National Level Science Talent Search Examination - 2012

Class : X — **Mathematics**

1 **What is the value of 'sin θ' if tan θ is $(-\frac{4}{3})$?**

(A) $-\frac{4}{5}$ but not $\frac{4}{5}$ (B) $-\frac{4}{5}$ or $\frac{4}{5}$

(C) $\frac{4}{5}$ but not $-\frac{4}{5}$ (D) $\frac{5}{4}$ but not $-\frac{5}{4}$

2 **Two isosceles triangles have their corresponding angles equal and their areas are in the ratio 25 : 36. Find the ratio of their corresponding heights.**

(A) 25 : 35 (B) 36 : 25 (C) 5 : 6 (D) 6 : 5

3 **In an Arithmetic sequence of terms, S_n represents sum to n terms, then what is $S_n - S_{n-1}$?**

(A) $t_1 + t_2 + \_\_\_\_ t_{n-1}$ (B) S_{n-2}

(C) $\sum_{n=1}^{n-2} t_n$ (D) t_n

4 **Find the number X in the data given below.**

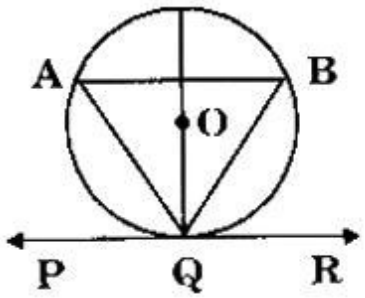
I. The L.C.M of x and 18 is 36
II. The H.C.F of x and 18 is 2.

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

5 **What is the total number of integer pairs (x, y) satisfying the equation x + y = xy?**

(A) 0 (B) 1 (C) 2 (D) 3

6 **In the given figure, if PQR is the tangent to a circle at Q whose centre is O, AB is a chord parallel to PR and $\angle BQR = 70^\circ$, find the measure of $\angle AQB$.**



(A) 70° (B) 30° (C) 35° (D) 40°

7 **If $x = 0.\overline{7}$, what is the value of 2x?**

(A) $1.\overline{4}$ (B) $1.\overline{5}$ (C) $1.\overline{54}$ (D) $1.\overline{45}$

8 **If the expression $x^2 - x + c$ when divided by $(x + 1)$ leaves a remainder 3, then what is the value of c?**

(A) 0 (B) 1 (C) 2 (D) 3

9 **A well planned Lokhandwala complex in Mumbai has two straight roads perpendicular to each other. There are 5 lanes parallel to road 1. Each lane has 8 houses. Srinivas lives in the 6^{th} house of the 5^{th} lane and Alok lives in the 2^{nd} house of the 2^{nd} lane. What will be the shortest distance between their houses? (Take distance between each house as 1 unit.)**

(A) 5 units (B) 10 units (C) 15 units (D) 20 units

10 **If $\left(\frac{a}{3}, 4\right)$ is the midpoint of the line segment joining A (– 6, 5) and B(–2, 3), then what is the value of 'a' ?**

(A) – 4 (B) – 12 (C) 12 (D) – 6

11 **$\Delta ABC \approx \Delta DEF$ and the perimeters of ΔABC and ΔDEF are 30 cm and 18 cm respectively. If BC = 9 cm, then measure of EF is:**

(A) 6.3 cm (B) 5.4 cm (C) 7.2 cm (D) 4.5 cm

12 **Find the value of** $\dfrac{\sin(-660^\circ)\tan(1050^\circ)\sec(-420^\circ)}{\cos(225^\circ)\operatorname{cosec}(315^\circ)\cos(510^\circ)}$.

(A) $\dfrac{\sqrt{3}}{4}$ (B) $\dfrac{\sqrt{3}}{2}$ (C) $\dfrac{2}{\sqrt{3}}$ (D) $\dfrac{4}{\sqrt{3}}$

13 **What can you say about the graph of $y = x^2 - 12x + 40$?**

(A) Intersects X-axis at 1 point.
(B) Intersects X-axis at 2 points.
(C) intersects X-axis at 3 points.
(D) Does not intersect at any point.

