LPU NEST 2024 Question Paper

1. Select the answer choice that identifies the noun in the sentence.

Sue's parents tried living in the north, but they could not adapt to the cold.

(A) north

(B) but

(C) not

(D) adapt

2. What is the missing pronoun?

The children are coming out of school in a minute. I need to go and pick _____ up.

(A) it

(B) her

(C) them

(D) they

3. Choose the correct order of adjectives to fill the blank.

She is a _____ supermodel.

(A) Beautiful slim Brazilian

(B) Brazilian beautiful slim

(C) Slim Brazilian beautiful

(D) Brazilian slim beautiful

4. Which kind of adverb is the word in capitals?

"Mothers look **GENTLY** at their babies."

(A) Adverb of Manner

(B) Adverb of Time/Frequency

(C) Adverb of Place

(D) Adverb of Degree

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5. Choose the right option to fill the gap.

When Pooja arrives, I _____ in my apartment.

(A) Will be sleeping

(B) Won't be sleeping

(C) Be sleeping

(D) Both Will be sleeping and Won't be sleeping

---

6. Choose the right option to fill the gap.

Nahal ____ his PhD in trauma studies by December this year.

(A) will completing

(B) will have been completing

(C) will have completed

(D) will be completed

---

7. Choose the right option to fill the gap.

Jean Martin Charcot ____ for us soon.

(A) Will work

(B) Shall work

(C) Would have worked

(D) Both Will work and Shall work

---

8. Choose the correct one.

(A) I think he would not come with us to the meeting

(B) I think he might not come with us to the meeting

(C) I think he shall not come with us to the meeting

(D) I think he might not came with us to the meeting

---

9. Choose the correct use of modal verb.

(A) I will make dinner tonight

(B) I will be making dinner tonight

(C) Both I will make dinner tonight and I will be making dinner tonight

(D) None of these

---

10. The sentence below contains an error. Identify which part has the error and choose from the options.

I am finding it difficult to choose among my pair of red trousers and my pair of green one.

(A) I did found it difficult

(B) To choose between my pair of red trousers

(C) And my pair of green one

(D) No error

---

11. Identify which part of the sentence has the error.

Following intense debate (1), the faculty has approved the measure to increase (2) class size by 15% over the next four years (3). No error (4)

(A) 1

(B) 2

(C) 3

(D) 4

---

12. Pick the right meaning for the following phrase.

To die in harness

(A) Die early

(B) Die after doing work

(C) To die while in duty

(D) Die peacefully

---

13. Identify the correct meaning of the idiom.

That ship has sailed.

(A) Work better or leave

(B) It is too late

(C) Work quickly

(D) Go through something difficult

---

14. A mild or indirect expression substituted for an offensive or harsh one.

(A) Wriggle

(B) Sacrilege

(C) Euphemism

(D) Linguist

---

15. Choose the pair that best expresses a relationship similar to that in the original pair.

earth is to ball as pancake is to ?

(A) soccer

(B) flag

(C) disc

(D) flat

---

16. I think, I ____ a new cellphone. This one does not function properly any more.

(A) needs

(B) needed

(C) need

(D) am needing

---

17. Mohul: "...... yourself?"

Zoya: "Yes, I am having a fun time!"

(A) You enjoying

(B) Enjoy you

(C) Do you enjoy

(D) Are you enjoying

---

18. During the two years Rishi ____ ten different jobs.

   (A) has has

(B) had had

(C) have had

(D) have has

---

19 Fill in the blank with the correct word.

   They went to the shopping center ____ shops were closed.

   (A) because

(B) or

(C) but

(D) so

---

20 Choose the most suitable interjection to complete the sentence.

   _____ I spilled my coffee on my dress.

   (A) Oops!

(B) Aww!

(C) Phew!

(D) Ah!

---

21 Fill in the blank with correct word.

   Nisha is pleased ____ her result.

   (A) about

(B) at

(C) with

(D) all of these

---

22. Fill in the right verb form.

The horse was _____ by the young boy.

(A) ride

(B) rode

(C) ridden

(D) riding

---

23 Change the voice of the following sentence.

They speak French at this shop.

(A) French is spoken at this shop

(B) French was spoken at this shop

(C) French has spoken at this shop

(D) French were spoken at this shop

---

24 Which of these words is opposite in meaning?

Pit

(A) group

(B) peak

(C) select

(D) marry

---

25 Closest meaning to the word.

Banish

(A) exile

(B) hate

(C) fade

(D) clean

---

26. Choose the right option to fill the gap.

Mrs Adams was _____ dinner at 6 o'clock yesterday morning.

(A) has

(B) had

(C) have

(D) having

---

27 Choose the correct option.

It was a very difficult movie, but I ____ because I ___the book.

(A) had understood, read

(B) Read, had understood

(C) had read, understood

(D) Understood, had read

---

28 The film wasn't very good. I ____ it very much.

(A) enjoyed

(B) wasn't enjoy

(C) didn't enjoyed

(D) didn't enjoy

**29 Choose correct noun identification.**

Susan was exceedingly proud of her beautiful new home.

(A) exceedingly

(B) home

(C) proud

(D) beautiful

---

30 By the time boss comes in the factory, will ____ the new project?

(A) Jane and Luke discuss

(B) Jane and Luke be discussed

(C) Jane and Luke be discussing

(D) Both Jane and Luke discuss and Jane and Luke be discussing

31 A lift is moving in upward direction. The total mass of the lift and the passengers is 1600 kg. The variation of the velocity of lift is as shown in the figure. The tension in the rope at $t = 8^{\text{th}}$ second will be
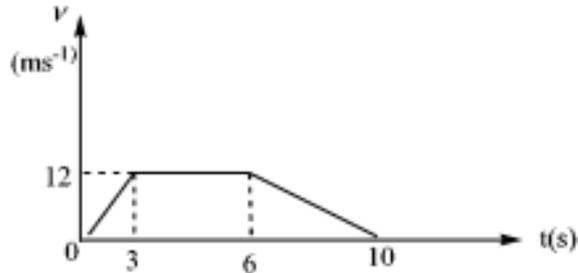
  (A) 11200 N

(B) 16000 N

(C) 4800 N

(D) 12000 N

---

32 A mass m moves with velocity v and collides elastically with another identical mass. After collision, the first mass moves with velocity $\frac{v}{\sqrt{3}}$ in a direction perpendicular to the initial direction of motion. Find the speed of 2nd mass after collision.

