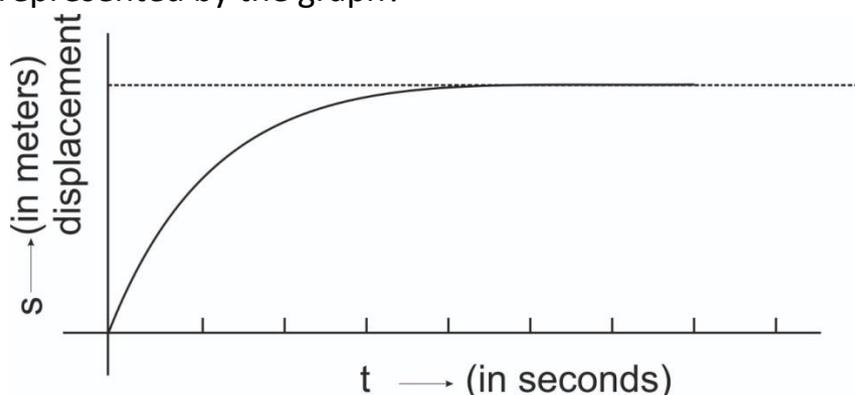


**SECTION: A**  
**PHYSICS**

1. A man has to travel on a straight highway to a certain destination. Going initially for a distance with a speed of 20 km/h; he realized that he has two-third more distance to be covered. Then he traveled with a speed of 40 km/h and reached his destination in time. Then his average speed during the journey must be:
- A. 30 km/h  
B. about 26.7 km/h  
C. 24 km/h  
D. 48 km/h

2. The displacement of a body as a function of time is shown below in the displacement (s) – time (t) graph. Which of the given four statements describe the motion represented by the graph?



- A. The body starts with a certain velocity which gets retarded with time so that the body finally stops moving.  
B. The body starts with a certain velocity which gets accelerated over time to finally attain another constant velocity.  
C. The body moves with a constant acceleration all throughout.  
D. The velocity of the body is constant throughout.
3. Two bodies of mass  $m$  and  $4m$  are moving with equal kinetic energies. The ratio of their linear momentum is:
- A. 1:4  
B. 4:1  
C. 1:2  
D. 1:1
4. An object is placed at a distance of 20 cm from the pole of a convex mirror of focal length 20cm. The image is produced at a distance:
- A. 10cm  
B. 13.3cm  
C. 20cm  
D. 25cm

5. Which of the following device should be used as a rear view mirror in an auto-mobile car?
- A. convex mirror  
B. plane mirror  
C. concave mirror  
D. parabolic mirror
6. A virtual image larger than the object can be produced by:
- A. Convex mirror  
B. Plane mirror  
C. Concave mirror  
D. None of the above
7. Light travels through a glass plate of thickness 'd' and its refractive index is 'n'. If 'c' is the speed of light in vacuum, the time taken by light to travel this thickness of glass is:
- A.  $\frac{d}{nc}$   
B.  $dnc$   
C.  $\frac{dn}{c}$   
D.  $\frac{dc}{n}$
8. A concave lens has focal length of 15cm. At what distance should the object from the lens be placed so that it forms an erect and virtual image at 10cm distance from the lens:
- A. 30cm  
B. 15cm  
C. 60cm  
D. 10cm
9. The traffic stop signals as well as the danger signals installed on the top of the hills or tall buildings are infact red light signals. This is necessary for viewing it easily from a distances, since red light is
- A. scattered the most by smoke or fog in air.  
B. scattered the least by smoke/ fog or dust particles in the atmosphere.  
C. absorbed the most in the atmosphere.  
D. faster moving in air compared to other colours like blue or yellow.
10. A copper wire of resistance R is drawn to such a point that its length increases to three times its original length. Then its new resistance will
- A. remain the same as R.  
B. increase to 3R.  
C. decrease to R/3.  
D. increase to 9 R.



14. An electric kettle has two thermal coils. When current passes in one of them, water in the kettle boils in 6 minutes. But when current is allowed to pass in the other coil; the same amount of water taken afresh in the kettle boils in 8 minutes. If both the coils are joined in series and current is passed how long would it take for the same amount of water taken again in the kettle to start boiling?
- A. 14 minutes  
B. 7 minutes  
C. 24 minutes  
D. 24/7 minutes
15. Two parallel conducting wires carry current in the same direction. They
- A. do not exert any force on each other.  
B. repel one another.  
C. attract one another.  
D. rotate about each other.

