

LPUNEST 2022 Question Paper

1. Choose the correct article and fill in the blanks:

How many stars are there in _____ sky?

- (A) No article
 - (B) The
 - (C) A
 - (D) Big
-

2. Choose the correct modal verb and fill in the blanks:

Mary _____ been to the supermarket; the cupboards are all full.

- (A) Can
 - (B) Have to
 - (C) Have
 - (D) Must have
-

3. Use the correct form of adjective in the sentence below.

All members of the family were at home for the holidays. What could make for _____ Diwali than that?

- (A) a happy
 - (B) a happier
 - (C) a more happier
 - (D) a happiest
-

4. Identify the adjectival clause in the sentence below.

The trousers which were gifted to me by my father were quite expensive.

- (A) The trousers which were gifted
- (B) The trousers which were gifted to me by my father

- (C) Which were gifted to me
 - (D) Which were gifted to me by my father
-

5. Select the correct conjunction from the choices given to join the sentence.

She cannot walk properly. The doctor removes her plaster.

- (A) as
 - (B) until
 - (C) when
 - (D) although
-

6. Choose the sentence with 'Better' used as a noun.

- (A) My suit is better than yours.
 - (B) We can always learn something from our betters.
 - (C) Our countrymen can better their lot.
 - (D) You have done better by refusing to help him.
-

7. "Myself" is a:

- (A) Relative Pronouns
 - (B) Demonstrative Pronouns
 - (C) Reflexive Pronouns
 - (D) Indefinite Pronouns
-

8. The car was parked in front of the store. Choose the preposition that would be unsuitable to the one underlined.

- (A) Across
 - (B) Next to
 - (C) On
 - (D) At the back
-

9. It is dead now. Identify the interjection which is not appropriate for use.

- (A) Alas!
 - (B) What a pity!
 - (C) Oh!
 - (D) Yay!
-

10. Choose the correct verb to complete the following sentence:

Either two nickels or one dime _____ in the parking meter.

- (A) Work
 - (B) Works
 - (C) are working
 - (D) were working
-

11. Which of these sentences does not contain an adverb?

- (A) The child ran happily towards his mother.
 - (B) Brendan gently woke the sleeping baby.
 - (C) Sali walked to the shops.
 - (D) I visited my mum yesterday.
-

12. Fill in the blanks.

The circumference of a circle _____ 3.14159265 times its diameter no matter how small or large it is.

- (A) Measures
 - (B) Measured
 - (C) Will be measuring
 - (D) Had been measured
-

13. Fill in the blanks.

While mom _____ the VCD I hired, I _____ my assignment.

- (A) Watch / would finish
 - (B) Was going to watch / finishes
 - (C) Was watching / finished
 - (D) Will watch / am finishing
-

14. Choose the correct option:

They have completed 24 years of togetherness today and by next year on the same day, they _____ their 25th anniversary.

- (A) Will have celebrated
 - (B) Will be celebrating
 - (C) Are celebrating
 - (D) Have been celebrating
-

15. Find out the synonym of 'Defray'.

- (A) Exit
 - (B) Spend
 - (C) Malicious
 - (D) Alight
-

16. Which of the following options is an antonym for 'Destitute'?

- (A) Exhausted
 - (B) Impoverished
 - (C) Affluent
 - (D) Poor
-

17. 'One who runs away from justice' — provide one word for the expression.

- (A) Extravagant
- (B) Eccentric
- (C) Fugitive
- (D) Connoisseur

18. Choose the correct meaning of the underlined phrase.

We are afraid that you may be led astray in Arvind's bad company.

- (A) Misguided
 - (B) Lose the job
 - (C) Killed
 - (D) Get into trouble
-

19. Which word is used for "Path of travel"?

- (A) Course
 - (B) Coarse
 - (C) Corse
 - (D) Caerse
-

20. Choose the appropriate homonym:

If one wants to reach God, he/she has to _____ worldly things.

- (A) Fergo
 - (B) Feorego
 - (C) Forgeo
 - (D) Forgo
-

21. Read the sentence and choose the independent clause.

While you were at recess, we were eating cake and ice cream.

- (A) While you were at recess, we were eating cake and ice cream.
 - (B) we were eating cake and
 - (C) we were eating cake and ice cream
 - (D) while you were at recess
-

22. What is true of the following example with regards to subordinate clause?

The cat whom we are watching just caught a mouse!

- (A) It contains a prepositional phrase.
 - (B) It contains an adjectival clause.
 - (C) It contains an adverbial clause.
 - (D) It contains a noun clause.
-

23. Read the following paragraph and carefully determine what the main idea is for it.

There are no effective boundaries when it comes to pollutants. Studies have shown that toxic insecticides that have been banned in many countries are riding the wind from countries where they remain legal. Compounds such as DDT and toxaphene have been found in remote places like the Yukon and other Arctic regions.

