SciQuest

Class XI

by Zaariya

16 November 2019. TIME ALLOTTED: 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. The Answer Sheet is kept inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars carefully.
2. This examination paper contains **EIGHTY(80)** questions and comprises **TWENTY TWO(22)** printed pages.
3. There are **FOUR(4)** parts in this question paper A, B, and C and D having 20 questions each.
4. Part A and Part B are common for all students, where as those who have opted for PCM and, for PCB are to attempt Part C and, Part D respectively.
5. The **last 5 questions** of each part are worth **+FOUR(4)** marks each and a wrong answer will result in deduction of **ONE(1)** mark.
6. The remaining questions are worth **+TWO(2)** marks and a wrong answer will result in deduction of **HALF(1/2)** mark from the total score.
7. Unattempted questions will not affect your score.
8. There is only one correct response to each question. Filling up more than one response in any question will be treated as a wrong response.
9. No candidate is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc. inside the examination room/hall.

Personal Details

Name of the Candidate

Registration Number | | | | | | | | | | |

Centre Code | | | |

Part A- PHYSICS

1. If Earth stops spinning, what would be the force on a person standing at an altitude above the equator(NORTH) experience and in what direction as observed from earth's frame? (Neglect revolution of the earth)

   (a) $mR\omega 2cos\lambda$ along the North-South axis.

   (b) $mR\omega 2sin\lambda$ along the North-South axis.

   (c) $mR\omega 2cos\lambda$ perpendicular to the North-South axis.

   (d) $mR\omega 2sin\lambda$ perpendicular to the North-South axis.

2. dU = Q - W can be deduced to dU = Q - PdV if the process is:

   (a) quasi-static (b) no quasi-static (c) both a and b (d) none of the a and b

3. If you have a cubical container with ideal gas of volume V, temperature T, density D, molar entropy S and total internal energy U. You partitioned the container in two equal halves. Which of the above properties will not be halved after partitioning?

   (a) V (b) S (c) U (d) D

4. A solid sphere having mass 'm' and radius 'R' is thrown on a rough surface with linear speed 'u'. Find the time taken by the sphere to start pure rolling. Take the coefficient of friction, μ

   (a) $\frac{5u}{7\mu g}$ (b) $\frac{2u}{7\mu g}$ (c) $\frac{3u}{\mu g}$ (d) none of the above

5. While orbiting Earth, a satellite releases an object towards it. It will hit at a point (neglect the air drag):

   (a) exactly below (b) it will never reach earth

   (c) at the front (d) at the back

Space for rough work

6. A pulse or a wave train travels along a stretched string and reaches the fixed end of the string. It will be reflected back with:

   (a) Same phase as the initial but different velocity

   (b) A phase change of 180^o with no reversal of velocity

   (c) Same phase as the incident pulse with no reversal of velocity

   (d) A phase change of 180^o with velocity reversed

7. If the density of a metal wire is decreased its young's modulus

   (a) increases

   (b) decreases

   (c) first increases, then decreases

   (d) first decreases, then increases

8. One mole of a gas is put under a weightless piston of a vertical Cylinder at a temperature T. Initially piston was in equilibrium. How much work should be performed by some external force double the volume under the piston isothermally? (Neglect the friction of piston)

   (a) $RT(ln2 - 1)$ (b) $RT(\frac{ln2}{ln3})$ (c) $RT(1 - ln2)$ (d) $RT(\frac{ln3}{ln2})$

9. Let us take a cylinder of mass m and suspend it in a hollow closed tube, such that the closed end is sealed. It is seen that the mass falls down fast, comes to a halt, and then moves downward slowly before coming to a complete stop after a long time. What are the processes which took place in the order?

   (a) Isothermal, isobaric

   (b) Isothermal, adiabatic

   (c) Adiabatic, isothermal

   (d) Adiabatic, isobaric

10. Water flows through a pipe that runs from the top to the bottom of a building. For the velocity of water to remain the same at both ends of the pipe. How should the diameter of the pipe vary? Let diameter at top and bottom be $\mathrm{d}_1 and d_2 respectively$.

