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Level - 1 : All Level-1 successful* participants will get certificate, aptitude report and online subscription, and school toppers will be eligible for school hero medals.

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*# See prospectus/website for details

1. You are allowed additional 10 minutes to fill the required details in the **RESPONSE SHEET (OMR)**. **STUDENTS OF CLASS 1 & 2 HAVE TO UNDERLINE** THE CORRECT ANSWER IN THE QUESTION PAPER ITSELF. THEY ARE NOT REQUIRED TO USE THE RESPONSE SHEET (OMR). THEY HAVE TO FILL THEIR NAME, ROLL NUMBER, CLASS, SCHOOL NAME IN THE SPACE PROVIDED IN THE QUESTION PAPER.
2. The question paper is made as per syllabus guidelines & pattern given in the information Booklet. The Question Paper for Classes 1 to 6 contains 25 Questions each to be answered in 40 minutes. The Question paper for classes 7 to 12 contains 50 Questions each to be answered in 60 minutes. All questions are compulsory. Further instructions are given in the instruction letter to the teacher.
3. Use the response sheet to mark your responses by darkening the required circle. The response sheet has to be returned to the foundation, duly filled in. The student can retain the Question Paper except for classes 1 and 2.

**NATIONAL
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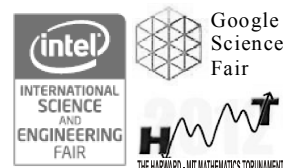
NIPPO

**12
Class**

**A1
Paper
Code**

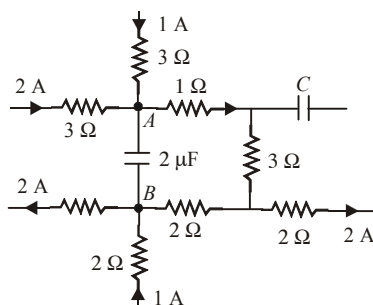
LEVEL - 1

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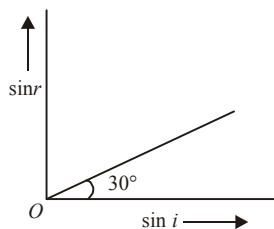
PHYSICS

1. A part of a circuit shown in figure. The potential difference across AB is
 - (1) 7V
 - (2) 11V
 - (3) 14V
 - (4) 15V
2. A circular current carrying coil has a radius R . The distance from the centre of the coil on the axis where the magnetic induction will be $1/8^{\text{th}}$ to its value at the centre of the coil is
 - (1) $\frac{R}{\sqrt{3}}$
 - (2) $R\sqrt{3}$
 - (3) $2R\sqrt{3}$
 - (4) $\left(\frac{2}{\sqrt{3}}\right)R$
3. An artificial satellite with a metal surface is moving about the earth in a circular orbit. A current will be induced in the satellite, if



- (1) the plane of the orbit coincides with the plane of the equator
 - (2) the plane of the orbit is inclined to the plane of the equator
 - (3) the plane of the orbit coincides with the plane of the satellite and the speed of satellite is more than 8 km/sec
 - (4) the plane of the orbit coincides with the plane of the equator and the speed of satellite is less than 8 km/sec
4. A concave mirror is placed on a horizontal table with its axis vertically upward. Let O be the pole of the mirror and C its centre of curvature. A point object is placed at C . It has a real image also located at C . If the mirror is now filled with water, the image will be
 - (1) real and will remain at C
 - (2) real and located at a point between C and ∞
 - (3) virtual and located at a point between C and O
 - (4) real and located at a point between C and O
 5. When light is incident on a medium at angle i and refracted into a second medium at an angle r , the graph of $\sin i$ versus $\sin r$ is as shown. From this one can conclude that

- (1) the velocity of light in second medium is $\sqrt{3}$ times the velocity of light in the first medium
- (2) the velocity of light in the first medium is $\sqrt{3}$ times the velocity of light in second medium



