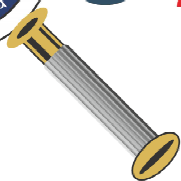# KH J-2025

Exam for
Young Scientists..!

SAMPLE QUESTIONS PAPER

CLASS 10

SCIENCE APTITUDE TEST

IIT Ashram
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SCIENCE APTITUDE TEST

INSTRUCTIONS

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

Caution : Class, as given on paper above MUST be correctly marked on the answer OMR sheet before attempting the paper. Wrong Class will give wrong results.

1. This booklet consists of 100 questions. Question paper consists of 4 sections. Marking scheme is given in table below:

Section	Subject	Questions No.	Making Scheme for each questions	
			Correct Answer	Wrong Answer
PART - **I**	Mental Ability	15	4	-1
PART - **II**	Mathematics	40	4	-1
PART - **III**	Physics & Chemistry	30	4	-1
PART - **IV**	Biology	15	4	-1

3. Answers have to be marked on the OMR sheet. The Question Paper contains blank spaces for your rough work. No additional sheets will be provided for rough work.

4. Blank papers, cellular phones, smart watches, log tables, slide rule, calculator and electronic devices, in any form, are not allowed.

PART - I : MENTAL ABILITY

Direction: (1 to 4)

There is a cube in which one pair of adjacent faces is painted red; the second pair of adjacent faces is painted blue and a third pair of adjacent faces is painted green. This cube is now cut into 216 smaller but identical cubes.

1. How many small cubes are there with no red paint at all?
   (a) 144   (b) 155
   (c) 125   (d) 150

2. How many small cubes are there with at least two different colours on their faces?
   (a) 64   (b) 54
   (c) 33   (d) 44

3. How many small cubes are there with one face painted red?
   (a) 64   (b) 81
   (c) 60   (d) 100

4. How many small cubes are with both red and green on their faces?
   (a) 8   (b) 12
   (c) 16   (d) 32

5. In a certain code language, if the word PANCREAS is coded as SAERCNAP, then how is the word STADIUM coded in that language?
   (a) MUDIATS   (b) MUDIAST
   (c) MUIDATS   (d) MIUDATS

6. Five boys P, Q, R, S and T stand at various points in a playground. A person O has to supply them with water. O can go directly to P and then to S. O can go directly to Q and then to T. O can go directly to R and then to P or Q. Which of the following is definitely TRUE?
   (a) O cannot supply water to all of them without touching at least one person twice.
   (b) O can reach all of them without touching any of them twice.
   (c) O must touch R to go to S.
   (d) O must touch R to go to Q.

7. Find the next three numbers
   5, 12, 13, 7, 14, 17, 9, 16, 19, 11, 18, 23,___, ___, ___.
   (a) 25, 27, 25   (b) 20, 25, 27
   (c) 17, 23, 29   (d) 13, 20, 29

8. Five books on five different subjects Physics, Chemistry, Mathematics, Anatomy and Botany are arranged on a shelf. The book on Mathematics is not on top or at the bottom. Chemistry book and Botany book have exactly two books between them, same as Mathematics and Physics books. Which of the following books has to be in the middle of the shelf?
   (a) Mathematics
   (b) Physics
   (c) Anatomy
   (d) Cannot be determined

9. Payal, Akhil, Rahul, Sahil and Tanuj are five persons who sit around a circular table. Tanuj is to the immediate right of Payal. Akhil and Rahul are on either side of Sahil. Who sits between Rahul and Tanuj, assuming that there is only one person between them?
   (a) Akhil   (d) Payal
   (c) Sahil   (d) None of these

Space for Rough Work

10. How many times, the minute hand of a clock overlaps with the hour hand from 10:00 a.m. to 7:00 p.m. in a day?
    (a) 5   (b) 6
    (c) 7   (d) 8

11. On which day of the week does 5th June, 2001 fall?
    (a) Monday   (b) Tuesday
    (c) Wednesday   (d) Thursday

12. Pointing to a person, Raju said, "He is the only brother of my father's mother's daughter." How is the person related to Raju?
    (a) Brother   (b) Father
    (c) Uncle   (d) Nephew

Direction for next (13 - 15) questions

In a class, 30% of the students gave their names to participate in the Chess and 75% to participate in the Table tennis. Three students participate in neither of these two and six students wanted to participate in both.