    (a) $\mathrm{d}_1 < d_2$

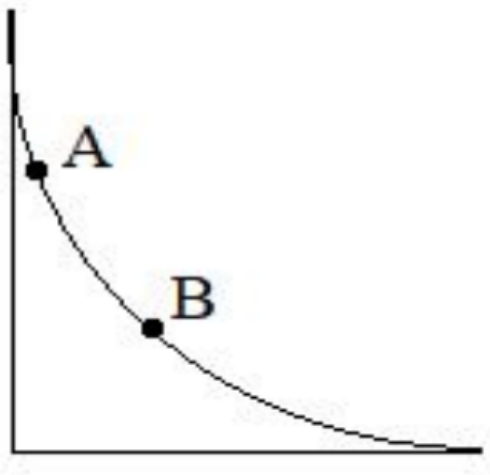
    (b) $\mathrm{d}_2 < d_1$

    (c) $\mathrm{d}_1 = d_2$

    (d) $\mathrm{d}_1 d_2 = constant$

Space for rough work

11. There is an incline whose surface is shaped like a quarter of a circle. If the time taken by a ball to reach the bottom when released from end A and end B is t_A and t_B respectively, then which of the following is true?



(a) $t_A = t_B t_A > t_B$ (b) $t_B > t_A Cannotbedetermined$

12. A vertical tunnel is dug through the earth (radius= R) which passes through the center and opens to the other side of the earth. A particle of mass 'm' is thrown inside the tunnel. For the particle to execute SHM, the density should be proportional to:

(a) R (b) $\frac{1}{R}$ (c) R^2 (d) None of these

13. Of the molecules chosen at random from a closed isolated container, the velocity of most of them was found to be $5 \times 10^4 cm/sec$. What would the root mean square speed of the molecules under the same conditions?

(a) $5.6 \times 10^4 cm/sec$ (b) $6.1 \times 10^4 cm/sec$

(c) $5.6 \times 10^6 cm/sec$ (d) $6.1 \times 10^6 cm/sec$

Space for rough work

14. "No process is possible whose sole result is the transfer of heat from a colder object to a hotter object." This is:

    (a) Third law of thermodynamics (b) Clasius statement

    (c) Kelvin - planck statement (d) None of these

15. A cube and a sphere of equal volume and material are heated to 370K and are then left in surrounding to cool. Then

    (a) Cube will cool faster because it has less surface area.

    (b) Sphere will cool faster because it has less surface area.

    (c) Cube will cool faster because it has more surface area.

    (d) Sphere will cool faster because it has more surface area.

16. You are working as a scientist in ISRO and were given the task to relocate the lost Vikram lander of the Chandryaan-2 mission. From the data, you got to know that the engines of lander failed when the lander was at an altitude of 2.1 km and had the vertical velocity of 160m/sec at that instant, at the same time it's horizontal velocity was reported to be 96m/sec. Determine how much horizontal distance it would have traveled before touching the lunar surface. (Take g at the moon to be 1.6 m/sec^2)

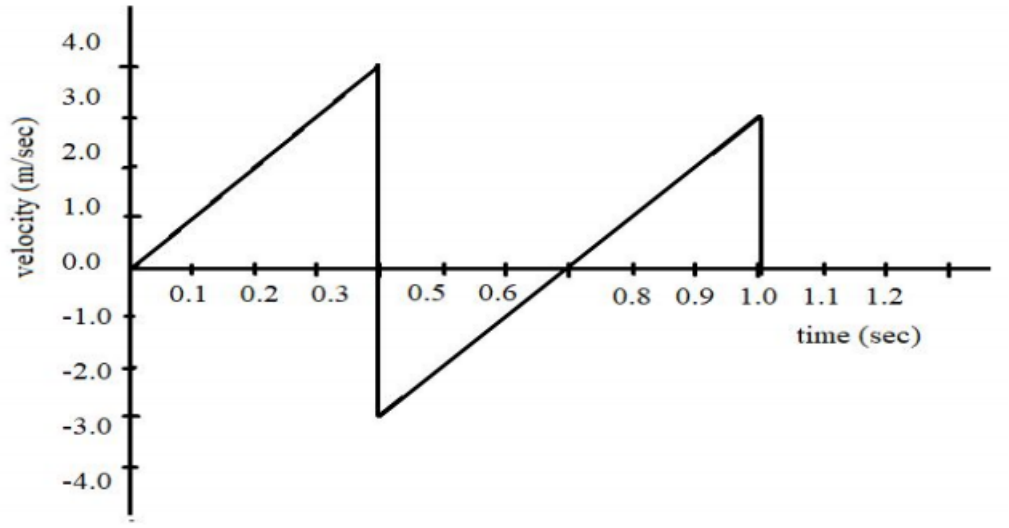
    (a) 600m (b) 1.2km (c) 6km (d) 1.8km

