

1. When a bicycle is in motion, the force of friction exerted by the ground on the two wheels is such that it acts

- (a) In the backward direction on the front wheel and in the forward direction on the rear wheel.
- (b) In the forward direction on the front wheel and in the backward direction on the rear wheel.
- (c) In the backward direction on both the front and rear wheels.
- (d) In the backward direction on both the front and rear wheels.

Ans. (d)

2. A certain radioactive element A, has a half life = t seconds.

In $(t/2)$ seconds the fraction of the initial quantity of the element so far decayed is nearly

- (a) 29%
- (b) 15%
- (c) 10%
- (d) 45%

Ans. (a)

3. Which of the following plots would be a straight line ?

- (a) Logarithm of decay rate against logarithm of time
- (b) Logarithm of decay rate against logarithm of number of decaying nuclei
- (c) Decay rate against time
- (d) Number of decaying nuclei against time

Ans. (b)

4. A radioactive element x has an atomic number of 100.

It decays directly into an element y which decays directly into element z.

In both processes a charged particle is emitted.

Which of the following statements would be true?

- (a) y has an atomic number of 102
- (b) y has an atomic number of 101
- (c) z has an atomic number of 100
- (d) z has an atomic number of 101

Ans. (b)

5. If the sum of the roots of the equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals

then a/c , b/a , c/b are in

- (a) AP
- (b) GP
- (c) HP
- (d) None of these

Ans. (c)

6. A man speaks the truth 3 out of 4 times.
He throws a die and reports it to be a 6.
What is the probability of it being a 6?

- (a) $\frac{3}{8}$
- (b) $\frac{5}{8}$
- (c) $\frac{3}{4}$
- (d) None of the above

Ans. (a)

7. If $\cos^2 A + \cos^2 B + \cos^2 C = 1$ then ABC is a

- (a) Right angle triangle
- (b) Equilateral triangle
- (c) All the angles are acute
- (d) None of these

Ans. (a)

8. Image of point (3,8) in the line $x + 3y = 7$ is

- (a) (-1,-4)
- (b) (-1,4)
- (c) (2,-4)
- (d) (-2,-4)

Ans. (a)

9. The mass number of a nucleus is

- (a) Always less than its atomic number
- (b) Always more than its atomic number
- (c) Sometimes more than and sometimes equal to its atomic number
- (d) None of the above

Ans. (c)

10. The maximum KE of the photoelectron emitted from a surface is dependent on

- (a) The intensity of incident radiation
- (b) The potential of the collector electrode
- (c) The frequency of incident radiation
- (d) The angle of incidence of radiation of the surface

Ans. (c)

11. Which of the following is not an essential condition for interference

- (a) The two interfering waves must be propagated in almost the same direction or the two interfering waves must intersect at a very small angle
- (b) The waves must have the same time period and wavelength
- (c) Amplitude of the two waves should be the same
- (d) The interfering beams of light must originate from the same source

Ans. (c)

12. When X-Ray photons collide with electrons

- (a) They slow down
- (b) Their mass increases
- (c) Their wave length increases
- (d) Their energy decreases

Ans. (c)

13. An electron emits energy

- (a) Because its in orbit
- (b) When it jumps from one energy level to another
- (c) Electrons are attracted towards the nucleus
- (d) The electrostatic force is insufficient to hold the electrons in orbits

Ans. (b)

14. How many bonds are present in CO_2 molecule?

- (a) 1
- (b) 2
- (c) 0
- (d) 4

Ans. (d)

15. In a balanced chemical equation

- (a) Atoms are conserved
- (b) Molecules are conserved
- (c) Moles are conserved
- (d) Reactant and product molecules are preserved

Ans. (a)

16. How many grams of NaOH will react with 0.2 equivalent of HCl?

- (a) 0.59
- (b) 0.285
- (c) 1.18
- (d) none of these

Ans. (a)

17. Which of the following is least acidic

- (a) Ortho-cresol
- (b) Para-cresol
- (c) Phenol
- (d) Meta-cresol

Ans. (b)

