LPUNEST 2022

Previous Year Question Paper of LPUNEST (B.Tech)

Section – English

This section contains **30 Multiple Choice Questions**. Each question has four choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

1. Select the answer choice that identifies the noun in the sentence.
It will take all of your energy and will to be able to walk again.
a) take b) all c) energy d) your

2. What does 'it' refer to?
Dad, can you take my coat and drop it off at the dry cleaner's?
a) Dad b) Dry cleaner's c) Coat d) Drop

3. Choose the correct order of adjectives to fill the blank.
He was wearing a _____ shirt.
a) flannel old dirty b) old dirty flannel c) dirty old flannel d) old flannel dirty

4. Which kind of adverb is the word in capitals?
"The watchman FREQUENTLY makes a round of the office building."
a) Adverb of Place b) Adverb of Degree
c) Adverb of Time/Frequency d) Adverb of Manner

5. Choose the right option to fill the gap.
At three o'clock tomorrow, I _____ in my office.
a) Working b) Will be working
c) 'll be working d) Both Will be working and 'll be working

6. Choose the right option to fill the gap.
Trish Stratus _____ women's championship by the time she turns 32.
a) Will win b) Would win c) Will have won d) Will be won

7. Choose the right option to fill the gap.
The train _____ very soon.
a) arrive b) will have arrived
c) will arrive d) both will have arrived and will arrive

8. Choose the right modal verb.
There are plenty of dresses in the almirah. You _____ buy any.
a) will not b) must not c) may not d) should not

9. Choose the incorrect use of modal verb.
a) Arif wouldn't eat garlic when he was a kid.
b) Arif wouldn't eat garlic when he is a kid.
c) Arif will not eat garlic when he was a kid.
d) Arif wouldn't eat garlic when he will a kid.

10. The sentence below contains an error. Identify the error and choose the correct option.
For Seema, Mohan is too important for tolerating any delay.
a) At tolerating b) With tolerating c) To tolerating d) To tolerate

11. Select the answer choice that identifies the noun in the sentence.
The works of many great poets have been placed on reserve.
a) many b) great c) placed d) reserve

12. What does 'it' refer to?
They've just closed the post office and turned it into a coffee shop.
a) They b) Post office c) Coffee shop d) Closed

13. Choose the correct order of adjectives to fill the blank.
Pass me the _____ cups.

a) plastic blue big b) plastic big blue c) big blue plastic d) big blue plastic

14. Which kind of adverb is the word in capitals?
"When he knocked on the door, he was asked to come INSIDE."
a) Adverb of Manner b) Adverb of Time/Frequency
c) Adverb of Place d) Adverb of Degree

15. Choose the right option to fill the gap.
At eight o'clock next week, you _____ on the beach.
a) lying b) lied c) will be lying d) will be laying

16. Choose the right option to fill the gap.
Ronda Rousey _____ her flat by the time you reach your home.
a) Will have reached b) Is reaching c) Would have reached d) Will reach

17. Choose the right option to fill the gap.
I _____ the Hollywood movie The Predator tomorrow.
a) will watch b) watch c) will have watched d) both a and c

18. Select the answer choice that identifies the noun in the sentence.
The Brooklyn Bridge was opened in 1883.
a) Bridge b) was c) opened d) in

19. What does 'it' refer to?
I put my coffee cup on the shelf next to the phone and now it's gone!
a) Coffee cup b) Phone c) Shelf d) Both a and b

20. Choose the correct order of adjectives to fill the blank.
All the girls fell in love with the _____ teacher.
a) handsome new American b) American new handsome
c) new handsome American d) American handsome new

21. Which kind of adverb is the word in capitals?
"The airline passengers were COMPLETELY exhausted after their long flight."
a) Adverb of Manner b) Adverb of Time/Frequency
c) Adverb of Place d) Adverb of Degree

22. Choose the right option to fill the gap.
At five o'clock day after tomorrow, he _____ for the train.
a) wait b) has waited c) will have been waiting d) will be waiting

23. Choose the right option to fill the gap.
Romeo_____a new car when you meet him tomorrow in the showroom.
a) Will be purchasing b) Purchase c) Will have purchased d) Both a and c

24. Choose the right option to fill the gap.
Ranveer _____ PTE in December.
a) Will qualify b) Will be qualified c) Will have qualify d) Will have been qualifying

25. Select the answer choice that identifies the noun in the sentence.
Sparta and Athens were enemies during the Peloponnesian War.
a) and b) were c) during d) war

26. What does 'they' refer to?
I asked at several shops for strawberries and the owners all told me they are out of season.
a) Shops b) Strawberries c) Owners d) Season

27. Choose the correct order of adjectives to fill the blank.
I used to drive _____ car.
a) a blue old German b) an old German blue

c) an old blue German d) a old German blue

28. Which kind of adverb is the word in capitals?
"Arvind coughed LOUDLY to attract attention."
a) Adverb of Place b) Adverb of Degree
c) Adverb of Time/Frequency d) Adverb of Manner

29. Choose the right option to fill the gap.
By the time you reach New Jersey, she _____ in New York.
a) Will shop b) Will be shopping c) Will be shipping d) Both b and c