This paragraph best supports the statement that

- (A) toxic insecticides such as DDT have not been banned throughout the world.
 - (B) more pollutants find their way into polar climates than they do into warmer areas.
 - (C) studies have proven that many countries have ignored their own anti-pollution laws.
 - (D) DDT and toxaphene are the two most toxic insecticides in the world.
-

24. Spot the error in the sentence below. If no error, then you may choose the required option as well:

None of two girls / who were present / appeared to be inclined / to listen to sane advice.

- (A) None of two girls
 - (B) Who were present
 - (C) Appeared to be inclined
 - (D) No error
-

25. Choose the same relationship from the given four choices as in the original pair.

Teeth : Chew

- (A) Mind : Think
- (B) Sweater : Heat

- (C) Food : Taste
(D) Eyes : Flicker
-

26. The empirical formula of a compound is CH_2O . If 0.0835 moles of the compound contain 1 g of hydrogen, the molecular formula of the compound is

- (A) $\text{C}_2\text{H}_4\text{O}_2$
(B) $\text{C}_6\text{H}_6\text{O}_6$
(C) $\text{C}_3\text{H}_5\text{O}_3$
(D) $\text{C}_3\text{H}_5\text{O}_3$
-

27. A solid has a structure in which W atoms are located at the corners of the unit cell, O atoms are located at the cube edges, and Na atoms at the cube centre. The formula of the compound is:

- (A) Na_2WO_3
(B) NaWO_3
(C) $\text{Na}_2\text{W}_2\text{O}_4$
(D) Na_2WO_6
-

28. The incorrect electronic arrangement is

- (A) 2, 8, 13, 1
(B) 2, 8, 12, 2
(C) 2, 8, 8, 1
(D) 2, 8, 8, 2
-

29. A molecule AX_2 has two lone pairs over A. Its shape is

- (A) Tetrahedral
(B) Pyramidal
(C) Angular
(D) Linear
-

30. If PCl_5 is heated in two separate vessels of volume 5 L and 10 L respectively at 27°C , the extent of dissociation of PCl_5 will be

- (A) More in 5 L vessel
 - (B) More in 10 L vessel
 - (C) More in 8 L vessel
 - (D) Cannot be said
-

31. Milk is an example of

- (A) Emulsion
 - (B) Suspension
 - (C) Gel
 - (D) True solution
-

32. Which of the following is the correct order of electron affinity?

- (A) $\text{I} > \text{Br} > \text{F} > \text{Cl}$
 - (B) $\text{F} < \text{Cl} < \text{Br} < \text{I}$
 - (C) $\text{F} > \text{Cl} > \text{Br} > \text{I}$
 - (D) $\text{I} < \text{Br} < \text{F} < \text{Cl}$
-

33. Ellingham diagram represents

- (A) Change of ΔG with temperature
 - (B) Change of ΔH with temperature
 - (C) Change of ΔG with pressure
 - (D) Change of $\Delta G - T\Delta S$ with temperature
-

34. Which of the following equations denotes that H_2O_2 acts as a reducing agent?

- (A) $\text{PbS} + 4\text{H}_2\text{O}_2 \rightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$
- (B) $\text{NaNO}_2 + \text{H}_2\text{O}_2 \rightarrow \text{NaNO}_3 + \text{H}_2\text{O}$
- (C) $\text{Ag}_2\text{O} + \text{H}_2\text{O}_2 \rightarrow 2\text{Ag} + \text{O}_2 + \text{H}_2\text{O}$
- (D) $2\text{KI} + \text{H}_2\text{O}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{I}_2 + \text{K}_2\text{SO}_4 + \text{H}_2\text{O}$

35. Which of the following gives apple green colour to the Bunsen flame?

- (A) Be
 - (B) Ca
 - (C) Sr
 - (D) Ba
-

36. The correct order of decreasing acid strength of oxy-acids of group 15 elements is

- (A) $\text{HNO}_3, \text{H}_3\text{SbO}_4, \text{H}_3\text{AsO}_4, \text{H}_3\text{PO}_4$
 - (B) $\text{H}_3\text{PO}_4, \text{H}_3\text{AsO}_4, \text{H}_3\text{SbO}_4, \text{HNO}_3$
 - (C) $\text{HNO}_3, \text{H}_3\text{PO}_4, \text{H}_3\text{AsO}_4, \text{H}_3\text{SbO}_4$
 - (D) $\text{HNO}_3, \text{H}_3\text{PO}_4, \text{H}_3\text{AsO}_4, \text{H}_3\text{SbO}_4$
-

37. The pair of xenon compounds which have the same number of lone pairs of electrons on the central atom is

- (A) $\text{XeO}_3, \text{XeF}_6$
 - (B) $\text{XeF}_2, \text{XeF}_4$
 - (C) $\text{XeF}_2, \text{XeO}_3$
 - (D) $\text{XeF}_4, \text{XeF}_4$
-