  (A) $\frac{2v}{\sqrt{3}}$

(B) $\frac{v}{\sqrt{3}}$

(C) v

(D) $\sqrt{3}\,v$

---

33 In a system, 8 kg mass is subjected to a force of 16 N along positive y axis and another 8 N along positive x axis. The angle made by acceleration of centre of mass with x axis is

  (A) $45°$

(B) $\theta = \tan^{-1}\left(\frac{2}{3}\right)$

(C) $\theta = \tan^{-1}(2)$

(D) $\theta = \tan^{-1}(\sqrt{3})$

34 Four spheres of diameter 2a and mass m are placed on corners of square of side b. The moment of inertia of system about an axis through one side is

(A) $\frac{4}{5}Ma^2 + 2Mb^2$

(B) $\frac{8}{5}Ma^2 + 8Mb^2$

(C) $\frac{8}{5}Ma^2$

(D) $\frac{5}{2}Ma^2 + 4Mb^2$

35 Time dependence of quantity $P = P_0 e^{-at^2}$, dimension of a is

(A) dimension less

(B) dimension of t^{-2}

(C) dimensions of P

(D) dimension of t^2

36 Acceleration versus velocity graph of a particle moving in a straight line is as shown in the graph. The corresponding velocity–time graph would be
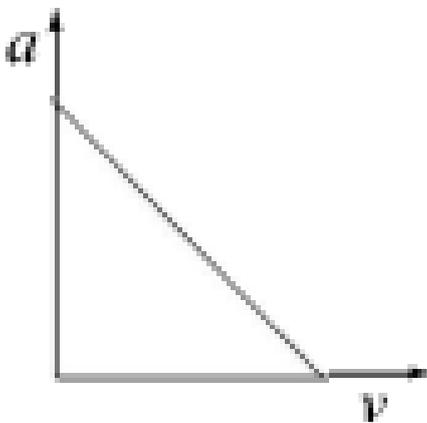
(A) linear rise then constant

(B) parabola with minimum

(C) curve with increasing slope

(D) semicircle type

---

37 A man wishes to cross the river flowing with velocity v making angle θ with y direction. If he swims with speed u and width of river is d, the time taken will be

(A) $\dfrac{d}{u + v\cos\theta}$

(B) $\dfrac{d}{u - v\cos\theta}$

(C) $\dfrac{d}{u\cos\theta}$

(D) $\dfrac{d}{v\sin\theta}$

---

38 If gravitational acceleration at surface is g, increase in P.E. lifting mass m to height equal to half radius $R/2$ from surface will be

(A) $\dfrac{mgR}{2}$

(B) $\dfrac{2mgR}{3}$

(C) $\dfrac{mgR}{4}$

(D) $\dfrac{mgR}{3}$

---

39 In the arrangement, spring constant $k = 2$ N/m, masses $M = 3$ kg and $m = 1$ kg, friction coefficient 0.1. Amplitude is 10 cm. The time period of SHM will be
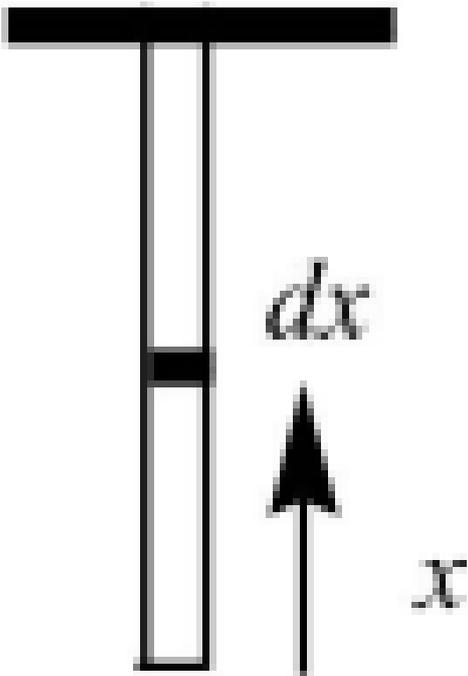

Smooth

(A) $\pi\sqrt{6}$

(B) $\pi\sqrt{2}$

(C) $2\sqrt{2}\,\pi$

(D) 2π

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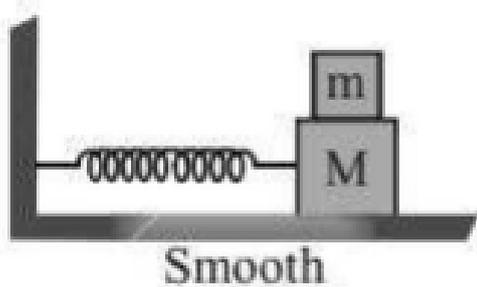
40 A wire of variable mass per unit length is $\mu = \mu_0 x$, hanging from the ceiling as shown in the figure. A small transverse disturbance is produced at its lower end. Find the time after which the disturbance will reach to the other end.