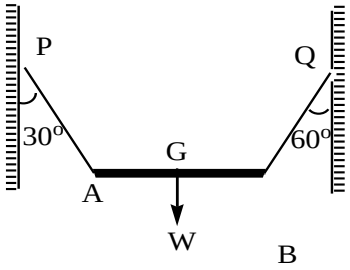
30. Choose the right option to fill the gap.
My cousin _____ her enrollment in the Indian military by the time I graduate
a) Will have completing b) Will have complete
c) Will have completed d) Will have been completing

Section – Physics

This section contains **30 Questions (25 Multiple Choice Questions and 5 Fill in the Blanks)**. Each **Multiple choice question** has four choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct. For **Fill in the Blank** type question, enter the correct numerical value upto TWO decimal places.

1. A bullet of mass 50gm is fired from a gun of mass 2kg.If the total KE produced is 2050J the energy of the bullet and the gun separately are
a) 200J, 5J b) 2000J, 50J c) 5J, 200J d) 50J, 2000J

2. A non-uniform rod AB of weight w is supported horizontally in a vertical plane by two light strings PA and PB as shown in the figure. G is the centre of gravity of the rod. If PA and PB make angles 30° and 60° respectively with the vertical, the ratio $\frac{AG}{GB}$ is



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

3. If I_1 is the moment of inertia of a thin rod about an axis perpendicular to its length and passing through its centre of mass and I_2 is the moment of inertia of ring about an axis perpendicular to plane of ring and passing through its centre formed by bending the rod, then
a) $\frac{I_1}{I_2}=\frac{3}{\pi^2}$ b) $\frac{I_1}{I_2}=\frac{2}{\pi^2}$ c) $\frac{I_1}{I_2}=\frac{\pi^2}{2}$ d) $\frac{I_1}{I_2}=\frac{\pi^2}{3}$

4. Object distance, u = (50.1 ± 0.5) cm and image distance v = (20.1 ± 0.2) cm then focal length is
a) (12.4 ± 0.4) cm b) (12.4 ± 0.1) cm c) (14.3 ± 0.4) cm d) (14.3 ± 0.1) cm

5. For motion of an object along the x axis. The velocity V depends on the displacement x as $V = 3x^2-2x$. Then what is the acceleration at x=2m?
a) 48 m/s^2 b) 80 m/s^2 c) 18 m/s^2 d) 10 m/s^2

6. Vector $\bar{a}$ and $\bar{b}$ include an angle θ between them if $\left(\bar{a}+\bar{b}\right)$ and $\left(\bar{a}-\bar{b}\right)$ respectively subtend angle α and β with $\bar{a}$,then $\left(\tan\alpha+\tan\beta\right)$ is

a) $\frac{ab\sin\theta}{a^2+b^2\cos^2\theta}$ b) $\frac{2b\sin\theta}{a^2-b^2\cos^2\theta}$ c) $\frac{a^2\sin^2\theta}{a^2+b^2\cos^2\theta}$ d) $\frac{b^2\sin^2\theta}{a^2-b^2\cos^2\theta}$

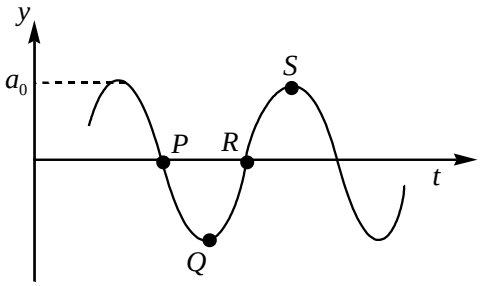
7. The mass of a spaceship in 1000kg. It is to be launched from the earth's surface out into free space. The value of 'g' and 'R' (radius of earth) are 10 m/s^2 and 6400 km respectively. The required energy of this work will be:

a) 6.4 × 10^{11} Joules b) 6.4 × 10^{8} Joules c) 6.4 × 10^{9} Joules d) 6.4 × 10^{10} Joules

8. A particle of mass 10 gm is in a potential Field given by V = $\left(50x^2 + 100\right)$ J/kg. The frequency of its oscillation in cycle/sec is

a) $\frac{10}{\pi}$ b) $\frac{5}{\pi}$ c) $\frac{100}{\pi}$ d) $\frac{50}{\pi}$

9. A wave motion has the function $y = a_0\sin(\omega t - kx)$. The graph in figure shows how the displacement y at a fixed point varies with time t. Which one of the labelled points shown a displacement equal to that at the position $x = \frac{\pi}{2k}$ at time $t = 0$?

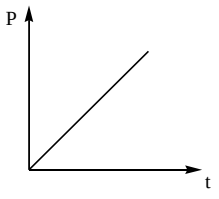


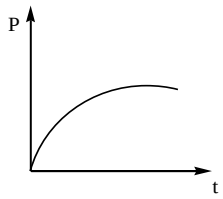
a) P b) Q c) R d) S

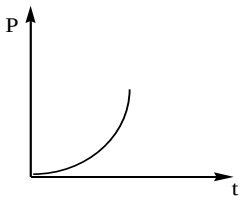
10. A balloon of mass M is descending at a constant acceleration α. When a mass m is released from the balloon it starts rising with the same acceleration α. Assuming that its volume does not change, what is the value of m?