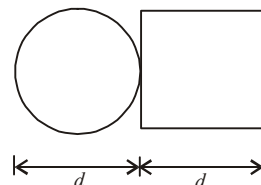
- (3) the critical angle of the two media is given by $\sin i_c = \frac{1}{\sqrt{5}}$
- (4) the critical angle of the two media is given by $\sin i_c = \frac{1}{\sqrt{2}}$
6. The counting rate observed from a radio active source at $t = 0$ second was 1600 counts per second and at $t = 8$ seconds it was 100 counts per second. The counting rate observed, as counts per second, at $t = 6$ seconds will be
- (1) 400 (2) 300
- (3) 200 (4) 150.
7. A semiconductor has the electron concentration $0.45 \times 10^{12} \text{ m}^{-3}$ and hole concentration $5 \times 10^{20} \text{ m}^{-3}$. Find its conductivity given that electron mobility $= 0.135 \text{ m}^2 \text{ V}^{-1} \text{ s}^{-1}$ and hole mobility $= 0.48 \text{ m}^2 \text{ V}^{-1} \text{ s}^{-1}$, $e = 1.6 \times 10^{-19} \text{ C}$.
- (1) $38.4 \Omega^{-1} \text{ m}^{-1}$ (2) $19.2 \Omega^{-1} \text{ m}^{-1}$
- (3) $47.3 \Omega^{-1} \text{ m}^{-1}$ (4) $38.4 \times 10^{-7} \Omega^{-1} \text{ m}^{-1}$.
8. The power of a sound from the speaker of a radio is 20 milliwatt. By turning the knob of the volume control the power of the sound is increased to 400 milliwatt. The power increase in decibels as compared to the original power is
- (1) 13 dB (2) 10 dB
- (3) 20 dB (4) 800 dB.
9. A charged oil drop of mass $2.5 \times 10^{-3} \text{ gm}$ is in space between the two plates each of area 200 cm^2 of a parallel plate capacitor. When the upper plate has a charge $5 \times 10^{-7} \text{ C}$ and the lower plate has an equal negative charge, the drop remains stationary. The charge of the oil drop is
- (1) $9 \times 10^{-12} \text{ C}$ (2) $9 \times 10^{-6} \text{ C}$
- (3) $9 \times 10^{-13} \text{ C}$ (4) $1.8 \times 10^{-14} \text{ C}$.
10. A small steel ball of radius r is allowed to fall under gravity through a column of a viscous liquid of coefficient of viscosity η . After sometime the velocity of ball attains a constant value known as terminal velocity, v_T . The terminal velocity depends on (i) the mass of the ball m , (ii) η , (iii) r , (iv) acceleration due to gravity g . Which of the following relations is dimensionally correct?
- (1) $v_T \propto \frac{F}{\eta r}$ (2) $v_T \propto \frac{\eta r}{F}$
- (3) $v_T \propto \eta r F$ (4) $v_T \propto \frac{F r}{\eta}$.
11. Which one of the following statements does not hold good when two balls of masses m_1 and m_2 undergo elastic collision?
- (1) when $m_1 < m_2$ and m_2 is at rest there will be maximum transfer of momentum
- (2) when $m_1 > m_2$ and m_2 at rest after collision the ball of

- mass m_2 moves with four times the velocity of m_1
- (3) when $m_1 = m_2$ and m_2 at rest, there will be maximum transfer of kinetic energy
- (4) when collision is oblique and m_2 at rest with $m_1 = m_2$, after collisions the ball moves in opposite direction.

12. A hemisphere of mass $4m$ and radius a is free to slide with its base on a smooth horizontal table. A particle of mass m is placed on the top of the hemisphere. Then the angular velocity of the particle at an angular displacement θ with respect to the hemisphere when the velocity of the hemisphere has become equal to v is

- (1) $\frac{5v}{a \cos \theta}$ (2) $\frac{4v}{a \cos \theta}$
- (3) $\frac{3v}{a \cos \theta}$ (4) $\frac{2v}{a \cos \theta}$

13. If density of material of circular plate and square is same, the centre of mass of the composite system will be



- (1) inside square plate
- (2) inside circular plate
- (3) at the point of contact
- (4) outside the system.