(A) $\sqrt{\dfrac{6l_0}{g}}$

(B) $\sqrt{\dfrac{8l_0}{g}}$

(C) $\sqrt{\dfrac{9l_0}{g}}$

(D) $\sqrt{\dfrac{10l_0}{g}}$

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41 A cubical ball is taken to a depth of 200 m in sea. The decrease in volume observed is 0.1%. The bulk modulus of the ball is
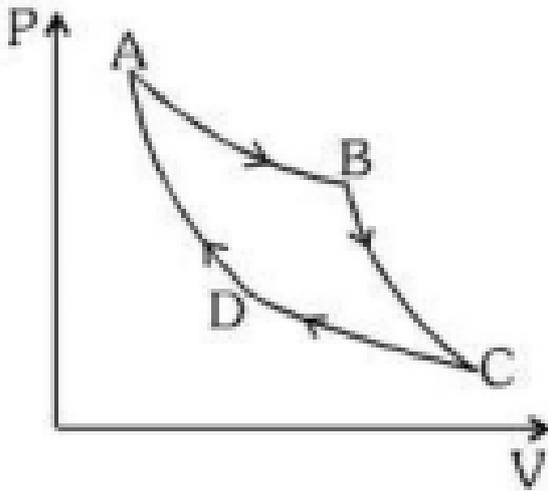
(A) 2×10^7 Pa

(B) 2×10^6 Pa

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(C) 2×10^9 Pa

(D) 1.2×10^9 Pa

---

42 Temperature of body falls from 62°C to 50°C in 10 minutes. Surroundings are 26°C. The temperature after next 10 minutes will become

(A) 42°C

(B) 40°C

(C) 56°C

(D) 55°C

---

43 In the indicator diagram fig. shown of Carnot cycle Ta, Tb, Te, Td represent temperature of gas at A, B, C, D respectively. Which of the following is correct relation

(A) $T_a = T_b = T_c = T_d$

(B) $T_a = T_c$, $T_b = T_d$

(C) $T_a = T_d$, $T_c = T_b$

(D) $T_a = T_b$, $T_c = T_d$

---

44. Modern vacuum pumps can evacuate a vessel down to a pressure of 4.0×10^{-15} atm. At room temperature (300 K), taking $R = 8.3\,\text{J K}^{-1}\text{mol}^{-1}$ and $N_{\textbf{Avogadro}} = 6 \times 10^{23}\,\text{mol}^{-1}$, the mean distance between molecules of gas in an evacuated vessel

will be of the order of:

 (A) $0.2\,\mu$m

(B) $0.2\,$mm

(C) $0.2\,$cm

(D) $0.2\,$nm

---

45 Three concentric conducting shells carry charges +4Q on inner, −2Q on middle and +6Q on outer. The charge on inner surface of the outer shell is

  (A) 0

(B) 4Q

(C) Q

(D) –2Q

---

46 Find equivalent capacitance between points A and B. Assume each conducting plate has same dimensions and neglect the thickness of plate. It is given that
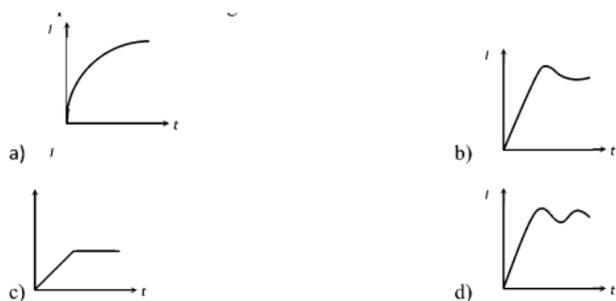
$$\frac{6A\varepsilon_0}{d} = 7\,\mu F,$$

where A is the area of plates.
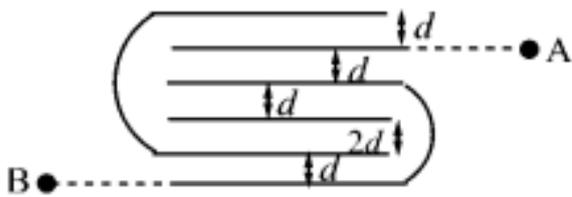
  (A) $7\ \mu F$

$(B) 11\mu F$

$(C) 12\mu F$

$(D) 15\mu F$

---

47 When an electric heater is switched on, the current i is plotted against time t. Taking into account the variation of resistance with temperature, which of the following best represents the resulting curve?

a)   b)   c)   d)

(A) continuously decreasing curve

(B) straight line rise

(C) curve bending downward

(D) curve bending upward

---

48. A wire of mass $100\,\text{g}$ is carrying a current of $2\,\text{A}$ towards increasing x in the form $y = x^2$ $(-2\,\text{m} \le x \le +2\,\text{m})$. This wire is placed in a magnetic field $\vec{B} = -0.02\,\hat{k}$ tesla. The acceleration of the wire (in m s^{-2}) is:

   (A) $-1.6\,\hat{j}$

(B) $-3.2\,\hat{j}$

(C) $1.6\,\hat{j}$

(D) zero

---

49. The real angle of dip at a place, if a magnet is suspended at an angle of $30°$ to the magnetic meridian and the dip needle makes an angle of $45°$ with the horizontal, is:

   (A) $\tan^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$

(B) $\tan^{-1}(\sqrt{3})$

(C) $\tan^{-1}\left(\sqrt{\dfrac{3}{2}}\right)$

(D) $\tan^{-1}\left(\dfrac{2}{\sqrt{3}}\right)$

---

50. In a hypothetical Bohr's hydrogen atom the mass of the electron is doubled. The energy E_0 and radius r_0 of the first orbit will be (a_0 is the Bohr radius for the

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first orbit):

(A) $E_0 = -27.2\,\text{eV}$, $r_0 = a_0$

(B) $E_0 = -13.6\,\text{eV}$, $r_0 = \dfrac{a_0}{2}$

(C) $E_0 = -27.3\,\text{eV}$, $r_0 = \dfrac{a_0}{2}$

(D) $E_0 = -13.6\,\text{eV}$, $r_0 = a_0$

---

51. A radioactive isotope is being produced at a constant rate X. Half-life of the radioactive substance is Y. After some time the number of radioactive nuclei becomes constant. The value of this constant is:

(A) $\dfrac{XY}{\ln(2)}$

(B) XY

(C) $(XY)\ln(2)$

(D) $\dfrac{X}{Y}$

---

52 Two identical particles move at right angles to each other, possessing de-Broglie wavelengths λ_1 and λ_2. The de-Broglie wavelength of each of the particles in their centre of mass frame will be

