IMPORTANT INSTRUCTIONS

GENERAL INSTRUCTIONS

1. This booklet is your Question Paper.
2. Blank papers, clip boards, log tables, slide rule, calculators, mobile or any other electronic gadgets in any form are not allowed to be used.
3. Write your **Name** in the space provided in the first page of this booklet.
4. No rough sheets will be provided by the invigilators. All the rough work is to be done in the blank space provided in the question paper.
5. No query related to question paper of any type is to be put to the invigilator.

INSTRUCTIONS FOR OPTICAL RESPONSE SHEET (ORS)

- Darken the appropriate bubbles on the original by applying sufficient pressure.
- The original is machine-gradable and will be collected by the invigilator at the end of the examination.
- Do not tamper with or mutilate the ORS.
- Before answering the paper, fill up the required details in the blank space provided in the Objective Response Sheet (ORS).
- Use a **BLACK / BLUE BALL POINT** to darken the bubbles in the ORS sheet.
- Darken the bubble **COMPLETELY.**
- Darken the bubble **ONLY** if you are sure of the answer.
- The correct way of darkening a bubble is as shown here : ●
- There is **NO** way to erase or "un-darkened bubble.
- The marking scheme given at the beginning of each section gives details of how darkened and **not darkened** bubbles are evaluated.
  Marks distribution of questions is as follows.

Vibro'NET

S.No.	Subject	Nature of Questions	Marks to be awarded			
			No. of Questions	Correct	Wrong	Total
1 to 20	PART-I (Physics)	Single Choice Questions (SCQ)	20	4	0	80
21 to 40	PART-II (Chemistry)	Single Choice Questions (SCQ)	20	4	0	80
41 to 60	PART-III (Maths)	Single Choice Questions (SCQ)	20	4	0	80
		Total	**60**			**240**

Zero marks '0' If none of the options is chosen (i.e. the question is unanswered).

Name_____

SPACE FOR ROUGH WORK

1. When the momentum of a body increases by 100%, its KE increases by

(A) 400%

(B) 100%

(C) 300%

(D) None

2. A long spring, when stretched by a distance x, has the potential energy U. On increasing the stretching to nx , the potential energy of the spring will be –

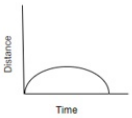
(A) U/n

(B) nU

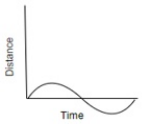
(C) n^2U

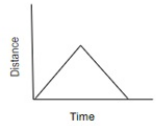
(D) U/n^2

3. Which of the following distance-time graphs is correct?

(A) 

(B) 

(C) 

(D) 

4. A body starts from rest, the ratio of distances travelled by the body during $3^{rd}$and 4^{th}seconds is

(A) 7/5

(B) 5/7

(C) 7/3

(D) 3/7

5. When a constant force is applied to a body, it moves with uniform

(A) acceleration

(B) velocity

(C) speed

(D) momentum

6. If a projectile is thrown such that range [R] is four times than the height [h] attained then angle of projection is

(A) 30°

(B) 45°

(C) 60°

(D) 90°

7. A particle is moving with velocity 5 m/s towards east and its velocity changes to 5 m/s north in 10 sec. Find the acceleration.

(A) $\sqrt{2}\,m/s^2N-W$

(B) $\frac{1}{\sqrt{2}}m/s^2N-W$

(C) $\frac{1}{\sqrt{2}}m/s^2N-E$

(D) $\sqrt{2}\,m/s^2N-E$

8. A train of 150 m length is going towards north direction at a speed of 10 m/sec. A parrot files at the speed of 5 m/sec towards south direction parallel to the railway track. The time taken by the parrot to cross the train is

(A) 12 sec

(B) 8 sec

(C) 15 sec

(D) 10 sec

9. A body is slipping from an inclined plane of height h and length ℓ. If the angle of inclination is θ, the time taken by the body to come from the top to the bottom of this inclined plane is

(A) $\sqrt{\frac{2h}{g}}$

(B) $\sqrt{\frac{2\ell}{g}}$

(C) $\frac{1}{\sin\theta}\sqrt{\frac{2h}{g}}$

(D) $\sin\theta\sqrt{\frac{2h}{g}}$

10. P, Q and R are three balloons ascending with velocities U, 4U and 8U respectively. If stones of the same mass be dropped from each, when they are at the same height, then

