11-BTMT - Provisional Answer Key

1.	A quantity <i>x</i> is given by (IFv ² /WL ⁴) in terms of moment of inertia I, force F, velocity v, work W and length L. The dimensional formula for <i>x</i> is same as that of:		
	(A) Planck's constant	(B) Force constant	
	(C) Energy Density	(D) Coefficient of viscosity	
2.	The dimension of stopping potential Vo in photoelectric effect in units of Planck's constant h, speed of light c, Gravitational constant G and ampere A is:		
	(A) $h^0 c^5 G^{-1} A^{-1}$	(B) $h^0 c^2 G^{-2} A^{-1}$	
	(C) $h^{-2/3}c^{-1/3}G^{4/3}A^{-1}$	(D) $h^2 c^{3/2} G^{1/3} A^{-1}$	
3.	A car starts from rest on a curved road of radius 200 m and attains a speed of 18 km/hr at the end of 60 seconds while travelling with constant tangential acceleration. What will be the normal acceleration of car after 30 second from the start?		
	(A) 0.0985 m/s^2	(B) 0.0836 m/s ²	
	(C) 0.03125 m/s ²	(D) 0.0252 m/s^2	
4.	A simple pendulum hangs from the roof of a train moving on horizontal rails. If the string is inclined towards the front of the train, then train is		
	(A) Moving with constant velocity	(B) In accelerated motion	
	(C) In retarded motion	(D) At rest	
5.	A bullet is fired into a fixed target loses one third of its velocity after travelling 4 cm. It penetrates further D x 10 ⁻³ m before coming to rest. The value of D is:		
	(A) 25	(B) 32	
	(C) 4	(D) 3	
6.	Electric intensity at any point in an electric f	ïeld is equal to the at that point.	
	(A) Electric flux	(B) Magnetic flux density	
	(C) Potential gradient	(D) Current density	
7.	The rating of fuse wire is always expressed in	n:	
	(A) Ampere-hours	(B) Ampere-volts	
	(C) kWh	(D) Amperes	
8.	A closed switch has a resistance of		
	(A) Infinity	(B) Zero	
	(C) 50 ohm	(D) 51.5 ohm	
9.	A gas has n degrees of freedom. The ratio of specific heat of gas at constant volume to the specific heat of gas at constant pressure will be		
	$(\mathbf{A}) \stackrel{n}{\underline{}}$	(B) $\frac{n+2}{2}$	
	n+2	n n	
	(C) $\frac{n}{2n+2}$	(D) $\frac{n}{n-2}$	
10.	A particle is vibrating in simple harmonic motion (S.H.M) with an amplitude of 4 cm. At what displacement from theequilibrium position is its energy half potential and half kinetic?		
	(A) 1 cm	(B) $2\sqrt{2}$ cm	
	(C) $\sqrt{2}$ cm	(D) 3 cm	
11.	Which of the following cannot be emitted by	radioactive substances during their decay?	
	(A) Protons	(B) Neutrinos	
	(C) Electrons	(D) Helium nuclei	
12.	The mean free path of molecules of a certain gas at STP is 1500d, where d is the diameter of the gas molecules. While maintain the standard pressure, the mean free path of the molecules at 373 K is approximately:		
	(A) 2049d	(B) 1890d	
	(C) 1560d	(D) 824d	