(A) $\sqrt{\dfrac{\lambda_1^2 + \lambda_2^2}{2}}$

(B) $\dfrac{\lambda_1 + \lambda_2}{2}$

(C) $\dfrac{2\lambda_1\lambda_2}{\lambda_1 + \lambda_2}$

(D) $\dfrac{2\lambda_1\lambda_2}{\sqrt{\lambda_1^2 + \lambda_2^2}}$

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53 An object is placed at distance of 20 cm from a plano-convex lens of focal length 15 cm ($\mu = 1.5$). The curved surface is silvered. The image will form at
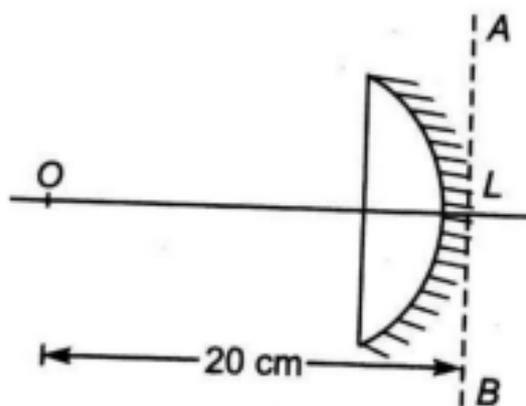
(A) 60 cm left of AB

(B) 30 cm left of AB

(C) 20/7 cm left on AB

(D) 60 cm right of AB

---

54. In Young's double slit experiment, the two slits act as coherent sources of equal amplitude A and wavelength λ. In another experiment with the same set up the two slits are sources of equal amplitude A and wavelength λ but are incoherent. The ratio of the intensity of light at the mid-point of the screen in the first case to that in the second case is:

(A) $4 : 1$

(B) $1 : 1$

(C) $2 : 1$

(D) $1 : 4$

---

55 The voltage time graph of a triangular wave having peak value Vo is as shown in figure.The rms value of V in time interval from t $= 0$ to $T/4$ is
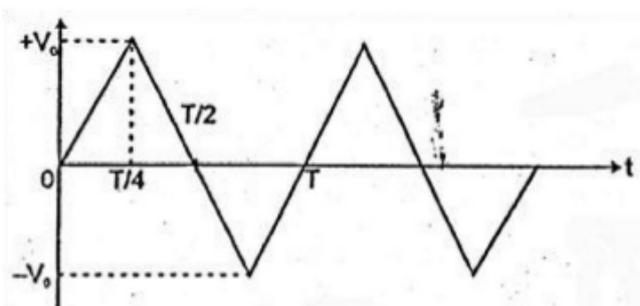
(A) $V_0/3$

(B) $V_0/2$

(C) $V_0/\sqrt{2}$

(D) $V_0/\sqrt{3}$

---

56. A potential difference of $2\,\text{V}$ is applied between the opposite faces of a Ge crystal plate of area $1\,\text{cm}^2$ and thickness $0.5\,\text{mm}$. If the concentration of electrons in Ge is $2 \times 10^{19}\,\text{m}^{-3}$ and mobilities of electrons and holes are $0.36\,\text{m}^2\text{V}^{-1}\text{s}^{-1}$ and $0.14\,\text{m}^2\text{V}^{-1}\text{s}^{-1}$ respectively, then the current flowing through the plate will be:

(A) $0.25\,\text{A}$

(B) $0.45\,\text{A}$
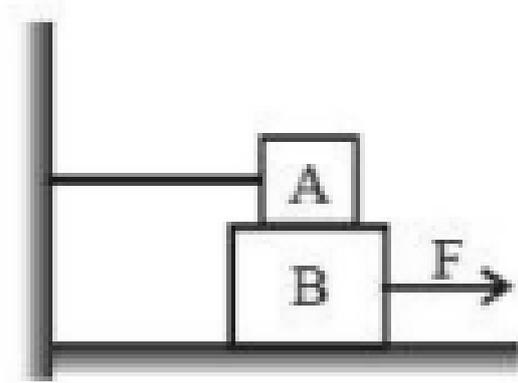
(C) $0.56\,\text{A}$

(D) $0.64\,\text{A}$

---

57 The diagram of a logic circuit is given below. The output F of the circuit is represented by
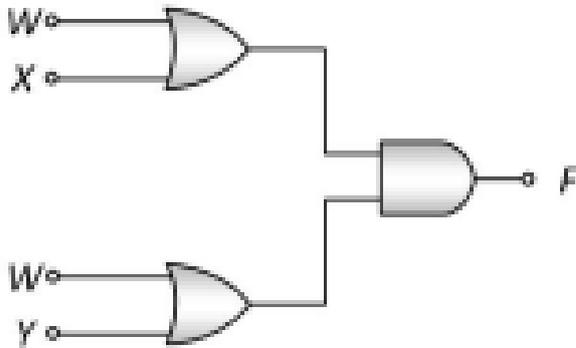
(A) $W(X + Y)$

(B) $W \cdot X \cdot Y$

(C) $W + (X \cdot Y)$

(D) $W + (X + Y)$

---

58 A block A of mass 100 kg rests on another block B of mass 200 kg and is tied to a wall as shown in figure. The coefficient of friction between A and B is 0.2 and

that between B and ground is 0.3. The minimum force required to move block B is

   (A) 900 N

(B) 200 N

(C) 1100 N

(D) 700 N

---

59. A fully charged capacitor C with initial charge q_0 is connected to a coil of self-inductance L at $t = 0$. The time at which the energy is stored equally in the form of electric field in the capacitor and the magnetic field in the inductor is:

   (A) $\pi\sqrt{LC}$

(B) $\dfrac{\pi}{4}\sqrt{LC}$

(C) $2\pi\sqrt{LC}$

(D) $\sqrt{LC}$

---

60 A signal of frequency 20 kHz and peak voltage 5 V is used to modulate a carrier wave of frequency 1.2 MHz and peak voltage 25 V. Choose the correct statement