14 **Find the sum of integers from 1 to 100 that are divisible by 2 or 5.**

(A) 3000 (B) 3050 (C) 4050 (D) 5000

15 **If there are n Arithmetic means between a & b then what is their common difference?**

(A) $\dfrac{n-1}{b+2}$ (B) $\dfrac{b-a}{n+1}$ (C) $\dfrac{a-b}{n-1}$ (D) $\dfrac{b+a}{n-1}$

16 **If the roots of $x^2 - px + q = 0$ are two consecutive integers, then find the value of $p^2 - 4q$.**

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

17 **Which of the following will have a terminating decimal expansion?**

(A) $\dfrac{77}{210}$ (B) $\dfrac{23}{30}$ (C) $\dfrac{125}{441}$ (D) $\dfrac{23}{8}$

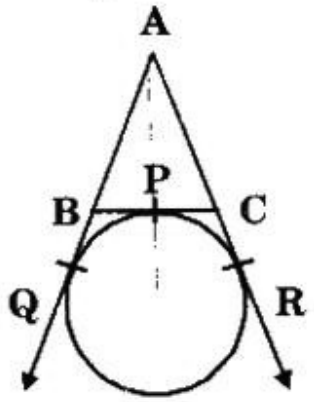
18 **The sum of three non - zero prime numbers is 100. One of them exceeds the other by 36. Find the largest number.**

(A) 73 (B) 91 (C) 67 (D) 57

19 **The string of a kite is 100 m long and it makes an angle of 60° with the horizontal. If there is no slack in the string, find the height of the kite from the ground.**

(A) $50\sqrt{3}$ m (B) $100\sqrt{3}$ m (C) $50\sqrt{2}$ m (D) 100 m

20 **A circle touches the side BC of ΔABC at P and touches AB and AC produced at Q and R respectively. If AQ = 5 cm, then find the perimeter of ΔABC.**



(A) 5 cm (B) 10 cm (C) 25 cm (D) 50 cm

21 **What is the maximum value of $2-4x-x^2$?**

(A) 2 (B) 4 (C) 6 (D) 8

22 **Two poles of heights 6 metres and 11 metres stand vertically on a plane ground. If the distance between their feet is 12 metres, what will be the distance between their tops?**

(A) 10 m (B) 12 m (C) 13 m (D) 15 m

23 **If p, q and r are the zeroes of the polynomial $f(x) = ax^3 + bx^2 + cx + d$, then the value of $\frac{1}{p}+\frac{1}{q}+\frac{1}{r}$ is**

(A) $\frac{-b}{a}$ (B) $\frac{c}{a}$ (C) $-\frac{c}{d}$ (D) $\frac{c}{d}$

24 **If $(\sin\alpha + \text{cosec}\,\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = \tan^2\alpha + \cot^2\alpha + K$ then find K.**

(A) 9 (B) 7 (C) 4 (D) 3

25 **E and F are points on the sides PQ and PR respectively of a ΔPQR. In which of the following options is EF $\|$ QR?**

(A) PE = 3.9 cm, EQ = 3 cm, PF = 3.6 cm, FR = 2.4 cm

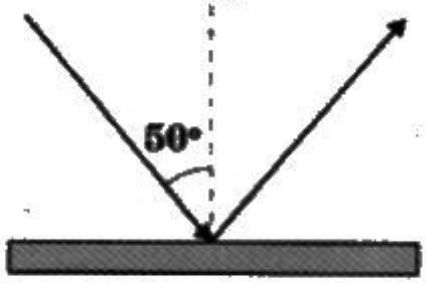
(B) PE = 4 cm, QE = 4.5 cm, PF = 8 cm, RF = 9 cm

(C) PQ = 1.28 cm, PR = 2.56 cm, PE = 0.18 cm, PF = 0.52 cm

(D) Both (B) and (C)

Class : X — Physics

26 **An incident ray strikes a plane mirror at an angle of incidence of 50°. What is the decrease in the angle of reflection, if the incident ray moves to an angle of incidence of 30°?**



(A) 10° (B) 20° (C) 30° (D) 40°

27 **At sunset, how does the sun seem to be?**

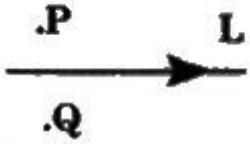
(A) Exactly where it really is. (B) Higher than it really is.

(C) Lower than it really is. (D) Lower than it would be at sunrise.