13. How many students are there in the class?
    (a) 100   (b) 75
    (c) 60   (d) 80

14. What percentage of students wants to participate only in the Chess?
    (a) 30%   (b) 25%
    (c) 15%   (d) 20%

15. What percentage of students wants to participate in only one programme – either Chess or Table tennis?
    (a) 85%   (b) 90%
    (c) 75%   (d) 20%

PART - II : MATHEMATICS

1. The cost of ten mangoes and nine apples is Rs104.The cost of twenty-seven mangoes and twenty-five apples is Rs 285. What is the cost of three mangoes and two apples?
    (a) 24   (b) 30
    (c) 27   (d) 32

2. For which of the following values of k will $3x + (k + 3)y = 1$ and $kx + 6y = 4$ have a unique solution?
    (a) 3   (b) -6
    (c) 6
    (d) Any value except 3 and -6

3. An amount of Rs 9000 is divided among four people A, B, C and D. The sum of the shares of A, C and D is four times the share of B. The sum of the shares of B and D is equal to four-fifths the sum of shares of A and C. Find the share of D.
    (a) 1,800   (b) 2,400
    (c) 2,200
    (d) Cannot be determined

4. The sum of squares of three consecutive positive integers is 869. Find the numbers.
    (a) 14, 15, 16   (b) 15, 16, 17
    (c) 16, 17, 18   (d) 17, 18, 19

5. If the product of the roots of the equation $x^2 - (R + 7)x + 2(2R - 2) = 0$ is three times the sum of the roots, then R =
   (a) 25   (b) 30
    (c) 27   (d) 32

Space for Rough Work

6. If α and β are the roots of the equation $x^2 - 11x + 24 = 0$, find the value of $\left(\dfrac{1}{\alpha} - \dfrac{1}{\beta}\right)$ given that it is positive.

    (a) 5/24   (b) 7/24

    (c) 1/24   (d) 1/8

7. If the roots of $2^m x^2 + 8x + 64^m = 0$ are real and equal, find m.

    (a) 2/3   (b) 1/2

    (c) 7/4   (d) 4/7

8. What is the 15th term of an arithmetic progression whose first term is equal to its common difference and whose 3rd term is 9?

    (a) 15   (b) 30

    (c) 45   (d) 60

9. Find the sum of the terms of the arithmetic progression whose first term, last term and common difference are 3, 101 and 7 respectively.

    (a) 750   (b) 720

    (c) 780   (d) 810

10. If $x = \sqrt[3]{49} + \sqrt[3]{42} + \sqrt[3]{36}$, then the value of $x - \dfrac{1}{x^2}$ is

    (a) $2\sqrt[3]{42}$ (b) $3\sqrt[3]{42}$

    (c) $\sqrt[3]{42}$ (d) $4\sqrt[3]{42}$

11. Find the GCD of the numbers p and q where $p = 2^3 \times 3^2 \times 7^2 \times 11^6$ and $q = 2^2 \times 3^1 \times 5^4 \times 11^2 \times 13^2$.

    (a) 776   (b) 1452

    (c) 1164   (d) 2028

12. If $2\sqrt{3 + \sqrt{5 - \sqrt{13 + \sqrt{48}}}} = \sqrt{a} + \sqrt{b}$ where a, b are natural number, then the value of a + b is ..

    (a) 8   (b) 9

    (c) 5   (d) 4

13. ABCD is a parallelogram and E is the midpoint of BC as shown in the figure. If DE and AB when produced meet at F, then AF is equal to
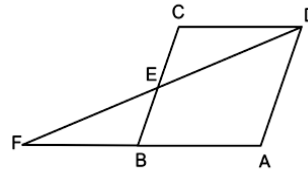
    (a) $\dfrac{3}{2}$ AB   (b) 2 AB

    (c) 3 AB   (d) $\dfrac{4}{2}$ AB

14. In the figure, PQ = 4 cm, QR = 14 cm and PS = 3 cm. Find ST.
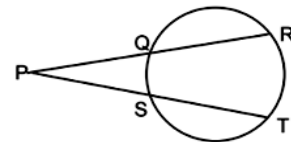
    (a) 24   (b) 21

