## Section 1: English

1. Choose the correct clipped form of "Perambulator" from the options:

    (A) Peram

    (B) Perambul

    (C) Pram

    (D) Bulator

2. Choose the correctly spelt word from the following options:

    (A) belive

    (B) believe

    (C) beleive

    (D) beleeve

3. Choose the tetrasyllabic word from the given options:

    (A) beauty

    (B) obnoxious

    (C) infinite

    (D) epitome

4. Choose the correct combination for the word 'fantabulous':

    (A) fantasy+fabulous

    (B) fan+tabulous

    (C) fanta+bulous

    (D) fantastic+fabulous

5. Form a new word by adding a suitable suffix to the root word 'illumine':

    (A) -ion

    (B) -ate

    (C) -ly

    (D) –ish

6. Choose the correct expansion for the acronym 'FAQ'

    (A) Frequently Asked Question

    (B) Fairly Asked Question

    (C) Funnily Asked Question

    (D) First Asked Question

7. Choose the correct meaning of the idiom:
   Students burn midnight oil just before examinations.

    (A) use a lot of oil at midnight

    (B) stay up late at night to work

    (C) use oil lamp for light

    (D) None of the Above

8. Choose the correct American English word for 'pavement':

    (A) sidewalk   (B) platform

    (C) walkway   (D) side road

9. Choose the most suitable simple sentence for the given compound sentence:
   Not only can she sing but also play the violin.

    (A) As she sings so can she play the violin.

    (B) She can sing as well as play the violin.

    (C) She can sing and play the violin.

    (D) Besides being able to sing, she can play the violin.

10. Choose from the options, the correct meaning of the foreign expression 'ad hoc':

    (A) without any purpose

    (B) forever

    (C) for the purpose

    (D) a bird

11. Three point charges, q_1, q, q_2 where $q_1 = q_2$ are placed with q midway between the other two charges as shown in figure.
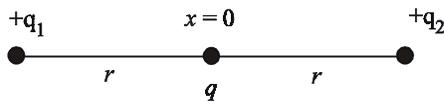
    If the charge at the center is slightly displaced towards charge q_2

    (A) It will accelerate towards q_2

    (B) It will be pulled back by q_1 and hence resume its original position.

    (C) It will stay at rest at its new position

    (D) It will execute simple harmonic oscillations about $x = 0$.

12. In the figures shown, the flux through which closed surface will be more?
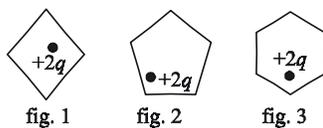

    (A) Fig. 1   (B) Fig. 2
    (C) Fig. 3   (D) All are equal

13. A 10 cm long straight conductor carrying a current of 1.2 A is placed along the x-direction in a magnetic field $\vec{B} = \alpha\,(\hat{i} - 3\,\hat{j} + 2\,\hat{k})$ tesla. The magnitude and direction of the Lorentz force acting is:

    (A) $\sqrt{6\,\alpha^2}, 33.66°$ to $z-$ axis

    (B) $0.433\alpha, 56.34°$ to $y-$ axis

    (C) $0.433\alpha, 56.34°$ to negative $y-$ axis

    (D) $\sqrt{6\,\alpha^2}, 33.66°$ to negative $z-$ axis

14. The effective impedance of an LCR circuit is $Z\,\Omega$. If the resistance is doubled, inductance is quadrupled, the AC frequency is halved and the capacitance is unchanged, the new impedance is ---- times Z.

    (A) 8

    (B) 4

    (C) 2

    (D) 1

15. A conducting rod of length 15 cm and fixed at one end rotates at a constant rate of 36 RPM about its fixed axis along the X-Y plane in a magnetic field $B = 1.8\,\hat{k}\,T$. The emf developed between its two ends is _____.