### CHEMISTRY

16. A hydrocarbon of 1 mole on combustion with oxygen produces 2 mole of  $\text{CO}_2$  and 3 moles of  $\text{H}_2\text{O}$ . The hydrocarbon is
- A. Methane  
B. Ethane  
C. Propane  
D. Ethene
17. A metal 'X' when exposed to moist air containing  $\text{CO}_2$  produced a green coating 'Y'. 'X' and 'y' are
- A. Cu and CuO  
B. Zn and  $\text{ZnCO}_3$   
C. Cu and  $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$   
D. Zn and  $\text{Zn}(\text{OH})_2 \cdot \text{ZnCO}_3$
18. Atomic number and mass number of an element X are 30 and 60 respectively. Then atomic number of  $\text{X}^{2-}$  and  $\text{X}^{2+}$  will be
- A. 30,28  
B. 28,22  
C. 32,28  
D. 30,30
19. The value of X in  $\text{KAl}(\text{SO}_4)_x \cdot 12\text{H}_2\text{O}$  is
- A. 1  
B. 2  
C. 3  
D. 4

20. The electronic configuration of Scandium is

- A. 2,8,9,2  
 B. 2,8,8,3  
 C. 2,8,10,1  
 D. 2,8,11,8

21. The electronic configuration  $1s^2 2s^2 3s^2 3p^6 3d^9$  represents a

- A. metal atom  
 B. non-metal atom  
 C. non-metallic ion  
 D. metallic cation

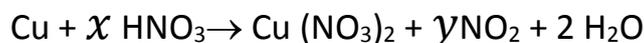
22. The following reaction is used for the preparation of  $O_2$  gas in the laboratory.



Which of the following statement(s) is /are correct about the reaction?

- A. It is a decomposition reaction and endothermic in nature.  
 B. It is a combination reaction.  
 C. It is a decomposition reaction & accompanied by release of heat.  
 D. It is a photochemical reaction and exothermic in nature.

23. A chemical reaction is given below:



The values of  $x$  and  $y$  are respectively

- A. 3 & 5  
 B. 8 & 6  
 C. 4 & 2  
 D. 7 & 1

24. The aqueous solution of which of the salt has pH close to 7?

- A.  $(\text{NH}_4)_2 \text{SO}_4$   
 B.  $\text{CH}_3\text{COONa}$   
 C.  $\text{CH}_3\text{COONH}_4$   
 D.  $\text{MgCl}_2$

25. The pH of  $10^{-8}$  M HCl aqueous solution at  $25^\circ \text{C}$  will be

- A. 8  
 B. 6.98  
 C. 7.02  
 D. 1.0

26. Among the following elements (whose electronic configurations are given below), the one having the highest ionization enthalpy is.

- A. 2,8,2  
 B. 2,8,8,2  
 C. 2,3  
 D. 2,2

27. Number of covalent bonds present in cyclohexane are
- A. 12  
B. 15  
C. 9  
D. 8
28. 19.7 kg of gold was recovered from a smuggler. The atoms of gold which were recovered are (Atomic mass of Au=197)
- A. 100  
B.  $6.02 \times 10^{23}$   
C.  $6.02 \times 10^{24}$   
D.  $6.02 \times 10^{25}$
29. The metal which reacts with superheated steam to form a mixed oxide and hydrogen gas is
- A. Al  
B. Ca  
C. Fe  
D. Mg
30. The electronic configuration of two elements X and Y are given below  
 $X = [\text{Ar}]4s^2$   $Y = [\text{Kr}]4d^{10} 5s^2 5p^5$   
The chemical bond between X and Y is
- A. Ionic bond  
B. Covalent bond  
C. Coordinate bond  
D. Hydrogen bond

### BIOLOGY

31. Which of the following statement is not correct?
- A. Starch is broken down by salivary amylase.  
B. Digested food in intestine is pushed forward by peristaltic movement.  
C. Pepsin works at pH above 9.  
D. Fat is a complex of fatty acids and glycerol.
32. During fermentation process
- A. Pyruvate is converted to Glucose and oxygen.  
B. Pyruvate is converted to ethyl alcohol and oxygen.  
C. Pyruvate is converted to ethanol and water.  
D. Pyruvate is converted to ethyl alcohol and carbon dioxide.
33. Which one of the following has only three chambered heart?
- A. Pigeon  
B. Street dog  
C. Pond frog  
D. Freshwater fish