   (A) Modulation index = 5, side frequency bands at 25 V

(B) Modulation index = 0.2, side frequency bands at 1400 Hz and 1000 kHz

(C) Modulation index = 0.4

(D) Modulation index = –0.2

---

61. A survey of 500 television viewers produced the following information: 285

watch football, **195 watch hockey, 115 watch basketball, 45 watch football and basketball, 70 watch football and hockey, 50 watch hockey and basketball, and 50 do not watch any of the three games. The number of viewers who watch *exactly one* of the three games is:**

(A) 325

(B) 310

(C) 315

(D) 372

---

62 The minimum number of elements that must be added to the relation $R = \{(1,2),(2,3)\}$ on the set $\{1,2,3\}$ so that it becomes an equivalence relation is

(A) 3

(B) 5

(C) 6

(D) 7

---

63. $f : \mathbb{R} - \{0\} \to \mathbb{R}$ **given by**

$$f(x) = \frac{1}{x} - \frac{2}{e^{2x} - 1}$$

can be made continuous at $x = 0$ by defining $f(0)$ as:

(A) 1

(B) 2

(C) -1

(D) 0

---

64 If z represents point on circle $|z| = 2$ then locus of $z + \frac{1}{z}$ is

(A) parabola

(B) circle

(C) ellipse

(D) hyperbola

---

65 The quadratic equation $8\sec^2 x - 6\sec x + 1 = 0$ **has**

   (A) No real roots

(B) Two real roots

(C) Many roots

(D) Only one real root

---

66 If 8 G.M.'s inserted between 2 and 3 then product of all 8 G.M.'s is

   (A) 6

(B) 36

(C) 216

(D) 1296

---

67. If x, y, z **are in A.P. with common difference** d **and the rank of the matrix**

$$\begin{pmatrix} 4 & 5 & x \\ 5 & 6 & y \\ 6 & k & z \end{pmatrix}$$

is 2**, then the values of** k, d **are:**

   (A) 6, $\dfrac{x}{2}$

(B) 5, x

(C) any arbitrary, x

(D) 7, any arbitrary

---

68. If

$$\Delta = \begin{vmatrix} f(x) & f\left(\dfrac{1}{x}\right) + f(x) \\ 1 & f\left(\dfrac{1}{x}\right) \end{vmatrix} = 0$$

where $f(x)$ **is a polynomial and** $f(2) = 17$**, then** $f(5) = ?$
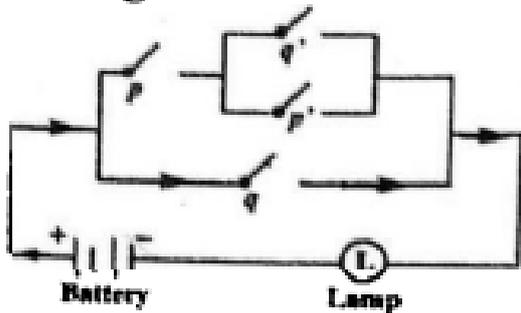
   (A) 624

(B) 626

(C) 82

(D) 79

69 The distance between line $\vec{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - \hat{j} + 4\hat{k})$ and plane $\vec{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 5$ is

   (A) $10/\sqrt{3}$

(B) $10/(2\sqrt{3})$

(C) $10/(3\sqrt{3})$

(D) $10/3$

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70 The symbolic form of logic of the circuit given below is

   (A) $[(p \wedge q') \vee p'] \wedge q$

(B) $[p \vee (q' \cdot p')] \vee q$

(C) $[(p \wedge p') \vee q'] \wedge q$

(D) $p \wedge (p \vee p') \vee q$

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71 The number of 4 digit even numbers whose sum of digits is 34

   (A) 5

(B) 12

(C) 3

(D) 7

---

72 The number of ordered triplets of positive integers satisfying $20 \leq x + y + z \leq 50$ is

   (A) $^5C_3$

(B) $^{19}C_3$

(C) $^{50}C_3 - {}^{19}C_3$

(D) $^{69}C_3 - {}^{19}C_3$

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73. If

$$\sum_{r=1}^{n} a_r = \frac{n(n+1)(n+2)}{6} \quad \forall\, n \geq 1,$$

then

$$\lim_{n\to\infty} \sum_{r=1}^{n} \frac{1}{a_r} =$$

  (A) 1

(B) $\dfrac{3}{2}$

(C) 2

(D) 3

---

74. Value of

$$\sum_{k=1}^{\infty} \sum_{r=0}^{k} \frac{1}{3^k} \binom{k}{r}$$

is:

  (A) 1

(B) 0

(C) $\dfrac{2}{3}$

(D) 2

---

75. If

$$y = (1-x)(1+x^2)(1+x^4)\cdots(1+x^{2^n}),$$

then $\dfrac{dy}{dx}$ **at** $x=0$ **is equal to**

  (A) -1

(B) $\dfrac{1}{(1+x)^2}$

(C) $\dfrac{x}{(1+x^2)}$

(D) $\dfrac{x}{(1-x)^2}$

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76 Consider $p(x)$ a polynomial of degree 5 having extremum at $x = -1, 1$. Given

$$\lim_{x \to 0} \left(\frac{p(x)}{x} - 2 \right) = 4,$$

the value of $p[1]$ (greatest integer function) is

   (A) 1

(B) 2

(C) 3

(D) 4

---

77 The integral

$$\int \frac{\sin^2 x \cos^2 x}{\left(\sin^5 x + \cos^3 x \sin^2 x + \sin^3 x \cos^2 x + x^5 + x \cos^5 x \right)} dx$$

is of the form

   (A) x^5

(B) 0

(C) 2/3

(D) 2

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78. If

$$\int \sin(101x) \, \sin^{99} x \, dx = \frac{\sin(100x) \sin^{100} x}{k + 5} + c,$$

then $\dfrac{k}{19} =$

   (A) -2

(B) -4

(C) 4

(D) 5

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79. If $g(x) = \cos x^2$, $f(x) = \sqrt{x}$ and α, β ($\alpha < \beta$) are the roots of $18x^2 - 9\pi x + \pi^2 = 0$, then the area bounded by the curve $y = (g \circ f)(x)$ and the lines $x = \alpha$, $x = \beta$ and $y = 0$ is:

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

(B) $\dfrac{\sqrt{3}+1}{2}$

(C) $\dfrac{\sqrt{3}-1}{2}$

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

---

80. If $y = f(x)$ passing through $(1,2)$ satisfies the differential equation

$$y(1 + xy)\,dx - x\,dy = 0,$$

then $f(x) =$

(A) $\dfrac{2x}{2 - x^2}$

(B) $\dfrac{x + 1}{x^2 + 1}$

(C) $\dfrac{x - 1}{4 - x^2}$

(D) $\dfrac{4x}{1 - 2x^2}$

---

81. A line cuts the x-axis at $A(7,0)$ and the y-axis at $B(0,-5)$. A variable line PQ is drawn perpendicular to AB cutting the x-axis and y-axis at P and Q respectively. If AQ and BP intersect at R, then the locus of R is:

(A) $x^2 + y^2 + 7x - 5y = 0$

(B) $x^2 + y^2 - 7x + 5y = 0$

(C) $x^2 + y^2 - 3x + 4y = 0$

(D) $x^2 + y^2 + 6x + 7y = 0$

---

82. A straight line through the origin O meets the parallel lines $4x + 2y = 9$ and $2x + y + 6 = 0$ at points P and Q respectively. The point O divides the segment PQ in the ratio:

(A) $1 : 2$

(B) $3 : 4$

(C) $2 : 1$

(D) $4 : 3$

83 The number of integral values of λ for which $x^2 + y^2 + \lambda x + (1 - \lambda)y + 5 = 0$ is the equation of a circle whose radius does not exceed 5 is

   (A) 14

(B) 15

(C) 16

(D) 18

84 The number of values of c such that the straight line $y = 4x + c$ touches the curve $\frac{x^2}{4} + y^2 = 1$ is

   (A) 0

(B) 1

(C) 2

(D) infinite

85 The plane x - 2y + 3z = 17 divides the line joining the points (-2, 4, 7) and (3, -5, 8) in the ratio

   (A) 3:5

(B) 3:10

(C) 3:7

(D) none of these

86 The ratio of the distances from the points (1,–1,3) and (3,3,3) to plane $5x + 2y - 7z + 9 = 0$ is

   (A) 1:3

(B) 1:3

(C) 1:1

(D) 3:2

87 If the mean deviation of the numbers 1, 1+d, 1+2d, ... , 1+100d from their mean is 255, then the common difference d is

   (A) 20.0

(B) 10.1

(C) 20.2

(D) 10.0

---

88 If n integers taken at random are multiplied together, the probability that the last digit of the product is 1, 3, 7 or 9 is

   (A) $\dfrac{2^n}{5^n}$

(B) $\dfrac{8^n - 2^n}{5^n}$

(C) $\dfrac{4^n - 2^n}{5^n}$

(D) None of these

---

89. If

$$\tan \beta = 2 \sin \alpha \sin \gamma \cdot \csc(\alpha + \gamma),$$

then $\cot \alpha$, $\cot \beta$, $\cot \gamma$ are in:

   (A) A.P.

(B) G.P.

(C) H.P.

(D) none of these

---

90. If

$$\cos^{-1} \alpha + \cos^{-1} \beta + \cos^{-1} \gamma = 3\pi,$$

then the value of $\alpha\beta + \beta\gamma + \gamma\alpha$ is:

   (A) 1

(B) 2

(C) 0

(D) 3

91 A mixture of CO and CO$_2$ has vapour density 20 at STP. 100 g of this mixture contains ____ mole of CO

   (A) 0.4

(B) 0.2

(C) 0.625

(D) 0.375

92 if ideal gas expands at constant temperature

   (A) kinetic energy of molecules increases

(B) number of gas molecules increases

(C) kinetic energy remains same

(D) pressure of gas increases

93 Number of photons emitted by 10 watt bulb in 10 seconds, if wavelength of light is 1000 Å is

   (A) 1.01×10^{11}

(B) 2.02×10^{13}

(C) 3.03×10^{15}

(D) 4.04×10^{19}

94 The hybridization of atomic orbitals of N in NO$_2^-$, NO$_3^-$ and NH$_4^+$ are respectively

   (A) sp, sp^2, sp^3

(B) sp^3, sp^2, sp^3

(C) sp^2, sp^2, sp^3

(D) sp^2, sp, sp

95. Bond dissociation energies of XY, X_2 and Y_2 (all diatomic molecules) are in the ratio $1 : 1 : 0.5$ and ΔH_f of XY is -200 kJ mol^{-1}. The bond dissociation energy of X_2 will be:

(A) 800 kJ mol^{-1}

(B) 200 kJ mol^{-1}

(C) 300 kJ mol^{-1}

(D) 400 kJ mol^{-1}

---

96. Van't Hoff factors of aqueous solutions of X, Y, Z are 1.8, 0.8 and 2.5 respectively. Hence, their:

(A) boiling point: $Z < X < Y$

(B) freezing point: $Z < X < Y$

(C) osmotic pressure: $X = Y = Z$

(D) vapour pressure: $Y < X < Z$

---

97 K$_{sp}$ of Mg(OH)$_2$ is 1×10^{-12}. 0.01 M MgCl$_2$ solution will precipitate when limiting pH is
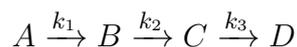
(A) 8

(B) 9

(C) 10

(D) 12

---

98. On the basis of information available for the reaction

$$\frac{4}{3}\,\text{Al} + \text{O}_2 \rightarrow \frac{2}{3}\,\text{Al}_2\text{O}_3, \quad \Delta G = -827\,\text{kJ mol}^{-1} \text{ of O}_2,$$

the minimum emf required to carry out electrolysis of Al$_2$O$_3$ is: (Given $1\,F = 96500\,\text{C}$)