(A) They reach the ground at the same time

(B) Stone from P reaches the ground first

(C) Stone from R reaches the ground first

(D) Stone from Q reaches the ground first

11. Two spheres of same size, one of mass 2 kg and another of mass 4 kg, are dropped simultaneously from the top of Qutub Minar (height = 72m). When they are 1 m above the ground, the two spheres have the same

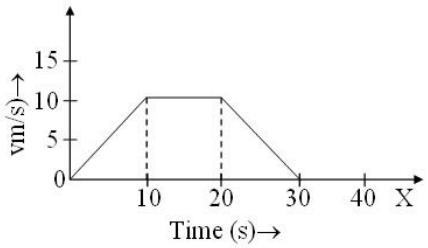
(A) Momentum

(B) Kinetic energy

(C) Potential energy

(D) Acceleration

12. In the following graph, distance travelled by the body in meters is



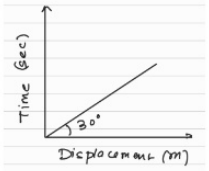
(A) 200

(B) 250

(C) 300

(D) 400

13. From the following displacement-time graph find out the velocity of a moving body



(A) $\frac{1}{\sqrt{3}}$ m/s

(B) 3 m/s

(C) $\sqrt{3}$ m/s

(D) $\frac{1}{3}$ m/s

14. A motor car moving with a uniform speed of 20 m/sec comes to stop on the application of brakes after travelling 10 m. Its acceleration is

(A) 20 m/sec^2

(B) –20 m/sec^2

(C) –40 m/sec^2

(D) +2 m/sec^2

15. The initial velocity of a body moving along a straight line is 7 m/s. It has a uniform acceleration of 4 m/s^2. The distance covered by the body in the 5th second of its motion is

(A) 25 m

(B) 35 m

(C) 50 m

(D) 85 m

16. Two equal masses m_1 and m_2 moving along the same straight line with velocities +3m/s and –5m/s respectively collide elastically.
Their velocities after the collision will be respectively

(A) + 4 m/s for both

(B) –3 m/s and +5 m/s

(C) – 4m/s and +4 m/s

(D) –5 m/s and + 3m/s

17. A ball is allowed to fall from a height of 10 m. If there is 40% loss of energy due to impact, then after one impact ball will go up to

(A) 10 m

(B) 8 m

(C) 4 m

(D) 6 m

18. Two spheres of masses 2M and M are initially at rest at a distance R apart. Due to mutual force of attraction, they approach each other. When they are at separation R/2, the acceleration of the centre of mass of spheres would be

(A) 0

(B) g

(C) 3 g

(D) 12 g

19. A projectile fired with initial velocity u at some angle θ has a range R. If the initial velocity be doubled at the same angle of projection, then the range will be

(A) 2R

(B) R/2

(C) R

(D) 4R

20. An athlete runs up a flight of stairs in 10 seconds, gaining a vertical height of 5 metres. If the athlete's weight is 600 N, what is the average power developed during the run? (Take $g = 9.8 m/s^2$)

