## PART - I - PHYSICS

## Section - 1 - Straight Objective Type (+2, 0)

This section contains 10 multiple choice questions.
Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

1. A passenger in a moving train tosses a coin which falls behind him. It means that motion of the train is
(A) accelerated
(B) uniform
(C) retarded
(D) along circular tracks
2. A body is projected at an angle $60^{\circ}$ with the horizontal with kinetic energy K , When the velocity makes an angle $30^{\circ}$ with the horizontal, the kinetic energy of the body will be
(A) $\mathrm{K} / 2$
(B) $\mathrm{K} / 3$
(C) $2 \mathrm{~K} / 3$
(D) $3 \mathrm{~K} / 4$
3. Out of the following the resultant of which cannot be 4 N .
(A) 2 N and 2 N
(B) 2 N and 8 N
(C) 2 N and 6 N
(D) 2 N and 4 N
4. For the same horizontal range, in how many projections (with same velocity) can an object be projected?
(A) 4
(B) 3
(C) 2
(D) 1
5. The below system is in equilibrium. What will be the acceleration of Block $A$, just after string is cut? $\left(\mathrm{g}=10 \mathrm{~m} / \mathrm{s}^{2}\right)$

(A) $10 \mathrm{~m} / \mathrm{s}^{2}$
(B) $12 \mathrm{~m} / \mathrm{s}^{2}$
(C) $15 \mathrm{~m} / \mathrm{s}^{2}$
(D) $25 \mathrm{~m} / \mathrm{s}^{2}$
6. A block is being pushed against a wall by 50 N Force as shown below. Find the friction action acting on block?

(A) 25 N
(B) 15 N
(C) 20 N
(D) 50 N
7. A particle is moving in a vertical circle. The tensions in the string when passing through two positions at angle $30^{\circ}$ and $60^{\circ}$ from vertical (lowest positions) are $\mathrm{T}_{1}$ and $T_{2}$ respectively, then
(A) $\mathrm{T}_{1}=\mathrm{T}_{2}$
(B) $\mathrm{T}_{1}<\mathrm{T}_{2}$
(C) $\mathrm{T}_{1}>\mathrm{T}_{2}$
(D)Data Insufficient
8. The air pressure inside a soap bubble of radius $R$ exceeds the outside air pressure by 10 pa. By how much will the pressure inside a bubble of radius $2 R$ exceed the outside air pressure?
(A) 20 pa
(B) 40 pa
(C) 2.5 pa
(D) 5 pa
9. The restoring force of SHM is maximum when particle
(A) Displacement is maximum.
(B) Is halfway between the mean and extreme position.
(C) Crosses mean position.
(D)Is at rest.
10. The intensity of a progressing plane wave in loss-free medium is
(A) Inversely proportional to the square of amplitude of wave.
(B) Directly proportional to the square velocity of wave.
(C)Directly proportional to square of frequency of the wave.
(D) Inversely proportional to density of medium.

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## Section - 2 - Straight Objective Type (+4, -1)

## This section contains 5 multiple choice questions.

## Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

11. A particle is projected from the ground with an initial speed of $\boldsymbol{v}$ at an angle $\theta$ with horizontal. The average velocity of the particle between its point of projection and highest point of trajectory is:
(A) $\frac{v}{2} \sqrt{1+2 \cos ^{2} \theta}$
(B) $\frac{v}{2} \sqrt{1+\cos ^{2} \theta}$
(C) $\frac{v}{2} \sqrt{1+3 \cos ^{2} \theta}$
(D) $v \cos \theta$
12. Kepler's second law regarding the constancy of aerial velocity of a planet is a consequence of the law of conservation of
(A) Energy
(B) Linear momentum
(C)Angular momentum
(D)None of these
13. Assertion: Torque is equal to rate of change of angular momentum.

Reason: Angular momentum depends on moment of inertia and angular velocity.
(A)Both assertion and reason are correct, and reason is correct explanation of assertion.
(B) Both assertion and reason are correct, and reason is not correct explanation of assertion.
(C)Assertion is true, Reason is false.
(D)Assertion is false, Reason is true.
14. A wire has mass $0.3 \pm 0.0003 \mathrm{~g}$, radius $0.5 \pm 0.0005 \mathrm{~mm}$ and length $6 \pm 0.06 \mathrm{~cm}$. The maximum percentage error in the measurement of its density is
(A) 1
(B) 2
(C) 3
(D) 4
15. The displacement $(x)$ of a particle depends on time $(t)$ as $x=\alpha t^{2}-\beta t^{3}$
(A) The particle will return to its starting point after time $2 \alpha / \beta$
(B) The particle will come to rest after $2 \alpha / 3 \beta$
(C) The initial velocity of particle was non-zero
(D)No net force will act on particle at $t=\alpha / \beta$