38. Bohr Magneton value in S.I. units is

- (A) $9.273 \times 10^{-24} \text{ erg T}^{-1}$
 - (B) $9.273 \times 10^{-24} \text{ J T}^{-1}$
 - (C) $9.273 \times 10^{-17} \text{ J T}^{-1}$
 - (D) $9.273 \times 10^{-10} \text{ cal T}^{-1}$
-

39. sp^3d^2 hybridisation is present in

- (A) $[\text{CoF}_6]^{3-}$
- (B) $[\text{Ni}(\text{CO})_4]$

(C) $[\text{Co}(\text{NH}_3)_6]^{2+}$

(D) All

40. Haemoglobin of the blood forms carboxyhaemoglobin with

(A) CO_2

(B) CO

(C) SO_2

(D) NO_2

41. Heterolytic fission of an organic covalent bond gives only

(A) Free radicals

(B) Both cation and anion

(C) Only cation

(D) Only anion

42. Huckel's rule of aromaticity is

(A) having 6π electrons

(B) having 3 double bonds

(C) having $(4n + 2)\pi$ electrons

(D) having alternate double bonds

43. Which of the following order is true regarding the acidic nature of phenol?

(A) Phenol > o-Cresol > o-Nitrophenol

(B) Phenol > o-Cresol < o-Nitrophenol

(C) Phenol < o-Cresol < o-Nitrophenol

(D) Phenol < o-Cresol > o-Nitrophenol

44. On ozonolysis 2-methyl-2-butene gives

(A) 2 moles of CH_3CHO

(B) 2 moles of CH_3COCH_3

(C) CH_3CHO & CH_3COCH_3

(D) CH_3CHO & HCHO

45. Aniline on heating with 'X' in the presence of KOH gives a product with very bad smell. Which of the following is 'X'?

(A) CH_3Cl

(B) CHCl_3

(C) CH_2Cl_2

(D) $\text{C}_2\text{H}_5\text{Cl}$

46. 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)

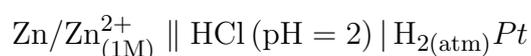
The maximum oxidation state of osmium is _____ ?

47. 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 van't Hoff factor for 0.1 M Barium nitrate is 2.74. The percentage of dissociation of Barium nitrate is _____ %.

48. 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)

Given the standard potential $E_{\text{Zn}^{2+}/\text{Zn}}^0 = -0.76 \text{ V}$, the EMF of the cell



is _____ V.

49. 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)

75% of a first order reaction is completed in 32 minutes. 50% of the reaction would have been completed in _____ minutes.

50. 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)

0.2 g of an organic compound on complete combustion produces 0.44 g of CO₂, then the percentage of carbon in it is _____ %.

51. Universal set,

$$U = \{x \mid x^5 - 6x^4 + 11x^3 - 6x^2 = 0\}$$

$$A = \{x \mid x^2 - 5x + 6 = 0\}$$

$$B = \{x \mid x^2 - 3x + 2 = 0\}$$

What is $(A \cap B)$ equal to?

- (A) {1, 3}
 - (B) {1, 2, 3}
 - (C) {0, 1, 3}
 - (D) {0, 1, 2, 3}
-

52. If R is an equivalence relation on a set A , then $R \circ R$ is

- (A) reflexive only
- (B) symmetric but not transitive

- (C) equivalence
(D) none of the above
-

53. Evaluate the limit:

$$\lim_{x \rightarrow \infty} \left(\frac{x^2 + 5x + 3}{x^2 + x + 2} \right)^x$$

- (A) e^4
(B) e^2
(C) e^3
(D) e
-

54. If one root of the quadratic equation $ax^2 + bx + c = 0$ is $3 - 4i$, then $31a + b + c =$

- (A) 0
(B) $2a$
(C) $2b$
(D) $2c$
-

55. If the 2nd, 5th and 9th terms of a non-constant A.P. are in G.P., then the common ratio of this G.P. is

- (A) $\frac{8}{5}$
(B) $\frac{4}{3}$
(C) 1
(D) $\frac{7}{4}$
-

56. If

$$A(\alpha) = \begin{pmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{pmatrix}$$

then $A(\alpha)A(\beta) =$

- (A) $A(\alpha) + A(\beta)$
(B) $A(\alpha) - A(\beta)$

- (C) $A(\alpha + \beta)$
(D) $A(\alpha - \beta)$
-

57. A square matrix (non-singular) satisfies $A^2 - A + 2I = 0$. Then $A^{-1} =$

- (A) $\frac{I - A}{2}$
(B) $I - A$
(C) $\frac{I + A}{2}$
(D) $I + A$
-

58. The ratio in which $\hat{i} + 2\hat{j} + 3\hat{k}$ divides the join of $-2\hat{i} + 3\hat{j} + 5\hat{k}$ and $7\hat{i} - \hat{k}$ is