    (A) 0.87 V   (B) 87 mV
    (C) 0.76 V   (D) 76 mV

16. In the circuit given below $V = 15$ volt, and $R_2 = \dfrac{R_1}{2}, R_3 = \dfrac{R_1}{3}$. If the power dissipated in the circuit is 120 watts, the maximum power is dissipated is _____ by _____.
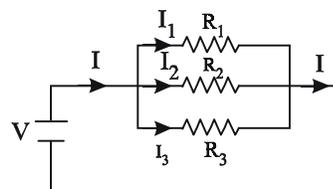

    (A) 60 watts by R_1

    (B) 60 watts, by R_2

    (C) 60 watts by R_3

    (D) All of them dissipate equal power

17. **Assertion:** Unpolarized light gets polarized when reflected off from a surface.
    Reason: The vibrating electrons in the surface radiate energy only parallel to their vibration.

    (A) Both the assertion and reason are correct

    (B) Only the assertion is correct, the reason is wrong.

    (C) The assertion is wrong, only the reason is correct

    (D) Both assertion and reason are wrong.

18. When electromagnetic radiation of wavelength 1200 Å is incident on a metal surface, the fastest electrons are found to have a kinetic energy of 6.2 eV. The threshold wavelength is

    (A) 4120 Å

    (B) 3610 Å

    (C) 2990 Å

    (D) 1980 Å

19. If a sample initially has 1.08 moles of a radioactive substance with a half-life of 12 hours, the number of nuclei left after 9 hours 30 minutes is:
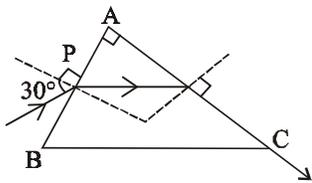
(A) 5.318×10^{23} (B) 4.913×10^{23}

(C) 4.227×10^{23} (D) 3.76×10^{23}

20. The output Q of the logic circuit give below is
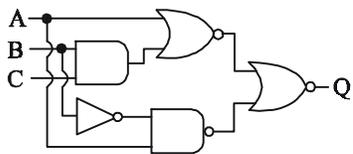
(A) $A\,\overline{B}$ (B) $\overline{A}\,B + C$

(C) $\overline{A}\,\overline{B} + C$ (D) $A + \overline{B}\,C$

21. A light ray enters through a right angled prism at point P with the angle of incidence $30°$ as shown in figure. It travels through the prism parallel to its base BC and emerges along the face AC. The refractive index of the prism is:

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

(C) $\dfrac{\sqrt{5}}{4}$ (D) $\dfrac{\sqrt{5}}{2}$

22. Match List I with List II.

List I (Material)	List II (Susceptibility (χ))
(a) Diamagnetic	(i) $\chi = 0$
(b) Ferromagnetic	(ii) $0 > \chi \geq -1$
(c) Paramagnetic	(iii) $\chi >> 1$
(d) Non-magnetic	(iv) $0 < \chi < \varepsilon$ (a small positive number)

Choose the correct answer from the options given below:

(A) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
(B) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
(C) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
(D) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)

23. In a plane electromagnetic wave travelling in free space, the electric field component oscillates sinusoidally at a frequency of 2.0×10^{10} Hz and amplitude $48\ \text{Vm}^{-1}$. Then the amplitude of oscillating magnetic field is:

(Speed of light in free space $= 3 \times 10^8\ \text{m s}^{-1}$)

(A) $1.6 \times 10^{-9}\ T$

(B) $1.6 \times 10^{-8}\ T$

(C) $1.6 \times 10^{-7}\ T$

(D) $1.6 \times 10^{-6}\ T$

24. For Young's double slit experiment, two statements are given below:

Statement I: If screen is moved away from the plane of slits, angular separation of the fringes remains constant.

Statement II: If the monochromatic source is replaced by another monochromatic source of larger wavelength, the angular separation of fringes decreases.
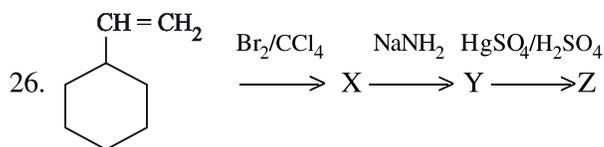
In the light of the above statements, choose the correct answer from the options given below:

(A) Both **Statement I** and **Statement II** are true.

(B) Both **Statement I** and **Statement II** are false.

(C) **Statement I** is true but **Statement II** is false.