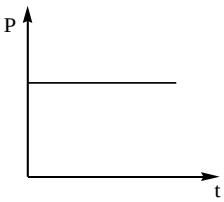
a) $\left(\frac{\alpha}{\alpha+g}\right)M$ b) $\left(\frac{2\alpha}{\alpha+g}\right)M$ c) $\left(\frac{\alpha+g}{\alpha}\right)M$ d) $\left(\frac{\alpha+g}{2\alpha}\right)M$

11. A motor drives a body along a straight line with a constant force. The power P developed by the motor must vary with time t as

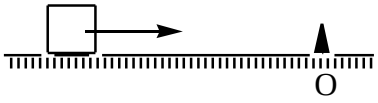
a)


b)


c)


d)


12. A cubical block of side 'a' is moving with velocity 'v' on a horizontal smooth plane as shown in figure. It hits a ridge at point O. The angular speed of the block after it hits 'O' is



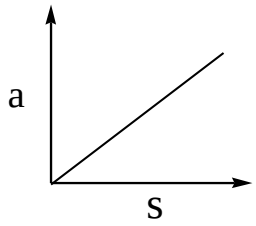
a) $\frac{3v}{4a}$ b) $\frac{3v}{2a}$ c) $\sqrt{\frac{3}{2}}a$ d) $\frac{4v}{3a}$

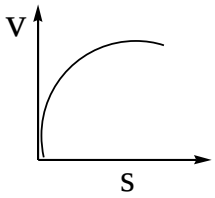
13. A particle of mass m=5 unit is moving with a uniform speed $v = 3\sqrt{2}$ unit is x-y plane along

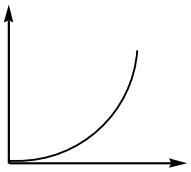
the line y=x+4. The magnitude of angular momentum about origin is

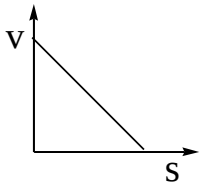
a) Zero b) 60 units c) 7.5 units d) $40\sqrt{2}$ units

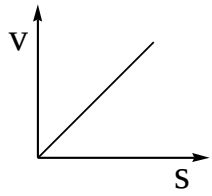
14. Acceleration (a) – displacement (s) graph of a particle moving in a straight line is as shown in figure. The initial displace velocity of the particle is zero. The v-s graph of the particle would be?



a) 

b) 

c) 

d) 

15. If $\overline{A}+\overline{B}+\overline{C}=0$ then $\overline{A}\times\overline{B}$ is equal to

a) $\overline{B}\times\overline{C}$ b) $\overline{C}\times\overline{B}$ c) $\overline{A}\times\overline{C}$ d) None of these

16. A particle is released from a height H. At certain height its kinetic energy is two times its potential energy. Height and speed of particle at that instant are

a) $\frac{H}{3},\sqrt{\frac{2gH}{3}}$ b) $\frac{H}{3},2\sqrt{\frac{gH}{3}}$ c) $\frac{2H}{3},\sqrt{\frac{2gH}{3}}$ d) $\frac{H}{3},\sqrt{2gH}$

17. A ladder of length *l* and mass *m* is placed against a smooth vertical wall, but the ground is not smooth. Coefficient of friction between the ground and ladder is μ. The angle θ at which the ladder will stay in equilibrium is

a) $\theta = \tan^{-1}(\mu)$ b) $\theta = \tan^{-1}(2\mu)$ c) $\theta=\tan^{-1}\left(\frac{\mu}{2}\right)$ d) $\theta=\tan^{-1}\left(\frac{1}{2\mu}\right)$

18. A solid sphere and a solid cylinder of same mass are rolled down on two inclined planes of heights h_1 & h_2. If at the bottom of the plane of two objects have same linear velocities, then ratio of h_1 to h_2 is

a) 2 : 3 b) 7 : 5 c) 14 : 15 d) 15 : 14

19. You measure two quantities as A = 1.0 m ± 0.2 m, B = 2.0 m ± 0.2 m. What should report correct value for $\sqrt{AB}$ as

a) 1.4 m ± 0.4 m b) 1.41 m ± 0.51 m c) 1.4 m ± 0.3 m d) 1.4 m ± 0.2 m

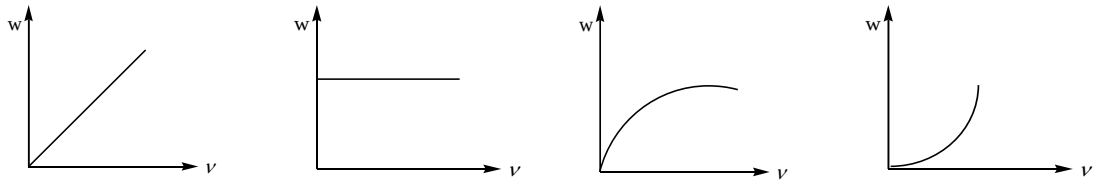
20. The area of the acceleration displacement curve of a body gives

a) Impulse b) Changing momentum per unit mass

c) Change in K.E per unit mass d) Total change in energy

21. A particle at rest on a frictionless table is acted upon by a horizontal force which is constant in magnitude and direction. A graph is plotted for the work done on the particle W, against the speed of the particle v. If there are no frictional forces acting on the particle the graph will look like

a) b) c) d)