34. Xylem cells belong to
- A. Vascular tissues of plants
  - B. Epidermal tissues of plants
  - C. Ground tissues of plants
  - D. Meristematic tissues of plants
35. When a stem of a plant is cut and grown to a plant in a pot, it is an example of
- A. Budding
  - B. Fragmentation
  - C. Regeneration
  - D. Vegetative propagation
36. Pistil is composed of
- A. stigma, style and ovary
  - B. stigma, anther and ovary
  - C. style, anther and filament
  - D. style, filament and ovary
37. Which of the following statement is not correct in case of females?
- A. Eggs are already formed in ovary before birth.
  - B. Fertilization takes place in ovary.
  - C. Implantation of fertilized egg occurs in uterus.
  - D. Placenta provides nutrition to growing embryo.
38. Which one of the following is not a part of male reproductive system in humans?
- A. Testis
  - B. Vas deferens
  - C. Urethra
  - D. Cervix
39. A person has one X chromosome and one Y chromosome in his cells. The person has inherited X chromosome from
- A. his father.
  - B. his mother.
  - C. either from his father or his mother.
  - D. from his paternal grandmother.
40. We should avoid use of plastic plates, cups, bags and other containers because plastic
- A. oxidizes cooked foods and causes them to rot.
  - B. causes toxicity to our body.
  - C. is non-biodegradable material.
  - D. releases toxic materials in soil during its degradation.

41. Abiotic components of environment comprise many factors. Which combination of the following represents correct combinations of abiotic component of environment?
- A. Rainfall, Temperature, Saprophytes, Wind and Soil
  - B. Wind, Temperature, Rainfall, Minerals and Soil
  - C. Soil, Sea, Rivers, Ponds, Forest, Winds and Mountains
  - D. Mines, Forests, Ponds and Rainfall
42. Energy present in sunlight is captured by autotrophs and is converted to chemical energy. This energy flows from primary producers to tertiary consumers in food chain. Which of the following is a correct statement regarding an ecosystem?
- A. More than 50% of the energy of food consumed by primary consumers is available to secondary consumers in trophic level.
  - B. Energy content in an ecosystem decreases as it moves from producers to consumers.
  - C. Energy content in an ecosystem increases as it flows from producers to consumers.
  - D. Numbers of producers are low in comparison to consumers in an ecosystem.
43. Which of the following constitute an ideal food chain?
- A. Frog, Snake and Elephant
  - B. Grass, Goat and Tiger
  - C. Fish, Horse and Tiger
  - D. Goat, Human and Elephant
44. Which of the following is called the suicide bag of cells?
- A. Ribosomes
  - B. Lysosomes
  - C. Nucleolus
  - D. Mitochondria
45. Main function of Golgi body is
- A. Digestion
  - B. Excretion
  - C. Rejection
  - D. Secretion

### MATHEMATICS

46. Write a number which is both rational and irrational.
- A. 0
  - B.  $\pi$
  - C.  $\frac{3}{5} + \sqrt{2}$
  - D. does not exist

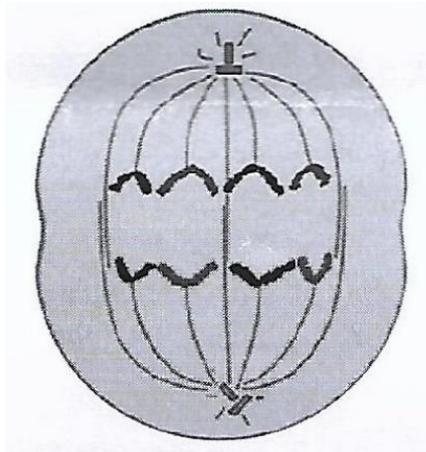


54. The point on the x-axis equidistant from (2,3) and (4,5) is  
A. (0,7) B. (7,0)  
C. (6,0) D. (-7,0)
55. When two circles touch each other externally then the number of tangent(s) common to both the circles is  
A. one B. two  
C. three D. four
56. If  $\sin \theta = \frac{2mn}{m^2+n^2}$ , then write the value of  $\sec \theta$ .  
A.  $\frac{2mn}{m^2-n^2}$  B.  $\frac{m^2-n^2}{m^2+n^2}$   
C.  $\frac{m^2-n^2}{2mn}$  D.  $\frac{m^2+n^2}{m^2-n^2}$
57. A bag contains 5 black balls, 5 white balls and 4 red balls. A ball is drawn at random from the bag. Write the probability that the ball drawn is not white.  
A.  $\frac{1}{5}$  B.  $\frac{1}{4}$   
C.  $\frac{3}{4}$  D.  $\frac{3}{5}$
58. From the top of a 3m building the angle of elevation of the top of a tower is  $60^\circ$  and the angle of depression of its foot is  $30^\circ$ . Find the height of the tower.  
A. 10m B. 12m  
C. 15m D. 18m
59. Write the median of the following data: 31, 28, 27, 28, 36, 25, 35, 40  
A. 28 B. 32  
C. 33 D. 36
60. A solid metallic cone of height 24cm and diameter of the base 12cm is melted and recast in the shape of a sphere. Find the radius of the sphere.  
A. 6cm B. 8cm  
C. 10cm D. 12cm