    (c) 15   (d) 12

15. Find the length of side AD in the figure given below:
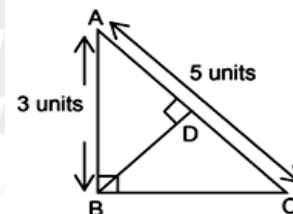
    (a) 1.8 units   (b) 0.8 units

    (c) 2.8 units   (d) 3.8 units

Space for Rough Work

16. In the given figure, O is the centre of the circle. If tangent PQ = 12 cm and AB = 10 cm, then QB is equal to _____.

  (a)   8 cm   (b)   9 cm
  (c)   10 cm   (d)   6 cm

17. A = (2, 4) and B = (6, 10). Find the point on the X-axis which is equidistant from A and B.
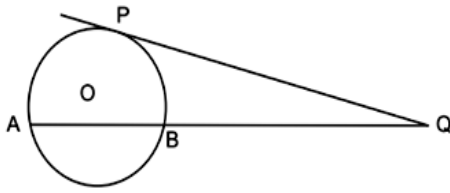 (a)   (25/2, 0)   (b)   (27/2, 0)
  (c)   (23/2, 0)   (d)   (29/2, 0)

18. If (-7, 8), (-3, 9) and (-5, 6) are the vertices of a parallelogram taken in that order. Find the coordinates of the fourth vertex.
  (a)   (-9, 5)   (b)   (-8, 4)
  (c)   (-8, 5)   (d)   (-9, 4)

19. The median of a series of 17 numbers is 23, two more numbers 20 and 27 are included to this set. Find the median of the extended set.
  (a)   27   (b)   23
  (c)   23.5
  (d)   Cannot be determined

20. Find the arithmetic mean of the multiples of 8 between 100 and 200.
  (a)   140   (b)   132
  (c)   148   (d)   156

21. Given that the units digits of A^3 and A are the same, where A is a single digit natural number. How many possibilities can A assume?
  (a)   6   (b)   5
  (c)   4   (d)   3

22. The sum of LCM and HCF of two numbers is 1260. If their LCM is 900 more than their HCF find the product of two numbers.
  (a)   203400   (b)   194400
  (c)   198400   (d)   205400

23. Find the maximum or miniumum value of the quadratic expression, $x^2 - 3x + 5$ whichever exists.

  (a)   The minimum value is $\dfrac{9}{10}$

  (b)   The minimum value is $\dfrac{11}{4}$

  (c)   The maximum value is $\dfrac{9}{10}$

  (d)   The maximum value is $\dfrac{11}{4}$

24. A father's present age is 6 times his son's present age. Thirty years later father's age will be ten years less than twice the son's age. After how many years will the son's age be half of the father's present age?
  (a)   20   (b)   30
  (c)   10   (d)   15

Space for Rough Work

25. Find the sum and the product of the roots of the equation $\sqrt{3}x^2 + 27x + 5\sqrt{3} = 0$.

(a) $-9\sqrt{3}, 5$ (b) $9\sqrt{3}, 5$

(c) $6\sqrt{3}, -5$ (d) $6\sqrt{3}, 5$

26. Find the value of $\sqrt{30 + \sqrt{30 + \sqrt{30 + ...\infty}}}$

(a) 6   (b) -5

(c) Either (a) or (b)   (d) Neither (a) nor (b)

27. If $\sin^4\theta - \cos^4\theta = k^4$, then $\sin^2\theta - \cos^2\theta$ is ____.

(a) K   (b) K^3

(c) K^2 (d) K^4

28. $\dfrac{\tan^3\theta - 1}{\tan\theta - 1} = $ _____.

(a) $\sec^2\theta + \tan\theta$ (b) $\sec^2\theta - \tan\theta$

(c) 0   (d) $\tan\theta - \sec^2\theta$

29. If a mode exceeds a mean by 12, then the mode exceeds the median by _____.

(a) 4   (b) 8

(c) 6   (d) 10

30. What is the probability that a non-leap year has 53 sundays?

(a) $\dfrac{6}{7}$ (b) $\dfrac{1}{7}$

(c) $\dfrac{5}{7}$ (d) $\dfrac{2}{7}$

31. How many three digit numbers would you find, which when divided by 3, 4, 5, 6, 7 leave the remainders 1, 2, 3, 4 and 5 respectively?