22. A uniform rod of length L and mass 3m is held vertically hinged at its base. A mass 'm' moving horizontally with a velocity v strikes the rod at the top and sticks to it. The angular velocity with which the rod hits the ground is

a) $\sqrt{\frac{5g}{L}+\frac{v^2}{L^2}}$ b) $\sqrt{\frac{5g}{2L}+\frac{v^2}{4L^2}}$ c) $\sqrt{\frac{g}{2L}+\frac{v^2}{L^2}}$ d) $\sqrt{\frac{g}{5L}+\frac{4v^2}{L^2}}$

23. Moment of inertia of a thin rod of mass M and length L about an axis passing through its centre is $\frac{ML^2}{12}$. Its moment of inertia about a parallel axis at a distance of $\frac{L}{4}$ from this axis is given by

a) $\frac{ML^2}{48}$ b) $\frac{ML^3}{48}$ c) $\frac{ML^2}{12}$ d) $\frac{7ML^2}{48}$

24. In the relation y = rsin(ωt – kx), the dimensional formula of ω/k are

a) $[M^0 L^0 T^0]$ b) $[M^0 L^1 T^{-1}]$ c) $[M^0 L^0 T^1]$ d) $[M^0 L^1 T^0]$

25. A juggler maintains four balls in motion making each of them to rise a height of 20m from his hand. What time interval should be maintained for the proper distance between them?

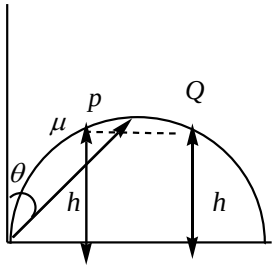
a) 1.5s b) $\frac{3}{2}s$ c) 1s d) 2s

26. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places. (For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)

A mass of 3kg descending vertically downwards supports a mass of 2kg by means of a light string passing over a pulley. At the end of 5s the string breaks. How much high from now the 2kg mass will go? _____m

27. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places. (For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)

A particle is thrown with velocity u making angle θ with vertical, it just crosses the top of two poles each of height h after 1s and 3s respectively. The maximum height of projectile is_____



28. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places. (For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)

An elevator and its load have a total mass of 800kg. If the elevator, originally moving downward at $10ms^{-1}$ is brought to rest-with constant deceleration in a distance of 25m, the tension in the supporting cable will be_____N [take $g=10ms^{-2}$].

29. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.

(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)

A mass of 50 kg is raised through certain height by a machine whose efficiency is 90%, the energy spent is 5000J. If the mass is now released, its KE on hitting the ground shall be_____J

30. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.

(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)

Number of significant figures in (3.20 + 4.80) x 10^5=_____

Section – Chemistry

This section contains **30 Questions (25 Multiple Choice Questions and 5 Fill in the Blanks)**. Each **Multiple choice question** has four choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct. For **Fill in the Blank** type question, enter the correct numerical value upto TWO decimal places.

1. After rounding 1.245 and 1.235 to three significant figures, we will have their answers respectively as

a) 1.24, 1.23 b) 1.23, 1.23 c) 1.23, 1.24 d) 1.24, 1.24

2. A manifestation of surface tension is:

a) Spherical shape of liquid drops b) Down ward movement of water in soils

c) Fall of liquid in a capillary tube d) All of these

3. In hydrogen atom, energy of electron in ground state is 13.6 eV, then energy of electron in second excited state is

a) 1.51 eV b) 3.4 eV c) 6.04 eV d) 13.5 eV

4. Octet rule is not followed in

a) CCl_4, N_2O_4 and N_2O_5 b) BF_3, $BeCl_2$ and NO_2

c) NaCl, $MgCl_2$, MgO d) PCl_3, NH_3, H_2O

5. The enthalpy of vaporization of liquid is 30 kJ mol^{-1} and entropy of vaporization is $75JK^{-1}mol^{-1}$. The boiling point of the liquid at 1atm is

a) 250 K b) 400 K c) 450 K d) 600 K

6. The solubility of N_2(g) in water exposed to the atmosphere, when the partial pressure is 593mm, is 5.3×10^{-4}M . Its solubility at 760mm and at the same temperature is

a) $4.1\times10^{-4}M$ b) $6.8\times10^{-4}M$ c) $1500M$ d) $2400M$

7. The Degree of disassociation 'α' of the reaction $N_2O_4 \underset{(g)}{} \rightleftharpoons 2NO_2 \underset{(g)}{}$ can be related to K_p as

a) $\alpha = \dfrac{\frac{K_p}{P}}{4+\frac{K_p}{P}}$ b) $\dfrac{K_p}{4+K_p}$ c) $\left[\dfrac{\frac{K_p}{P}}{4+\frac{K_p}{P}}\right]^{1/2}$ d) $\alpha = \left(\dfrac{K_p}{4+K_p}\right)^{\frac{1}{2}}$