14. A thick rope of density ρ and length L is hung from a rigid support. The Young's modulus of the material of rope is Y . The increase in length of the rope is due to its own weight is

- (1) $\frac{1}{4} \frac{\rho g L^2}{Y}$ (2) $\frac{1}{2} \frac{\rho g L^2}{Y}$
- (3) $\frac{\rho g L^2}{Y}$ (4) $\frac{3}{4} \frac{\rho g L^2}{Y}$

15. A uniformly tapering vessel of height h whose lower and upper radii are r and R is completely filled with a liquid of density ρ . The force that acts on the base of vessel due to the liquid is

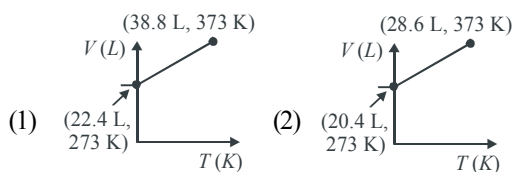
- (1) $\pi R^2 h \rho g$ (2) $\pi r^2 h \rho g$
- (3) $\pi \left(\frac{R+r}{2} \right)^2 h \rho g$ (4) $\frac{1}{3} \pi (R^2 - r^2) h \rho g$

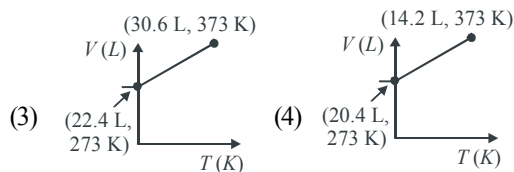
CHEMISTRY

16. How many moles of electron weigh one kilogram?

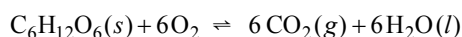
- (1) 6.023×10^{23} (2) $\frac{1}{9.108} \times 10^{31}$
- (3) $\frac{6.023}{9.108} \times 10^{54}$ (4) $\frac{1}{9.108 \times 6.023} \times 10^8$

17. Which of the following volume (V) - temperature (T) plots represents the behaviour of one mole of an ideal gas at one atmospheric pressure ?





18. The following reaction represents the oxidation of glucose



Consider the following data in this regard :

Substances	ΔG_f° (Kcal/mol)
$C_6H_{12}O_6$ (s)	-218
CO_2 (g)	-94
H_2O (l)	-57

Based on the above data, the standard free energy (ΔG°) for oxidation of glucose is

- (1) +67.0 kcal (2) -67.0 kcal
 (3) -688.0 kcal (4) +688.0 kcal

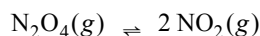
19. If the nitrogen atom had electronic configuration $1s^7$, it would have energy lower than that half of the normal ground state configuration $1s^2 2s^2 2p^3$, because the electrons would be closer to the nucleus. Yet, $1s^7$ is not observed because it violates

- (1) Heisenberg uncertainty principle
 (2) Hund's rule
 (3) Pauli exclusion principle
 (4) Bohr postulate of stationary orbits

20. Rutherford's experiment, which established the nuclear model of the atom, used a beam of

- (1) β -particles, which impinged on a metal foil and got absorbed
 (2) γ -rays, which impinged on a metal foil and ejected electrons
 (3) helium atoms, which impinged on a metal foil and got scattered
 (4) helium nuclei, which impinged on a metal foil and got scattered

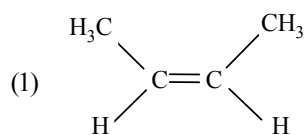
21. Consider the following equilibrium in a closed container



At a fixed temperature, the volume of the reaction container is halved. For this change, which of the following statements holds true regarding the equilibrium constant (K_p) and degree of dissociation (1) ?