17. With your help, the orbiter was able to find the Vikram lander. Since it was a crash landing, the lander exploded and the temperature of debris was detected to be 700K. From the experiments done on earth, you observed that a similar material took 6 hours to cool from 600K to 400K at room temperature (300K). The next data from the orbiter after 8 hours reported the temp. of the debris to be 300K. Find surface temperature of the moon. (assume surface temp. of the moon to be constant)

    (a) 125K (b) 500K (c) 75K (d) 200K

Space for rough work

18. A ball is dropped from a height and it bounces off from the surface several times before coming to rest. The velocity-time graph for the first two bounce is given. Find the maximum height of the ball after the first bounce?



(a) 0.45m (b) 0.25m (c) 0.3m (d) 0.9m

19. One mole of an ideal gas with adiabatic exponent 'y' has its volume changed according to the relation V=a/T, where a is a constant. Find the amount of heat absorbed by the gas in this process, if the temperature rises by dT.

(a) (3-y)/(y-1)RdT (b) (2-y)/(y-1)RdT

(c) (y-4)/(y-1)RdT (d) (y-1)/(4-y)RdT

20. The equation $y = Acos2(2\pi nt - 2\pi x/\lambda)$ represents a wave with:

(a) Amplitude A/2, frequency 2n and wavelength $2/\lambda$

(b) Amplitude A/2, frequency 2n and wavelength λ

(c) Amplitude A, frequency 2n and wavelength 2λ

(d) Amplitude A, frequency 2n and wavelength λ

Space for rough work

21. A White solid is dissolved in water, giving off a gas that can be absorbed by alkaline pyrogallol. A red litmus paper when dipped into the solution turns White. The gas evolved is used during the commercial preparation of Phenol from benzene. What can the solid be?

    (a) Na_2O_2 (b) Na_2O (c) $NaOCl$ (d) CaO

22. Which of these pairs are paramagnetic according to the molecular orbital theory?

    (a) F_2 and CO (b) $NO^+ and O_2$ (c) $CO and F_2^+ and NO$

23. When Sodium metal is dissolved in liquid ammonia, The solution appears to be blue in color due to:-

    (a) Solvated electrons present in the solution

    (b) Electron clusters are formed

    (c) The sodium Metal dispersed through the solution reflects off the light

    (d) None of the above

24. Which process will have the highest slope in a Pressure vs Volume curve?

    (a) Isobaric (b) Isochoric (c) Isothermal (d) Adiabatic

25. Which conformation is more stable for ethane-1,2-diol?

    (a) Stagerred (b) Eclipsed (c) Gauche (d) None of these

26. Calcium burns under an atmosphere of Nitrogen gas to produce a white powder that dissolves in water producing a gas A and An alkaline solution That forms a Thin White layer on the top B. Identify B.

    (a) $Ca(OH)_2$ (b) $CaCO_3$ (c) $Ca(N_3)_2$ (d) Ca_3N_2

Space for rough work

27. In Solvay's process for making Na_2CO_3, Ammonia is bubbled through the brine before bubbling CO_2 through it. What would happen if Ammonia isn't bubbled through, and why?

    (a) The Na_2CO_3 will be impure because of $NaHCO_3$.