(A) 294 W

(B) 245 W

(C) 122.5 W

(D) 300 W

21. Molarity is

(A) The number of moles of solute present in 1 dm^3 volume of solution

(B) The number of moles of solute dissolved in 1 kg of solvent

(C) The number of moles of solute dissolved in 1 kg of solution

(D) The number of moles of solute present in 100 dm^3 volume of solution

22. The decreasing order of electronegativity is

(A) Cl > I > Br

(B) Br > I > F

(C) F > Br > I

(D) Cl > F > Br

23. For the given reaction,

$C(s) + O_2(g) \rightarrow CO_2(g)$

(A) $\Delta H > \Delta U$

(B) $\Delta H < \Delta U$

(C) $\Delta H = \Delta U$

(D) $\Delta U = 0$

24. Oxidation states in nitrogen can range from:

(A) 0 to +5

(B) –3 to +4

(C) –3 to +5

(D) +3 to +5

25. Two electrons occupying the same orbital are distinguished by

(A) Azimuthal quantum number

(B) Spin quantum number

(C) Principal quantum number

(D) Magnetic quantum number

26. What is ratio of mass of an electron to the mass of a proton?

(A) 1 : 2

(B) 1 : 1

(C) 1 : 1837

(D) 1 : 3

27. How many unpaired electron are present in N_2^+

(A) 1

(B) 2

(C) 3

(D) 4

28. In the equilibrium reaction involving the dissociation of $CaCO_3$.

$CaCO_3\,(s) \rightleftharpoons CaO\,(s) + CO_2\,(g)$

the equilibrium constant is given by

(A) $\frac{P_{CaO} \times P_{CO_2}}{P_{CaCO_3}}$

(B) $C_{CaO} \times \frac{P_{CO_2}}{C_{CaCO_3}}$

(C) $\frac{P_{CaO}}{P_{CaCO_3}}$

(D) P_{CO_2}

29. Which of the following species can form hydrogen bond with themselves?

(A) NH_3

(B) C_2H_6

(C) H_2S

(D) CH_3OCH_3

30. The pH of an aqueous solution tends to be zero, hence solution is-

(A) acidic

(B) neutral

(C) basic

(D) amphoteric

31. Given the reaction

$C(s) + H_2O\,(1) \longrightarrow CO(g) + H_2(g)$

Calculate the volume of the gases produced at STP from 48.0 g of carbon.

(A) 179.2 L

(B) 89.6 L

(C) 44.8 L

(D) 22.4 L

32. In $^{235}_{92}U$ nucleus, the number of electrons is

(A) 92

(B) 235

(C) 143

(D) zero

33. The value of Bohr's radius of hydrogen atom is

(A) 0.529×10^{-5} cm

(B) 0.529×10^{-6} m

(C) 0.529×10^{-10} cm

(D) 0.529×10^{-8} cm

34. n-butane and isobutane are examples of

(A) Chain isomers

(B) Geometrical isomers

(C) Position isomers

(D) Tautomer

35. The bond angle around Be in $BeCl_2(g)$ is

(A) 109° 28'

(B) 120°

(C) 110°

(D) 180°

36. Which of the following bond is least polar?

(A) H – F

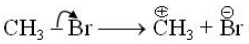
(B) H – Cl

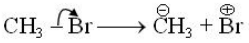
(C) N – H

(D) C – H

37. Covalent bond can undergo fission in two different ways. The correct representation involving a heterolytic fission of CH_3–Br is

(A) $\overset{\curvearrowleft}{CH_3} - Br \longrightarrow \overset{\oplus}{C}H_3 + \overset{\ominus}{Br}$

(B) 

(C) 

(D) 

38. "Mass can neither be created nor destroyed" is the statement of

(A) Gay Lussac Law of gaseous volume

(B) Law of definite proportion

(C) Law of conservation of mass

(D) Law of multiple proportions

39. How many molecules are present in 22400 cm^3 of a gas at STP?

(A) 22.4×10^{20}

(B) 6.022×10^{23}

(C) 6.022×10^{20}

(D) 22.4×10^{23}

40. What is the bond order of O_2 molecule?

(A) 1

(B) 1.5

(C) 2

(D) 3

41. The general solution of

$\sin x - 3\sin 2x + \sin 3x = \cos 3x + \cos x - 3\cos 2x$ is

(A) $\frac{n\pi}{4} + \frac{\pi}{8}$

(B) $\frac{n\pi}{2} + \frac{\pi}{4}$

(C) $\frac{n\pi}{6} + \frac{\pi}{8}$

(D) $\frac{n\pi}{2} + \frac{\pi}{8}$

42. The points P(a, b + c), Q(b, c + a) and R(c, a + b) are such that PQ = QR if $(a \neq b \neq c)$ –

(A) a, b, c are in A.P.

(B) a, b, c are in G.P.

(C) a, b, c are in H.P.

(D) None of these

43. Line $ax + by + p = 0$ makes angle $\pi/4$ with $x\cos\alpha + y\sin\alpha = p, p \in R^+$. If these lines and the line $x\sin\alpha - y\sin\alpha = 0$ are concurrent, then

(A) $a^2 + b^2 = 1$

(B) $a^2 + b^2 = 2$

(C) $2(a^2 + b^2) = 1$

(D) None of these

44. The graph of the function $y = \cos x \cos(x + 2) - \cos^2(x + 1)$ is

(A) A straight line passing through $(0, -\sin^2 1)$ with slope 2

(B) A straight line passing through (0, 0)

(C) A parabola with vertex $(1, -\sin^2 1)$

(D) A straight line passing through the point $\left(\frac{\pi}{2}, -\sin^2 1\right)$ and parallel to the x-axis

45. The line $\frac{x}{a} + \frac{y}{b} = 1$ moves in such a way that $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{2c^2}$, where a, b, c $\in R_0$ and c is constant, then locus of the foot of the perpendicular from the origin on the given line is:

(A) $x^2 + y^2 = c^2$

(B) $x^2 + y^2 = 2c^2$

(C) $x^2 + y^2 = \frac{c^2}{2}$

(D) $x^2 + y^2 = 4c^2$

46. The sum of the coefficients in the expansion of $(1 + x - 3x^2)^{2163}$ will be:

(A) 0

(B) 1

(C) –1

(D) 2^{2163}

47. $\frac{1}{(2+x)^4} =$

(A) $\frac{1}{2}\left(1 - 2x + \frac{5}{2}x^2 - \ldots.\right)$

(B) $\frac{1}{16}\left(1 - 2x + \frac{5}{2}x^2 - \ldots.\right)$

(C) $\frac{1}{16}\left(1 + 2x + \frac{5}{2}x^2 + \ldots.\right)$

(D) $\frac{1}{2}\left(1 + 2x + \frac{5}{2}x^2 + \ldots.\right)$

48. If two balanced dice are tossed once, the probability of the event, that the sum of the integers coming on the upper sides of the two dice is 9, is

(A) $\frac{7}{18}$

(B) $\frac{5}{36}$

(C) $\frac{1}{9}$

(D) $\frac{1}{6}$

49. If the odds against an event be 2 : 3, then the probability of its occurrence is

(A) $\frac{1}{5}$

(B) $\frac{2}{5}$

(C) $\frac{3}{5}$

(D) 1

50. If $A + B + C = 180°$, then $\sum \tan\frac{A}{2}\tan\frac{B}{2} =$

(A) 0

(B) 1

(C) 2

(D) 3

51. If $\tan\alpha$ equals the integral solution of the inequality $4x^2 - 16x + 15 < 0$ and $\cos\beta$ equals to the slope of the bisector of first quadrant, then $\sin(\alpha + \beta)\sin(\alpha - \beta)$ is equal to

(A) $\frac{3}{5}$

(B) $-\frac{3}{5}$

(C) $\frac{2}{\sqrt{5}}$

(D) $\frac{4}{5}$

52. If 2p is the length of perpendicular from the origin to the lines $\frac{x}{a} + \frac{y}{b} = 1$, then a^2, $8p^2$, b^2 are in

(A) A.P.

(B) G.P.

(C) H.P.

(D) None of these

53. If $\sin 2x + \sin 4x = 2\sin 3x$, then $x =$ (where n is an integer)

(A) $\frac{n\pi}{3}$

(B) $n\pi + \frac{\pi}{3}$

(C) $2n\pi \pm \frac{\pi}{3}$

(D) None of these

54. If A(6, 3), B(–3, 5), C(4, –2) and D(x , 3x) are four points. If the ratio of area of ΔDBC and ΔABC is 1 : 2, then the value of x, will be

(A) $\frac{11}{8}$

(B) $\frac{8}{11}$

(C) 3

(D) None of these

55. The points A(–4, –1), B(–2, –4) , C(4, 0) and D(2, 3) are the vertices of

(A) Parallelogram

(B) Rectangle

(C) Rhombus

(D) None of these

56. If the intercept made by the line between the axis is bisected at the point (5, 2), then its equation is

(A) $5x + 2y = 20$

(B) $2x + 5y = 20$

(C) $5x - 2y = 20$

(D) $2x - 5y = 20$

57. A(–1, 1), B(5, 3) are opposite vertices of a square in xy-plane. The equation of the other diagonal (not passing through (A, B) of the square is given by

(A) $x - 3y + 4 = 0$

(B) $2x - y + 3 = 0$

(C) $y + 3x - 8 = 0$

(D) $x + 2y - 1 = 0$

58. $\tan A + 2\tan 2A + 4\tan 4A + 8\cot 8A =$

(A) $\tan 2A$ (C) $\tan A$

(B) $\cot A$ (D) $\cot 2A$

59. The number of elements in the set
$S = \left\{x \in R : 2\cos\left(\frac{x^2 + x}{6}\right) = 4^x + 4^{-x}\right\}$ is:

(A) 1

(B) 3

(C) 0

(D) infinite

60. The value of $(\cos\alpha + \cos\beta)^2 + (\sin\alpha + \sin\beta)^2$ is

(A) $2\sin^2\left(\frac{\alpha - \beta}{2}\right)$

(B) $2\cos^2\left(\frac{\alpha - \beta}{2}\right)$

(C) $4\cos^2\left(\frac{\alpha - \beta}{2}\right)$

(D) $4\sin^2\left(\frac{\alpha - \beta}{2}\right)$

SPACE FOR ROUGH WORK

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