell	D	Heating Effect

Which of the following shows the correct matching?
1. 1C; 2B; 3A; 4D
2. 1B; 2A; 3C; 4D
3. 1D; 2C; 3B; 4A
4. 1D; 2B; 3C; 4A

Soln. **3**

29. Of the materials listed below
    A. Water (Distilled)
    B. Solution of common salt
    C. Mercury
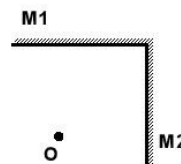   D. Caustic Soda Solution
    E. Glycerin

A set of materials consisting of good conductor of electricity is
1. A B C
2. A D E
3. C A E
4. B C D

Soln. **4**

30. Two mirrors M1 and M2 are placed at right angle to each others as shown. The total number of images of an object 'O' that can be seen are
1. Two
2. Three
3. Four
4. Infinite

Soln. **2**

Number of image = $\dfrac{360°}{90°} - 1 = 4 - 1 = 3$

31. On passing through a prism, a parallel beam of sunlight splits into lights of several colours. Take a combination of two identical prisms as shown below. A parallel beam of sunlight is incident on the face AD. The emergent light from the face BC, consists of
1. a parallel beam of light of several colours
2. a divergent beam of lights of several colours.
3. a parallel beam of white light
4. a divergent beam of white light.
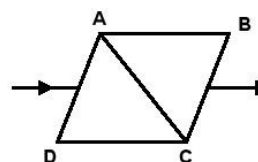
Soln. **3**

32. A ball of mass 0.20 kg falls freely from a certain height and rebounds elastically with a speed of 40 ms^{-1}. The change in momentum of the ball is
1. 4 kg ms^{-1}
2. 8 kg ms^{-1}
3. 16 kg ms^{-1}
4. 40 kg ms^{-1}

Soln. **3**

$\Delta p = 2mv = 2 \times 0.2 \times 40 = 16$ kg-ms^{-1}

33. The force of friction acting on a car on different roads in the increasing order of magnitude will be
1. mud, tar, concrete and gravel roads
2. tar, concrete, gravel and mud roads
3. concrete, tar, gravel and mud roads
4. gravel, mud, tar and concrete roads

Soln. **4**

34. Voice of which of the following creatures is likely to have maximum frequency?
1. Man
2. Cow
3. Bird
4. Dog

Soln. **3**

35. When we look towards the pole star, it appears stationary because
    1. it is very far from earth as compared to other stars.
    2. it moves with much lesser speed than others stars
    3. it is pointing exactly in the south direction
    4. it is pointing exactly in the north direction

Soln. **4**

36. If $(x-1)^2 + (y-3)^2 + (z-5)^2 + (t-7)^2 = 0$, then $xyzt + 16$ is equal to
    (A) 5^2 (B) 9^2
    (C) 11^2 (D) 12^2

Soln. **C**
    $x = 1$, $y = 3$, $z = 5$ and $t = 7$
    $\Rightarrow xyzt + 16 = 121 = 11^2$.

37. $\sqrt{\dfrac{8^{10} + 4^{10}}{64^2 + 4^9 \times 16}}$ is equal to

    (A) 8   (B) 16
    (C) 36   (D) 256

Soln. **B**
    $$\sqrt{\frac{8^{10} + 4^{10}}{64^2 + 4^9 \times 16}} = \sqrt{\frac{(4 \times 2)^{10} + 4^{10}}{4^6 + 4^{11}}}$$
    $$= \sqrt{\frac{4^{10}(2^{10} + 1)}{4^6(2^{10} + 1)}} = \sqrt{4^4} = 16.$$

38. $\sqrt{3 + 2\sqrt{2}} - \sqrt{3 - 2\sqrt{2}}$ is equal to
    (A) 2   (B) 1
    (C) $2\sqrt{2}$ (D) $\sqrt{6}$

Soln. **A**
    $$x = \sqrt{3 + 2\sqrt{2}} - \sqrt{3 - 2\sqrt{2}}$$
    $$x^2 = \left(\sqrt{3 + 2\sqrt{2}} - \sqrt{3 - 2\sqrt{2}}\right)^2$$
    $$x^2 = 3 + 2\sqrt{2} + 3 - 2\sqrt{2} - 2$$
    $$x^2 = 4$$
    $$x = 2.$$

39. If $a^x = \sqrt{b}$, $b^y = \sqrt[3]{c}$ and $c^z = \sqrt{a}$, then the value of xyz is

    (A) $\dfrac{1}{2}$ (B) $\dfrac{1}{3}$

    (C) $\dfrac{1}{6}$ (D) $\dfrac{1}{12}$

Soln. D

$a^x = \sqrt{b},\ b^y = \sqrt[3]{c}$ and $c^z = \sqrt{a}$

$a^{2x} = b,\ b^{3y} = c,\ c^{2z} = a$

$\qquad (a^{2x})^{3y} = c \Rightarrow (a^{6xy})^{2z} = a$

$\qquad\qquad a^{12xyz} = a$

$\Rightarrow xzy = \dfrac{1}{12}$.