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

59. Consider the following statements

P : Suman is brilliant

Q : Suman is rich

R : Suman is honest

The negation of the statement “Suman is brilliant and dishonest if and only if Suman is rich” can be expressed as:

- (A) $\sim (P \wedge \sim R) \leftrightarrow Q$
(B) $\sim P \wedge (Q \leftrightarrow \sim R)$
(C) $\sim (Q \leftrightarrow (P \wedge \sim R))$
(D) $\sim Q \leftrightarrow \sim P \wedge R$
-

60. 10 men and 6 women are to be seated in a row so that no two women sit together. The number of ways they can be seated is

- (A) $11 \cdot 10!$
(B) $\frac{11!}{6!5!}$
(C) $\frac{10!9!}{5!}$
(D) $\frac{11!10!}{5!}$
-

61. $1^3 - 2^3 + 3^3 - 4^3 + \dots + 9^3 =$

- (A) 425
(B) -425
(C) 475
(D) -475
-

62. The ratio of the coefficient of x^{15} to the term independent of x in the expansion of $\left(x^2 + \frac{2}{x}\right)^{15}$ is

- (A) 1 : 32
(B) 1 : 4
(C) 7 : 16
(D) 7 : 64
-

63. Let f be a polynomial function such that $f'(x) = f(x)f''(x)$ for all $x \in \mathbb{R}$. Then:

- (A) $f'(2) - f''(2) = 0$
(B) $f''(2) - f(2) = 4$
(C) $f(2) - f'(2) + f''(2) = 10$
(D) $f'(2) + f''(2) = 6$
-

64. The minimum distance of a point on the curve $y = x^2 - 4$ from the origin is

- (A) $\frac{\sqrt{15}}{2}$
(B) $\sqrt{\frac{19}{2}}$
(C) $\sqrt{\frac{15}{2}}$

(D) $\frac{\sqrt{19}}{2}$

65. Evaluate:

$$\int \frac{dx}{\cos x + \sqrt{3} \sin x}$$

- (A) $\log \tan \left(\frac{x}{2} + \frac{\pi}{12} \right) + c$
(B) $\log \tan \left(\frac{x}{2} - \frac{\pi}{12} \right) + c$
(C) $\frac{1}{2} \log \tan \left(\frac{x}{2} + \frac{\pi}{12} \right) + c$
(D) $\frac{1}{2} \log \tan \left(\frac{x}{2} - \frac{\pi}{12} \right) + c$
-

66. If

$$\int \frac{1}{(x+100)\sqrt{x+99}} dx = f(x) + c$$

then $f(x) =$

- (A) $2(x+100)^{1/2}$
(B) $3(x+100)^{1/2}$
(C) $2 \tan^{-1} \sqrt{x+99}$
(D) $2 \tan^{-1} \sqrt{x+100}$
-

67. Evaluate:

$$\int_0^\pi \frac{x \sin x}{1 + \cos^2 x} dx$$

- (A) $\frac{\pi^2}{4}$
(B) $\frac{\pi^2}{2}$
(C) $\frac{\pi^2}{3}$
(D) π^2
-

68. If $y = y(x)$ **is the solution of the differential equation**

$$x \frac{dy}{dx} + 2y = x^2$$

satisfying $y(1) = 1$, then $y\left(\frac{1}{2}\right)$ is equal to:

- (A) $\frac{1}{4}$
 - (B) $\frac{7}{64}$
 - (C) $\frac{16}{49}$
 - (D) $\frac{13}{16}$
-

69. If the midpoints of the sides BC , CA and AB of a triangle ABC are respectively $(2, 1)$, $(-1, -2)$ and $(3, 3)$, then the equation of the side BC is

- (A) $x - 2y = 0$
 - (B) $5x - 4y = 6$
 - (C) $2x + 3y = 8$
 - (D) $3x - 2y = 6$
-

70. Two vertices of a triangle are $(5, -1)$ and $(-2, 3)$. If the origin is the orthocentre of this triangle, then the coordinates of the third vertex of that triangle are

- (A) $(4, 7)$
 - (B) $\left(-2, -\frac{7}{2}\right)$
 - (C) $(-4, -7)$
 - (D) $(-2, 3)$
-

71. 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 z , iz and $z + iz$ are the vertices of a triangle and if $|z| = 4$, then the area (in sq. units) of that triangle is

72. 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) There are 10 points in a plane out of which 6 are collinear. The number of straight lines formed by joining all these points is ----.

73. 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) Minimum number of times a fair coin must be tossed so that the probability of getting at least one head is more than 99% is ----.

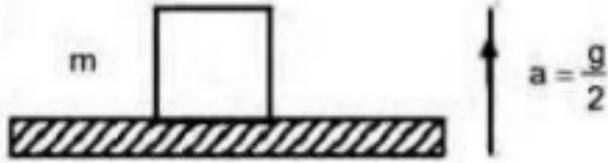
74. For the following question, enter the correct numerical value upto TWO decimal places. If the numerical value has more than two decimal places, round-off the value to TWO decimal places. (For example: Numeric value 5 will be written as 5.00 and 2.346 will be written as 2.35) An envelope is known to have come from either 'LONDON' OR 'CLIFTON'. On the postal card only two successive letters 'ON' are visible. The probability that the envelope comes from LONDON is $\frac{12}{--}$.