13.	Two identical conducting spheres P and S with charge Q on each, repel each other with a force 16 N. A third identical uncharged conducting sphere R is successively brought in contact with the two spheres. The new force of repulsion between P and S is:		
	(A) 1 N	(B) 6 N	
	(C) 12 N	(D) 4 N	
14.	If the electric potential at any point (x, y, z) m in space is given by $V = 3x^2$ volt. The electric field at the point $(1, 0, 3)$ m will be:		
	(A) 3 Vm ⁻¹ , directed along positive x-axis	(B) 3 Vm ⁻¹ , directed along negative x-axis	
	(C) 6 Vm ⁻¹ , directed along positive x-axis	(D) 6 Vm ⁻¹ , directed along negative x-axis	
15.	When the charged particles move in a combined magnetic and electric field, then the force acting is known as		
	(A) Centripetal force	(B) Centrifugal force	
	(C) Lorentz force	(D) Orbital force	
16.	A beam of protons with speed 4×10^5 m/s enters a uniform magnetic field of 0.3 T at an angle 60° to the magnetic field, the pitch of the resulting helical path of protons is close to:		
	(Given, mass of the proton = 1.67×10^{-27} kg	, charge of the proton = 1.69×10^{-19} C)	
	(A) 2 cm	<mark>(B)</mark> 4 cm	
	(C) 8 cm	(D) 15 cm	
17.	The induced emf can be produced in a coil by:		
	(a) moving the coil with uniform speed inside uniform magnetic field		
	(b) moving the coil with non-uniform speed inside uniform magnetic field		
	(c) rotating the coil inside the uniform mag	(c) rotating the coil inside the uniform magnetic field	
	(d) changing the area of the coil inside the u	iniform magnetic field	
	(A) (b) and (c) only	(B) (a) and (b) only	
	<mark>(C)</mark> (c) and (d) only	(D) (b) and (d) only	
18.	If the value of C in a series RLC circuit is d	ecreased, the resonant frequency	
	(A) is not affected	(B) increases	
	(C) is reduced to zero	(D) none of these	
19.	A convex mirror of radius of curvature 30 c distance is:	m forms an image that is half the size of the object. The object	
	(A) 15 cm	<mark>(B)</mark> -15 cm	
	(C) 45 cm	(D) -45 cm	
20.	The ripple factor of a half-wave rectifier is		
	(A) 2	(B) 1.21	
	(C) 2.5	(D) 0.48	
21.	At absolute temperature, an intrinsic semic	onductor has:	
	(A) A few free electrons	(B) Many holes	
	(C) Many free electrons	(D) No holes or free electrons	
22.	A Zener diode utilizes characteristics for its operation		
	(A) forward	(B) reversed	
	(C) both forward and reverse	(D) None of these	
23.	For a purely inductive circuit which of the	following is true?	
	(A) Apparent power is zero		
	(B) Reactive power is zero		
	(C) Active power of the circuit is zero		
	(D) Any capacitance even if present in the circuit will not be charged		

24.	Kirchhoff's laws do not apply to circuits with	h:	
	(A) Parameters that are distributed	(B) Parameters grouped together	
	(C) Elements that are passive	(D) Non-linear resistances	
25.	In an experiment with vernier calipers of least count 0.1 mm, when two jaws are joined together the zero of the vernier scale lies right to the zero of the main scale and 6th division of vernier scale coincides with the main scale division. While measuring the diameter of a spherical bob, the zero of vernier scale lies between 3.2 cm to 3.3 cm marks and the 4th division of vernier scale coincides with the main scale division. The diameter of bob is measured as		
	(A) 3.22 cm	(B) 3.18 cm	
	(C) 3.26 cm	(D) 3.25 cm	
26.	For a first-order reaction, the graph of ln[R] vs time is:		
	(A) Linear with a positive slope	(B) Parabolic	
	(C) Linear with a negative slope	(D) A horizontal line	
27.	Osmotic pressure is used to determine:		
	(A) Volume of solute	(B) Boiling point of a solvent	
	(C) Molar mass of a solute	(D) Pressure of a solution	
28.	Which one of the following statements is true about azeotropes?		
	(A) They can be separated by fractional distillation		
	(B) They boil at variable temperatures		
	(C) They exhibit either a maximum or minimum boiling point		
	(D) They consist of a pure component only		
29.	The unit of conductivity in SI is:		
	(A) S cm ² mol ⁻¹	(B) Ω^{-1} cm ⁻¹	
	(C) S m ⁻¹	(D) Ohm	
30.	KMnO4 in acidic medium acts as a/an:		
	(A) Weak base	(B) Reducing agent	
	(C) Strong oxidising agent	(D) Buffer	
31.	The magnetic moment (spin-only) of Mn ²⁺ is	approximately:	
	(A) 2.84 BM	(B) 5.92 BM	
	(C) 4.90 BM	(D) 1.73 BM	
32.	Which of the following is used in the Contact	t Process as a catalyst?	
	(A) Fe	$(B) V_2 O_5$	
	(C) Pt	(D) MnO ₂	
33.	Which of the following oxides is amphoteric?		
	(A) CrO	$(B) \operatorname{Cr}_2 O_3$	
	(C) CrO ₃	(D) MnO	
34.	Which statement is correct about lanthanoid	contraction?	
	(A) It causes decrease in basicity		
	(B) It causes increase in ionic size		
	(C) It causes identical radii for 4d and 5d elements		
	(D) It has no effect on periodic trends		
35.	The complex [Fe(CN) ₆] ³⁻ is weakly paramage	netic. What does this suggest about the bonding?	
	(A) It is an outer orbital complex	(B) It involves sp ³ d ² hybridisation	
	(C) It is a high-spin complex	(D) It is a low-spin inner orbital complex	
36.	Which of the following best explains the low reactivity of vinyl chloride in nucleophilic substitution?		
	(A) Strong C–Cl bond	(B) Partial double bond character of C–Cl	
	(C) Weak nucleophile	(D) Low dipole moment	