    (b) The Na_2CO_3 formed in the next step will not precipitate because of excess brine.

    (c) The $NaHCO_3$ formed in the next step will not precipitate due to acidic by-product.

    (d) The unused brine will be rendered useless at the end because it reacts with the acidic components formed.

28. A beaker contains a mixture of Mn^{2+}, Fe^{2+}, Zn^{2+}, Hg^{2+} of which Fe^{2+} and Mn^{2+} are 10^{-4} in concentration and the rest are 10^{-3} in concentration. When 10^{-16} molar sulfide ions are added to the solution, which of the following will precipitate out first? Given, Ksp of MnS,FeS,HgS,ZnS are 10^{-15}, 10^{-20}, 10^{-23}, 10^{-53} respectively.

    (a) FeS (b) MnS (c) HgS (d) ZnS

29. How many aliphatic hydrocarbons are possible with the molecular formula $C_4H_{10}O$

    (a) 6 (b) 7 (c) 8 (d) 10

30. The pH of hot boiling water is (approximately):-

    (a) Greater than 7

    (b) Less than 7

    (c) 7

    (d) Cannot be predicted

31. What is the pH of 0.50 M aqueous NaCN solution? pKb of CN^- is 4.70.

    (a) 12.4 (b) 3.5 (c) 11.5 (d) 8.6

32. A polytropic process is a thermodynamic process that obeys the relation PV^n=K where P is pressure, V is volume, n is polytropic index, K is constant. Then for 2 moles of gas undergoing a reversible process where

    (a) $n = \gamma, \Delta W = \frac{P_1V_1 - P_2V_2}{\gamma - 1}$

    (b) $n = 3, \Delta W = \frac{2R(T_2 - T_1)}{2}$

    (c) $n = \gamma \Delta Q = 0$

    (d) $n = 3R(T_1 - T_2$

Space for rough work

33. Arrange the bonds in order of increasing ionic character in the molecules: LiF; K_2O; N_2; SO_2 and ClF_3.

    (a) LiF; K_2O; N_2; SO_2; ClF_3

    (b) SO_2; ClF_3; LiF; K_2O; N_2

    (c) K2O; N_2; SO_2; ClF_3; LiF

    (d) N_2; ClF_3; K_2O; LiF

34. Which of the following statements about buffer solutions are wrong?

    (a) Weak acids and their salts form a buffer for pH¡7

    (b) Weak bases and their salts form a buffer with pH¿7

    (c) A buffer solution loses its usefulness when one component of the buffer pair is less than 10

    (d) For most effective buffers, in the acidic range or basic range, The two components of the buffer pair should have almost the same mass per unit volume.

35. Which of the following has the most acidic proton:

    (a) 49 gm/mol

    (b) 58 gm/mol

    (c) 55 gm/mol

    (d) 53 gm/mol

36. The correct statement about OSF_4 is:-

    (a) S has sp^3d^2 hybridisation

    (b) It has square pyramidal geometry

    (c) O occupies axial position

    (d) O has sp^3 hybridisation

37. Entropy is defined as the total energy unavailable for being converted into work, or the degree of 'randomness'. Which of the following changes are accompanied by an increase in entropy?