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## Section - 1- Straight Objective Type (+2, 0)

## This section contains 10 multiple choice questions. Each question has 4 choices

 $(A),(B),(C)$ and (D), out of which ONLY ONE is correct.16. Which of the following $R$ value is incorrect?
(A) $2 \mathrm{cal} \mathrm{K}^{-1} \mathrm{~mol}^{-1}$
(B) $7.189 \times 10^{19} \mathrm{eV} \mathrm{K}^{-1} \mathrm{~mol}^{-1}$
(C) $8.314 \mathrm{JK}^{-1} \mathrm{~mol}^{-1}$
(D) 0.0821 litre $\mathrm{atm} \mathrm{mol}^{-1} \mathrm{~K}^{-1}$
17. If $m$ is molality, $M$ is molarity, $\chi$ mole fraction of solute, $M_{1}$, is molar mass of solute and $M_{2}$ is molar mass of solvent then which of the following relation is correct
(A) $M=\frac{1000 M}{1000 d+M \chi}$
(B) $M=\frac{1000 \chi}{(1-\chi) M_{2}}$
(C) $M=\frac{1000(1-\chi)}{\chi M}$
(D) All of these
18. The uncertainty in measurement of position and momentum are equal, the uncertainty in the measurement of velocity of an electron is
(a) $3 \times 10^{15} \mathrm{~m} / \mathrm{sec}$
(b) $6 \times 10^{15} \mathrm{~m} / \mathrm{sec}$
(c) $8 \times 10^{12} \mathrm{~m} / \mathrm{sec}$
(d) $9 \times 10^{15} \mathrm{~m} / \mathrm{sec}$
19. Formula of stable halide which may formed by element of atomic no. 114 will be
(A) MX
(B) $\mathrm{MX}_{2}$
(C) $\mathrm{MX}_{3}$
(D) $\mathrm{MX}_{4}$
20. Formal charge on the oxygen ( $\mathrm{O}^{*}$ ) in the phosphate ion will be

(A) 0
(B) +1
(C) -1
(D) +2

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21. For which of the following conditions a reaction is non-spontaneous at any temperature?
(A) $\Delta \mathrm{H}>0<\Delta \mathrm{S}$
(B) $\Delta \mathrm{H}>0>\Delta \mathrm{S}$
(C) $\Delta \mathrm{H}<0<\Delta \mathrm{S}$
(D) $\Delta \mathrm{H}=0=\Delta \mathrm{S}$
22. Spectator ion in the following reaction will be
$\mathrm{Zn}+2 \mathrm{H}^{+}+2 \mathrm{Cl}^{-} \longrightarrow \mathrm{Zn}^{2+}+2 \mathrm{Cl}^{-}+\mathrm{H}_{2}$
(A) $\mathrm{H}^{+}$
(B) $\mathrm{Cl}^{-}$
(C) $\mathrm{Zn}^{2+}$
(D) Both (A) and (C)
23. Hybridisation of 2 carbon in $\mathrm{CH}_{3}-\overline{\mathrm{C}} \mathrm{H}-\mathrm{CH}_{3}$ will be
(A) sp
(B) $\mathrm{sp}^{2}$
(C) $\mathrm{sp}^{3}$
(D) $s p^{3} d$
24. Kw of pure water at $95^{\circ} \mathrm{C}$ is $10^{-11}, \mathrm{pH}$ and nature of water is
(A) 7 and neutral
(B) 5.5 and acidic
(C) 5.5 and basic
(D) 5.5 and neutral
25. 


(A)

(B)

(C)

(D)


## Section - 2 - Straight Objective Type (+4, -1)

This section contains 5 multiple choice questions. Each question has 4 choices $(A),(B),(C)$ and (D), out of which ONLY ONE is correct.
26. Which of the following resonating structure of Nitro benzene is incorrect?
(A)

(B)

(C)

(D)