75. 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 eccentricity of the ellipse

$$\frac{x^2}{25} + \frac{y^2}{16} = 1$$

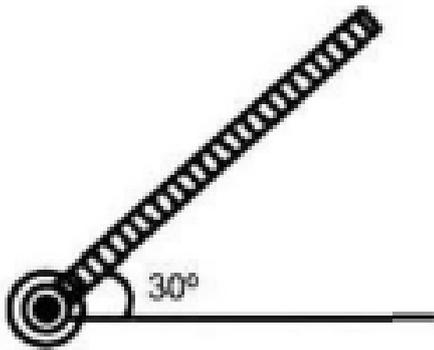
is $\frac{3}{--}$.

76. A block of mass m is kept on a platform which starts from rest with constant acceleration $\frac{g}{2}$ upward, as shown in the figure. Work done by the normal reaction on the block in time t is:



- (A) $\frac{mg^2t^2}{8}$
 (B) 0
 (C) $-\frac{mg^2t^2}{8}$
 (D) $\frac{3mg^2t^2}{8}$

77. A rod of length 50 cm is pivoted at one end. It is raised such that it makes an angle of 30° from the horizontal as shown and released from rest. Its angular speed when it passes through the horizontal (in rad s^{-1}) will be



- (A) $\sqrt{30}$
 (B) $\frac{\sqrt{20}}{3}$
 (C) $\frac{\sqrt{30}}{2}$
 (D) $\frac{\sqrt{40}}{2}$

78. A long cylindrical rod is welded to a thin circular disc of diameter 0.5 m at a point on its circumference. The rod is in the same plane as that of the disc and forms a tangent to the disc. The radius of gyration of the disc about the rod (in m) is

- (A) $\frac{1}{4}$

- (B) $\frac{\sqrt{5}}{8}$
(C) $\frac{1}{2}$
(D) 2^2
-

79. Expression for time in terms of G (universal gravitational constant), h (Planck constant) and c (speed of light) is proportional to:

- (A) $\sqrt{\frac{hc^5}{G}}$
(B) $\sqrt{\frac{Gh}{c^3}}$
(C) $\sqrt{\frac{c^3}{Gh}}$
(D) $\sqrt{\frac{Gh}{c^5}}$
-

80. In a car race on a straight road, car A takes a time t less than car B at the finish and passes the finishing point with a speed v more than that of car B. Both the cars start from rest and travel with constant accelerations a_1 and a_2 respectively.

Then v is equal to

- (A) $\frac{2a_1a_2}{a_1 + a_2}$
(B) $\sqrt{2a_1a_2} t$
(C) $\frac{a_1 + a_2}{2} t$
(D) $\sqrt{a_1a_2} t$
-

81. A shell is fired from a fixed artillery gun with an initial speed u such that it hits the target on the ground at a distance R from it. If t_1 and t_2 are the values of the time taken by it to hit the target in two possible ways, the product t_1t_2 is

- (A) $\frac{R}{g}$
(B) $\frac{2R}{g}$
(C) $\frac{R}{2g}$
(D) $\frac{R}{4g}$

82. Moon is revolving in a circular orbit of radius $60R$ ($R =$ radius of earth). Assume that the radius of the moon is $\frac{R}{4}$. If the moon is stopped for an instant and then released, it will fall towards the earth. Ignoring atmospheric friction, the velocity of the moon just before it strikes the earth is (Take $g =$ acceleration due to gravity at the surface of earth)

- (A) $\sqrt{\frac{59}{30}} gR$
(B) $\sqrt{\frac{118}{61}} gR$
(C) $\sqrt{\frac{7gR}{10}}$
(D) $\sqrt{\frac{47}{30}} gR$
-

83. A particle executing SHM along a straight line has zero velocity at points A and B whose distances from O on the same direction OAB are a and b respectively. If the velocity at the midpoint between A and B is v , then its time period is

- (A) $\frac{\pi(b+a)}{v}$
(B) $\pi\left(\frac{b-a}{v}\right)$
(C) $\frac{\pi(b+a)}{2v}$
(D) $\frac{(b-a)}{2v}$
-

84. The frequency of a tuning fork P is $a\%$ less than a standard fork A . The frequency of another fork Q is $b\%$ greater than that of A . When P and Q are sounded together, x beats are produced in one second. The frequency of the standard fork is (in Hz)

- (A) $\frac{100x}{a+b}$
(B) $\frac{100x}{a-b}$
(C) $\frac{100x}{b-a}$
(D) $\frac{200x}{b-a}$