    (a) Boiling of egg

    (b) Freezing of water

    (c) Formation of ammonia from H2 and N2

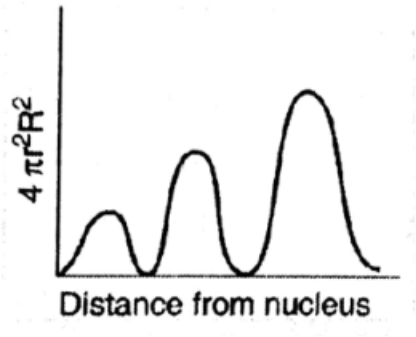
    (d) Crystallization of cane sugar

Space for rough work

38. For the wave function of hydrogen,

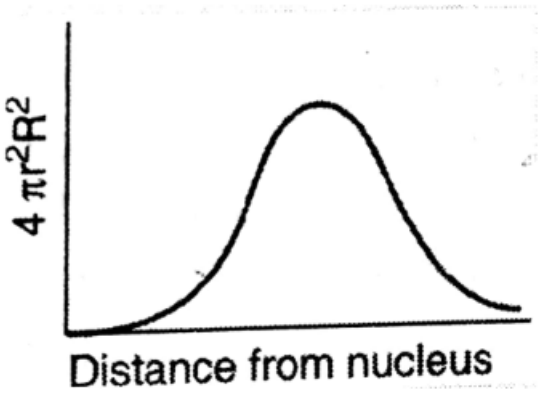
$$\Psi_{3s} = \frac{1}{81\pi}\left(\frac{1}{a_0^{3/2}}\right)\left[27 - \frac{18h}{a_0} + \frac{2h^2}{a_0^2}\right] e^{-r/3a_0}$$

(a) The probability distribution function plotted against radial distance is



(b) The radial node is $27^{1/2}a^{\circ}$

(c) The probability distribution function plotted against radial distance is



(d) The number of angular nodes is 0

Space for rough work

39. A gas cylinder of capacity 20 litres contains a hypothetical combustible gas at a pressure of 4.5 atm at room temperature.The calorific value of the gas is 50 kilojoule/Kg. What is the work that can be done using the gas in the cylinder at STP before it needs refilling? Molar mass of the gas is 20 gm/mole.

(a) 28.25 kJ

(b) 30kJ

(c) 22.32kJ

(d) 27.9kJ

40. H^+ concentration of 0.2 molar solution of formic acid is 6.4×10^{-3}mol/litre. To this solution sodium formate is added so that its concentration is 1 mol/litre. Find the pH of this solution.

$$K\alpha_{HCOOH} = 2.4 \times 10^{-4}$$
$$\alpha_{HCOONa} = 0.75$$

(a) 4.0

(b) 3.89

(c) 4.19

(d) 4.56

Space for rough work

41. $y = \sqrt{x + \sqrt{x + \sqrt{x}...}}$
Then what is $\frac{dy}{dx}$ in terms of y?

(a) $\frac{1}{2y-1}$ (b) $\frac{1}{2y+1}$ (c) $\frac{1}{2\sqrt{y}}$ (d) None of the above

42. $f(x+y) = f(x) + f(y)$
$f(5) = 10 f'(0) = 6$
What is f'(5)?

(a) 0 (b) 16 (c) 4 (d) 60

43. If $\sin\alpha$ and $\cos\alpha$ are the roots of $px^2 + qx + r = 0$
Then what is the relation between p, q, r?

(a) $p^2 + q^2 + 2pr = 0$
(b) $p^2 + q^2 - 2pr = 0$
(c) $(p+r)^2 = q^2 - r^2$
(d) $(p-r)^2 = q^2 + r^2$

44. if $T = \Sigma_{k=1}^{n} \frac{1}{k}$ and
$Y =_1^n C - \binom{n}{2} * \frac{1}{2} + ...(-1)^{n-1} * \binom{n}{n}C * \frac{1}{n}$
If $T = kY$, where k is a real number. Find k

(a) 0.5 (b) 1 (c) -1 (d) -0.5

45. $\lim \sin \pi\sqrt{n^2 + n + 1} =$

(a) 1 (b) $\frac{2}{3}$ (c) $\frac{1}{2}$ (d) $\sqrt{\frac{3}{4}}$

46. If $\frac{(_{n-1}^{n}C)^6 + (_{k}^{n}C)^6 + (_{n+1}^{n+3}C))^3}{3((_{k}^{n-2}C)^2) * (_{2}^{n+3}C)} = n^2$
Then what is the possible solution (n,k):

(a) $(6,3)$ (b) $(6,2)$ (c) $(2,4)$ (d) $(4,2)$

Space for rough work

47. Let a,b,c be integers in AP with $a - c = 2$.
If ω is a cube root of 1 excluding 1 itself and $\alpha^{\frac{1}{3}}$ be the minimum value of $|a\omega^2 + b\omega + c| + |a + b\omega^2 + c\omega|$ Then α is:

(a) 1624 (b) 1728 (c) 432 (d) 442

48. $f(x) = ax^3 + bx^2 + cx + d, d > 0$
Given i) $a + b + c + d = -4$ ii) $3a + 2b + c = 0$
What conclusion can you draw about f(x)?