18. In Reimer-Tiemann's reaction, the reaction intermediate is

- (a) Carbene
- (b) Dichloro carbene
- (c) Carbonion
- (d) Carbonium ion

Ans. (b)

19. Which of the following is most acidic?

- (a) $\text{C}_2\text{H}_5\text{OH}$
- (b) $\text{CH}_3\text{CHOHCH}_3$

- (c) Ethanol
- (d) CH_3OH

Ans. (b)

20. A catalyst

- (a) always slows down the reaction
- (b) always starts a reaction that would not have occurred at all otherwise
- (c) causes changes in the rate of the reaction
- (d) changes the quantities of the products formed

Ans. (c)

21. The rate of the first order reaction depends on the

- (a) Concentration of the reactant
- (b) Concentration of the product
- (c) Time
- (d) Temperature

Ans. (d)

22. The most abundant element in the universe is

- (a) Hydrogen
- (b) Helium
- (c) Oxygen
- (d) Silicon

Ans. (a)

23. Integrate $3x + 5 / (x^3 - x^2 - x + 1)$

- (a) $\frac{1}{2} \log \left| \frac{(x+1)}{(x-1)} \right| - \frac{4}{(x-1)}$
- (b) $\log |2 + \tan x|$
- (c) $-(1 + \log x)/x$
- (d) $2 \log |(\tan x)/(\tan x + 2)|$

Ans. A

24. If $y = \cos^{-1}(\cos x + 4\sin x)/(17)^{1/2}$, then dy/dx is

- (a) 0
- (b) 1
- (c) -1
- (d) none of these

Ans. (b)

25. If the sum of n terms of two series of A.P are in the ratio $5n+4:9n+6$.find the ratio of their 13th terms

- (a) 129/231
- (b) 1/2
- (c) 23/15
- (d) None of the above

Ans. (a)

26. If the letters of the word "rachit" are arranged in all possible ways and these words are written out as in a dictionary, what is the rank of the word "rachit".

- (a) 485
- (b) 480
- (c) 478
- (d) 481

Ans. (d)

27. Ravi's salary was reduced by 25%.Percentage increase to be effected to bring the salary to the original level is

- (a) 20%
- (b) 25%
- (c) $33 \frac{1}{3}\%$
- (d) 30%

Ans. (c)

28. A and B can finish a piece of work in 20 days .B and C in 30 days and C and A in 40 days.
In how many days will A alone finish the job

- (a) 48
- (b) $34 \frac{2}{7}$
- (c) 44
- (d) 45

Ans. (a)

29. How long will a train 100m long travelling at 72kmph take to overtake another train 200m long travelling at 54kmph

- (a) 70sec
- (b) 1min
- (c) 1 min 15 sec
- (d) 55 sec

Ans. (b)

30. What is the product of the irrational roots of the equation $(2x-1)(2x-3)(2x-5)(2x-7)=9$?

- (a) $\frac{3}{2}$
- (b) 4
- (c) 3
- (d) $\frac{3}{4}$

Ans. (a)

31. Which of the following parameters is the same for molecules of all gases at a given temperature?

- (a) Mass
- (b) Momentum
- (c) Speed
- (d) Kinetic energy

Ans. (d)

32. A solid is completely immersed in liquid. The force exerted by the liquid on the solid will

- (a) Increase if it is pushed deeper inside the liquid
- (b) Change if its orientation is changed
- (c) Decrease if it is taken partially out of the liquid
- (d) None of the above

Ans. (c)

33. Select the correct statements

- (a) A simple harmonic motion is necessarily periodic
- (b) An oscillatory motion is necessarily periodic

- (c) A periodic motion is necessarily oscillatory
- (d) All of the above

Ans. (a)

34. An electron is injected into a region of uniform magnetic flux density with the components of velocity parallel to and normal to the flux. What is the path of the electron?