28 **If an electron revolves in the path of radius of 0.5×10^{-10} m at a frequency of 5×10^{15} cycles s^{-1}, then find the electric current in the circle.**

(A) 0.4 mA (B) 0.8 mA (C) 1.2 mA (D) 1.6 mA

29 **Two compass needles are placed near a current carrying wire at points P and Q as shown in the figure below.**



What can be concluded?

(A) Their needles will not deflect.

(B) Needle at P only will deflect.

(C) Both the needles will deflect in the same direction.

(D) The needles will deflect in opposite directions.

30 **The resistance of a metal wire of length 2 m is 40 Ω at 20 °C. If the diameter of the wire is 1 mm, then what will be the resistivity of the metal at that temperature?**

(A) $1.28\times10^{-8}\ \Omega\,m$ (B) $1.57\times10^{-9}\ \Omega\,m$

(C) $1.75\times10^{-9}\ \Omega\,m$ (D) $1.88\times10^{-8}\ \Omega\,m$

31 **Which of the following is the best conductor of electricity?**

(A) Distilled water (B) Water

(C) Salt water (D) Hot water

32 **Which of the following does not belong to the group formed by the others?**

(A) Generator (B) Dynamo (C) Motor (D) Windmill

33 **If the far point of an eye is at 4 m, then identify the defect of eye and the lens needed to correct this.**

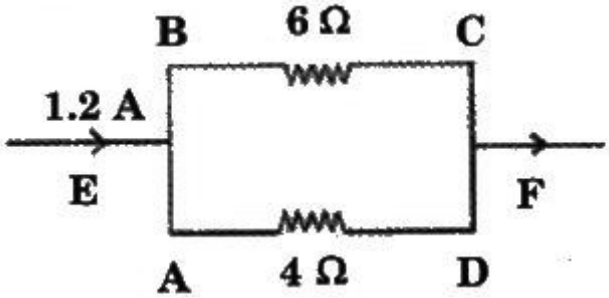
(A) Hypermetropic and needs –1.25 D lens.

(B) Hypermetropic and needs +2.5 D lens.

(C) Myopic and needs +0.25 D lens.

(D) Myopic and needs –0.25 D lens.

34 **Observe the figure given below.**



Find the current passing through 6 Ω resistor.

(A) 0.72 A (B) 0.80 A (C) 0.48 A (D) Cannot be said

35 **Why does a red coloured object seem to be red?**

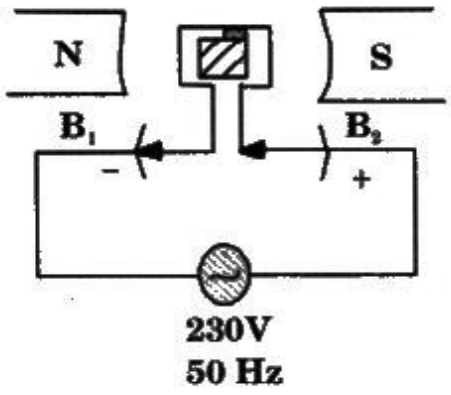
(A) It absorbs red colour.

(B) It allows red colour to pass through.

(C) It scatters red colour.

(D) It reflects red colour.

36 **Observe the figure given below.**



What is wrong with the DC motor connections shown in the above figure?

(A) Nothing is wrong with it.

(B) Polarity of the magnets are wrong.

(C) Polarity of the brushes B_1 and B_2 are not correct.

(D) Supply voltage is not correct.

37 **The power of a lens is +2.5 D. What kind of lens is it and what is its focal length?**

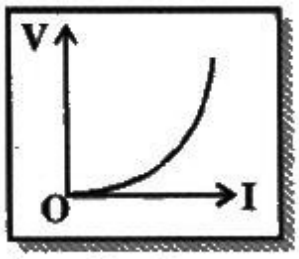
(A) Convex lens, 40 cm (B) Concave lens, 100 cm

(C) Convex lens, 50 cm (D) Concave lens, 40 cm

38 **What is the least distance of distinct vision for a normal adult human being?**

(A) 10 cm (B) 25 cm (C) 1 m (D) Infinity

39 **The graph of the potential difference V against the current I for a device is as shown below.**



Which of the following is the *correct* deduction?