8. $MnO_4^- + Br^- + H_2O \rightarrow MnO_2 + BrO_3^- + OH^-$ In balanced reaction the coefficients of $MnO_4^-, BrO_3^- and OH^-$ are respectively:

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

9. The half-life of a first order chemical reaction is 60 hrs at 300 K. As temperature is increased to 310 K, half-life becomes 40 hrs. Determine the half-life of same reaction at 350 K.

a) 10 min b) 160 min c) 600 min d) 6 hrs

10. According to Freundlich adsorption isotherm, which of the following is correct?

a) $x/m \propto P^0$ b) $\dfrac{x}{m} \propto P^1$

c) $\frac{x}{m} \propto P^{\frac{1}{n}}$ d) All of these are correct for different ranges of pressure

11. 122.4 L of O_2 at STP has same mass as

a) 11.2 L of Methane at STP b) 22.4 L of Methane at STP

c) 33.6 L of Methane at STP d) 44.8 L of Methane at STP

12. Root mean square velocity of a gas is tripled when the temperature is

a) Reduced to one third b) Reduced to one ninth

c) Increased by three times d) Increased by nine times

13. The ratio of velocities of two photons of wavelengths 2000Å and 4000Å

a) 2: 1 b) 1: 2 c) 1: 4 d) 1: 1

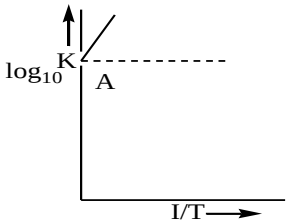
14. Number of bonding pairs (X) and lone pairs (Y) around the central atom in the I_3^- ion is

a) X – 2, Y – 2 b) X – 2, Y – 3 c) X – 3, Y – 2 d) X – 4, Y – 3

15. Consider the following data $\Delta_f H^0\left(N_2H_4,\, l\right) = 50\, kJ/mol$, $\Delta_f H^0\left(NH_3,\, g\right) = -46\, kJ/mol$ B.E (N – H) = 393 kJ/mol and B.E (H – H) = 436 kJ/mol, $\Delta_{vap} H\left(N_2H_4, l\right) = 18\ kJ/mol$. The N – N bond energy in N_2H_4 is

a) 226 kJ/mol b) 154 kJ/mol c) 190 kJ/mol d) None of these

16. Variation of $\log_{10} K$ with $\frac{1}{T}$ is shown by the following graph in which straight line is at 45^0. Hence ΔH^0 is:



a) +4.606 cal b) -4.606 cal c) 2 cal d) -2 cal

17. Vapour density of a compound is 26. It contains carbon and hydrogen atoms in the ratio 1 **:** 1. Its molecular formula is

a) CH b) C_2H_2 c) C_4H_4 d) C_6H_6

18. A real gas deviates least from ideal behaviour at:

a) High pressure and low temperature b) High temperature and low pressure

c) High temperature and high pressure d) Low temperature and low pressure

19. Probability of finding electron in YZ plane for P_x orbital is:

a) 100% b) 0% c) 90% d) 95%

20. In which pair or pairs is the stronger bond found in the first species?

$I: O_2^{2-}, O_2$; $II: N_2, N_2^+$; $III: NO^+, NO^-$

a) I only b) II only c) I and III only d) II and III only

21. Intensive property among the following is:

a) pressure b) Internal energy c) Heat capacity d) Enthalpy

22. Which has the highest boiling point?

a) 0.1 M Na_2SO_4 b) 0.1 M $C_6H_{12}O_6$ (glucose) c) 0.1 M $MgCl_2$ d) 0.1 M $Al(NO_3)_3$

23. Given the following reaction at equilibrium $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$. Some inert gas at constant pressure is added to the system. Predict which of the following facts will be affected

a) More $NH_3(g)$ is produced b) Less $NH_3(g)$ is produced

c) No effect on the equilibrium d) K_p of the reaction is decreased

24. Ratio of average kinetic energies of equal masses of H_2 and He at same temperature is

a) 2:1 b) 1:2 c) 1:1 d) 4:1

25. Orbital angular momentum of electron in ‘p’ orbital is equal to

a) $2\sqrt{3}\hbar$ b) zero c) $\sqrt{6}\hbar$ d) $\sqrt{2}\hbar$

26. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.
(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)

A diatomic molecule has a dipole moment of 1.2D. If the bond distance is 1.0 $\overset{0}{\text{A}}$, fraction of an electronic charge on each atom is_____

27. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.
(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)

The entropy of a sample of a certain substance increases by $0.836JK^{-1}$ on adding reversibly 0.3344J of heat at constant temperature. The temperature of the sample is_____K

28. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.
(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)

Human blood gives rise to an osmotic pressure of approximately 7.65 atm at body temperature, 37°C. Hence, molarity of an intravenous glucose solution be to have the same osmotic pressure as blood is_____M

29. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.
(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)

20.4 g of H_2O_2 solution on decomposition gives 1.68 L of O_2 at STP. Percentage strength by weight of the solution is_____

30. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.
(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)

Elevation in boiling point of an aqueous urea solution is 0.52^0, ($k_b = 0.52^0$ mol $^{-1}$ kg). Hence, mole fraction of urea in this solution is_____

Section – Mathematics

This section contains **30 Questions (25 Multiple Choice Questions and 5 Fill in the Blanks)**. Each **Multiple choice question** has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct. For **Fill in the Blank** type question, enter the correct numerical value upto TWO decimal places.