40. If $5\dfrac{7}{x} \times y\dfrac{1}{13} = 12$, where fractions are in their lowest terms, then $x - y$ is equal to

(A) 2   (B) 4

(C) 7   (D) 9

Soln. C

$5\dfrac{7}{x} \times y\dfrac{1}{13} = 12$

By trial and error.

$x = 9,\ y = 2$

where the fractions are in their lowest terms, then x should be maximum possible single digit and y is minimum possible single digit.

$\Rightarrow x = 9$ and $y = 2$

$5 \times \dfrac{7}{9} \times 2 \times \dfrac{1}{13} = \dfrac{52}{9} \times \dfrac{27}{13} = 12$.

$x - y = 7$.

41. 1x3y6 is a five digit number where x, y are digits and y exceeds x by 6. If this number is divisible by 18, then the value of $\dfrac{y}{x}$ is

(A) 7   (B) 3

(C) $\dfrac{1}{3}$ (D) $\dfrac{1}{7}$

Soln. A

1x3y6 is divisible by 18 $\Rightarrow$ divisible by 9

$1 + x + 3 + y + 6 = 10 + x + y\ (x + y = 8)$

$y - x = 6$ ... (1) [Given in the problem]

$y + x = 8$ ... (2)

Subtracting (1) from (2)

$y + x = 8$

$y - x = 6$

$2y = 14$

$y = 7 \Rightarrow x = 1$

$\dfrac{y}{x} = 7$.

42. A person invested 3 times as much money at 5% as he had invested at 2% per annum simple interest. Further, he invested Rs. 6000 more at 3% than he had invested at 2%. If the total interest from the three investments after a year is Rs. 980, then the total amount he invested is
(A) Rs. 17600
(B) Rs. 18000
(C) Rs. 20000
(D) Rs. 26000

Soln. D
Let he invested x amount of Rs. at 2%
then $\dfrac{3x \times 5}{100} + \dfrac{2x}{100} + \dfrac{(x + 6000) \times 3}{100} = 980$
20x − 18000 = 98,000
20x = 80,000
x = 4000.
Total amount he invested is 3x + 2x + 3x + 6000 = 26,000.

43. In a triangle ABC, AB = AC. Points D and E are on the sides BC and AC respectively such that AD = AE. If ∠BAD = 30°, then the measure of ∠EDC is
(A) 10°
(B) 15°
(C) 20°
(D) 25°

Soln. B
AB = AC
⇒ ∠B = ∠C = x°
AD = AE
⇒ ∠D = ∠E = y°
In ΔDEC ∠y is external angle
⇒ y° = a + x° ⇒ a° = y − x°
In ΔABC
2x° + 30° + 180° − 2y° = 180°
2(y − x) = 30°
y − x = 15°
∴ ∠EDC = 15°.
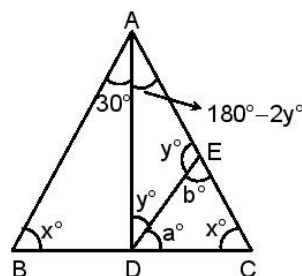
44. Population of a town increased by 1200 persons in a year and then this new population decreased by 11% during the next year. If the town now has 32 persons less than it had before the increase, then the original population of the town is
(A) 9968
(B) 10000
(C) 11232
(D) 12000

Soln. B
$\dfrac{(x + 1200) \times 11}{100} = 1200 + 32$
$(x + 1200) = \dfrac{1232 \times 100}{11}$
x = 11200 − 1200
x = 10,000

45. How much percent above the cost price should a shopkeeper mark his goods so that after allowing a discount of 20% on the marked price, he still has a gain of 10% ?
(A) 10 (B) 25.5
(C) 30 (D) 37.5

Soln. D
Let c.p. = 100
and also let the marked price is Rs x

$$\Rightarrow \left(x - \left(\frac{x \times 20}{100} \right) \right) = 110$$

$$\frac{4x}{5} = 110$$

$$x = \frac{110 \times 5}{4} = 137.5$$

$\Rightarrow$ c.p. = 100
m.p. = 137.5
$\Rightarrow$ 37.5%

46. If in a group of goats and hens, the number of legs is 24 more than twice the number of heads, then the number of goats in the group is
(A) 18 (B) 16
(C) 14 (D) 12

Soln. D
Let x be the number of goats
$2x = 24$
$x = 12$.