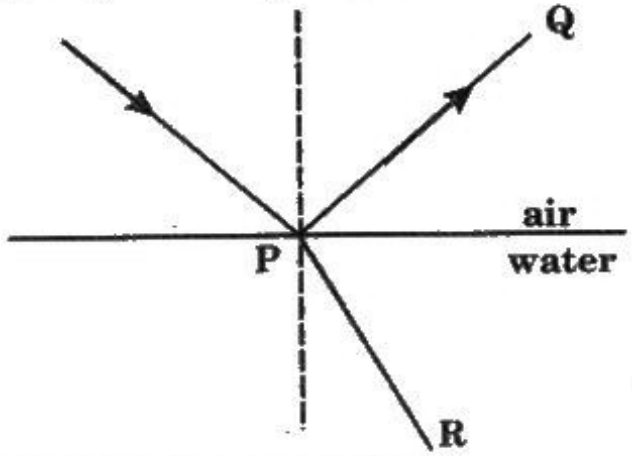
(A) The device obeys Ohm's law.

(B) The resistance of the device increases when the current increases.

(C) The resistance of the device remains constant when the p.d. increases.

(D) The resistance of the device remains constant when the current increases.

40 **A ray of light travels from air to water as shown below. What are ray PQ and ray PR ?**



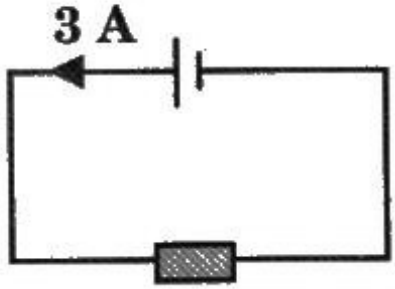
	Ray PQ	Ray PR
(A)	Reflected ray	Refracted ray
(B)	Reflected ray	Reflected ray
(C)	Refracted ray	Reflected ray
(D)	Refracted ray	Refracted ray

41 **If the forefinger shows the direction of the magnetic field and the thumb indicates the motion of the conductor, then, according to Fleming's left hand rule, what does the middle finger point at?**

(A) The direction of e.m.f. (B) The direction of current.

(C) The direction of flux. (D) The direction of lines of force.

42 **How much charge flows through the resistor in 4 s?**



(A) 3 C (B) 6 C (C) 12 C (D) 18 C

43 **Which of the following cannot be deflected by a magnetic field?**

(A) Alpha rays (B) Beta rays

(C) Gamma rays (D) Cosmic rays

44 **Which of the following statements are *true*?**

(i) The principal focus of a converging lens is real.

(ii) The principal focus of a diverging lens is virtual.

(iii) The principal focus of a lens is always along the principal axis.

(A) (i) and (ii) only (B) (ii) and (iii) only

(C) (i) and (iii) only (D) (i), (ii) and (iii)

45 ***Assertion*: There is no dispersion of light refracted through a rectangular glass slab.**

***Reason*: Dispersion of light is the phenomenon of splitting of a beam of white light into its constituent colours.**

(A) Both Assertion and Reason are true. Reason is the correct explanation of Assertion.

(B) Both Assertion and Reason are true. Reason is not the correct explanation of Assertion.

(C) Assertion is true and Reason is false

(D) Both Assertion and Reason are false.

46 **Which of the following statements are always true?**

(i) When the object is placed nearer to the focal point of a converging lens the image gets bigger.

(ii) When the object is placed farther away from the converging lens, the image gets smaller.

(iii) When the object is placed very far away from the converging lens, the image distance approaches focal length.

(A) (i) and (ii) only (B) (ii) and (iii) only

(C) (i) and (iii) only (D) (i), (ii) and (iii)

47 **A 220 V, 100 W bulb is connected to a 110 V source. Calculate the power consumed by the bulb.**

(A) 10 W (B) 15 W (C) 20 W (D) 25 W

48 **If the index finger points towards the north and the middle finger towards the east, when using Fleming's left-hand rule, what will be the direction of motion or that of the force acting on the conductor?**

(A) South (B) West (C) Top (D) Bottom

49 **Which of the following can produce a virtual image for any position of the object?**