1. If $X=\left\{8^n-7n-1/\,n\in N\right\}$ and $Y=\left\{49(n-1)/\,n\in N\right\}$,then

a) $X\subset Y$ b) $Y\subset X$ c) $X=Y$ d) Information not sufficient

2. If the relation $R:A\to B$ where $A=\{1,2,3,4\}, B=\{1,3,5\}$ is defined by $R=\{(x,y):x<y,x\in A,y\in B\}$ then $RoR^{-1}=$

a) $\{(1,3),(1,5),(2,3),(2,5),(3,5),(4,5)\}$ b) $\{(3,1),(5,1),(3,2),(5,2),(5,3),(5,4)\}$

c) $\{(3,3),(3,5),(5,3),(5,5)\}$ d) $\{(3,3),(3,4),(4,5)\}$

3. If $2f(x)-3f\left(\frac{1}{x}\right)=x^2, x\neq 0$, then $f(2)=$

a) $-\frac{7}{4}$ b) $\frac{5}{2}$ c) -1 d) 2

4. If $\begin{vmatrix} x^n & x^{n+2} & x^{n+3} \\ y^n & y^{n+2} & y^{n+3} \\ z^n & z^{n+2} & z^{n+3} \end{vmatrix} = (x-y)(y-z)(z-x)\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$ then n is equals to:

a) 1 b) -1 c) 2 d) -2

5. The vectors $\overline{AB} = -3\bar{i} + 4\bar{k}$ and $\overline{AC} = 5\bar{i} - 2\bar{j} + 4\bar{k}$ are the sides of a triangle ABC. The length of the median through A is

a) $\sqrt{72}$ b) $\sqrt{33}$ c) $\sqrt{288}$ d) $\sqrt{18}$

6. The contrapositive of the statement "if $2^2 = 5$, then I got first class" is

a) If I do not get a first class, then $2^2 = 5$ b) If I do not get a first class, then $2^2 \neq 5$

c) If I get a first class, then $2^2 = 5$ d) If I get a first class, then $2^3 = 5$

7. If $A = \{x / x^2 - 5x + 6 = 0\}, B = \{2,4\}, C = \{4,5\}$, then $A \times (B \cap C) =$

a) $\{(2,4),(3,4)\}$ b) $\{(4,5),(4,3)\}$

c) $\{(2,4),(3,4),(4,4)\}$ d $\{(2,2),(3,3),(4,4),(5,5)\}$

8. Let $R = \{(3,3),(6,6),(9,9),(12,12),(6,12),(3,9),(3,12),(3,6)\}$ be relation on the set $A = \{3,6,9,12\}$. The relation is

a) An equialence relation b) Reflexive and symmetric only

c) Reflexive and transitive only d) Reflexive only

9. The graph of the function $y = f(x)$ is symmetrical about the line $x = 2$, then

a) $f(x+2) = f(x-2)$ b) $f(2+x) = f(2-x)$

c) $f(x) = f(-x)$ d) $f(x) = -f(-x)$

10. If z_1, z_2, z_3 are 3 distinct complex numbers a, b, c are three positive real numbers such that $\frac{a}{|z_2 - z_3|} = \frac{b}{|z_3 - z_1|} = \frac{c}{|z_1 - z_2|}$ then $\frac{a^2}{z_2 - z_3} + \frac{b^2}{z_3 - z_1} + \frac{c^2}{z_1 - z_2} =$

a) 1 b) 0 c) $z_1 + z_2 + z_3$ d) $z_1^2 + z_2^2 + z_3^2$

11. Let $S = \{x \in R / x \geq 0 \text{ and } 2|\sqrt{x} - 3| + \sqrt{x}(\sqrt{x} - 6) + 6 = 0\}$ then $S =$

a) Contains exactly one element

b) Contains exactly two elements

c) Contains exactly four elements

d) ϕ

12. If the first term of an A.P, is 2 and the sum of first five terms is equal to one fourth of the sum of the next five terms, then the sum of the first 30 terms is

a) 2550 b) 3000 c) -2550 d) -3000

13. If A=$(a_{ij})_{4x4}$ such that $a_{ij} = \begin{cases} 2 & if \quad i = j \\ 0 & if \quad i \neq j \end{cases}$ then $\left\{\frac{\det(adj(adjA))}{7}\right\}$ is (where { } represents fractional part function)

a) $\frac{1}{7}$ b) $\frac{2}{7}$ c) $\frac{3}{7}$ d) $\frac{4}{7}$

14. A set A has 3 elements and another set B has 6 elements. Then

a) $3 \le n(A \cup B) \le 6$ b) $3 \le n(A \cup B) \le 9$ c) $6 \le n(A \cup B) \le 9$ d) $0 \le n(A \cup B) \le 9$