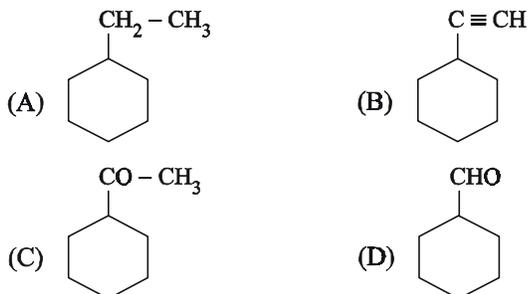(D) **Statement I** is false but **Statement II** is true.

25. When two monochromatic lights of frequency, v and $\dfrac{v}{2}$ are incident on a photoelectric metal, their stopping potential becomes $\dfrac{V_s}{2}$ and V_s respectively. The threshold frequency for this metal is:

(A) $\dfrac{3}{2}v$

(B) $2v$

(C) $3v$

(D) $\dfrac{2}{3}v$

26.

CH=CH$_2$

$\xrightarrow{Br_2/CCl_4}$ X $\xrightarrow{NaNH_2}$ Y $\xrightarrow{HgSO_4/H_2SO_4}$ Z

The product 'Z' is

(A) CH$_2$–CH$_3$

(B) C≡CH

(C) CO–CH$_3$

(D) CHO

27. An alkene, $C_{16}H_{16}$ on ozonolysis followed by hydrolysis gives only one product, A. Compound 'A' on reaction with I_2/NaOH gives an yellow precipitate and a compound B. Compound B reacts with NH_2NH_2/KOH gives a hydrocarbon. The alkene is

(A) $C_6H_5 - CH_2 - CH = CH - CH_2 - C_6H_5$

(B) $C_6H_5 - C(CH_3) = C(CH_3) - C_6H_5$

(C) $(C_6H_5 - CH_2)_2 C = CH_2$

(D) $C_6H_5 - CH = CH - CH = CH - C_6H_5$

28. The IUPAC name of the following compound is:

COOH

NH$_2$
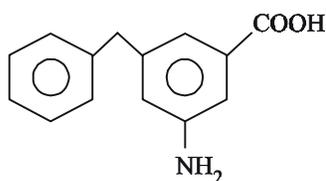
(A) 3-benzyl-5-carboxyaniline
(B) 3-amino-5-phenylbenzoic acid
(C) 1-amino-3-carboxyldiphenylmethane
(D) 3-amino-5-benzylbenzene-1-carboxylic acid

29. If a I order chemical reaction is 50% completed in 100 minutes, the time taken for 90% completion at the same temperature approximately in minutes, is

(A) 240
(B) 330
(C) 690
(D) 1000

30. When equal volumes of aq.HCl of pH = 1 and aq.NaOH of pOH = 1 are mixed. The resulting concentration of the solution is

(A) 0 M   (B) 1 M
(C) 0.05 M   (D) 2 M

31. **Assertion:** Ionic product of water, K_w increases with increase of temperature.
   Reason: Hot water is more acidic than cold water.

(A) Both assertion and reason are correct, and reason is the correct explanation of assertion
(B) Both assertion and reason are correct but reason is not the correct explanation of assertion
(C) Assertion is correct but reason is wrong
(D) Assertion is wrong but reason is correct

32. When aqueous copper sulphate solution is electrolysed, the gas liberated at anode is

(A) SO_2 (B) H_2S
(C) H_2 (D) O_2

33. In the extraction of copper from copper pyrites, the one which is not obtained on heating in a reverberatory furnace is

(A) CuS   (B) FeS
(C) Cu_2S (D) SO_2

34. Match the methods used for refining the metals in the following

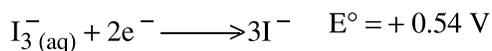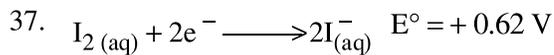|	Metal		Process
(1)	Germanium	(i)	Electrolytic refining
(2)	Zirconium	(ii)	Mond's process
(3)	Silver	(iii)	Zone refining
(4)	Nickel	(iv)	Van-Arkel method