47. The expression $\dfrac{bx(a^2x^2 + 2a^2y^2 + b^2y^2) + ay(a^2x^2 + 2b^2x^2 + b^2y^2)}{(ax + by)^2}$ is equal to

(A) a(x + y) (B) bx + ay
(C) ax + by (D) b(x + y)

Soln. B

$$\frac{bx(a^2x^2 + 2a^2y^2 + b^2y^2) + ay(a^2x^2 + 2b^2x^2 + b^2y^2)}{(ax + by)^2}$$

$$\frac{\left(a^2x^2(ay + bx) + b^2y^2(ay + bx) + 2a^2y^2bx + 2b^2x^2ay\right)}{(ax + by)^2}$$

$$\frac{a^2x^2(ay + bx) + b^2y^2(ay + bx) + ay(2axby) + bx(2axby)}{(ax + by)^2}$$

$$\frac{(a^2x^2 + 2axby + b^2y^2)(ay + bx)}{(ax + by)^2} = (ay + bx)$$

48.   The lengths of the sides of a right angled triangle are all given in natural numbers. If two of these numbers are odd and they differ by 50, then the least possible value for the third side is

(A) 61
(B) 60
(C) 51
(D) 50

Soln.   B
We can observe that
$5^2 = 3^2 + 4^2$ (5, 3 are odd and 4 lies between 5, 3)
hypotenuse
and $13^2 = 5^2 + 12^2$ (5, 12 are odd and 12 lies between 5, 13)
hypotenuse
By trial and error
$61^2 - 11^2 = 60^2$
$61^2 = 60^2 + 11^2$
since (61, 11 are odd and 61 hypotenuse)
$61 - 11 = 50$

49.   E is the midpoint of diagonal BD of a parallelogram ABCD. If the point E is joined to a point F on DA such that $DF = \dfrac{1}{3} DA$, then the ratio of the area of ΔDFE to the area of quadrilateral ABEF is

(A) 1 : 3
(B) 1 : 4
(C) 1 : 5
(D) 2 : 5

Soln.   C

$\dfrac{ar(DEF)}{ar(ABEF)}$

$\Delta DEN \sim \Delta DBM$

$BM = 2EN$

$ar(DEF) = \dfrac{1}{2} DF \times EN$

$= \dfrac{1}{2}\left(\dfrac{1}{3}DA\right) \times \dfrac{1}{2} BM$

$= \dfrac{1}{12}(DA \times BM)$

$= \dfrac{1}{12}(DA \times BM) : \dfrac{1}{2}(DA \times BM) = 1:6$

$ar(\Delta EFD) : ar(\Delta ABD) = 1 : 6$

$ar(\Delta ABD) = ar(\Delta EFD) + ar(ABEF)$

let $\Delta_1 = ar(\Delta EFD)$, $\Delta_2 = ar(ABEF)$

$\Rightarrow 6\Delta_1 = \Delta_1 + \Delta_2$
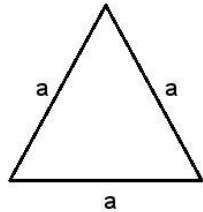
$5\Delta_1 = \Delta_2$

$\dfrac{\Delta_1}{\Delta_2} = \dfrac{1}{5} = 1 : 5$
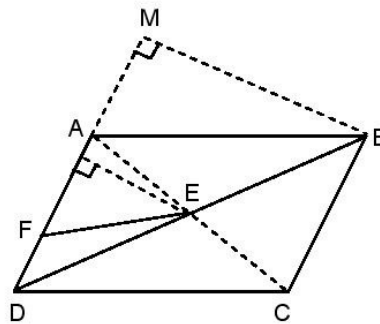
50. An equilateral triangle and a regular hexagon have equal perimeters. If the area of the triangle is 12 dm^2, then the difference of their areas (in dm^2) is
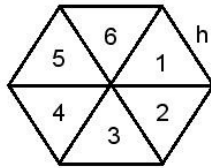(A) 2 (B) 4
(C) 6 (D) 8

Soln. C

Let a be the side of equilateral triangle $\frac{\sqrt{3}}{4}a^2 = 12$

The perimeter 3a and this equal to perimeter of hexagon
$\Rightarrow$ 3a = 6h (h is side of hexagon)
h = $\frac{1}{2}$a

The area of the hexagon = $6 \times \frac{\sqrt{3}}{4}h^2$

$= 6 \times \frac{\sqrt{3}}{4}\left(\frac{a}{2}\right)^2 = \frac{6}{4} \times \left(\frac{\sqrt{3}}{4}a^2\right) = \frac{6}{4} \times 12 = 18$

$\Rightarrow$ 18 − 12 = 6 dm^2.