(a) No root in [0,1]
(b) Exactly one root in [0,1]
(c) All three roots in [0,1]
(d) No conclusion

49. A polygon has 44 diagonals. How many sides does the diagonal have?

(a) 10 (b) 11 (c) 12 (d) 13

50. If A gets 1 B gets 4 and C gets 7 cookies and so on in an Arithmetic Progression. How many cookies are required so that person K gets his share of cookies?

(a) 145 (b) 210 (c) 176 (d) 150

51. If $f(x + 1) + f(x - 1) = 2f(x)$ $f(o) = 0$
Then $f(5) = -5k$
find k (f(1) is a fixed real number for the function f)

(a) f(-1) (b) f(1) (c) 0 (d) 1

52. if $\alpha \neq \beta$ and $\alpha, \beta \neq 1$.
f(x)= $\alpha^n + \beta^n$ and $\begin{matrix} 3 & 1+f(1) & 1+f(2) \\ 1+f(1) & 1+f(2) & 1+f(3) \\ 1+f(2) & 1+f(3) & 1+f(4) \end{matrix}$
has determinant to be $k(1 - \alpha)^2(1 - \beta)^2(\alpha - \beta)^2$
then find k

(a) 1 (b) -1 (c) $\alpha\beta$ (d) $\frac{1}{\alpha\beta}$

Space for rough work

53. If $5(\tan^2(\theta) - \cos^2(\theta)) = 2\cos(2\theta) + 9$
Then, the value of $\cos(4\theta)$ is

(a) $\frac{-3}{5}$ (b) $\frac{4}{5}$ (c) $\frac{2}{9}$ (d) $\frac{-7}{9}$

54. The shortest distance between the parabola $y^2 = 4x$ and $x^2 + y^2 + 6x - 12y + 20 = 0$

(a) $4\sqrt{2} + 5$ (b) $4\sqrt{2} - 5$ (c) $2\sqrt{2} + 5$ (d) $2\sqrt{2} - 5$

55. What is the largest n such that the region represented by the
set{w is a complex number$||w - 4 - i| \leq n\}$ is contained in the
set{z is a complx number$||z - 1| \leq |z + i|\}isequalto$

(a) $2\sqrt{2}$ (b) $\frac{5}{\sqrt{2}}$ (c) $\sqrt{17}$ (d) $\frac{3}{\sqrt{2}}$

56. Let α and β be two complex numbers. Then $T_{(a,b)}$ is a function from complex numbers to the real numbers defined by $T_{(\alpha,\beta)}(z) = |z - \alpha| + |z - \beta|$
Now all the z satisfying equation $T_{(\pi,2\sqrt{2})} = \frac{1}{2010}$

(a) circle (b) eclipse (c) hyperbola (d) Straight line

57. σ is an ellipse with eccentricity e and equation $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1(a > b)$
now , normal at a variable point p on σ meets the axes of the ellipse at A_p and B_p
the conic produced by the midpoint of the line joining A_pB_p is a conic eccentricity ϵ. then,

(a) a,e and ϵ are independent
(b) $e = \epsilon$
(c) $e = \frac{1}{\epsilon}$
(d) $\epsilon = 1$

58. p is a parabola with equation $Y^2 = 4aX$. Now (α, β) is a point satisfying $(\alpha - 2a)^{2019} < 0$
and $27a\beta^2 - 4(\beta - 2a)^3 < -(2019!)$
Now, the number of distinct normals that can be drawn from (α, β) to P is :

(a) 3 (b) 2 (c) 1 (d) 0

Space for rough work

59. There are 12 intermediate stations between Cuttack and Bhubaneswar.A train can be made to stop at 4 of these 12 stations in n ways provided none of these 4 stations must be consecutive stations.Then, Then,the sum of the digits of n is:

(a) 6 (b) 7 (c) 8 (d) 9

60. If $\frac{\sin x+\cos x}{\sin x-\cos x} = \frac{\alpha}{\tan x+\beta}$ then, $\alpha^2 + \beta^2$ equals?

(a) 2 (b) 5 (c) 1 (d) 8

Space for rough work

Part D- BIOLOGY

61. Varicose veins are those veins in which valves do not close properly, so the blood starts flowing backward. The condition most commonly appears in the legs and feet, with blue, dark and purple appearance. Why?

    (a) a.Legs are situated at the greatest distance from the heart, as compared to other organs.

    (b) The longest bone, Femur is present in the legs.

    (c) Increased blood pressure in the lower veins

    (d) None of these

62. Rahul wants to prepare a recipe, that needs ripe tomatoes, on Monday. On Sunday night, he finds out that he only has five unripe tomatoes in his refrigerator. What should he do to ripen the tomatoes he has?

    (a) Keep the tomatoes outside the refrigerator overnight

    (b) Store bananas and tomatoes together in the fridge

    (c) Reduce the temperature of the fridge

    (d) Store the tomatoes separately inside the fridge

63. A diploid(2n) organism contains 6 chromosomes. Assuming that there are no crossover recombination events and all genes are present in heterozygous pairs, how many different kinds of gametes(n) will be formed through meiosis?

    (a) 6 (b) 9 (c) 12 (d) 8

64. A healthy person undergoes haemodialysis. Subsequently, the person dies. An investigation reveals that the dialysis machine was contaminated with a lethal amount of Arsenic. In an autopsy, where would you expect to find high concentrations of Arsenic in his body?

    (a) Kidney

    (b) Liver

    (c) Uniformly distributed in the whole body

    (d) Uniformly distributed in the whole body, but absent in kidney

Space for rough work

65. One day, Priya's biology teacher told her that the human cornea is not vascularised, but she pondered how does cornea meet its gaseous requirements and nutrition. How will you clear her doubts?

    (a) Diffusion occurs from the tear fluid at the outside and the aqueous humor at the inside

    (b) Cornea is a dead tissue

    (c) The teacher is wrong because our cornea is vascularised

    (d) Cornea does not require nutrition

66. Reptiles were very successful on land while amphibians were not. What evolutionary development was primarily responsible for the success of reptiles on land?

    (a) Scales over skin (b) Thoracic breathing

    (c) Amniotic egg (d) Strong jaws

67. If the egg of an organism has 10 pg of DNA in its nucleus. How much DNA would a diploid cell of the same organism have in the G2-Phase of meiosis?

    (a) 10pg (b) 5pg (c) 20pg (d) 40pg

68. How many ATPs are liberated from the conversion of one citric acid to oxaloacetic acid through Electron Transport System?

    (a) 10 (b) 11 (c) 12 (d) 16

69. The human heart is called myogenic i.e. it has the ability to contract independent of the nervous input. Let us suppose an assassin(a professional killer) with his special assassin skills directly takes out the entire heart of a person. What will happen to the heart immediately after it is completely taken out of the body?

    (a) It will stop beating immediately

    (b) Will beat for a short time and then stops

    (c) Continue beating for a long time

    (d) Will burst like a bubble

Space for rough work

70. Every bacteriophage attacks a specific species of bacterium and sometimes, not even different strains. As more and more bacteria are developing resistance against available antibiotics, people are thinking of substituting antibiotics with bacteriophages. Yet it is not commercialized as a proper medication. From the following options, which is not the reason for limiting its extensive use:

    (a) These viruses can also attack human cells

    (b) Very costly to develop as of now

    (c) Manipulating bacteriophage is extremely hard

    (d) None of the above

71. If in a controlled environment maintaining autumn season for the entire time we grew a Pinus tree. Which of the following will definitely occur?