(A) Plane mirror (B) Concave mirror

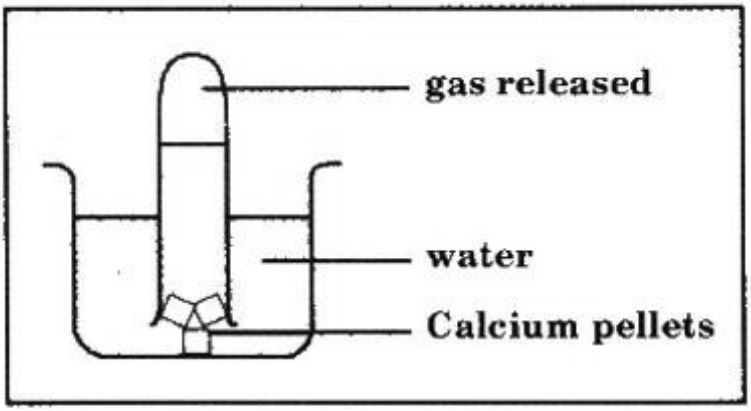
(C) Convex lens (D) All of the above

50 **A concave mirror is made by cutting a portion of a hollow glass sphere of radius 24 cm. Find the focal length of the mirror.**

(A) 24 cm (B) 12 cm (C) 6 cm (D) 18 cm

Class : X — Chemistry

51 **Observe the given reaction of Calcium with water.**



What happens when pellets of calcium are added to the water?

(i) The solution produced turns red litmus into blue.
(ii) The gas released produces a 'pop' sound when tested with a lighted splinter.
(iii) The calcium pellets burn with a brick-redflame.

(A) (i) and (ii) only (B) (ii) and (iii) only

(C) (i) and (iii) only (D) (i), (ii) and (iii)

52 **Study the following statements about dilute sulphuric acid.**

(i) A white precipitate is formed when aqueous barium chloride is added.
(ii) The solution turns anhydrous copper(II) sulphate from white to blue.
(iii) Addition of a Universal Indicator shows that the solution has a pH value of less than 7.0.
(iv) The solution reacts with copper(II) oxide, forming a blue solution.

Which two statements confirm the acidic nature of the solution?

(A) (i) and (ii) only
(B) (i) and (iii) only
(C) (ii) and (iv) only
(D) (iii) and (iv) only

53 **Which of the following is *not* a decomposition reaction?**

(A) $CaCO_3 \rightarrow CaO + CO_2$
(B) $2KClO_3 \rightarrow 2KCl + 3O_2$
(C) $2NaNO_3 \rightarrow 2NaNO_2 + O_2$
(D) $H_2 + Cl_2 \rightarrow 2HCl$

54 **Study the given reaction below.**

$$2Pb(NO_3)_2 \rightarrow 2PbO + nA + O_2$$

In the above reaction, what is nA?

(A) $4NO_2$
(B) $2NO_2$
(C) $2PbNO_2$
(D) NO_2

55 **Which statement about an homologous series is *incorrect*?**

(A) All the members of the series have similar chemical reactions.

(B) All the members of the series have the same functional group.

(C) All the members of the series have the same general formula.

(D) All the members of the series have similar physical properties.

56 **In which reaction do two compounds exchange their ions or radicals mutually to form two new compounds?**

(A) Displacement reaction.

(B) Double displacement reaction.

(C) Synthesis reaction.

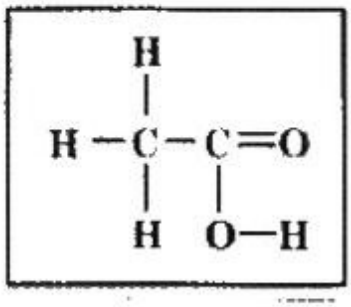
(D) Decomposition reaction.

57 **Which calcium compound *does not* increase the pH of acidic soils?**

(A) Calcium carbonate (B) Calcium hydroxide

(C) Calcium oxide (D) Calcium sulphate

58 **The diagram shows the structure of ethanoic acid.**



How many moles of ethanoic acid react with one mole of magnesium ?

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

59 **Why is roasting carried out?**

(i) To convert sulphide ore to oxide.
(ii) To remove water of hydration.
(iii) To remove water of crystallisation and volatile impurities.

(A) (i) and (ii) only
(B) (ii) and (iii) only
(C) (i) and (iii) only
(D) (i), (ii) and (iii)

60 **Which observation most strongly suggests that a solid element X is a non-metal?**

(A) X forms an acidic oxide.
(B) X has a high melting point.
(C) X is a conductor of electricity.
(D) X reacts vigorously with chlorine.