15. Consider the non-empty set consisting of children in a house, consider a relation R ; xRy if x is brother of y the R is:

a) Symmetric but not transitive b) Transitive but not symmetric and reflexive

c) Neither symmetric nor transitive d) Both symmetric and transitive

16. $f : R \to R$ is a function defined by $f(x) = \frac{e^{|x|} - e^{-x}}{e^{x} + e^{-x}}$. Then f is

a) One – one and into b) One – one not into

c) Onto but not one – one d) Neither one – one nor onto

17. If $\left|\frac{z_1 - 7z_2}{7 - z_1\overline{z}_2}\right| = 1$ and $|z_2| \neq 1$ then $|z_1| \neq$

a) 0 b)1 c)7 d) $\frac{1}{7}$

18. If α be a root of the equation, $4x^2 + 2x - 1 = 0$ then the other root is

a) $-2\alpha - i$ b) $4\alpha^2 + \alpha - 1$ c) $4\alpha^3 - 3\alpha$ d) $4\alpha^2 - 3\alpha$

19. Let $a_1, a_2, a_3 \ldots\ldots\ldots\ldots$ be terms of an A.P. If

$\frac{a_1 + a_2 + \ldots\ldots\ldots\ldots a_p}{a_1 + a_2 + \ldots\ldots\ldots\ldots a_q} = \frac{p^2}{q^2} \quad (p \neq q)$ Then $\frac{a_6}{a_{21}} =$

a) 7/2 b) 2/7 c) 11/41 d) 41/11

20. If $x \neq 0, y \neq 0, z \equiv 0$ and $\begin{vmatrix} 1+x & 1 & 1 \\ 1+y & 1+2y & 1 \\ 1+z & 1+z & 1+3z \end{vmatrix} = 0$ then $x^{-1} + y^{-1} + z^{-1} =$

a) -1 b) -2 c) -3 d) -4

21. If $A = \{(x, y) / x^2 + y^2 \le 4; x, y \in R\}$ and $B = \{(x, y) / x^2 + y^2 \ge 9; x, y \in R\}$,then

a) $A - B = \phi$ b) $B - A = \phi$ c) $A \cap B \neq \phi$ d) $A \cap B = \phi$

22. For $x, y \in R,$ define a relation R by xRy if and only if $x - y + \sqrt{2}$ is an irrational numbers. Then R is

a) An equivalence relation b) Symmetric

c) Transitive d) Reflexive but not symmetric & transitive

23. If $y = \frac{1}{2}\sin^{-1}\left(\frac{2xy}{x^2 + y^2}\right)$ and $y < x$ then $\lim_{y \to 0} x =$

a) -1 b) 0 c) 1 d) ∞

24. z be a complex number satisfying $|z - 5i| \le 1$ such that amp z is minimum then $z =$

a) $1 + i2\sqrt{6}$ b) $\frac{1 + i2\sqrt{6}}{5}$ c) $\frac{2\sqrt{6}}{5}(1 + i2\sqrt{6})$ d) $\frac{2\sqrt{6}}{5}(1 - i2\sqrt{6})$

25. If p, q, r are +ve and are in A.P. the roots of the equation $px^2 + qx + r = 0$ all real for

a) $\left|\frac{r}{p} - 7\right| \ge 4\sqrt{3}$ b) $\left|\frac{p}{r} - 7\right| \ge 4\sqrt{3}$ c) all p and q d) No p and r

26. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.
(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)
After inserting n A.M.'s between 2 and 38, the sum of the resulting progressions is 200. The value of n is _____

27. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.
(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)
If α, β, γ and a, b, c are complex numbers such that $\frac{\alpha}{a}+\frac{\beta}{b}+\frac{\gamma}{c}=1+i$ and $\frac{a}{\alpha}+\frac{b}{\beta}+\frac{c}{\gamma}=0$ then the value of $\frac{\alpha^2}{a^2}+\frac{\beta^2}{b^2}+\frac{\gamma^2}{c^2}=$_____i.

28. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.
(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)
If $\alpha, \beta \in C$ are the distinct roots of the equation $x^2 - x + 1 = 0$ then $\alpha^{101} + \beta^{107}$ is equal to_____

29. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.
(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)
If 7 times of the 7th term of an AP is equal to 11 times of its 11th term, then 18th term of A.P is____

30. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places.
(For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35)
If $A = \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix}, C = \begin{bmatrix} 3 & -4 \\ -2 & 3 \end{bmatrix}$ then the value of the sum
$tr\,(A) + tr\left(\frac{ABC}{2}\right) + tr\left(\frac{A(BC)^2}{4}\right) + tr\left(\frac{A(BC)^3}{8}\right) +$ ____$\infty =$_____

Section – Biology

This section contains **30 Multiple Choice Questions**. Each question has four choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