(A) 2.14 V

(B) 4.28 V

(C) 6.42 V

(D) 8.56 V

---

99. Consider a successive reaction (all first order)

$$A \xrightarrow{k_1} B \xrightarrow{k_2} C \xrightarrow{k_3} D$$

The incorrect statement is:

(A) Concentration of A decreases exponentially with time

(B) Concentration of both B and C first increases, reaches maxima, then decreases

(C) If $k_1 < k_2$ and $k_2 < k_3$, $[B]_{\text{max}}$ will be greater than $[C]_{\text{max}}$

(D) If $k_1 > k_2$ and $k_2 < k_3$, $[B]_{\text{max}}$ will be greater than $[C]_{\text{max}}$

---

100. Assertion (A): Colloidal solution is electrically neutral.

Reason (R): Due to similar nature of the charge carried by the particles, they repel each other and do not combine to form bigger particles.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true and (R) is not the correct explanation of (A)

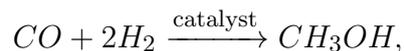(C) (A) is true but (R) is false

(D) Both (A) and (R) are false

---

101 Which is the most basic oxide?

(A) SnO_2

(B) K_2O

(C) CuO

(D) FeO

---

102 Which of the following acts as 'activator' in froth flotation process?

(A) KCN

(B) NaCN

(C) Sodium ethyl xanthate

(D) Copper sulphate

---

103 For the reaction

$$CO + 2H_2 \xrightarrow{\text{catalyst}} CH_3OH,$$

the catalyst used is

   (A) Fe

(B) Cr_2O_3/ZnO

(C) V_2O_5

(D) Al_2O_3

---

104 Which of the following statement(s) is (are) incorrect for alkali metals?

   (A) Li^+ is exceptionally small and shows covalent character in some compounds

(B) Sodium oxide is isomorphic in nature

(C) Lithium is strongest reducing agent

(D) All alkali metals give blue coloration in liquid ammonia

---

105 The structures of quartz, mica and asbestos have the common basic unit of

   (A) $(SiO_4)^{4-}$

(B) $(SiO_3)^{2-}$

(C) $(SiO_3)^{2+}$

(D) SiO_2

---

106 For advertisement, the coloured discharge tubes contain

   (A) Ne

(B) Ar

(C) Be

(D) Kr

---

107 Given catalyst and corresponding process are matched. The mismatch is

   (A) $[RhCl(pph_3)_2]$: Hydrogenation

(B) $TiCl_4 + Al(C_2H_5)_3$: Polymerization

(C) V_2O_5 : Haber-Bosch process

(D) Ni : Hydrogenation

---

108 The EAN of Co(CO)$_4$ is 35. It attains stability by

(A) Oxidation of $[Co(CO)_4]$

(B) Reduction of $[Co(CO)_4]$

(C) Dimerization of $[Co(CO)_4]$

(D) Both (B) and (C)

---

109 Carcinogenic pollutant in the following is

(A) Polychlorinated biphenyls

(B) Sodium chlorate

(C) Tetrachloroethene

(D) Both (A) and (C)

---

110 29.5 mg of organic compound contains N. Ammonia from Kjeldahl method absorbed in 20 mL of 0.1 M HCl. Excess acid requires 15 mL of 0.1 M NaOH for neutralization. The percentage of nitrogen in compound is

(A) 29.5%

(B) 59.0%

(C) 23.7%

(D) 47.4%

---

111 Hyper conjugation involves overlap of following orbitals
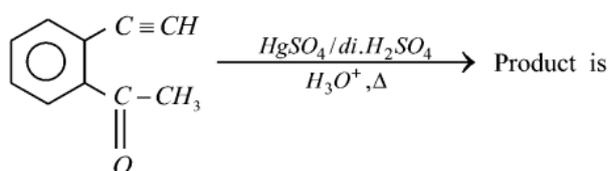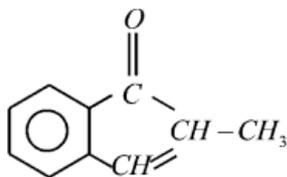
(A) –

(B) –

(C) p – p

(D) –

---

112 What volume of methane at NTP is formed from 8.2 g sodium acetate fused with soda lime
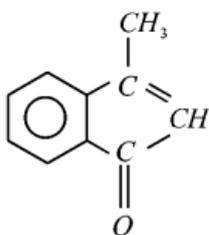
(A) 10 L

(B) 11.2 L

(C) 5.6 L

(D) 2.24 L

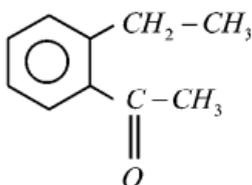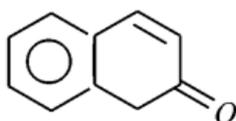**113 For the reaction shown, the product formed is:**

(A) Acetophenone type structure

(B) Vinyl ketone on benzene
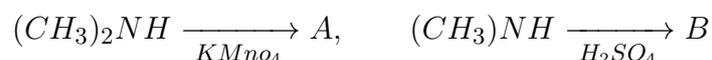
(C) Ethyl substituted ketone

(D) Cyclohexanone fused to benzene

---

114 How many monochloro derivatives are possible when 3-methylpentane is subjected to free radical chlorination (including isomers)?

(A) 7

(B) 5

(C) 6

(D) 4

---

115 Identify the correct compound formed in the reaction

$$(CH_3)_2NH \xrightarrow[KMno_4]{} A, \qquad (CH_3)NH \xrightarrow[H_2SO_4]{} B$$

(A) Tetramethylhydrazine and dimethylhydroxylamine

(B) Dimethylphenol amine and tetramethylhydrazine

(C) Tetramethylhydrazine and tetramethylhydrazine

(D) Dimethylhydroxylamine and dimethylhydroxylamine

---

116. Gutta-percha, a naturally occurring highly crystalline non-elastic rubber, consists of:

(A) $1, 4$-polyisoprenes in which all the double bonds have E-configurations

(B) $1, 4$-polyisoprenes in which all the double bonds have Z-configurations

(C) A mixture of Z-$1, 4$-polyisoprenes and E-$1, 4$-polyisoprenes

(D) $1, 4$-polyisoprenes in which some double bonds have Z-configurations and some others have E-configurations

---

117. Statement–I: Glucose is in pyranose form and has free anomeric hydroxyl group.

Statement–II: In sucrose, glucose is in pyranose form and fructose is in furanose form.