61 **The gases X and Y, have the following properties.**

- **X dissolves in aqueous sodium hydroxide but Y is insoluble.**
- **Y burns in excess oxygen to give X and water only.**
- **Y does not decolourise aqueous bromine.**

What are gases X and Y ?

	X	Y
(A)	Carbon monoxide	ethene
(B)	Carbon monoxide	ethane
(C)	Carbon dioxide	ethane
(D)	Carbon dioxide	ethene

62 **Which physical property of the alkanes *does not* increase as relative molecular mass increases ?**

(A) Boiling point (B) Flammability

(C) Melting point (D) Viscosity

63 **Why is aluminium a suitable material for building air crafts?**

(A) It is a good conductor of heat.

(B) It has a high melting point.

(C) It is shiny.

(D) It is light and does not rust easily.

64 **Study the equation given below.**

$$2Al + (X)H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2$$

In the given equation, what does 'X' stand for?

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

65 **Which of the following metals cannot be reduced by carbon?**

(A) Magnesium (B) Iron

(C) Zinc (D) Lead

66 **Same acid solution is taken in two test tubes. Zinc is introduced in the first test tube and magnesium in the second. A gas is evolved in the second test tube which burns with a pop sound while no gas is evolved from the first. Identify the acid solution taken in the two test tubes.**

(A) HCl (B) HNO_3

(C) H_2SO_4 (D) H_3PO_4

67 **Which of the following reactions involves oxidation and reduction?**

(A) $NaBr + HCl \rightarrow NaCl + HBr$

(B) $HBr + AgNO_3 \rightarrow AgBr + HNO_3$

(C) $H_2 + Br_2 \rightarrow 2HBr$

(D) $Na_2O + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

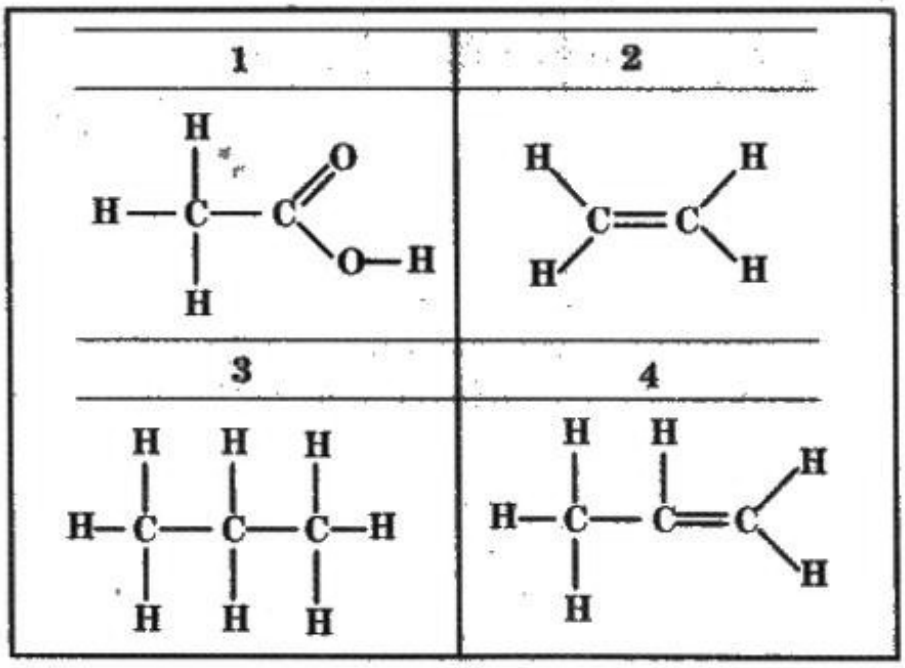
68 **N, P, As and Sb react with O_2 to form N_2O_5, P_4O_{10}, As_4O_{10} and Sb_4O_{10} respectively. Among all these, identify the most acidic oxide.**

(A) N_2O_5 (B) P_4O_{10} (C) As_4O_{10} (D) Sb_4O_{10}

69 **One mole of hydrocarbon 'X' reacted completely with one mole of hydrogen gas in the presence of a heated catalyst. What could be the formula of 'X' ?**

(A) C_2H_6 (B) C_4H_{10} (C) C_5H_{10} (D) C_7H_{16}

70 **The structures of four organic compounds are shown below.**



Which compounds decolourise bromine water ?