(a) 4   (b) 3

(c) 2   (d) 1

32. If $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ are the roots of equation $x^4 + \left(2 - \sqrt{3}\right)x^2 + 2 + \sqrt{3} = 0$, then the value of $(1 - \alpha_1)(1 - \alpha_2)(1 - \alpha_3)(1 - \alpha_4)$ is

(a) $2\sqrt{3}$ (b) 5

(c) 1   (d) 4

33. If $2\sin\theta + 3\cos\theta = 2$, then $3\sin\theta - 2\cos\theta = ?$

(a) ± 3 (b) ± 1

(c) 0   (d) ± 2

34. A test consists of 100 questions, for every right answer student gets 3 marks and 1 marks is deducted for wrong answer. Rahul attempted all the questions and he scored 180 marks. Find the number of questions he answered wrong :

(a) 40   (b) 30

(c) 60   (d) 32

35. 20 players participated in a chess competition. According to rule of the competition, each player has to play once against every other one. How many matches will be played in this competition?

(a) 190   (b) 200

(c) 210   (d) None

36. The mean of the values 1, 2, 3, ……. , n with respective frequencies x, 2x, 3x …… , nx is:

(a) $\dfrac{n}{2}$ (b) $\dfrac{n+1}{2}$

(c) $\dfrac{2n+1}{2}$ (d) $\dfrac{2n+1}{3}$

Space for Rough Work

37. If $\sin\theta + \operatorname{cosec}\theta = 2,$ then the value of $\sin^{2016}\theta + \operatorname{cosec}^{2016}\theta$ is.

    (a) 1   (b) 2016
    (c) 2   (d) 4032

38. If a pair of linear equations is inconsistent, then lines will be

    (a) parallel
    (b) always coincident
    (c) intersecting or coincident
    (d) always intersecting

39. If both a and b belong to the set {1, 2, 3, 4}, then the number of equations of the form $ax^2 + bx + 1 = 0$ having real roots is

    (a) 10   (b) 7
    (c) 6   (d) 12

40. In the figure (not drawn to scale) given below, P is a point on AB such that AP: PB = 4 : 3. PQ is parallel to AC and QD is parallel to CP. In $\Delta ARC, \angle ARC = 90^0,$ and in $\Delta PQS, \angle PSQ = 90^0,$ The length is QS is 6 cm. What is ratio AP : PD?
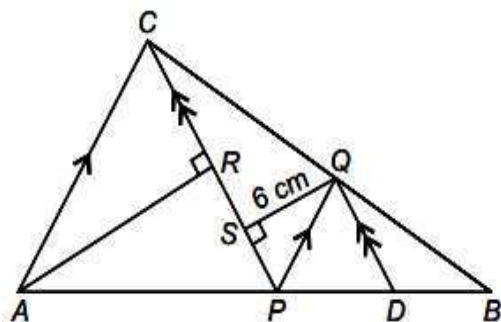

    (a) 10 :3   (b) 2 : 1
    (c) 7 : 3   (d) 8 : 3

PART - III : PHYSICS & CHEMISTRY

1. A clock hung on a wall has marks instead of numbers on its dial. On the opposite wall there is a mirror. And the image of the clock in the mirror if read, indicates the time as 8 : 20. What is the time in the clock

    (a) 3 : 40   (b) 4 : 40
    (c) 5 : 20   (d) 4 : 20

2. An object is at a distance of 0.5 m in front of a plane mirror. Distance between the object and image is

    (a) 0.5 m   (b) 1 m
    (c) 0.25 m   (d) 1.5 m

3. The light reflected by a plane mirror may form a real image

    (a) If the ray incident on the mirror are diverging
    (b) If the rays incident on the mirror are converging
    (c) If the object is placed very close to the mirror
    (d) If the object is placed very far from the mirror

4. The image formed by a convex mirror of focal length 30 cm is a quarter of the size of the object. The distance of the object from the mirror is

    (a) 30 cm   (b) 90 cm
   (c) 120 cm   (d) 60 cm

Space for Rough Work

5. The dispersion of light in a medium implies that
   (a) lights of different wavelengths travel with different speeds in the medium
   (b) lights of different frequencies travel with different speeds in the medium
   (c) the refractive index of medium is different for different wavelengths
   (d) all of the above.