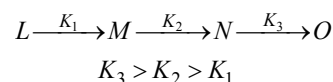
- (1) neither K_p nor α changes
 (2) both K_p and α change
 (3) K_p changes, but α does not change
 (4) K_p does not change, but α changes

22. Which of the following hydrocarbons has the lowest dipole moment ?



- (2) $CH_3C \equiv CCH_3$
 (3) $CH_3CH_2C \equiv CH$
 (4) $CH_2 = CH - C \equiv CH$

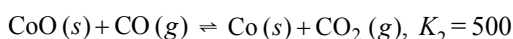
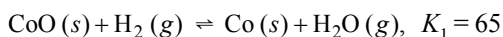
23. In the sequence of reaction,



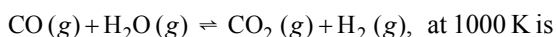
Thus, the rate determining step of the reaction is

- (1) $L \longrightarrow M$ (2) $M \longrightarrow N$
 (3) $N \longrightarrow O$ (4) $L \longrightarrow O$

24. The equilibrium constants for the reaction at 1000 K are



The equilibrium constant for the reaction

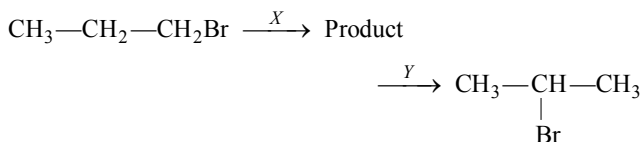


- (1) 0.13 (2) 7.69
 (3) 0.0179 (4) 69.3

25. Compound 'A' (molecular formula C_3H_8O) is treated with acidified potassium dichromate to form a product 'B' (molecular formula C_3H_6O). 'B' forms a shining silver mirror on warming with ammoniacal silver nitrate. 'B' when treated with an aqueous solution of $H_2NCONHNH_2 \cdot HCl$ and sodium acetate gives a product 'C'. Identify the structure of 'C'

- (1) $CH_3CH_2CH = NNHCONH_2$
 (2) $CH_3 - C = NNHCONH_2$
 |
 CH_3
 (3) $CH_3 - C = NCONHNH_2$
 |
 CH_3
 (4) $CH_3CH_2CH = NCONHNH_2$

26. Identify the set of reagents/reaction conditions 'X' and 'Y' in the following set of transformations



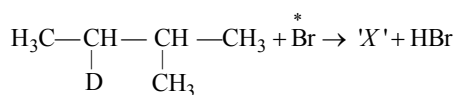
- (1) X = dilute aqueous NaOH, 20°C; Y = HBr/acetic acid, 20°C
 (2) X = concentrated alcoholic NaOH, 80°C; Y = HBr/acetic acid, 20°C
 (3) X = dilute aqueous NaOH, 20°C; Y = $Br_2/CHCl_3$, 0°C
 (4) X = concentrated alcoholic NaOH, 80°C; Y = $Br_2/CHCl_3$, 0°C

27. Variation of vapour pressure of a liquid with temperature is given by

$$\log_{10} P (\text{mm}) = \frac{-4000 (K)}{T} + 10,$$

what will be the value of ΔH_{vap} at 190°C ?

- (1) 18.304 kcal/mol (2) 18.806 kcal/mol
 (3) 7.948 kcal/mol (4) none of these
28. Identify a reagent from the following list which can easily distinguish between 1-butyne and 2-butyne
- (1) bromine, CCl_4
 (2) H_2 , Lindlar catalyst
 (3) dilute H_2SO_4 , HgSO_4
 (4) ammoniacal Cu_2Cl_2 solution
29. Consider the following reaction



Identify the structure of the major product 'X'