27. Total number of radial nodes present in $5 f$ orbitals will be
(A) 0
(B) 1
(C) 2
(D) 3
28. Formations of sulphur trioxide from $\mathrm{SO}_{2}$ and $\mathrm{O}_{2}$ is favoured by
(A) High pressure
(B) Low temperature
(C) Excess of $\mathrm{O}_{2}$ and $\mathrm{SO}_{2}$
(D) All of these
29. Which of the following salt is acidic in nature?
(A) $\mathrm{Mg}(\mathrm{OH}) \mathrm{Cl}$
(B) $\mathrm{Zn}(\mathrm{OH}) \mathrm{Cl}$
(C) $\mathrm{NaH}_{2} \mathrm{PO}_{4}$
(D) KCN
30. Oxidation no. of sulphur in $\mathrm{Na}_{2} \mathrm{~S}_{2} \mathrm{O}_{3}$ will be
(A) +6
(B) -2
(C) -2 and +6
(D) +2

## END OF CHEMISTRY PART

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## PART - III - MATHEMATICS

## Section - 1- Straight Objective Type (+3, -1)

This section contains 20 multiple choice questions. Each question has $\mathbf{4}$ choices (A), (B), (C) and (D), out of which ONLY ONE is correct.
31. The minimum number of terms $1+3+5+7+\ldots \ldots \ldots \ldots \ldots$. that add up to a number exceeding 1357 is
(A) 15
(B) 37
(C) 35
(D) 17
32. The number of ways to give away 20 apples to 3 boys each boy receiving at least 4 apples is
(A) ${ }_{8}^{10} \mathrm{C}$
(B) 90
(C) ${ }_{8}^{20} \mathrm{C}$
(D) None of these
33. The numerical value of $\sin \frac{\pi}{18} \sin \frac{5 \pi}{18} \sin \frac{7 \pi}{18}$ is equal to
(A) 1
(B) $1 / 8$
(C) $11 / 4$
(D) $1 / 2$
34. The total number of integral solutions for $(x, y, z)$ such that $x y z=24$ is
(A) 36
(B) 90
(C) 120
(D)None of these
35. If $(a+i b)^{5}=\alpha+i \beta$ then $(b+i a)^{5}$ is equal to
(A) $\beta+i \alpha$
(B) $\beta-i \alpha$
(C) $-\beta-i \alpha$
(D) $\alpha-i \beta$
36. The number of different 6-digit numbers that can be formed using the three digits 0 , 1,2 is
(A) $3^{6}$
(B) $2 \times 3^{5}$
(C) $3^{5}$
(D) None of these

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37. If $\mathrm{HM}: \mathrm{GM}=4: 5$ for two positive numbers then the ratio of the numbers is
(A) $4: 1$
(B) $3: 2$
(C) $3: 4$
(D) $2: 3$
38. If $\tan A+\tan B+\tan C=\tan A \cdot \tan B \cdot \tan C$ then
(A) $A, B, C$ must be the angles of a triangle.
(B) The sum of any two angles is equal to third angle.
(C) $A+B+C$ must be an integral multiple $\pi$.
(D) None of these.
39. A point on the line $\mathrm{y}=\mathrm{x}$ whose perpendicular distance from the line $\frac{x}{4}+\frac{y}{3}=1$ is 4 has the coordinates
(A) (-8/7, -8/7)
(B) $(32 / 7,32 / 7)$
(C) (3/2, 3/2)
(D) None of these
40. The domain of the function $f(x)=\log _{10} \log _{10}\left(1+x^{3}\right)$ is
(A) $(-1, \infty)$
(B) $(0, \infty)$
(C) $[0, \infty)$
(D) $(-1,0)$
41. If the focus of a parabola is $(-2,1)$ and the directrix has the equation $x+y=3$ then the vertex is
(A) $(0,3)$
(B) $(-1,1 / 2)$
(C) (-1, 2)
(D) $(2,-1)$
42. Value of $(1+i)^{3}+(1-i)^{6}$ is
(A)I
(B) $2(-1+5 i)$
(C) $1-5 i$
(D)
43. Let $t_{n}=n$.( $n!$ )then $\sum_{n=1}^{15} t_{n}$ is equal to
(A) 15! - 1
(B) $15!+1$
(C) $16!-1$
(D) none of these
44. The most general solution of $2^{\sin x}+2^{\cos x}=2^{1-\frac{1}{\sqrt{2}}}$ are
(A) $n \pi-\frac{\pi}{4}$
(B) $n \pi+\frac{\pi}{4}$
(C) $n \pi+(-1)^{n} \frac{\pi}{4}$
(D) $2 n \pi \pm \frac{\pi}{4}$
45. If $\mathrm{A}+\mathrm{B}=\pi / 3$ and $\operatorname{Cos} \mathrm{A}+\operatorname{Cos} \mathrm{B}=1$ then
$(A) \operatorname{Cos}(A-B)=1 / 3$
(B) $|\operatorname{Cos} \mathrm{A}-\operatorname{Cos} \mathrm{B}|=\sqrt{\frac{2}{3}}$
(C) $\operatorname{Cos}(A-B)=-1 / 3$
(D) $|\operatorname{Cos} \mathrm{A}-\cos \mathrm{B}|=\sqrt{\frac{1}{12}}$
46. In triangle $A B C, a=5, b=4, \tan C / 2=\sqrt{\frac{7}{9}}$ then side $c$ is
(A) 6
(B) 3
(C) 2
(D) None of these
47. The locus of the centres of the circle for which one end point of a diameter is $(1,1)$ while the other end is on the line $x+y=3$ is
(A) $x+y=1$
(B) $2(x-y)=5$
(C) $2 x+2 y=5$
(D) None of these
48. Three dice are thrown. The probability of getting a sum which is a perfect square is
(A) $2 / 5$
(B) $9 / 20$
(C) $1 / 4$
(D) None of these
49. If the sides of a triangle are in the ratio $1: \sqrt{3}: 2$ then the angles of the triangle are in the ratio
(A) 1:3:5
(B) 2:3:4
(C) 3:2:1
(D) 1:2:3
50. Let $A=\{1,2,3\}$ then the total number of distinct relations that can be defined over $A$ is
(A) $2^{9}$
(B) 6
(C) 8
(D)None of these