- 37. Williamson synthesis involves the reaction between:
 - (A) Alcohol and carboxylic acid (B) Ether and acid
 - (C) Alcohol and alkyl halide (D) Sodium alkoxide and alkyl halide

38. Which of the following reacts fastest with Lucas reagent at room temperature?

- (A) 1° Alcohol (B) 2° Alcohol
- (C) 3° Alcohol (D) Phenol

39. Oxidation of primary alcohols using PCC (Pyridinium chlorochromate) gives:

(A) Ketones (B) Acids

(C) Aldehydes (D) Esters

- Which reagent is used to convert phenol to 2,4,6-tribromophenol?
 - (A) Br₂ in CS₂ (B) Br₂ in water
 - (C) Br₂ in CCl₄ (D) Br₂ in acetic acid

41. What is the mechanistic basis for the stability of arenediazonium salts compared to alkyldiazonium salts, and how does this influence their synthetic utility in aromatic chemistry?

- (A) Resonance delocalizes positive charge in arenediazonium; enables nucleophilic substitutions without rearrangement
- (B) Alkyl groups stabilize diazonium via hyperconjugation; limits synthetic versatility
- (C) Aromatic rings increase steric hindrance; prevents nucleophilic attack on diazonium
- (D) Alkyldiazonium salts form stable carbocations; promotes electrophilic additions
- 42. In the electrophilic substitution of aniline, why does acetylation with acetic anhydride allow controlled monosubstitution, and how does this affect the electron density on the nitrogen atom?
 - (A) Acetylation reduces nitrogen's lone pair availability via resonance with carbonyl; lowers ortho/para activation
 - (B) Acetylation protonates the amino group; converts it to a meta-directing group
 - (C) Acetylation forms a steric barrier; prevents substitution at ortho positions
 - (D) Acetylation enhances nitrogen's basicity; increases electron density at para position
- 43. Why does the Gabriel phthalimide synthesis fail to produce aromatic primary amines, and what specific chemical property of aryl halides is responsible for this limitation?
 - (A) Aryl halides resist nucleophilic substitution due to sp²-hybridized carbon; resonance stabilizes the C-X bond
 - (B) Aryl halides undergo electrophilic substitution; phthalimide anion is a poor electrophile
 - (C) Aromatic rings deactivate the nitrogen in phthalimide; steric hindrance prevents reaction
 - (D) Aryl halides form stable diazonium salts; phthalimide anion is too basic
- 44. Which sequence of reactions correctly converts benzyl chloride to 2-phenylethanamine, and what is the key intermediate formed?

(A) KCN, LiAlH4; phenylacetonitrile

- (B) NaCN, NaOH, Br2; benzylamine
- (C) NH₃, HNO₂; benzenediazonium chloride
- (D) Phthalimide, KOH, hydrolysis; N-benzylphthalimide
- 45. What is the major product formed when the compound with the molecular formula C₃H₉N, identified as propan-2-amine, reacts with nitrous acid, and why does it produce nitrogen gas?

(A) Propan-2-ol; due to the formation of a stable secondary carbocation

- (B) Propan-2-amine nitrite; due to salt formation
- (C) Propene; due to elimination from an unstable alkyldiazonium ion
- (D) Propan-1-ol; due to rearrangement of the carbocation

40.

- 46. Which reaction of D-glucose with nitric acid confirms the presence of a primary alcoholic group, and what is the product formed?
 - (A) Oxidation to gluconic acid; indicates aldehyde group
 - (B) Reduction to n-hexane; confirms straight chain
 - (C) Oxidation to saccharic acid; indicates primary alcoholic group
 - (D) Formation of pentaacetate; confirms hydroxyl groups
- 47. What is the significance of the D and L notations in carbohydrates, and how is the configuration of D-(+)-glucose determined?
 - (A) Relates to optical rotation; based on highest asymmetric carbon
 - (B) Indicates relative configuration to glyceraldehyde; based on lowest asymmetric carbon
 - (C) Denotes anomeric carbon orientation; based on C1 hydroxyl group
 - (D) Refers to ring size; based on pyranose vs. furanose structure
- 48. Why can't vitamin C be stored in the body, and what is the biochemical consequence of its deficiency?
 - (A) Water-soluble; leads to scurvy (B) Fat-soluble; causes night blindness
 - (C) Excreted in bile; results in rickets (D) Metabolized rapidly; causes beriberi
- 49. Why does the hydrolysis of starch yield only glucose, and what type of glycosidic linkage is primarily involved?
 - (A) Homopolysaccharide with α-1,4 linkages; yields single monosaccharide
 - (B) Heteropolysaccharide with β-1,4 linkages; yields multiple sugars
 - (C) Disaccharide with α-1,2 linkages; yields glucose and fructose
 - (D) Polysaccharide with β-1,6 linkages; yields galactose
- 50. What is the biochemical significance of the zwitterionic form of amino acids in peptide bond formation, and how does this influence the stability of the resulting polypeptide?
 - (A) Neutralizes charges, facilitates amide bond formation; enhances hydrogen bonding in secondary structure
 - (B) Increases solubility, prevents peptide linkage; stabilizes tertiary structure via disulfide bonds
 - (C) Promotes optical activity, inhibits amide formation; weakens quaternary structure
 - (D) Enhances basicity, catalyzes hydrolysis; reduces van der Waals interactions
- 51. If A = 1, B = 2, ..., Z = 26, then what is the value of CAT?