(A) (1) → (ii)   (2) → (iii)   (3) → (i)   (4) →(iv)
(B) (1) → (iii) (2) → (i)   (3) → (iv)   (4) → (ii)
(C) (1) → (iv)   (2) → (iii)   (3) → (ii)   (4) → (i)
(D) (1) → (iii) (2) → (iv)   (3) → (i)   (4) → (ii)

35. A primitive crystal system with edge sides $a \neq b \neq c$ and angle between the edges $\alpha = \beta = \gamma = 90°$ is

    (A) Rhombohedral   (B) Triclinic
    (C) Orthorhombic   (D) Monoclinic

36. Which of the following statement/s is/are wrong?

    (1) $t_{1/2}$ of a I order reaction is directly proportional to initial concentration

    (2) Order of a reaction is never fractional

    (3) Time taken for 100% completion of a I order reaction is infinity

    (4) Hydrolysis of an ester in acid medium is a second order reaction

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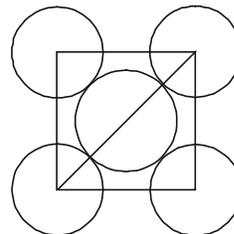   (C) (2), (3) and (4) only
    (D) 1, 2 and 4 only

37. $I_{2\,(aq)} + 2e^- \longrightarrow 2I^-_{(aq)}$ $E° = +0.62$ V

    $I^-_{3\,(aq)} + 2e^- \longrightarrow 3I^-$ $E° = +0.54$ V

    K_c for the reaction $I_{2\,(aq)} + I^-_{(aq)} \rightleftharpoons I^-_{3\,(aq)}$ is approximately

    (A) 4.0   (B) 25.3
    (C) 710.5   (D) 1520.2

38. The packing efficiency of the following two dimensional square unit cell is about

    (A) 24.8%   (B) 39.4%
    (C) 64.5%   (D) 78.5%

39. The resistance of an electrolyte of 0.2 N and 0.5 N solutions are 100 and 600 ohms respectively. The specific conductance of 0.2 N electrolyte is 1.5 Sm^{-1}. The equivalent conductivity of 0.5 N solution of the electrolyte, in Sm^{-2} gram equiv^{-1}, is

    (A) 2×10^{-3}

    (B) 5×10^{-4}

    (C) 7.5×10^{-3}

    (D) 1×10^{-5}

40. Which of the following is an imino acid?

    (A) Serine
    (B) Proline
    (C) Methionine
    (D) Tryptophan

Section 4:   Mathematics / Biology

41. If $z = 2 + 3i$, then $z^5 + (\bar{z})^5$ is equal to:

    (A) 244
    (B) 224
    (C) 245
    (D) 265

42. If $\sin^{-1}\left(x - \dfrac{x^2}{2} + \dfrac{x^3}{4} - \ldots\right) + \cos^{-1}\left(x^2 - \dfrac{x^4}{2} + \dfrac{x^6}{4} - \ldots\right)$

    $= \dfrac{\pi}{2}$ for $0 < |x| < \sqrt{2}$ then x equals

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

    (C) $\dfrac{-1}{2}$ (D) -1

43. If A is a square matrix of order 3 and if $\det(A) = 3$, then $\det[\text{adj} \{ \text{adj} (\text{adj} A) \}]$ is equal to:

    (A) 81^2
    (B) 81
    (C) 729
    (D) 27

44. Magnitude of moment of force $-2\vec{i} + 6\vec{j} - 8\vec{k}$ acting at point $2\vec{i} - \vec{j} + 3\vec{k}$ about point $\vec{i} + 2\vec{j} - \vec{k}$

    (A) $\sqrt{211}$
    (B) 0
    (C) $\sqrt{54}$
    (D) None of these

45. The eccentricity of an ellipse, with its centre at the origin, is $\frac{1}{2}$. If one of the directices is $x = 4$, then the equation of the ellipse is

(A) $3x^2 + 4y^2 = 1$

(B) $3x^2 + 4y^2 = 12$

(C) $4x^2 + 3y^2 = 12$

(D) $4x^2 + 3y^2 = 1$

46. If $u = (x-y)^4 + (y-z)^4 + (z-x)^4$ then $\Sigma \frac{\partial u}{\partial x} =$

(A) 4   (B) 1

(C) 0   (D) -4

47. A random variable X has the following probability mass function?

X	-2	3	1
$P(X = x)$	$\frac{\lambda}{6}$	$\frac{\lambda}{4}$	$\frac{\lambda}{12}$

Then which of the following is incorrect?