- (a) Helix
- (b) Parabola
- (c) Circle
- (d) Rectangle

Ans. (a)

35. A constant voltage is applied between the 2 ends of a uniform metallic wire. Some heat is developed in it. The heat developed is doubled if

- (a) both the length and radius of the wire are halved.
- (b) both the length and radius of the wire are doubled
- (c) the radius of the wire is doubled
- (d) the length of the wire is doubled

Ans. (b)

36. If Young's double slit experiment is performed in water

- (a) the fringe width will decrease
- (b) the fringe width will increase
- (c) the fringe width remains unchanged
- (d) there will be no fringe

Ans. (a)

37. The shape of a spot of light produced when bright sunshine passes perpendicular through a hole of very small size is

- (a) Square, because the hole is a square
- (b) Round, because it is an image of the sun
- (c) Round with a small penumbra around it
- (d) Square with a small penumbra

Ans. (b)

Select the alternative that logically follows from the two given statements.

38.

- λ Some forms are books
- λ All books are made of paper

- (a) Some forms are made of paper
- (b) Some forms are not made of paper
- (c) No forms are made of paper
- (d) None of the above

Ans. (a)

39.

- λ All toffees are chocolates
- λ Some toffees are not good for health

- (a) Some chocolates are not good for health
- (b) Some toffees are good for health
- (c) No toffees are good for health
- (d) Both (a) and (b)

Ans. (a)

The questions 40-46 are based on the following pattern. The problems below contain a question and two statements giving certain data. You have to decide whether the data given in the statements are sufficient for answering the questions. The correct answer is

- (A) If statement (I) alone is sufficient but statement (II) alone is not sufficient.
- (B) If statement (II) alone is sufficient but statement (I) alone is not sufficient.
- (C) If both statements together are sufficient but neither of statements alone is sufficient.
- (D) If both together are not sufficient.
- (E) If statements (I) and (II) are not sufficient

40. What is the volume of a cubical box in cubic centimetres?

- (I) One face of the box has an area of 49 sq.cms.
- (II) The longest diagonal of the box is 20 cms.

Ans. D

41. Is z positive?

- (I) $y+z$ is positive
- (II) $y-z$ is positive

Ans. E

42. Is $x > y$? x, y are real numbers?

- (I) $8x = 6y$
- (II) $x = y + 4$

Ans. B

43. If a ground is rectangular, what is its width?

- (I) The ratio of its length to its breadth is 7:2
- (II) Perimeter of the playground is 396 mts.

Ans. C

44. If the present age of my father is 39 yrs and my present age is x yrs, what is x ?

- (I) Next year my mother will be four times as old as I would be.
- (II) My brother is 2 years older than I and my father is 4 years older than my mother.

Ans. C

45. How many brothers and sisters are there in the family of seven children?

- (I) Each boy in the family has as many sisters as brothers
- (II) Each of the girl in the family has twice as many brothers as sisters

Ans. D

46. x is not equal to 0, is $x + y = 0$?

- (I) x is the reciprocal of y
- (II) x is not equal to 1

Ans. A

Following questions are based on letter's analogy. First pair of letters should have the same relationship as the second pair of letters or vice versa.

47. ? : BGLQ :: YDIN : VAFK

- (a) EKNS
- (b) DKMT
- (c) DLMS
- (d) EJOT

Ans. (d)

48. NLO : RPS :: ? : ZXA

- (a) VUW
- (b) VTR
- (c) VTW
- (d) TRP

Ans. (c)

49. If "segment" is coded as rffndou, then "ritual" is coded as

- (a) shutbm
- (b) qjutbk
- (c) qhutbk
- (d) qhubtk

Ans. (c)

50. If "football" is "cricket" , "cricket" is "basketball" , "basketball" is "volleyball", "volleyball" is "khokho" and "khokho" is cricket, which is not a ball game?

- (a) cricket
- (b) football
- (c) khokho
- (d) basketball

Ans. (a)

51. Which of the following is a recursive set of production

- (a) $S \rightarrow aA, A \rightarrow S$
- (b) $S \rightarrow aA, A \rightarrow b$

- (c) $S \rightarrow aA$, $A \rightarrow S$
- (d) None of these

Ans. (c)