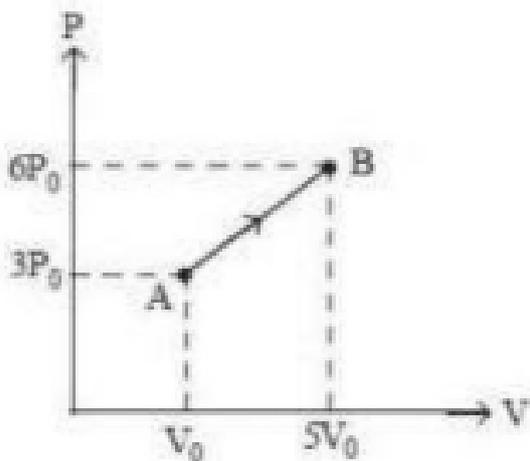
85. A tank full of water has a small hole at the bottom. If one-fourth of the tank is emptied in t_1 seconds and the remaining three-fourths of the tank is emptied in t_2 seconds, then the ratio t_1/t_2 is

- (A) $\sqrt{3}$
 - (B) $\sqrt{2}$
 - (C) $\frac{1}{\sqrt{2}}$
 - (D) $\frac{2}{\sqrt{3}} - 1$
-

86. A metallic wire of density d floats horizontally in water. The maximum radius of the wire so that the wire may not sink will be (surface tension of water = T)

- (A) $\sqrt{\frac{2T}{\pi dg}}$
 - (B) $\sqrt{\frac{2\pi T}{dg}}$
 - (C) $\sqrt{\frac{2\pi Tg}{d}}$
 - (D) $\sqrt{2\pi Tgd}$
-

87. One mole of a monoatomic ideal gas undergoes the process $A \rightarrow B$ as shown in the given P - V diagram. The specific heat capacity in the process is



- (A) $\frac{13R}{3}$
- (B) $\frac{13R}{6}$

- (C) $\frac{7R}{3}$
 (D) $\frac{2R}{3}$

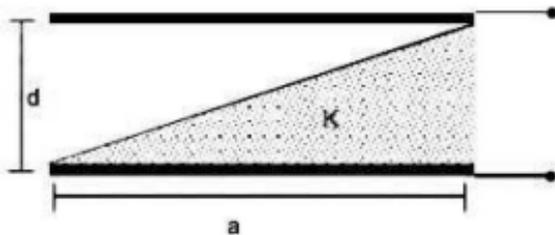
88. An ideal gas enclosed in a cylinder is at pressure 2 atm and temperature 300 K. The mean time between two successive collisions is 6×10^{-8} s. If the pressure is doubled and temperature is increased to 500 K, the mean time between two successive collisions will be close to

- (A) 3×10^{-6} s
 (B) 4×10^{-8} s
 (C) 2×10^{-7} s
 (D) 5×10^{-8} s

89. Two point charges $q_1(\sqrt{10} \mu\text{C})$ and $q_2(-25 \mu\text{C})$ are placed on the x -axis at $x = 1$ m and $x = 4$ m respectively. The electric field (in V/m) at a point $y = 3$ m on the y -axis is (take $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2\text{C}^{-2}$)

- (A) $(-81\hat{i} + 81\hat{j}) \times 10^2$
 (B) $(81\hat{i} + 81\hat{j}) \times 10^2$
 (C) $(-63\hat{i} + 27\hat{j}) \times 10^2$
 (D) $(63\hat{i} + 27\hat{j}) \times 10^2$

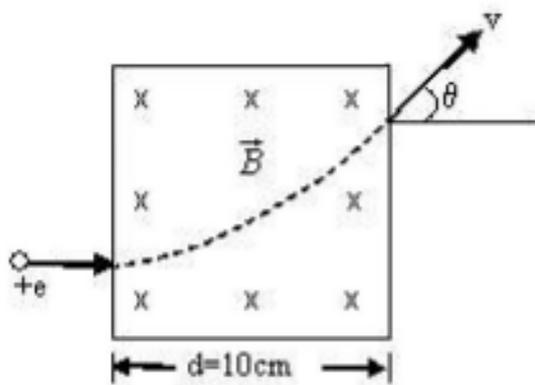
90. A parallel plate capacitor is made of two square plates of side a , separated by a distance d ($d \ll a$). The lower triangular portion is filled with a dielectric of dielectric constant K , as shown in the figure. The capacitance of this capacitor is



- (A) $\frac{K\epsilon_0 a^2}{2d(K+1)}$

- (B) $\frac{K\varepsilon_0 a^2}{d} \ln K$
 (C) $\frac{K\varepsilon_0 a^2}{d(K-1)} \ln K$
 (D) $\frac{1}{2} \frac{K\varepsilon_0 a^2}{d} \ln K$