(A) Both I and II are true

(B) I is true, but II is false

(C) I is false, but II is true

(D) Both I and II are false

---

118. The drug used for the treatment of throat infection is:

    (A) quinine

(B) piperazine

(C) sulpha drug like sulphanilamide

(D) isonicotin hydrazide

---

119. Which of the following statement is not correct?

    (A) Only α-amino acids are obtained on hydrolysis of proteins

(B) The amino acids which are synthesized in the body are known as non-essential amino acids

(C) There are 20 essential amino acids

(D) L-amino acids are represented by writing the $-NH_2$ group on the left side

---

120. In a reaction involving ring substitution of C_6H_5Y, the major product is the meta-isomer. The group Y can be:

    (A) $-NH_2$

(B) $-COOH$

(C) $-CH_3$

(D) $-Cl$

---

121. When two or more authors publish a new species or propose a new name, their names are linked using the epithet:

    (A) In

(B) Ex

(C) emend

(D) et

---

122. Members of which kingdom have cell walls and are all heterotrophic?

(A) Plantae

(B) Fungi

(C) Animalia

(D) Protista

---

123. Squamous epithelium occurs in the inner lining of:

(A) Kidney

(B) Pancreatic duct

(C) Lung alveoli

(D) Heart

---

124. Which of the following statements is true?

(A) Eukaryotic cells have membrane-bound organelles

(B) Prokaryotic cells have a nucleus

(C) Eukaryotic cells have genetic information

(D) Prokaryotic cells are surrounded by a cell membrane

---

125. DNA structure was discovered by Watson and Crick in:

(A) 1953

(B) 1962

(C) 1952

(D) 1951

---

126. Name the phenomenon that begins when sugar solution is separated from water by a semipermeable membrane.

(A) Osmosis

(B) Diffusion

(C) Imbibition

(D) Translocation

127. This is a rich source for Vitamin C:

   (A) Rice

(B) Milk

(C) Egg

(D) Lemon

128. Synthesis of ADP $+ P_i \rightarrow$ ATP in grana is:

   (A) Phosphorylation

(B) Photophosphorylation

(C) Oxidative phosphorylation

(D) Photolysis

129. Citric acid cycle takes place in:

   (A) Cytosol

(B) Peroxisomes

(C) Mitochondria

(D) None of these

130. Coiling of garden pea tendrils around any support is an example of:

   (A) Thermotaxis

(B) Thigmotaxis

(C) Thigmotropism

(D) Thigmonasty

131. The instrument used for measuring blood pressure is known as:

   (A) ECG

(B) Stethoscope

(C) Sphygmomanometer

(D) EEG

132. Amount of blood passes through kidney per minute is:

(A) 110−200 ml

(B) 150−200 ml

(C) 100−120 ml

(D) 50−100 ml

133. Hinge joints:

(A) Are synovial joints

(B) Permit movements in one direction

(C) Are found in knee

(D) All of these

134. When a neuron is in resting state i.e. not conducting any impulse, the axonal membrane is:

(A) Comparatively more permeable to K^+ ions and nearly impermeable to Na^+ ions

(B) Comparatively more permeable to Na^+ ions and nearly impermeable to K^+ ions

(C) Equally permeable to both Na^+ and K^+ ions

(D) Impermeable to both Na^+ and K^+ ions

135. Parthenocarpy leads to:

(A) Seed fruit

(B) Seedless fruit

(C) No fruit

(D) Seed formation

136. Tyson's glands occur in male on:

(A) urethra

(B) scrotum

(C) prepuce

(D) epididymis

---

137. Chromatin is composed of:

(A) Nucleic acid and protein

(B) Only nucleic acid

(C) Only protein

(D) None of these

---

138. B-lymphocytes are:

(A) Formed in bone marrow

(B) Preprocessed in bone marrow

(C) Preprocessed in liver

(D) Both formed in bone marrow and preprocessed in bone marrow

---

139. Choose the complex fertilizer:

(A) Potassium sulphate

(B) Calcium ammonium nitrate

(C) Triple super phosphate

(D) Urea ammonium phosphate

---

140. Hop flowers are used for:

(A) Gluconic acid production

(B) Beer production

(C) Vinegar production

(D) Alcohol production

---

141. The two DNA strands are held together by bonds of:

(A) Nitrogen

(B) Oxygen

(C) Hydrogen

(D) Carbon

---

142. Green Fluorescent Protein was first observed in:

(A) Jellyfish

(B) Primate

(C) Cuttlefish

(D) Shark

---

143. The carrying capacity of a population is determined by its:

(A) Natality

(B) Limiting resources

(C) Population growth rate

(D) Mortality

---

144. The richness of species in an ecosystem is termed as:

(A) Genetic diversity

(B) Species diversity

(C) Community diversity

(D) All of these

---

145. Red Data Book provides data on:

(A) Red flowered plants

(B) Red coloured fishes

(C) Endangered plants and animals

(D) Red eyed birds

---

146. The Taj Mahal is being affected by:

(A) Noise pollution

(B) Air pollution

(C) Water pollution

(D) None of these

---

147. Blood flow in lungs is circulated by:

(A) Cardiac circulation

(B) Pulmonary circulation

(C) Gastric circulation

(D) Trachea

---

148. Which of these is true for gastric juices?

(A) Kill bacteria

(B) Digest food

(C) Include hydrochloric acid

(D) All of these

---

149. Which of the following country has the richest biodiversity?

(A) India

(B) South Africa

(C) Brazil

(D) Russia

---

150. Disease caused by eating fish inhabiting mercury contaminated water is:

(A) Hiroshima episode

(B) Minamata disease

(C) Bright's disease

(D) Osteosclerosis