51. The cost of diamond varies directly as the square of its weight. A diamond weighting 10 decigrams costs Rs. 8,000. If it breaks into two pieces whose weights are in the ratio 3 : 2, then the loss incurred (in rupees) in
(A) 3840 (B) 3960
(C) 4040 (D) 4160

Soln. A

10 dgrm $\rightarrow$ 8000   10 dgrm dividing in 3 : 2 we get, 6 dgrm : 4 dgrm

100 : 36 $\Rightarrow$ $\frac{8000}{25}$ = 320

320 $\times$ 9 = 2880

100 : 24 $\Rightarrow$ 320 $\times$ 4 = $\frac{1280}{4160}$

$\Rightarrow$ 8000 − 4160 = 2840.

52. Area of the four walls of a room is 108 m². If the height and length of the room are in the ratio of 2 : 5 and the height and breadth in the ratio 4 : 5, then the area, in m², of the floor of the room is
(A) 72 (B) 54
(C) 45 (D) 24

Soln. C
Let l – length, b – breadth, h – height
area of four walls $= l \times h + l \times h + b \times h + b \times h$
$2(lh) + 2(bh)$
$2h(l + b) = 108$ m²
$h : l = 2 : 5, h : b = 4 : 5$
$h : l : b = 4 : 10 : 5$
$h = 4x, l = 10x, b = 5x$
$2 \times 4x(15x) = 108$
$x^2 = \dfrac{108}{120}$
then the area of the floor is $l \times b = 10x \times 5x = 50x^2$
$= 50 \times \dfrac{108}{120} = 45 m^2$

53. Four pipes each of 5 cm in diameter are to be replaced by a single pipe discharging the same quantity of water. If the speed of water remains same in both the cases, then the diameter (in cm) of the single pipe is
(A) 5 (B) 6
(C) 10 (D) 12

Soln. A
Four pipes each of 5cm in diameter
$\Rightarrow$ radius r = 2.5cm
volume $= \pi r^2 h$ (since we are considering the height (length) of the pipe as constant or same)
let the height is h
volume $v = \pi(2.5)^2 h$
$4 \times \pi \times (2.5)^2 \times h = \pi r_2^2 h$ (r_2 is required pipe radius)
$r_2^2 = 4 \times (2.5)^2$
$r_2 = 2 \times (2.5) = 5$ cm.

54. If there are n numbers of which one is $\left(1 - \dfrac{1}{n}\right)$ and all the others are 1's, then the arithmetic mean of these numbers is less than 1 by
(A) n^2 (B) n
(C) $\dfrac{1}{n^2}$ (D) $\dfrac{1}{n}$

Soln. C

$$\frac{1-\dfrac{1}{n}+1+1+1\ldots(n-1)\,\text{times}}{n} = \frac{(n-1)+1-\dfrac{1}{n}}{n}$$

$$= \frac{n-\dfrac{1}{n}}{n} = \frac{n^2-1}{n^2} = 1-\frac{1}{n^2}$$

the arithmetic mean of these numbers is less than 1 by $\dfrac{1}{n^2}$.

55. If the mean of three numbers a, b and c is 3, then $\sqrt[3]{(7^{a+b-c})(7^{b+c-a})(7^{c+a-b})}$ equals
(A) $7^{1/3}$ (B) $7^{2/3}$
(C) 7^2 (D) 7^3

Soln. D

$$\sqrt[3]{(7^{a+b-c})(7^{b+c-a})(7^{c+a-b})} = \sqrt[3]{(7^{a+b-c+b+c-a+c+a-b})}$$

$$= \sqrt[3]{(7^{a+b+c})}$$

$$= \left(7^{\frac{a+b+c}{3}}\right) = 7^3 \qquad \left[\because \quad \frac{a+b+c}{3} = \text{mean} = 3\right]$$

56. Match the names of foreign chroniclers with the names of Indian rulers whose period became the theme of their description.
i. Megasthenes   a. Alauddin Khilji
ii. Fahien   b. Harsha Vardhana
iii. Ziauddin Barani   c. Chandragupta Maurya
iv. Hiuen Tsang   d. Samudragupta
Which of the following is the correct matching?
1. i – c, ii – b, iii – a, iv – d   2. i – a, ii – b, iii – c, iv – d
3. i – c, ii – d, iii – a, iv – b   4. i – d, ii – c, iii – b, iv – a

Soln. 1
These foreign visitors wrote about the period in which these kings ruled.