91. A proton accelerated by a potential difference $V = 500 \text{ kV}$ moves through a transverse magnetic field $B = 0.51 \text{ T}$ as shown in the figure. The width of the magnetic field region is $d = 10 \text{ cm}$. Then the angle θ through which the proton deviates from the initial direction of its motion is (approximately)



- (A) 15°
 (B) 30°
 (C) 45°
 (D) 60°

92. A magnetic dipole in a constant magnetic field has

- (A) zero potential energy when the torque is maximum
 (B) minimum potential energy when the torque is maximum
 (C) maximum potential energy when the torque is maximum
 (D) zero potential energy when the torque is minimum

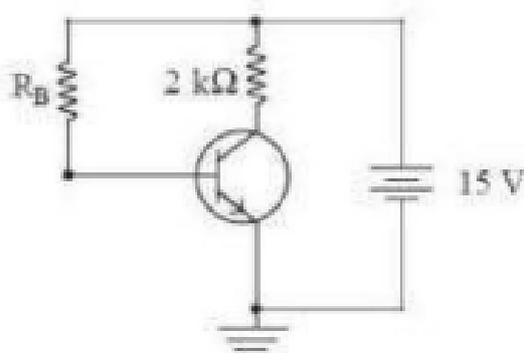
93. If λ_1 and λ_2 are the wavelengths of the photons emitted when an electron in the n^{th} orbit of a hydrogen atom falls to the first excited state and the ground state respectively, then the value of n is

- (A) $\sqrt{\frac{2(\lambda_2 - \lambda_1)}{2\lambda_2 - \lambda_1}}$
 (B) $\frac{2\lambda_2 - \lambda_1}{2(\lambda_2 - \lambda_1)}$
 (C) $\sqrt{\frac{4\lambda_2 - \lambda_1}{4(\lambda_2 - \lambda_1)}}$
 (D) $\sqrt{\frac{4(\lambda_2 - \lambda_1)}{4\lambda_2 - \lambda_1}}$

94. The energy released per fission of ${}_{92}^{235}\text{U}$ is 200 MeV. The fission rate of ${}_{92}^{235}\text{U}$ required to produce 2 W power is

- (A) 1.25×10^{26} per second
 (B) 2.56×10^{26} per second
 (C) 1.25×10^{13} per second
 (D) 6.25×10^{10} per second

95. In the following common emitter circuit, $\beta = 100$ and $V_{CE} = 7 \text{ V}$. If V_{BE} is negligible, then the base current is



- (A) 0.015 mA
 (B) 0.045 mA
 (C) 0.025 mA
 (D) 0.035 mA

96. 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 1 kW carrier is modulated to a depth of 80%. The total power in the modulated wave is ____ kW.

97. 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 10 kg is suspended vertically by a rope from the roof. When a horizontal force is applied on the rope at some point, the rope deviates at an angle of 45° at that point. If the suspended mass is at equilibrium, the magnitude of the force applied is ____ N. ($g = 10 \text{ m s}^{-2}$)

98. 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) On interchanging the resistances, the balance point of a meter bridge shifts to the left by 10 cm. The resistance of their series combination is $1 \text{ k}\Omega$. How much was the resistance on the left slot before interchanging the resistances? ____ Ω .

99. 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 image of an object placed in front of a concave mirror of focal length 12 cm is formed at a point which is 10 cm more distant from the mirror than the object. The magnification of the image is ____.

100. 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 body moves along a circular path of radius 10 m and the coefficient of friction is 0.5. What should be its angular velocity in rad/s if it is not to slip from the surface? _____. ($g = 9.8 \text{ m s}^{-2}$)

101. During the propagation of a nerve impulse, the action potential results from the movement of

- (A) Sodium ions from ECF to ICF
 - (B) Sodium ions from ICF to ECF
 - (C) Potassium ions from ECF to ICF
 - (D) Potassium ions from ICF to ECF
-

102. Acromegaly is the result of

- (A) Hypersecretion of GH in children
 - (B) Hypersecretion of GH in adults
 - (C) Hypersecretion of GH
 - (D) Deficiency of vitamin D
-

103. Electrons from the excited chlorophyll molecules of PS-II are first accepted by

- (A) Pheophytin
 - (B) Ferredoxin
 - (C) Cytochrome *f*
 - (D) Cytochrome *b*
-

104. During which stage in the complete oxidation of glucose are the greatest number of ATP molecules formed from ADP?

- (A) Kreb's cycle
- (B) Glycolysis
- (C) Electron transport chain
- (D) Conversion of pyruvic acid to acetyl CoA

105. Which of these bioactive compounds is used as an immunosuppressive agent in organ-transplant patients?

- (A) Acetic acid
- (B) Ethanol
- (C) Cyclosporine A
- (D) Pectinase

106. Which is not an example of transmembrane transport between different sub-cellular compartments?

- (A) Transport from the stroma into thylakoid space
- (B) Transport from the cytoplasm into the lumen of the endoplasmic reticulum
- (C) Transport from the endoplasmic reticulum into the Golgi complex
- (D) Transport from mitochondrial intermembrane space into the mitochondrial matrix