- (1) $\begin{array}{c} \text{H}_3\text{C}-\text{CH}-\text{CH}-\text{CH}_2 \\ | \quad | \\ \text{D} \quad \text{CH}_3 \end{array}$
 (2) $\begin{array}{c} \text{H}_3\text{C}-\text{CH}-\text{C}-\text{CH}_3 \\ | \quad | \\ \text{D} \quad \text{CH}_3 \end{array}$
 (3) $\begin{array}{c} \text{H}_3\text{C}-\text{C}-\text{CH}-\text{CH}_3 \\ | \quad | \\ \text{D} \quad \text{CH}_3 \end{array}$
 (4) $\begin{array}{c} \text{H}_3\text{C}-\text{CH}-\text{CH}-\text{CH}_3 \\ | \quad | \\ \text{CH}_3 \end{array}$
30. Which of the following acids has the smallest dissociation constant ?
- (1) $\text{CH}_3\text{CHF}\text{COOH}$ (2) $\text{FCH}_2\text{CH}_2\text{COOH}$
 (3) $\text{BrCH}_2\text{CH}_2\text{COOH}$ (4) $\text{CH}_3\text{CHBr}\text{COOH}$

MATHEMATICS

31. The function $f(x) = x^3$ is increasing in
- (1) $(0, \infty)$ (2) $(-\infty, 0)$
 (3) $(-\infty, \infty)$ (4) $(-\infty, -1) \cup (1, \infty)$
32. A student appears for test I, II and III. The student is successful if he passes through either in tests I and II or in tests I and III. The probabilities of the student passing in tests I, II and III are p, q are $1/2$ respectively. If the probability that the student is successful is $1/2$, then
- (1) $p = q = 1$ (2) $p = q = 1/2$
 (3) $p = 1/2, q = 1/2$ (4) $p = 1, q = 1/2$
33. If a half ray makes angles α, β, γ with the positive directions of the X-axis and Y-axis and Z-axis respectively,

then the value of $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma =$

- (1) 1 (2) 0
 (3) 2 (4) 3
34. n biscuits are distributed among N boys at random. The probability that a particular boy gets r ($\leq n$) biscuits is
- (1) r/n (2) ${}^n C_r$
 (3) ${}^n C_r (1/N)^r \{(N-1)/N\}^{n-r}$
 (4) ${}^n C_r (1/N)^r$
35. The equation $2x - 5y = 0$ represents, in the three dimensional space, a
- (1) plane containing X-axis
 (2) plane containing Y-axis
 (3) plane containing Z-axis
 (4) line with direction numbers $\langle 2, -5, 0 \rangle$
36. If A is a 3×3 non-singular matrix, then $\det [\text{Adj}(A)]$ is equal to
- (1) $(\det A)^2$ (2) $(\det A)^3$
 (3) $\det A$ (4) $(\det A)^{-1}$
37. Let $f: \mathbf{R} \rightarrow \mathbf{R}$ be any function. Define $g: \mathbf{R} \rightarrow \mathbf{R}$ by $g(x) = |f(x)|$ for all x , then g is
- (1) onto if f is onto
 (2) continuous if f is continuous
 (3) one-one if f is one-one
 (4) differentiable if f is differentiable
38. The function $f(x) = 1$ is the same as the function defined by
- (1) $f(x) = x/x$ (2) $f(x) = (x-1)/(x-1)$
 (3) $f(x) = \begin{cases} \frac{x}{2}, & \text{if } x \neq 0 \\ 0, & \text{if } x = 0 \end{cases}$ (4) $f(x) = \begin{cases} \frac{x}{x}, & \text{if } x \neq 0 \\ 1, & \text{if } x = 0 \end{cases}$
39. The graph of the inequalities $x \geq 0, y \geq 0, 2x + y \leq 6, x + 2y \leq 6$ is bounded by
- (1) a quadrilateral
 (2) a triangle
 (3) a concave quadrilateral
 (4) none of these
40. Let C_1 and C_2 be the centres of the two circles with radii r_1 and r_2 respectively. The two circles do not meet iff
- (1) $|C_1 C_2| > r_1 + r_2$
 (2) $|C_1 C_2| < |r_2 - r_1|$
 (3) $|C_1 C_2| > r_1 + r_2$ or $|C_1 C_2| < |r_2 - r_1|$
 (4) none of these
41. The probability that the 6th day of a randomly chosen month of a year is a Sunday is
- (1) $1/12$ (2) $1/7$
 (3) $1/84$ (4) none of these
42. Let $f(x) = \begin{cases} |x| & \text{for } 0 < |x| \leq 2 \\ 1 & \text{for } x = 0 \end{cases}$, then at $x = 0$, f has
- (1) a local maximum (2) a local minimum
 (3) no local extremum (4) no local maximum