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## Section - 2- Straight Objective Type (+6, -2)

This section contains 10 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct.
51. A vertical lamp post 6 m high stands at a distance of 2 m from a wall 4 m high. A 1.5 m tall man starts to walk away from the wall on the other side of the wall in line with lamp post. The maximum distance to which the man can walk remaining in the shadow is
(A) $5 / 2 \mathrm{~m}$
(B) $3 / 2 \mathrm{~m}$
(C) 4 m
(D) None of these
52. The sum ${ }_{3}^{10} C+{ }_{3}^{11} C+{ }_{3}^{12} C+\ldots \ldots \ldots+{ }_{3}^{20} C$ is equal to
(A) ${ }_{4}^{21} \mathrm{C}$
(B) ${ }_{4}^{21} C+{ }_{4}^{10} C$
(C) ${ }_{17}^{21} \mathrm{C}-{ }_{6}^{10} \mathrm{C}$
(D) None of these
53. A line perpendicular to the line $3 x-2 y=5$ cuts off an intercept 3 on the positive side of $x$-axis then
(A) Slope of line is $2 / 3$
(B) Intercept on the $y$-axis is 2
(C) The area of the triangle formed by the line with the axes is 3 sq. unit.
(D)None of these
54. The equation $2 x^{2}-3 x y-p y^{2}+x+q y-1=0$ represent two mutually perpendicular lines if
(A) $p=3, q=2$
(B) $p=2, q=3$
(C) $p=-2, q=3$
(D) $p=2, q=-9 / 2$
55. The number of points on a circle $2 x^{2}+2 y^{2}-3 x=0$ which are at a distance of 2 units from the point $(-2,1)$ is
(A) 2
(B) 0
(C) 1
(D)None of these

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56. A point on the ellipse $\frac{x^{2}}{6}+\frac{y^{2}}{2}=1$ at a distance of 2 units from the centre of the ellipse has the eccentric angle
(A) $\frac{\pi}{4}$
(B) $\frac{\pi}{3}$
(C) $\frac{\pi}{6}$
(D) $\frac{\pi}{2}$
57. $\lim _{n \rightarrow \infty} \frac{n^{p} \sin ^{2}(n!)}{n+1}, 0<p<1$ is equal to
(A) 0
(B) $\infty$
(C) 1
(D) None of these
58. If $\mathrm{P}(\mathrm{B})=3 / 4, P(A \cap B \cap \bar{C})=1 / 3$ and $P(\bar{A} \cap B \cap \bar{C})=1 / 3$ then $P(B \cap C)$ is
(A) $1 / 12$
(B) $1 / 6$
(C) $1 / 15$
(D) $1 / 5$
59. The number of solutions of $||x-4|-1|=2$ is
(A) 4
(B) 2
(C) 3
(D) 1
60. If $f^{\prime}(x) \sqrt{2 x^{2}-1}$ and $y=f\left(x^{2}\right)$ then $d y / d x$ at $x=1$ is
(A) 2
(B) 1
(C) -2
(D) None of these