	(A) 24	(B) 27
	(C) 48	(D) 45
52.	Monday is the first day of the month. What is the 15th day?	
	(A) Monday	(B) Tuesday
	<mark>(C)</mark> Wednesday	(D) Thursday
53.	A is older than B. B is older than C. Who is the youngest?	
	(A) A	(B) B
	(C) C	(D) Can't say
54.	Which word cannot be formed from 'INFORMATION'?	
	(A) FORM	(B) RATION
	(C) MOTION	<mark>(D)</mark> MONITOR
55.	If 'X' means '+', ' \div ' means '×', then $6 \div 3 \times 2 = ?$	
	(A) 18	<mark>(B)</mark> 12
	(C) 6	(D) 4
56.	Who discovered Gravity?	
	(A) Galileo	(B) Newton
	(C) Kepler	(D) Einstein

57.	What is the National Animal of India?		
	(A) Lion	(B) Tiger	
	(C) Elephant	(D) Leopard	
58.	Which is the smallest continent?		
	(A) Europe	(B) Australia	
	(C) Antarctica	(D) Africa	
59.	Who wrote 'Discovery of India'?		
	(A) Rabinderanath Tagore	<mark>(B)</mark> Jawaharlal Nehru	
	(C) Subhas Chandra Bose	(D) M K Gandhi	
60.	Which is the highest peak in the world?		
	(A) K2	(B) Everest	
	(C) Kanchenjunga	(D) Annapurna	
61.	Neither of them prepared to help the old woman cross the road.		
	(A) were	(B) was	
	(C) is	(D) are	
62.	I'd hurry up if I You.		
	(A) was	(B) be	
	(C) were	(D) can	
63.	The standard is a high IQ.		
	<mark>(A)</mark> criteria	(B) criterias	
	(C) criterion	(D) crit	
64.	Give an antonym for 'partison'.		
	(A) biased	(B) partial	
	<mark>(C)</mark> neutral	(D) discriminatory	
65.	He <u>broke off</u> in the middle of his story.	Find the similar meaning for above underlined idiom.	
	(A) Broken	(B) stopped suddenly	
	(C) quarrel	(D) caused	
66.	He not enter my house again.		
	<mark>(A)</mark> shall	(B) will	
	(C) can	(D) might	
67.	You have accepted the offer.		
	(A) can	(B) may	
	(C) shall	(D) could	
68.	One can always try herbal remedies, can't?		
	(A) you	(B) they	
	(C) he	(D) one	
69.	Give synonym for 'Explicit'.		
	(A) Inexplicit	(B) Ambiguous	
	<mark>(C)</mark> Clear	(D) Confuse	
70.	What is the meaning of ' Sororicide' ?		
	(A) Who Kills Sorrow	(B) Who Kills Father	
	(C) Who Kills Brother	(D) Who Kills Sister	