57. What lands were assigned for the maintenance of educational institutions under the Cholas?
1. Brahmadeya   2. Shalabhoga
3. Tirunanattukkani   4. Vellanvagai

Soln. 2
As per NCERT description

58. Match the names of the following tribes with the areas of their settlement.
i. Khokhar   a. Malabar
ii. Kurichayyas   b. Punjab
iii. Gonds   c. Maharashtra
iv. Kolis   d. Madhya Pradesh

Which of the following is the correct matching?
1. i – b, ii – a, iii – d, iv – c   2. i – a, ii – b, iii – c, iv – d
3. i – b, ii – d, iii – a, iv – c   4. i – c, ii – a, iii – d, iv – b

Soln. **1**
As per the concentration of these tribes in the areas mentioned here.

59.   If you lived in Agra during Shahjahan's time what would you witness the most?
1. Rebellion of Rajputs   2. A lot of construction activity
3. Peasant rebellions   4. Flourishing banking activities

Soln. **2**
Some of the famous Mughal buildings were built in this period.

60.   If you are interested in knowing the economic history of a period, which of the following sources can help you the most?
a. Coins
b. Holy Texts
c. Inscriptions
d. Architecture
1. a, b, c   2. b, c, d
3. a, c, d   4. a, b, d

Soln. **3**
Coins, inscriptions and architecture help the most to know about the economic history.

61.   Surat and Masulipatnam were important trading towns in 17th century. However in the 18th century they lost their importance.
Which of the following was NOT responsible for their decline?
1. Loss of market and productivity because of the decline of the Mughal Empire.
2. Control of sea-routes by the Portugese and competition from Bombay.
3. Fierce competition among various trading groups like Golconda nobles, Persian merchants etc.
4. Shifting of company trade centres to Bombay, Calcutta and Madras.

Soln. **3**
This is not an appropriate reason.

62.   The worst effect of the agricultural indebtedness was
1. the acquisition of land by money-lenders
2. distribution of the debtor's land to others by money-lenders.
3. social boycott of the debtor by villagers.
4. intervention by the Government.

Soln. **1**
The farmers were caught in this cycle of debt where they ended losing their land.

63. Western education proved to be significant because it
   1. changed the habits of Indians.
   2. led to industrialization of India.
   3. established democracy in India
   4. changed the thinking and outlook of the Indians.

Soln. **4**
Education changed the thinking process.

64. The Indigo farmers (ryots) were facing oppressive conditions for a long time. However, they decided to rebel against the planters in 1859 because.
   1. ryots had to sign and agreement for planting indigo against a loan.
   2. planters forced the ryots to plant indigo on the best soil meant for cultivating rice.
   3. the price that the ryots got for the indigo was very low and the cycle of loans never ended.
   4. ryots had the support of local zamindars, village headmen as well as of the British Government.

Soln. **4**
The local zamindar and village headmen mobilized the indigo peasants and fought pitched battles with the lathiyals.

65. The Revolt of 1857 was a landmark in the history of India because it
   a. taught Indians to fight against a common enemy.
   b. gave confidence, courage and hope to the Indian people.
   c. transferred the power from the company to the British Crown.
   d. spread all over India and involved all Indians.
   Which of the following alternatives has the correct reasons?
   1. a, b and c   2. a, b and d
   3. a, c and d   4. b, c and d

Soln. **1**
The influence of the rebellion was confined to North India.

66. Which of the following was NOT the reason for the decline of Indian textiles at the end of 18th century?
   1. The Indian textiles with traditional intricate patterns had lost their demand amongst the rich and middle classes.
   2. Indian textiles had to complete with British textiles in the European and American markets.
   3. Exporting textiles to England became difficult due to high import duties.
   4. English cotton mills started producing cheap cloth to oust Indian textiles from Indian market.

Soln. **1**
Indian textiles were always popular with Europeans.

67.   Match the following.
        a. William Jones   i.   Respect for ancient cultures
        b. Thomas Macaulay   ii. Critical of English Language
        c. Rabindranath Tagore   iii. Learning in a natural environment
        d. Mahatma Gandhi   iv. Promotion of English language
        Which of the following is the correct matching?
        1. a – i, b – ii, c – iii, d – iv   2. a – i, b – iv, c – iii, d - ii
        3. a – i, b – iii, c – ii, d – iv   4. a – iv, b – i, c – ii, d - iii

Soln.   **1**
        Given are the educational philosophies of the mentioned scholars.