6. Observe the given diagram carefully. What could be the causes of this defect?
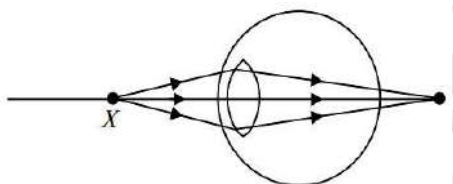
   (i) The focal length of the eye lens is too long.
   (ii) The eyeball becomes too small.
   (iii) The focal length of the eye lens is too small.
   (iv) The eyeball becomes too long.
   (a) Only (i) and (ii)   (b) Only (i) and (iv)
   (c) only (ii) and (iii)   (d) Only (iii) and (iv)

7. During a planned maneuver in a space flight, a free floating astronaut X pushes another free floating astronaut Y, the mass of X being greater than that of Y. Then, the magnitude of the force exerted by astronaut X on astronaut Y is _____
   (a) Equal to zero
   (b) Equal to the force exerted by Y on X
   (c) Greater than the force exerted by Y on X
   (d) Less than the force exerted by Y on X

8. White light is incident on face XY of a glass prism. The path of the green component of the light is shown in the figure. If the green light is just totally internally reflected at face XZ as shown, then the light emerging from face XZ will contain.
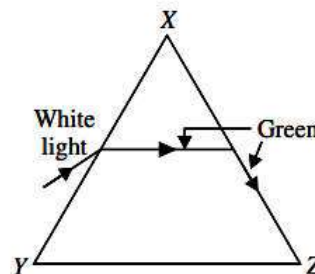

   (a) Red, violet and blue colours
   (b) Violet, indigo and blue colours
   (c) All colours except green
   (d) Yellow, orange and red colours.

9. A wire of resistance $5 \, \Omega$ is bent into a circular loop and the resistance between its diametrically opposite points is measured to be R_1. Now, it is stretched so that its length is increased by twice its original. Again, it is bent into a bigger circular loop and the resistance between its diametrically opposite points is measured to be R_2. Then $R_1 : R_2$ will be
   (a) $1 : 4$ (b) $9 : 1$
   (c) $1 : 9$ (d) $4 : 1$

Space for Rough Work

10. A car covers one-third of its journey with speed v_1, next one third with speed v_2 and the last one-third with speed v_3. The average speed of the body during the entire journey is

(a) $\dfrac{2v_1v_2v_3}{v_1v_2 + v_2v_3 + v_1v_3}$

(b) $\dfrac{3v_1v_2v_3}{v_1v_2 + v_2v_3 + v_1v_3}$

(c) $\dfrac{v_1v_2v_3}{v_1v_2 + v_2v_3 + v_1v_3}$

(d) $\dfrac{(v_1 + v_2 + v_3)}{3}$

11. A prism ABC is placed in different orientations. A narrow beam of white light is incident on the prism as shown in figures. In which of the following cases, after dispersion, the third colour from the top corresponds to the colour of the sky?
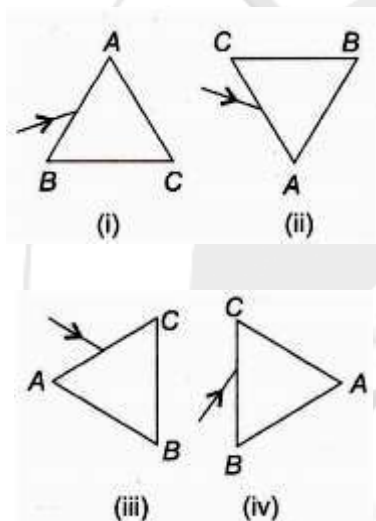

(a) (i)

(b) (ii)

(c) (iii)

(d) (iv)

12. Which car, moving from rest, has an average acceleration of 2.0 m s^{-2}?

(a) A car reaching a speed of 10 m s^{-1} in 2 s.