43. $\int \frac{1}{(x^4+1)^{5/4}} dx$ is equal to
 (1) $-4/(x^4+1)^{1/4}$ (2) $1/(x^4+1)^{1/4}$
 (3) $x/(x^4+1)^{1/4}$ (4) none of these
44. To open a lock, a key is taken out of a collection of n keys at random. If the lock is not opened with this key, it is put back into the collection and another key is tried. The process is repeated again and again. If it is given that with only one key in the collection, the lock can be opened, then the probability that the lock will open in n trials is
 (1) $(1/n)^n$ (2) $(\{n-1\}/n)^n$
 (3) $1 - (\{n-1\}/n)^n$ (4) none of these
45. $\lim_{x \rightarrow \pi/4} \frac{\tan x - 1}{x - \pi/4}$ is equal to
 (1) 1 (2) 1/2 (3) 2 (4) 0
46. $\lim_{h \rightarrow 0} \frac{\sin \sqrt{x+h} - \sin \sqrt{x}}{h}$ is equal to
 (1) $\cos \sqrt{x}$ (2) $1/2 \sin \sqrt{x}$
 (3) $\cos \sqrt{x}/2\sqrt{x}$ (4) $\sin \sqrt{x}$
47. If a, b, c are different real numbers and $a\hat{i} + b\hat{j} + c\hat{k}, b\hat{i} + c\hat{j} + a\hat{k}$ and $c\hat{i} + a\hat{j} + b\hat{k}$ are position vectors of three non-collinear points, then
 (1) centroid of ΔABC is $\{(a+b+c)/3\}(\hat{i} + \hat{j} + \hat{k})$
 (2) $(\hat{i} + \hat{j} + \hat{k})$ is not really inclined to three vectors
 (3) triangle ABC is a scalene triangle
 (4) perpendicular from the origin to the plane of the triangle does not meet it at the centroid
48. If a function F is such that $F(0) = 2, F(1) = 3, F(n+2) = 2F(n) - F(n+1)$ for $n \geq 0$, then $F(5)$ is equal to
 (1) -7 (2) -3 (3) 7 (4) 13
49. If x and y are odd integers, then $x^2 + y^2$ is
 (1) an odd integer
 (2) an even integer divisible by 4
 (3) an even integer not divisible by 4
 (4) none of these
50. The locus of the centre of a circle of radius 2 which rolls on the outside of the circle
 $x^2 + y^2 + 3x - 6y - 9 = 0$
 (1) $x^2 + y^2 + 3x - 6y + 5 = 0$
 (2) $x^2 + y^2 - 9x - 6y - 31 = 0$
 (3) $x^2 + y^2 + 3x - 6y + 29/4 = 0$
 (4) none of these