68.   People were afraid of sending the girls to schools in mid-nineteenth century for many
        reasons. Which of the following was NOT true?
        1. People feared that schools would take girls away from home.
        2. Schools would prevent girls from doing their domestic duties.
        3. People felt that education would improve the conditions of women.
        4. Traveling to school might have corrupting influence on girls.

Soln.   **3**
        Amongst all this is the most appropriate option.

69.   Read the following.
        The late nineteenth and early twentieth centuries witnessed the rise of nationalism in
        many Afro-Asian countries. The freedom movement in one African country was led by
        Convention People's Party through strikes, boycotts and mass rallies. In 1957 that
        country became the first sub-Saharan African country to gain independence.
        In view of the above which pair is correct?
        1. Nelson Mandela and South Africa   2. Col. Nasir and Egypt
        3. Col. Gaddari and Libya   4. Kwane Nkrumah and Ghana

Soln.   **2**
        The year 1957 matches with the incident.

70.   Mahatma Gandhi called off the Non-cooperation Movement after the Chauri Chaura
        incident because
        1. he intended to avoid probable arrest
        2. Moplah peasants in Kerala opposed him.
        3. the movement had turned violent.
        4. of growing opposition to his leadership within Congress.

Soln.   **3**
        M K Gandhi never supported violence.

71. Which of the following is the correct sequence of the process of precipitation?
    1. unsaturated air, condensation, dew point, precipitation
    2. dew point, condensation, unsaturated air, precipitation
    3. unsaturated air, dew point, unsaturated air, precipitation
    4. condensation, dew point, unsaturated air, precipitation.

Soln. **1**
This is the correct sequence of precipitation.

72. Read the following statements.
    a. Ozone is found mostly in the stratosphere.
    b. Ozone layer lies 55-75 kms above the surface of the earth.
    c. Ozone absorbs ultraviolet radiation from the Sun.
    d. Ozone layer has no significance for life on the earth.
    Which set of the statements is correct?
    1. a and c   2. b and d
    3. b and c   4. a and d

Soln. **1**
This is the most appropriate option.

73. Which of the following group of industries belongs to sunrise industries?
    1. I. T., knowledge, aircraft, ship building
    2. Ship building, health, I. T., synthetic fibre.
    3. I. T., knowledge, health, hospitality
    4. Knowledge, aircraft, hospitality, I. T.

Soln. **3**
This group of industries belongs to the sunrise industries.

74. Which of the following pairs is correctly matched?
    1. Elbe – Caspian Sea   2. Rhone – Baltic Sea
    3. Ural – White Sea   4. Danube – Black Sea

Soln. **4**
Danube drains into black sea.

75. Which of the following is correctly matched?
    1. Shimla Hills – Snowclad mountains
    2. Aravali – Oldest mountain
    3. Nanda Devi – Located in outer Himalayas
    4. Satpura Hills – Lie north of the Vindhyas

Soln. **2**
Aravali is the oldest mountain range.

76. The dotted areas in the given rough outline map of India indicate the distribution of
    1. Coal fields
    2. Hydel power plants
    3. Iron ore deposits
    4. Copper ore deposits

Soln. **2**

These are the hydel power plants.

77. Which of these are positive influences of human beings on the ecosystem?
    A. Declaring areas as wildlife sanctuaries
    B. Increasing biodegradable packing materials that can be recycled
    C. Removing pollutants from toxic industrial smoke
    D. Using the natural resources intensively
    1. A, B
    2. B, C
    3. A, B, C
    4. B, C, D

Soln. **3**

Intensive use of natural resources will help them to deplete fast.

78. Match list I (Forest types) with list II (Types of trees)

List I	List II
A. Tropical Evergreen	I. Oak, pine, eucalyptus
B. Temperate Evergreen	II. Oak, ash, beech
C. Tropical Deciduous	III. Rosewood, ebony, mahogany
D. Temperate Deciduous	IV. Sal, teak, shisham

    1. (A – II), (B – IV), (C – III), (D – I)
    2. (A – IV), (B – II), (C – I), (D –III)
    3. (A – I), (B – III), (C – II), (D – IV)
    4. (A – III), (B – I), (C – IV), (D –II)

Soln. **4**

This is correct matching.

79. Which of the following is the correct sequence of countries form high to low with reference to annual rate of natural increase of population?
    1. Angola, Iran, Canada, Pakistan
    2. Angola, Pakistan, Iran, Canada
    3. Pakistan, Angola, Canada, Iran
    4. Pakistan, Canada, Angola, Iran

Soln. **2**

Canada is the least populated country.