64. Suppose a thistle tube containing a 10% sugar solution is covered at one end by a differentially permeable membrane and is placed in a beaker containing 5% sugar solution. Which of the following statement is NOT correct?
- A. As water enters the thistle tube, fluid pressure builds up inside the tube.
  - B. Given enough time, the net movement of water entering the thistle tube will cease.
  - C. Given enough time, the fluid pressure will become greater than the osmotic pressure inside the thistle tube.
  - D. Initially, the concentration of water molecules is greater per volume outside the thistle than inside the thistle tube.

65. How many chromosomes and how many chromatids are shown in this picture?



- A. 4 chromosomes, 4 chromatids
  - B. 4 chromosomes, 8 chromatids
  - C. 8 chromosomes, 4 chromatids
  - D. 8 chromosomes, 8 chromatids
66. Which of the following statement (s) is (are) true about respiration?
- i. During inhalation, ribs move inward and diaphragm is raised.
  - ii. In the alveoli, exchange of gases takes place, i.e. oxygen from alveolar air diffuses into blood and carbon dioxide from blood into alveolar air.
  - iii. Hemoglobin has greater affinity for carbon dioxide than oxygen.
  - iv. Alveoli increases surface area for exchange of gases.
- A. i and iv
  - B. ii and iii
  - C. i and iii
  - D. ii and iv

67. The number of chromosomes in parents and offsprings of a particular species remains constant due to:
- A. Doubling of chromosomes after zygote formation.
  - B. Halving of chromosomes during gamete formation.
  - C. Doubling of chromosomes after gamete formation.
  - D. Halving of chromosomes after gamete formation.
68. A Planaria worm is cut horizontally in the middle into two halves P and Q such that the part P contains the whole head of the worm. Another Planaria worm is cut vertically into two halves R and S in such a way that both the cut pieces R and S contain half head each. Which of the cut pieces of the two Planaria worms could regenerate to form the complete respective worms?
- A. only P
  - B. only R and S
  - C. P, R and S
  - D. P,Q,R and S
69. Along the path of vas-deferens the secretions of which gland provide nutrition to the sperms?
- A. Prostate glands
  - B. Seminal vesicles
  - C. Scrotum
  - D. Urinary bladder
70. A boy having less musculature, less facial and body hair, developed breasts and having sexual characters of a girl. What may be the sex chromosome composition of the boy?
- A. XXX
  - B. XXY
  - C. XO
  - D. XYY
71. In pea plants, the long-stem trait (L) is dominant and the short-stem trait (l) is recessive. Two pea plants were crossed, producing seeds that yielded 165 long-stem plants and 54 short-stem plants. The genotypes of the parent plants were most likely.
- A. Ll and Ll
  - B. Ll and Ll
  - C. ll and ll
  - D. Ll and ll

72. In plants, upward movement of water takes place through dead cells of xylem vessels. If the soil water surrounding the roots becomes hypertonic, then the rate of water movement in plants will
- A. be reduced  
B. be increased  
C. remain the same  
D. not take place
73. A woman has her fallopian tube blocked. How is it going to affect her?
- A. She won't be able to conceive.  
B. She won't have menstrual cycle.  
C. She will have abnormal hormonal production.  
D. She will not be able to mate with partner.
74. Anil washes some pieces of beetroot till it stops leaching pink colour. Then he boils these pieces. On boiling, they start giving out pink colours again. What may be the reason?
- A. Dead plasma membrane allows pigments to come out.  
B. Cell wall becomes permeable on boiling.  
C. Water enters inside cells and dissolves pigments.  
D. Osmosis takes place.
75. Age of fossils in the past was generally determined by radio- carbon method and other methods involving radioactive elements found in the rocks. More precise methods, which were used recently and led to the revision of the evolutionary period for different groups of organisms, includes
- A. Study of carbohydrates / proteins in fossils  
B. Study of the conditions of fossilization  
C. Electron Spin Resonance (ESR) and fossil DNA  
D. Study of carbohydrates / proteins in rocks.