31. Which one of the following is the character of bile juice?
 (1) it has enterogastrone
 (2) it has trypsin
 (3) it has no enzyme
 (4) it is secreted from gall bladder.
32. The layer of parenchyma surrounding a vascular bundle is known as
 (1) bundle fibres (2) bundle shield
 (3) bundle parenchyma (4) bundle sheath
33. Which of the following is correctly matched.
 (1) oxytocin - brings about ovulation
 (2) FSH - stimulates spermatogenesis
 (3) GH - controls BMR
 (4) relaxin - stimulates lactation
34. For each molecule of glucose formed in plants the number of molecules of ATP and NADPH₂ required are respectively
 (1) 12 and 18 (2) 15 and 10
 (3) 18 and 12 (4) 33 and 22.
35. One bacterium which has found extensive use in genetic engineering work in plants is
 (1) Clostridium septicum
 (2) Xanthomonas citri
 (3) Agrobacterium tumefaciens
 (4) Bacillus coagulans
36. The organelles which occur external to cell membrane but internal to cell wall are
 (1) lomasome (2) glyoxysome
 (3) sphaerosome (4) peroxisome
37. Plant cells
 (1) does not possess cell junction like animal cells
 (2) have interconnections in which cytoplasmic strand extend
 (3) secondary wall is present although primary wall may disappear
 (4) none of these
38. If a person is feeling thirsty and is urinating frequently and if there is no sugar in the urine. The reason may be
 (1) hypersecretion of anterior pituitary
 (2) hyposecretion of thyroid
 (3) hypersecretion of thyroid
 (4) hyposecretion of posterior pituitary
39. Bony fishes differ from shark in that
 (1) bony fish have operculum
 (2) bony fish have scales
 (3) bony fish have caudal fin
 (4) none of these
40. Mark the correct answer from the codes given ?
 (i) Cholesterol has a derived role in nerve transmission
 (ii) Na⁺ play an important role in nerve transmission

- (iii) Mg maintains osmotic pressure (O.P.)
 (iv) K maintains acid base balance
 (1) (i) & (ii) (2) (iii) & (iv)
 (3) (ii) & (iv) (4) (i) & (iv)
41. "Organ of Bojanus" refers to
 (1) balancing organ of mussel
 (2) respiratory organ of mussel
 (3) kidneys of the fresh water mussel
 (4) sense organ of mussel.
42. Which statement is true for membrane fluidity?
 (1) decreases with lowering of temperature
 (2) increases with lowering of temperature
 (3) decreases with rise in temperature
 (4) no effect observed with respect to temperature
43. Zona adherens is another name for
 (1) desmosome
 (2) tight junction
 (3) terminal bars
 (4) gap junction
44. If a normal woman marries an albino man and their offsprings are half albino, half normal, the woman is
 (1) homozygous recessive
 (2) homozygous normal
 (3) heterozygous normal
 (4) homozygous dominant
45. When there is more than one codon code for the same amino acid, this is called as
 (1) punctuation in genetic code
 (2) universal nature of generic code
 (3) redundancy of genetic code
 (4) continuous nature of genetic code
46. In *Mirabilis jalapa*, when homozygous red flowered and white flowered plants are crossed, all F_1 plants have pink-coloured flowers. In F_2 , produced by selfing of F_1 plants, red, pink and white flowered plants would appear respectively in the ratio of
 (1) 1 : 0 : 1 (2) 2 : 1 : 1
 (3) 1 : 2 : 1 (4) 1 : 1 : 2
47. Coelom is found at cavity between
 (1) mesoderm and body wall (endoderm)
 (2) mesoderm and ectoderm
 (3) body wall and ectoderm
 (4) ectoderm and endoderm
48. The C_4 plants are different from C_3 plants with reference to the
 (1) type of end products of photosynthesis
 (2) substance that accepts CO_2 in carbon assimilation
 (3) number of ATP that are consumed in preparing sugars
 (4) both (2) & (3)
49. If cell X with OP = 5, TP = 4 is surrounded by the cells with OP = 3 and TP = 1 then what will be the direction of movement of water?
 (1) water will not move
 (2) from other cells to cell X
 (3) from cell X to other cells
 (4) water will move up
50. Human females have different karyotype than human male. Difference is
 (1) one extra Y chromosome in female
 (2) one X chromosome less in female
 (3) one pair of autosome more in male
 (4) none of these



END OF THE EXAM