80. Identify the pair of countries which has subsistence intensive agriculture.
    1. India and Argentina
    2. Brazil and Canada
    3. Myanmar and Indonesia
    4. Bangladesh and France

Soln. **1**

India and Argentina have the practice of subsistence agriculture.

81. **Assertion**

(A): Banglore has developed as the major IT centre in India.

Reason

(R): The Government of Karnataka was the first to pass and announce and IT Policy in 1992.

Select the correct answer from the given alternatives.

1. A is false, R is true
2. A is true, R is false
3. Both A and R is true
4. Both A and R are false.

Soln. **3**

Both the statements are correct.

82. Which of the following describes the common property resource?

1. Forests owned by the state
2. Pastures, grazing lands used by community
3. Woodlots, orchards used by cooperatives
4. Fruit orchards, grasslands owned by individual

Soln. **2**

Pastures and grazing land come under common property resource.

83. Read the following statements.

a. Unity in spite of dissimilarities implies 'unity in diversity'
b. Indian' diverse dress and food habits threaten national unity.
c. There has been a feeling of general unity among Indians since ancient time.
d. Communalism weakens 'unity in diversity'.

Which alternative has all the correct statements?

1. a, b, d
2. a, c, d
3. a, b, c
4. b, c, d

Soln. **2**

It is the most appropriate option.

84. A 'republic' is a state in which the Head of the State is

1. nominated by the Prime Minister.
2. elected, directly or indirectly, by the people
3. selected by the ruling party.
4. self-appointed

Soln. **2**

Election of the head of a state makes it a Republic.

85. India is a federal state because its Constitution provides for
    1. dual citizenship
    2. division of powers between the Union and the States
    3. a written constitution
    4. election of members of Parliament by the people.

Soln. **2**
Division of power is a feature of Indian federalism.

86. The appeal of Democracy is based on the fact that Democracy
    a. upholds freedom of conscience
    b. offers the opportunity of free thinking and expression.
    c. guarantees equal opportunity to have jobs in the public sector.
    d. protects the privileges of the elites.
    Which pair of answers is true?
    1. a and b   2. b and c
    3. c and d   4. a and d

Soln. **2**
This is the most appropriate answer.

87. Independence of judiciary is possible only under
    1. Communism   2. Fascism
    3. Liberalism   4. Military dictatorship

Soln. **3**
Only liberalism promotes independence of judiciary.

88. Which Fundamental Right of the citizens of India was violated in the Bhopal Gas Tragedy (1984)?
    1. Right to Equality   2. Right to Freedom
    3. Right to Life   4. Right against Exploitation

Soln. **3**
Right to life is a fundamental right under article 21 of Right to Freedom.

89. State-controlled media is inconsistent with the ideology of
    1. Democratic State   2. Communist State
    3. Fascist State   4. Theocratic State

Soln. **1**
State controlled media does not support democracy.

90. India's Constitution has specifically ensured cultural justice for the minorities through
    1. Preamble   2. Fundamental Rights
   3. Directive Principles of State Policy   4. Free elections

Soln. **2**
Fundamental right ensures cultural justice.

There is an abundant supply of nitrogen in the earth's atmosphere - nearly 79% in the form of N_2 gas. However, N_2 is unavailable for use by most organisms because there is a triple bond between the two nitrogen atoms, making the molecule almost inert. In order for nitrogen to be used for growth it must be "fixed" (combined) in the form of ammonium (NH_4) or nitrate (NO_3) ions. The weathering of rocks releases these ions so slowly that it has a negligible effect on the availability of fixed nitrogen. So, nitrogen is often the limiting factor for growth and biomass production in all environments where there is suitable climate and availability of water to support life.

Microorganisms have a central role in almost all aspects of nitrogen availability and thus for life support on earth: some bacteria can convert N_2 into ammonia by the process termed nitrogen fixation; these bacteria are either free-living or form symbiotic associations with plants or other organisms (e.g. termites, protozoa) other bacteria bring about transformations of ammonia to nitrate, and of nitrate to N_2 or other nitrogen gases many bacteria and fungi degrade organic matter, releasing fixed nitrogen for reuse by other organisms.