**SECTION: C**  
**MATHEMATICS**

76. A rational number R is in the form  $\frac{2a}{15b}$ , where a and b are positive integers. For which of the following values of a and b, can R be expressed as a terminating decimal with 3(three) digits after decimal?
- A. a = 3, b=20  
B. a = 3, b=30  
C. a = 6, b=25  
D. a = 15, b=50

77. Consider the following statements.

- I. The number of positive integral solutions of the equation  $\frac{1}{x} + \frac{1}{y} = \frac{1}{6}$  is 9.  
 II. The number of positive integral solutions of the equation  $\frac{1}{x} + \frac{1}{y} = \frac{1}{15}$  is 9.

Which one of the following option is correct?

- A. I is true, but II is false. B. I is false, but II is true.  
 C. Both I and II are false. D. Both I and II are true.

78. A circle passes through the points, where the lines  $3kx - 2y = 1$  and  $4x - 3y = -2$  meet the co-ordinate axes. Then the value of k is

- A.  $-\frac{1}{2}$  B.  $\frac{1}{2}$   
 C. -1 D. 1

79. If  $\alpha$ ,  $\beta$  and  $\gamma$  are zeros of polynomial  $ax^3+bx^2+cx+d$ , then the value of  $(\alpha\beta + \beta\gamma + \alpha\gamma)$  is

- A.  $\frac{c}{a}$  B.  $-\frac{b}{a}$   
 C.  $\frac{b}{a}$  D.  $-\frac{c}{a}$

80. Let  $a_1, a_2, \dots, a_{100}$  be the terms of Arithmetic Progression (AP) with  $a_1=5, a_2=8, \dots$ , and  $b_1, b_2, \dots, b_{100}$  be the terms of another AP with  $b_1=3, b_2=7, \dots$ . Then the number of elements common to both the AP is

- A. 13 B. 17  
 C. 21 D. 25

81. If  $\alpha$  and  $\beta$  are the roots of the equation  $x^2 - bx + c = 0$  and  $p_n = \alpha^n + \beta^n$ , then which one of the following is true?

- A.  $P_{n+1} = bp_n + cp_{n-1}$  B.  $P_{n+1} = bp_n - cp_{n-1}$   
 C.  $P_{n+1} = cp_n - bp_{n-1}$  D.  $P_{n+1} = cp_n + bp_{n-1}$

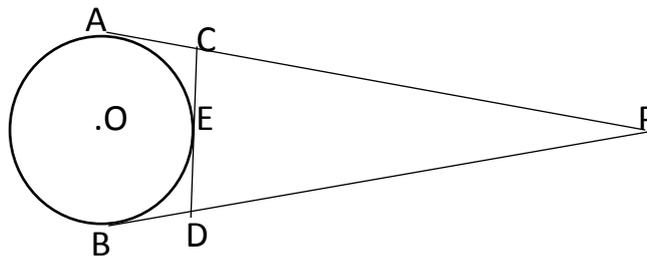
82. A cylindrical vessel with base radius 14 cm is filled with water to some height. If a rectangular solid of dimensions 22cm x 7cm x 5cm is immersed in the vessel, then what is the rise in the water level?

- A. 0.5cm  
B. 1.0cm  
C. 1.25cm  
D. 1.5cm

83. 'A' speaks the truth in 75% cases and 'B' in 80% cases. The probability that they contradict each other stating the same statement is

- A.  $\frac{2}{5}$   
B.  $\frac{3}{5}$   
C.  $\frac{7}{20}$   
D.  $\frac{13}{20}$

84. In the figure given below, from an external point P, two tangents PA and PB are drawn to a circle centered at O.



If CD is a tangent to the circle at E and the length of the tangent PA is 14cm, then the perimeter of the  $\triangle PCD$  is

- A. 28cm  
B. 25cm  
C. 21cm  
D. 18cm

85. The value of  $\sin^2 5^\circ + \sin^2 10^\circ + \dots + \sin^2 85^\circ + \sin^2 90^\circ$  is

- A.  $6\frac{1}{2}$   
B.  $7\frac{1}{2}$   
C.  $8\frac{1}{2}$   
D.  $9\frac{1}{2}$