(A) 1 and 2 only (B) 1, 2 and 4 only
(C) 2 and 4 only (D) 3 and 4 only

71 **Proteins are digested in which of the following parts of the alimentary canal ?**

(A) Mouth, stomach and duodenum

(B) Stomach, duodenum and intestine

(C) Stomach, pancreas and intestine

(D) Duodenum, ileum and liver

72 **Which of the following organisms reproduces by budding?**

(A) Plasmodium (B) Planaria

(C) Paramecium (D) Hydra

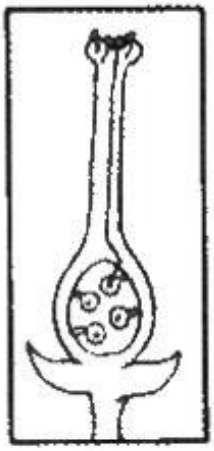
73 **Which of the following is the seat of intelligence and control voluntary actions in the brain ?**

(A) Pons (B) Cerebellum (C) Cerebrum (D) Medullaoblongata

74 **Which of the following is a plant hormone ?**

(A) Insulin (B) Thyroxine (C) Oestrogen (D) Cytokinin

75 **Observe the diagram given below.**



What happens after the above stage ?

(A) The ovary splits open.

(B) Ovary develops into a fruit and ovules into seeds.

(C) The ovules are dispersed.

(D) Germination of seeds takes place.

76 **Which of the following is a primary sex organ that produces gametes in a mammal ?**

(A) Uterus (B) Vagina (C) Ovary (D) Mammary glands

77 **Which of the following systems is responsible for producing enzymes that aid in breaking down of complex substances to be absorbed for the body's growth and repair ?**

(A) Respiratory system (B) Digestive system

(C) Circulatory system (D) Nervous system

78 **Which the following processes takes place in the figure given below ?**

(A) Selective reabsorption (B) Filtration of blood

(C) Stores urine (D) Conducts urine

79 **Which of the following methods is used to produce new rose plants ?**

(A) Layering (B) Bud grafting

(C) Budding (D) Stem cutting

80 **Which of the following set represents homologous organs?**

(A) Fore limb of a bird, the wing of a bat.

(B) Fore limb of a frog, a lizard and a bird.

(C) The wing of a bat and the wing of a bird.

(D) Fore limb of a lizard and the wing of a insect.

81 **Which of the following is the function of stomata ?**

(A) It controls the loss of food material from the plant.

(B) It helps in transpiration.

(C) It prevents exchange of gases.

(D) It controls the loss of energy from the plant.

82 **Which of the following set of chromosomes represents male chromosomes ?**

(A) XX (B) YY (C) XY (D) OX

83 **Which of the following processes cause the movement of water in a plant against gravity ?**

(A) Osmosis (B) Diffusion

(C) Photosynthesis (D) Transpiration

84 **Which of the following statements refers to parthenocarpy ?**

(A) The development of fruit after fertilisation.

(B) The development of fruit before the union of male nucleus with antipodals.

(C) The development of fruit from petals.

(D) The development of fruit without fertilisation.

85 **Which of the following glands is lost as the age advances ?**

(A) Thyroid (B) Thymus (C) Pancreas (D) Adrenal

86 **Which of the following is the correct sequence ?**

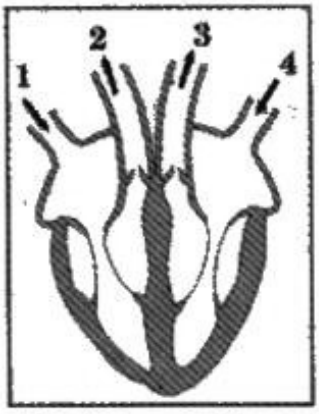
(A) Gametogenesis → syngamy → embryogenesis → zygote