1. Quality of storing food using simple inorganic material belongs to plants which are
a) heterptrophs b) autotrophs
c) both heterptrophs and autotrophs d) hypotrophs

2. Rank the following animal groups from greater to least (left to right) in the number of described species: Mammalia (mammals), Aves (Birds), Mollusca (clams, snails, etc), and Insecta
a) Mollusca, Aves, Insecta, Mammalia b) Insecta, Mollusca, Aves, Mammalia
c) Insecta, Aves, Mammalia, Mollusca d) Mammalia, Aves, Insecta, Mollusca

3. Epithelium that appears layered due to the varying levels at which nuclei are found in cells, but in reality is not layered, is
a) transitional epithelium b) pseudostratified columnar epithelium
c) stratified squamous epithelium d) stratified columnar epithelium

4. Cell theory states
I. All living cells must have a cell wall.
II. All living cells require glucose for survival.

III. The basic unit of life is a cell.

a) III only b) I and II c) Only I d) None of these

5. Lipids are water insoluble because lipid molecules are

a) Hydrophilic b) Neutral c) Zwitter ions d) Hydrophobic

6. Due to low atmospheric pressure, the rate of transpiration will be

a) Decrease slowly b) Decrease fast c) Increase d) Remain unaffected

7. A trace element essential for plant growth and radioactive isotope which is used in cancer therapy is known as

a) Calcium b) Iron c) Cobalt d) Sodium

8. Quantasomes contain

a) 200 chlorophyll molecules b) 230 chlorophyll molecules

c) 250 chlorophyll molecules d) 300 chlorophyll molecules

9. Glycolysis takes place in

a) Mitochondria b) Peroxisomes c) Cytoplasm d) Glyoxysomes

10. Coconut milk factor is

a) Auxin b) A gibberellins c) Abscisic acid d) Cytokinin

11. There are five kingdoms according to Lynn and Karolene which are Prokaryotes, Protoctista, Fungi, Animalia and

a) eukaryotes b) plantae c) Protista d) vertebrates

12. Deep sea hydrothermal vents are habitats where the primary producers are

a) Organotrophic bacteria b) Chemolithotrophic bacteria

c) Chemoorganotrophs d) Methylotrophs

13. The lining of the vagina is covered with

a) mucus, columnar b) pseudostratified epithelium

c) stratified cuboidal d) stratified squamous

14. Prokaryotic genetic system has

a) Both DNA and histones b) DNA but no histones

c) Neither DNA nor histones d) Either DNA or histones

15. ATP is

a) Vitamin b) Enzyme c) Nucleotide d) Nuclei acid

16. Guard cells help in

a) Protection b) Fighting against infection

c) Guttation d) Transpiration

17. Which one of the following is not an essential element for plants?

a) Iron b) Zinc c) Potassium d) Iodine

18. Which one of the following is an example ex-situ conservation?

a) National park b) Wildlife sanctuary c) Seed bank d) Sacred groves

19. Which of the following traits do not help distinguish animals from others forms of life?

a) The presence of DNA in the cell nucleus

b) The presence of two types of tissues: nervous tissues for impulse conduction and muscle tissue for movement

c) Cell walls that have structural support

d) Both b and c

20. Identify the INCORRECT statement

a) Epithelia are classified by the shape of the epithelial cells in the surface layer

b) The shape of the cells in the surface layer of transitional epithelia is variable

c) In pseudostratified epithelia all epithelial cells are in contact with the basement membrane

d) Desmosomes are an effective barrier to the diffusion of substances across an epithelium

21. Which of the following statements are true about Eukaryotes?

(1) They are cells with a nucleus.
(2) They are found both in humans and multicellular organisms.
(3) Endoplasmic reticulum is present in Eukaryotes.
(4) They have chemically complexed cell wall.

a) (1), (3) and (4) b) (1), (2) and (4) c) (1), (2) and (3) d) All of these

22. Which of the following is non-reducing sugar?

a) Maltose b) Lactose c) Sucrose d) Glucose

23. The water readily available to plants for absorption by roots is

a) Gravitational water b) Capillary water
c) Rain water d) Hygroscopic water

24. Fat soluble vitamins are

a) Soluble in alcohol b) one or more Propene units
c) Stored in liver c) All of these

25. Hot spots are regions of high _____

a) Rarity b) Endemism c) Critically endangered population d) Diversity

26. Arrange the following taxonomic categories in their hierarchical order from highest to lowest (left to right): Genus, Family, Class, Order, Phylum.

a) Phylum, Order, Class, Genus, Family b) Class, Phylum, Order, Family, Genus
c) Order, Phylum, Class, Family, Genus d) Phylum, Class, Order, Family, Genus

27. What is the induction source of development of cellular polarity in epithelial cells?

a) Vinculin b) Occludin c) Basal lamina d) Extra cellular matrix

28. Animal cell differs from plant cells in possessing

a) Plastid b) Entrosome c) Vacoule d) Golgi body

29. Ketose sugar is

a) Galactose b) Fructose c) Mannose d) Glucose

30. The water potential of pure water at atmospheric pressure is

a) Zero bar b) +2.3 bar c) one bar d) -2.3 bar