    (a) The tree won't grow

    (b) The tree will die sooner

    (c) No annual rings will be observed

    (d) The tree will be harder than the normal

72. In 2006, a woman named Lydia Angiyou saved several children by fighting a polar bear until a local hunter shot it. This presentation of superhuman strength is known as Hysteric Strength and is a display of extreme strength by humans, beyond what is believed to be normal. It usually occurs when people are in a life-and-death situation. Which of the following hormone do you think is responsible for this phenomenon?

    (a) Melatonin (b) thyroxine (c) Adrenaline (d) Testosterone

73. Transcription is the making of RNA from DNA. Some organisms can also make DNA from RNA using a process known as reverse transcription. From the following organisms, which is most likely to have this mechanism of reverse transcription?

    (a) Bacteria (b) Nerve cell (c) DNA virus (d) RNA virus

74. Pick the odd one out:

    (a) Sweet potato (b) potato (c) Ginger (d) Zaminkand

Space for rough work

75. Two media, one containing heavy water and the other containing normal water, are separated by a semi-permeable membrane. Which of the following will be observed if the two media are isotonic to each other, after leaving the apparatus for some time?

    (a) No overall water movement.

    (b) Both the media contain heavy water.

    (c) Both the media contain normal water.

    (d) All of the above.

76. A line is drawn from the exterior of an animal cell to the center of the nucleus, crossing through one mitochondria. What is the minimum number of membrane bilayers that the line will cross?

    (a) 4 (b) 3 (c) 5 (d) 6

77. Suppose you are Peter currently working under a pharmaceutical company named Stark Pharma. You were working on evolving the WBCs to function as guided nanobots but the company stopped funding your work when they found about your research, and they tried to destroy your work. For preventing your work from being destroyed you injected those cells into your body. Now, you can modify your body cells and their function on your wish. Considering no side effects will occur, which command will you give these cells to get a super memory (remember everything):

    (a) Change all the chemical synapse to electrical synapse

    (b) Shutting down the filter that decides which information is not necessary to retain.

    (c) Supplying blood directly to CNS.

    (d) Giving the neurons the ability to divide.

78. Shubham was having a high fever, so his friends visited his home to meet him and they found that his mother was giving wet cloth treatment to his head on the doctor's recommendation. Shubham asked his friends for a valid reason for the treatment, and Harshit answered it in terms of enzymatic activity. He explained it with the help of a graph between enzymatic activity and temperature. Choose the correct shape of the graph and the maxima in terms of normal body temperature for a human. Also, assuming that the activity of a particular brain enzyme was halved at 104 degrees Fahrenheit, then at what temperature less than optimum temperature, would the activity will be again halved?

    (a) Bell-shaped, 98.6°F; 96°F

    (b) Parabola, 98.6°F; 96 °F

    (c) Parabola, 98.6 °F; 93.2 °F

    (d) Bell-shaped, 98.6 °F; 93.2 °F

Space for rough work

79. A cell is taken from Arabidopsis thaliana (Thale cress), an Asian weed, and is put in the following solutions:
A: ψ_p = 2 Pa; ψ_s = -1.8 Pa
B: ψ_p = 8 10 -10 GPa; ψ_s = -8000 mPa
C: ψ_p = 5 Pa; Ψ_s = -3.250 103 mPa
Where ψ_p is pressure potential and ψ_s is solute potential What will be the state of the cell in these solutions assuming the cell to be at a water potential of +1 Pa in solution A, B, and C respectively?

    (a) Shrinked, Turgid, Turgid

    (b) Turgid, Shrinked, Turgid

    (c) Shrinked, Shrinked, Turgid

    (d) Turgid, Turgid, Shrinked

80. Considering the average molecular mass of a base to be 500 Da, what is the molecular mass of a double-stranded DNA of 100 base pairs? Also calculate the number of helical turns if at each base pair, the strand turns 36°

    (a) 500 Da; 50 turns

    (b) 100 kDa; 10 turns

    (c) 10 kDa; 1 turns

    (d) 500 kDa; 50 turns

Space for rough work

Space for rough work

Space for rough work

END OF QUESTIONS