107. The two amino acids having R groups with a negative net charge at pH 7.0 are

- (A) Aspartate and glutamate
- (B) Arginine and histidine
- (C) Cysteine and methionine
- (D) Proline and valine

108. The major electron transport chain complexes of mitochondria that are involved in the generation of Reactive Oxygen Species (ROS) are

- (A) Complex I and Complex IV
 - (B) Complex I and Complex III
 - (C) Complex II and Complex IV
 - (D) None of these
-

109. Name the state where never dividing cells of neurons and skeletal muscle are present?

- (A) G₀
 - (B) G₁
 - (C) G₂
 - (D) M
-

110. One of the following is the correct sequence to make a transgenic animal.

- (A) Transgenics – transfection – microinjection – electroporation – retroviral vectors
 - (B) Microinjection – transfection – electroporation – retroviral vectors – transgenics
 - (C) Transfection – microinjection – transgenics – electroporation – retroviral vectors
 - (D) None of these
-

111. In which organ of the digestive tract does hydrolysis of starch into maltose take place?

- (A) Stomach
 - (B) Liver
 - (C) Mouth
 - (D) Duodenum
-

112. The alveoli of the lungs do not contain “air” because

- (A) We normally do not ventilate our lungs at a high enough rate.
 - (B) The lungs have too many alveoli to ventilate.
 - (C) There is “dead space” in the trachea and bronchi.
 - (D) The trachea and bronchi are too small in volume.
-

113. Which of the following statement(s) about plasmid is/are correct?

- I) It can replicate by itself
- II) Hybrid plasmid is introduced into bacteria by transformation

III) Other than bacteria, plasmid can also be found in bacteriophage

- (A) I only
 - (B) I and II only
 - (C) II and III only
 - (D) I, II and III
-

114. Which one of the following is the correct matching of the events occurring during menstrual cycle?

- (A) Menstruation: breakdown of myometrium and ovum not fertilized
 - (B) Ovulation: LH and FSH attain peak level and sharp fall in the secretion of progesterone
 - (C) Proliferative phase: Rapid regeneration of myometrium and maturation of Graafian follicle
 - (D) Development of corpus luteum: Secretory phase and increased secretion of progesterone
-

115. Out of the total sunlight energy reaching the atmosphere, the fraction utilized in photosynthesis is approximately:

- (A) 0.002%
 - (B) 0.02%
 - (C) 0.2%
 - (D) 2.0%
-

116. Depolarization of the T-tubule membrane activates the sarcoplasmic reticulum via the:

- (A) Ryanodine receptor
 - (B) Dihydropyridine receptors
 - (C) Increased Na^+ and K^+ conductance in end-plate membrane
 - (D) IP_3 receptor
-

117. Consider the following statements:

- (a) The banded appearance of the sarcomere is due to difference in the size and density of thick and thin filaments.

- (b) The A band is the area containing thick filaments.
- (c) A band includes the M line, the H band and the zone of overlap (thick and thin filaments).
- (d) A band and I band are anisotropic and isotropic, respectively.

The incorrect statements are:

- (A) a, b and c
 - (B) b and c
 - (C) b, c and d
 - (D) None
-

118. A sedentary sea anemone gets attached to the shell lining of a hermit crab.

The association is

- (A) Ectoparasitism
 - (B) Symbiosis
 - (C) Commensalism
 - (D) Amensalism
-

119. The zone at the edge of a lake or ocean which is alternatively exposed to air and immersed in water is called

- (A) Pelagic zone
 - (B) Benthic zone
 - (C) Lentic zone
 - (D) Littoral zone
-

120. Elicitors are molecules that

- (A) Induce cell division
 - (B) Stimulate production of secondary metabolites
 - (C) Stimulate hairy root formation that accumulate secondary metabolites
 - (D) None of these
-

121. Rheumatoid arthritis is different from some other forms of arthritis as it

- (A) Generally occurs above the waist
 - (B) Is more painful than other forms
 - (C) Is symmetrical, affecting the right and the left sides of the body
 - (D) Occurs below the waist
-

122. IUCN (The International Union for Conservation of Nature and Natural Resources) headquarters is at

- (A) Morges, Switzerland
 - (B) Paris, France
 - (C) Vienna, Austria
 - (D) New York, USA
-

123. Which of the following organisms found in human waste cause water pollution?

- (A) Coliform bacteria
 - (B) Viruses
 - (C) Protozoa
 - (D) Parasitic worms
-

124. What is tautonym?

- (A) These are the repeated sequence
 - (B) It is a name of fish
 - (C) Identical name of genus and species
 - (D) It is a name of the genus
-

125. T.O. Diener discovered _____.

- (A) Bacteriophage
- (B) Infectious protein
- (C) Free infectious DNA
- (D) Free infectious RNA