(b) A car reaching a speed of 20 m s^{-1} in 5 s.

(c) A car reaching a speed of 30 m s^{-1} in 10 s.

(d) A car reaching a speed of 40 m s^{-1} in 20 s

13. Read the given statements and mark the correct option.

Statement 1 : Convex lens is used as magnifying glass.

**Statement 2 :** Convex lens can form real and inverted images.

(a) Both statement 1 and statement 2 are true and statement 2 is the correct explanation of statement 1.

(b) Both statement 1 and statement 2 are true but statement 2 is not the correct explanation of statement 1.

(c) Statement 1 is true but statement 2 is false.

(d) Statement 1 is false but statement 2 is true.

14. Two identical balls are released at the same time from a building of height 85 m, one from the top while the other from half way up.

Which of the following quantities is same for both balls?

(a) Time of travel

(b) Final speed

(c) Acceleration

(d) Total displacement

15. Which of the follow diagrams best depicts the situation when two long iron rods are placed at the ends of a very short bar magnet?
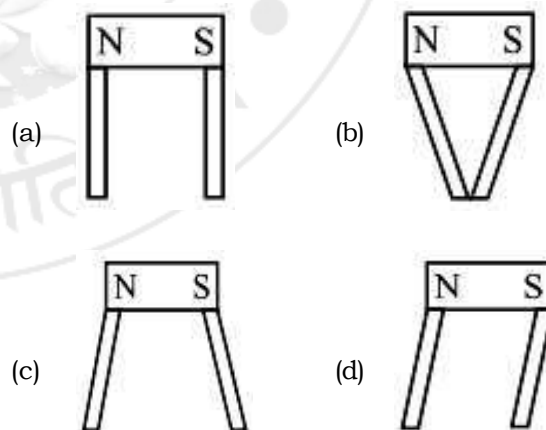
Space for Rough Work

16. Chlorine is in + 1 oxidation state in

    (a) HCl   (b) $HClO_4$

    (c) ICl   (d) Cl_2O

17. A substance A reacts with another substance B to produce the product C and a gas D. If a mixture of the gas D and ammonia is passed through an aqueous solution of C, baking soda is formed. The substances A and B are

    (a) HCI and NaOH

    (b) HCI and Na_2CO_3

    (c) Na and HCl

    (d) Na_2CO_3 and H_2O

18. Solder is an alloy of

    (a) Tin and lead

    (b) Copper and tin

    (c) Copper and zinc

    (d) Copper, nickel and iron

19. Which of the following ore is subjected to roasting in the concentration of ore procedure?

    (a) Oxide ores   (b) Silicate ores

    (c) Sulphide ores   (d) Carbonate ores

20. Triple point of water is

    (a) 273 K   (b) 373 K

    (c) 203 K   (d) 193 K

21. A balloon initially contains 7g of Nitrogen, and then 14g of Nitrogen is added to the balloon to expand its volume to 12 litre at the same temperature and pressure. Find the initial volume of the balloon.

    (a) 8 litre   (b) 7 litre

    (c) 5.6 litre   (d) 4 litre

22. The solubility of potassium chloride at 20°C is 34.7 g in 100 g of water. The density of the solution is 1.3 g mL^{-1}. What is the w/V percentage of potassium chloride in the solution ?

    (a) 25.76   (b) 32.98

    (c) 33.49   (d) 22.56

23. Light is passed through the solution of X and solution of Y. The following figure shows the observation.
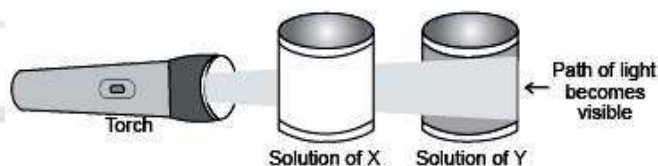
    What could be X and Y ?