(A) $\frac{\lambda}{6} + \frac{\lambda}{4} + \frac{\lambda}{12} = 1$

(B) $\lambda = 2$

(C) $P(X = 3) = \frac{1}{8}$

(D) $P(1 \le x \le 3) = \frac{2}{3}$

48. The number of commutative binary operations which can be defined on a set containing n elements is

(A) $n \frac{n(n+1)}{2}$

(B) n^{n^2}

(C) $n^{n/2}$

(D) n^2

49. The value of the definite integral $\int\limits_{1}^{e} \sqrt{x} \ln(x)\, dx$ is

(A) $\frac{4}{9}\sqrt{e^3} + \frac{2}{9}$

(B) $\frac{2}{9}\sqrt{e^3} - \frac{4}{9}$

(C) $\frac{2}{9}\sqrt{e^3} + \frac{4}{9}$

(D) $\frac{4}{9}\sqrt{e^3} - \frac{2}{9}$

50. The critical points of the function $f(x) = (x-2)^{2/3}(2x+1)$ are

(A) $-1, 2$ (B) $1, \frac{-1}{2}$

(C) $1, 2$ (D) none

Section 4: Biology

41. **Assertion:** Generally pollen tube enters into the ovule through micropyle.
    Reason: Pollen tube enters in any one of the synergids through filiform apparatus.

    (A) Both assertion and reason are true moreover reason explains assertion.

    (B) Both assertion and reason are true but reason does not explain assertion.

    (C) Assertion is true but reason is false.

    (D) Both assertion and reason are false.

42. **Statement I:** Haploid diploid sex determination is seen in fruitfly.
    Statement II: Y chromosome is responsible for maleness in human beings.

    (A) Statement I is correct and Statement II is wrong

    (B) Statement I is wrong but Statement II is correct

    (C) Both Statement I and Statement II are correct.

    (D) Both Statement I and Statement II are wrong

43. Match the following and find the correct answer.

	List I		List II
1	Histone	(i)	DNA wrapped around basic protein
2	Nucleosome	(ii)	Positive charged basic proteins
3	Euchromatin	(iii)	Densely packed & darkly stained
4	heterochromatin	(iv)	Loosely packed & lightly stained

	1	2	3	4
A	(ii)	(i)	(iv)	(iii)
B	(iii)	(iv)	(i)	(ii)
C	(iv)	(ii)	(iii)	(i)
D	(i)	(iii)	(ii)	(iv)

44. Find out the true and false statements from the following.

(i) Yeast is used for commercial production of cyclosporin A

(ii) Yeast is commonly known as brewer's bacteria.

(iii) Bt cotton contains toxic gene in their cell itself.

(iv) Bt cotton is resistant to certain fungal attack.

(A) (i) true, (ii) false, (iii) false, (iv) true.

(B) (i) false, (ii) false, (iii) false, (iv) false.

(C) (i) true, (ii) true, (iii) false, (iv) true.

(D) (i) true, (ii) false, (iii) true, (iv) true.

45. Find out the type of parasite for (i) viscum (ii) cuscutta & (iii) Orobancha spp.

A.	(i)	holoparasite	(ii)	Partial parasite	(iii)	Root parasite
B.	(i)	stem parasite	(ii)	root parasite	(iii)	Total parasite
C.	(i)	leaf parasite	(ii)	partial parasite	(iii)	Stem parasite
D.	(i)	partial stem parasite	(ii)	holoparasite	(iii)	root parasite

46. **Assertion:** Ampulla helps in collection of ovum after ovulation

Reason: Infundibulum is part of fallopian tube.

(A) Both assertion and reason are true moreover reason explains assertion.

(B) Both assertion and reason are true but reason does not explain assertion.

(C) Assertion is true but reason is false.