(B) Gametogenesis → syngamy → zygote → embryogenesis

(C) Syngamy → gametogenesis → embryogenesis → zygote

(D) Zygote → embryogenesis → syngamy → gametogenesis

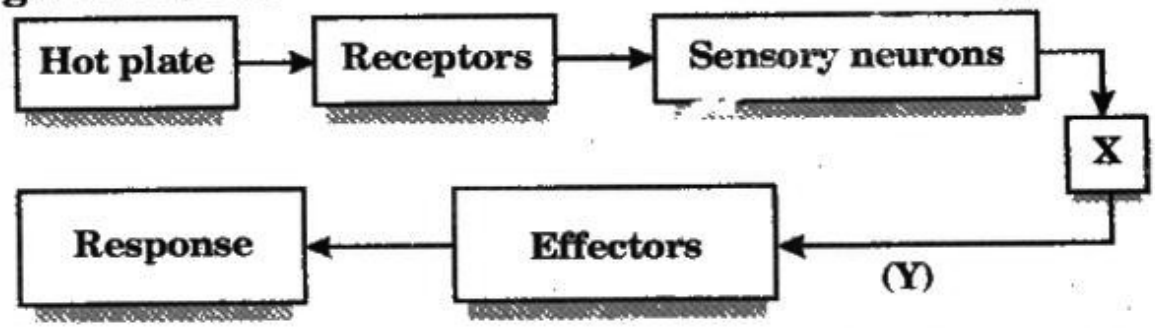
87 **The diagram shows a section through the human heart.**



Which blood vessels carry blood to and from the lungs ?

	Blood to lungs	Blood from lungs
(A)	1	3
(B)	1	4
(C)	2	3
(D)	2	4

88 **Observe the reflex arc pathway shown in the flow chart given below.**



Which of the following is represented by X and Y ?

	X	Y
(A)	Brain	Sensory neuron
(B)	Spinal cord	Motor neuron
(C)	Brain	Motor neuron
(D)	Sensory neuron	Spinal cord

89 **The root of a plant is said to be:**

(A) Positively geotropic
(B) Positively phototropic
(C) Negatively geotropic
(D) Positively thigmotropic

90 **Which of the following is the part of female reproductive system ?**

(A) Epididymis
(B) Vas deferens
(C) Fallopian tube
(D) Seminal vesicle

91 **What is ergatocracy?**

(A) Government run by workers.
(B) Government run by priests.
(C) Government run by rich people.
(D) Government run by old people.

92 **Which of these is a type of relay race ?**

(A) 4 × 100 m (B) 2 × 400 m (C) 3 × 400 m (D) 4 × 150 m

93 **What is the study of earthquakes called?**

(A) Morphology (B) Graphology (C) Toxicology (D) Seismology

94 **Which of these books was written by Sri Krishna Devaraya?**

(A) Vasucharitra (B) Manucharitra
(C) Parijathapaharanam (D) Amukta Malyada

95 **Which of the following is also called 'Hansen's disease'?**

(A) Syphilis (B) Mumps (C) Leprosy (D) Plague

96 **What is the full form of e-mail ?**

(A) English mail (B) Elaborate mail
(C) Electronic mail (D) Elongated mail

97 **Which of these tells us how much a vehicle has travelled?**

(A) Odometer (B) Ammeter (C) Voltmeter (D) Speedometer

98 **What do you call an excessive rise in the general level of prices?**

(A) Demand (B) Inflation (C) Price level (D) Increased price

99 **Who invented DNA finger printing?**

(A) Hanson Crockett (B) Sir Alec Jeffrey
(C) Gerhard Fisher (D) Othmar Zeidler

100 **What is a set of exclusive rights that regulate the use of a particular expression of an idea or information called?**

(A) Fundamental right (B) Basic right
(C) Copyright (D) Birth right

Key for NSTSE-2012

1. B	2. C	3. D	4. D	5. C	6. D	7. B	8. B	9. A	10. B
11. B	12. C	13. D	14. B	15. B	16. A	17. D	18. C	19. A	20. B
21. C	22. C	23. C	24. B	25. B	26. B	27. B	28. B	29. D	30. B
31. C	32. C	33. D	34. C	35. D	36. D	37. A	38. B	39. B	40. A
41. B	42. C	43. C	44. D	45. B	46. C	47. D	48. C	49. A	50. B
51. A	52. D	53. D	54. A	55. D	56. B	57. D	58. B	59. C	60. A
61. C	62. B	63. D	64. B	65. A	66. B	67. C	68. A	69. C	70. C
71. B	72. D	73. C	74. D	75. B	76. C	77. B	78. B	79. D	80. B
81. B	82. C	83. D	84. D	85. B	86. B	87. D	88. B	89. A	90. C
91. A	92. A	93. D	94. D	95. C	96. C	97. A	98. B	99. B	100. C