    (a) X = Milk Y = Mud

    (b) X = Mud Y = Milk

    (c) X = Milk Y = Copper sulphate

    (d) X = Copper sulphate Y = Milk

24. What is the mass of electron particles.

    (a) 1.67×10^{-27} kg   (b) 1.67×10^{-24} g

    (c) 9.1×10^{-31} kg   (d) 1.6×10^{-91} gm

25. Which of the following contains maximum number of molecules?

    (a) 1 g CO_2 (b) 1 g N_2

    (c) 1 g H_2 (d) 1 g CH_4

26. What is the pH of the solution has OH$^-$ ion concentroation is 2×10^{-5} M.

    (a) pH = 9.3   (b) pH = 7.8

    (c) pH = 8   (d) pH = 5

Space for Rough Work

27. If formula of chromic acid is H_2CrO_4, then what is the formula of divalent metal chromate ?

    (a) $MCrO_4$

    (b) M_2CrO_4

    (c) $M_2(CrO_4)_3$

    (d) M_3CrO_4

28. One 'u' stands for :

    (a) An atom of carbon (C–12)

    (b) $1/12^{th}$ of mass of carbon (C –12)

    (c) $1/12^{th}$ of hydrogen atom.

    (d) one atom of all the elements.

29. Which of the following statements about isotopes of an element is not correct?

    (a) Isotopes have the same proton number.

    (b) Isotopes have the same chemical properties

    (c) Isotopes have the same nucleon number.

    (d) Atoms of the isotopes of the element have the same number of electrons.

30. An atom has a net charge of –1. It has 18 electrons and 20 neutrons. Its mass number is :

    (a) 37

    (b) 35

    (c) 38

    (d) 20

PART - IV : BIOLOGY

1. What is the primary function of the liver in the human body?
   (a) Blood circulation
   (b) Digestion of carbohydrates
   (c) Detoxification and metabolism
   (d) Oxygen transport

2. Which enzyme is responsible for the digestion of proteins in the stomach?
   (a) Lipase
   (b) Amylase
   (c) Pepsin
   (d) Trypsin

3. Which part of the brain controls voluntary actions like walking and talking?
   (a) Cerebellum
   (b) Medulla oblongata
   (c) Hypothalamus
   (d) Cerebrum

4. What is the function of a sensory neuron?
   (a) Transmit impulses from the brain to muscles
   (b) Transmit impulses from sense organs to the brain
   (c) Transmit impulses within the brain
   (d) Stimulate muscle contractions

5. What type of cell division is responsible for producing gametes in humans?
   (a) Mitosis
   (b) Meiosis
   (c) Binary fission
   (d) Budding

6. In sexual reproduction, what is the significance of genetic diversity?
   (a) It increases the number of offspring
   (b) It ensures identical offspring
   (c) It helps in adaptation to changing environments
   (d) It prevents the transmission of genetic traits

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7. Which type of cell division is responsible for growth and repair in multicellular organisms?
   (a) Meiosis   (b) Mitosis
   (c) Binary fission   (d) Budding

8. Which type of tissue forms the outermost layer of leaves, stems, and roots in plants?
   (a) Nervous tissue   (b) Muscular tissue
   (c) Connective tissue (d) Dermal tissue

9. What is the function of adipose tissue in animals?
   (a) Storage of water
   (b) Storage of fat
   (c) Support and movement
   (d) Conducting electrical signals

10. Blood Pressure in hypertension condition started with...
    (a) 120/80 mmHg   (b) 140/90 mmHg.
    (c) 180/110 mmHg   (d) 100/60 mmHg

11. Who has higher respiration rate?
    (a) Animal
    (b) Plant
    (c) Both has same rate
    (d) Question is invalide

12. What is the main function of the nervous system in humans?
    (a) Control and coordination of body functions
    (b) Digestion of food
    (c) Production of hormones
    (d) Oxygen transport

13. Which part of the human brain controls involuntary activities like breathing and heartbeat?
    (a) Cerebellum   (b) Hypothalamus
    (c) Cerebrum   (d) Medulla oblongata

14. What is the main difference between asexual and sexual reproduction?
    (a) Asexual reproduction involves two parents, while sexual reproduction involves one parent.
    (b) Asexual reproduction results in genetically identical offspring, while sexual reproduction results in genetically diverse offspring.
    (c) Asexual reproduction is faster than sexual reproduction.
    (d) Asexual reproduction occurs only in plants.

15. In plants, what is the male reproductive organ called?
    (a) Ovary   (b) Stamen
    (c) Pistil   (d) Ovule

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