(D) assertion is false but reason is true.

47. Findout the incorrect pair.

(A) Bacteria - (i) tuberculosis

(B) virus - (ii) typhoid

(C) cprotozoa - (iii) amoebiasis

(D) Wuchereria spp - (iv) elephantiasis

48. **Statement- I:** extraction of electrophoresed DNA from agrose gel is known as elution.

Statement -II: purified DNA is finally precipitated out by using chilled ethanol.

(A) Statement I is correct and Statement II is wrong

(B) Statement I is wrong but Statement II is correct

(C) Both Statement I and Statement II are correct.

(D) Both Statement I and Statement II are wrong

49. Findout the false statement from the following

(A) transgenic mice are used for detecting safety of polio vaccine.

(B) genetic modification is used to enhance nutritional value of food.

(C) PCR is the most sensitive diagnostic test .

(D) insulin can not be digested by our intestinal enzymes.

50. Match the following and find the correct answer.

	List I		List II
1	Gametogenesis	(i)	Attachment to uterine wall
2	Implantation	(ii)	Delivery of baby
3	Gestation	(iii)	Embryonic development
4	parturition	(iv)	Formation of gametes

	1	2	3	4
(A)	(iv)	(i)	(iii)	(ii)
(B)	(iv)	(i)	(ii)	(iii)
(C)	(i)	(ii)	(iv)	(iii)
(D)	(ii)	(i)	(iv)	(iii)

51. In this question, the numbers are arranged based on some pattern or principle. Choose the correct answer for the term marked by the symbol (?)

    5, 6, 16, 57, ?, 1245

    (A) 244   (B) 148
    (C) 296   (D) 271

52. In the following figures, numbers are written according to some patterns. One number is missing. Find the missing number that replaces the question mark (?).
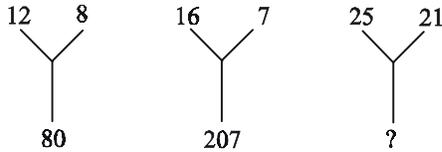
    (A) 210   (B) 184
    (C) 241   (D) 425

53. **Statements:**
    (A) All dogs are mammals
    (B) No monkeys are dogs

    Conclusions:

    (i) All monkeys are dogs
    (ii) Some monkeys are mammals
    (iii) No dogs are monkeys
    (iv) No dogs are non-mammals

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

54. In a code language, $D = 4$ and DEAR $= 7$ then in the same language, how will you write the word HOTEL?

    (A) 12   (B) 13
    (C) 15   (D) 14

55. If 3 is subtracted from the middle digit of each of the following numbers and then the positions of the digits are reversed, which of the following will be the last digit of the middle number after they are rearranged in descending order? 589, 362, 554, 371, 442

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

56. A man started walking from his home towards South after walking 6 km, he turned to his left and walked 5 km. Then he walked further 3 km after turning left. He then turned to his left and continued his walk for 9 km. How far is he away from his home?

    (A) 3 km   (B) 4 km
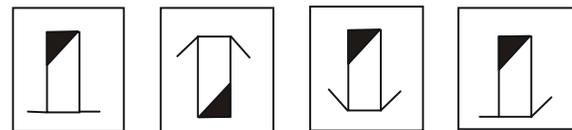   (C) 5 km   (D) 6 km

57. What angle is formed by the hour and minute hands of a clock when the time is 10:10?

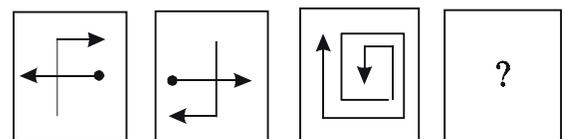   (A) 100°   (B) 115°
    (C) 120°   (D) 60°

58. A introduces B saying, "He is the husband of the girl who is grand daughter of my father's father." How is B related to A?

    (A) Son-in-law   (B) Brother-in-law
    (C) Brother   (D) Son

59. This question is based on the figures in series. Pick from the options what will come next.

60. In this question, there is a relationship between first two figures (1) and (2). The same relation is between the next two figures (3) and (4), but one is missing. Find the missing figure from the given alternatives.