71. Let $f: R \to R$ be defined as $f(x) = x^4$. Choose the correct answer.

(B) f is many-one onto (A) f is one-one onto (C) f is one-one but not onto (D) f is neither one-one nor onto $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$ is equal to 72. (A) $\frac{7\pi}{\epsilon}$ (B) $\frac{5\pi}{6}$ (C) $\frac{\pi}{2}$ (D) $\frac{\pi}{\epsilon}$ 73. if $\cos\left(\sin^{-1}\frac{2}{5} + \cos^{-1}x\right) = 0$, then x =_____. (A) $\frac{1}{5}$ (B) $\frac{2}{5}$ (C) 0 **(D)** 1 74. If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then value of x is _____. (A) 3 **(B)** \pm 3 $(C) \pm 6$ (D) 6 75. If $y = \log\left(\frac{1-x^2}{1+x^2}\right)$, then $\frac{dy}{dx}$ is equal to (A) $\frac{4x^3}{1-x^4}$ (B) $\frac{-4x}{1-x^4}$ (C) $\frac{1}{4-r^4}$ (D) $\frac{-4x^3}{1-x^4}$ 76. if $f(x) = 4x^3 + 3x^2 + 3x + 4; x \neq 0$, then $\frac{d}{dx} \left(x^3 \cdot f\left(\frac{1}{x}\right) \right) =$ _____. (B) $\frac{12}{r^2} + \frac{6}{r} + 3$ (A) $12x^2 + 6x + 3$ (C) $\frac{x^2}{12} + \frac{x}{6} + \frac{1}{3}$ (D) $24x^5 + 15x^4 + 12x^3 + 12x^2$ 77. If $y = \sqrt{\sin x + y}$, then $\frac{dy}{dx}$ is equal to (A) $\frac{\cos x}{2v-1}$ (B) $\frac{\cos x}{1-2v}$ (C) $\frac{\sin x}{1-2v}$ (D) $\frac{\sin x}{2v-1}$ The interval in which $y = x^2 e^{-x}$ is increasing is _____. 78. (A) $(-\infty,\infty)$ (B)(-2,0)(C) (2, ∞) (D)(0,2)

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(C) 4 (D) Any real number

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[P.T.O.

88. If
$$\begin{vmatrix} \vec{a} \cdot \vec{b} \end{vmatrix} = 3$$
 and $\begin{vmatrix} \vec{a} \times \vec{b} \end{vmatrix} = 4$ then the angle between \vec{a} and \vec{b} is ______.
(A) $\cos^{-1} \frac{3}{4}$ (B) $\cos^{-1} \frac{3}{5}$
(C) $\cos^{-1} \frac{4}{5}$ (D) $\frac{\pi}{4}$
89. The area of a parallelogram whose adjacent sides are $\vec{a} = \hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j}$ is ______.
(A) $\sqrt{42}$ (B) $2\sqrt{21}$ (D) $\frac{1}{2}\sqrt{21}$
90. The feasible solution of LPP ______.
(A) satisfy all the constraints
(C) always corner points of feasible solution
(D) always optimal value of objective function
91. If $P(A) = \frac{3}{10}$, $P(B) = \frac{2}{5}$ and $P(A \cup B) = \frac{3}{5}$ then $P(A \mid B) + P(B \mid A)$ equals ______.
(A) $\frac{1}{4}$ (B) $\frac{1}{3}$
(C) $\frac{5}{12}$ (D) $\frac{7}{12}$
92. If sin $\frac{1}{x} = y$ then,
(A) $0 \le y \le \pi$ (B) $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$
(C) $0 \le y \le \pi$ (B) $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$
(C) $0 \le y \le \pi$ (D) $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$
93. Let $f : R \to R$ be defined as $f(x) = 3x$. Choose the correct answer.
(A) $f(x)$ is an invertible matrix of order 2, then det (A^+) is equal to ______.
(A) det(A) (B) 1
(C) $\frac{1}{det(A)}$ (D) 0
94. If A is an invertible matrix of order 2, then det (A^+) is equal to ______.
(A) det(A) (B) 1
(C) $\frac{1}{det(A)}$ (D) 0
95. $\frac{d}{dx} [4\cos^3 x - 3\cos x] = ____.$
(A) -sin $3x$ (B) $3\sin^3x$
(C) $-3in^3x$ (D) \cos^3x
95. If $A = \{1, 2, 3\}$ and consider the relation $R = \{1, 1, (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)\}$. Then, R is _____.
(A) reflexive but not symmetric
(B) reflexive but not transitive (D) neither symmetric nor transitive

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97. If
$$A = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$$
 then $|A^2 - 2A| =$ _____.
(A) 15 (B) 20
(C) 25 (D) -15
98. If $A = \begin{bmatrix} \cos a & -\sin a \\ \sin a & \cos a \end{bmatrix}$ and $A + A' = I$, then the value of *a* is _____.
(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$
(C) π (D) $\frac{3\pi}{2}$

Let A be a nonsingular square matrix of order 3 × 3 then |*adj* A| is equal to _____. 99.

(A)
$$|A|$$
 (B) $|A|^2$

 (C) $|A|^3$
 (D) $3|A|$

$$(C) |A|^3$$
 (D) 3 A

100. The feasible solution for a LPP is shown in Figure



Let Z = 3x - 4y be the objective function. Minimum of Z occurs at

(A) (0, 0) **(B) (5, 0)** (C) (4, 10) **(D)** (0, 8)