97. The bar graph given below shows the composition of the inhaled air in humans. A person is standing in an open field. Write the number of the correct bar of the inhaled air by that person.
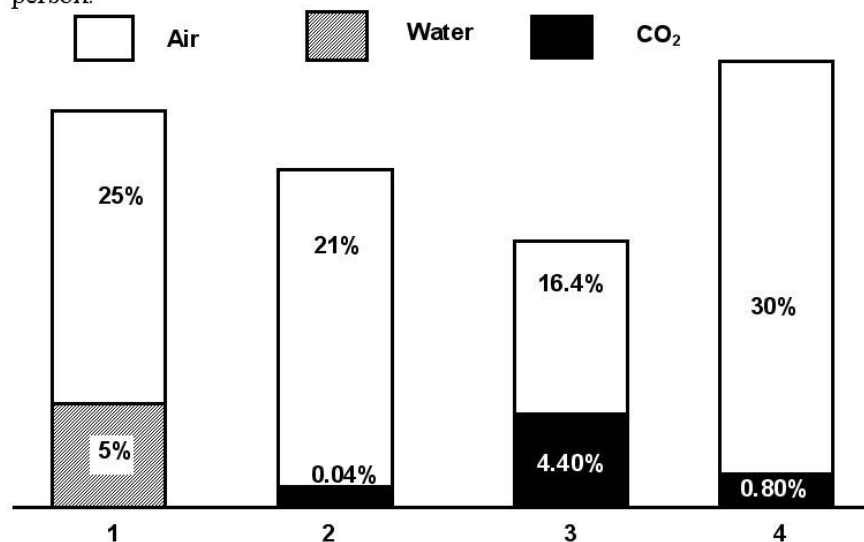
Soln. 2

The proportion of gases in atmosphere is O_2: 20.8%, N_2 : 79% and CO_2 : 0.03%. The second bar is representing the most appropriate proportion of gases in atmosphere, which the person inhales.
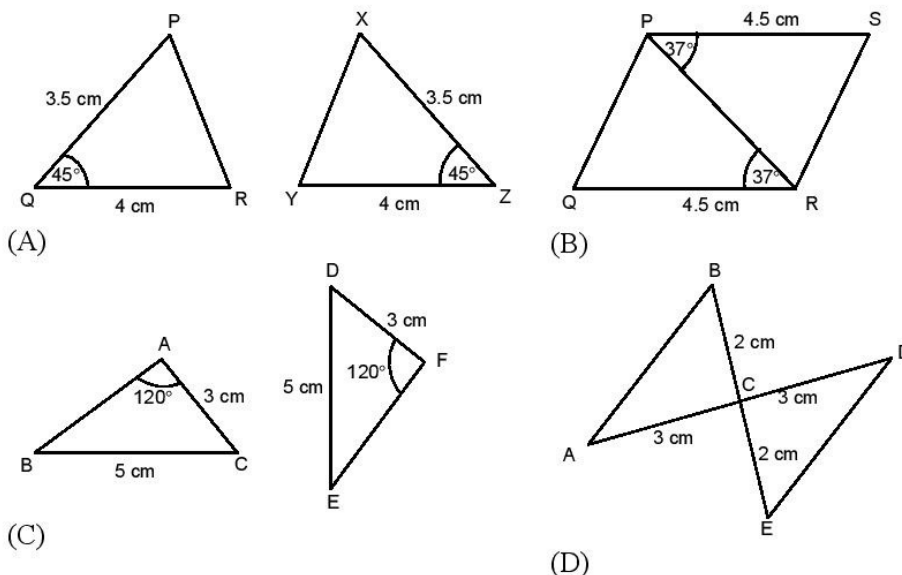
98.

(A)

(B)

(C)

(D)

Soln. **C**

Figure (3) not satisfying the SAS criterion.

99. 24 Carat gold is known as pure gold. 22 carat gold is prepared by mixing 22 parts of pure gold with 2 parts of either silver or copper. Now-a-days 22 carat hallmarked jewellery is marked by a number (916) which indicates its purity. Which number should be marked on 19 carat jewellery. Write the number of correct alternative in the answer sheet.

(A) 913   (B) 833

(C) 792   (D) 750

Soln. **C**

$\dfrac{22}{24} = 0.916$

Satisfying $\dfrac{19}{24} = 0.792$.

792 should be marked on 19 carat jewellery.

100. Mohan has two identical balloons, one is white and one is black. Both are filled with the same amount of air and are tied so that no air can get in or out. What will happen if both balloons are put in direct sunlight?

1. The black balloon will become larger than the white balloon.

2. The white balloon will become larger than black balloon.

3. Both balloons will stay the same size.

Write the number of correct alternative in the answer sheet.

Soln. **1**

Among colours, black is the best absorbent as well as radiant of heat. Therefore, the black balloon will absorb more heat and hence will expand more.