ARYABHATT SUPER 30

Ensure your success in IIT -JEE / PMT

Set :- A

Name of the Student: | | | | | | | | | | | | | | | | | | | | | | | | | |

Enrolment No: | | | | | | | | |

[11th] IIT - JEE

Time :- 2 Hours **General Instructions** **Full Marks :- 225**

1 This question booklet contains 75 questions. Divided into three sections Section A, Section B and Section C.

2 Each section contains 25 multiple choice questions as well as multiple choice question. Choose the most appropriate option.

3 Each question carrries 3 marks, for each correct answer the student will be awarded 3 marks, zero if not attempted and -1 in all other cases.

4 The OMR will be graded by machine so do not fold or make any stray marks on the OMR sheet.

5 The bubbles on the OMR sheet should be filled completely with black ball pen. Do not hard press the pen on the OMR sheet.

6 Fill the required details in the OMR sheet. Incomplete OMR sheets will not be considered for evaluation.

1. इस प्रश्न पुस्तिका में 75 प्रश्न शामिल हैं। जो तीन खंडों खड A, खंड B और खड C में विभाजित हैं।

2 प्रत्येक खंड में 25 प्रश्न शामिल हैं। केवल एक सही विकल्प और एक से अधिक वहुविकल्पीय प्रश्न शामिल हैं। सबसे उपयुक्त विकल्प चुनें।

3 प्रत्यकक प्रश्न के सही जबाब के लिए 3 अंक मिलेंगे, प्रश्न का हल नही करने पर शुन्य अंक और गलत विकल्प के लिए -1 अंक मिलेंगे।

4 **OMR** मशीन द्वारा मूल्यांकन किया जाएगा इसलिए **OMR** शीट पर किसी भी प्रकार का निशान या मोड़ नही बनाए।

5 **OMR** शीट पर बने गोले काले बॉल पेन के साथ पूरी तरह से भरा जाना चाहिए। **OMR** शीट पर कलम से हार्ड प्रेस न करें।

6 **OMR** शीट के दोनो पक्षों में आवश्यक फील्ड भरें। अधूरे **OMR** शीट का मूल्यांकन नहीं होगा।

Deposit the Question Booklet and OMR sheet both to the invigilator.

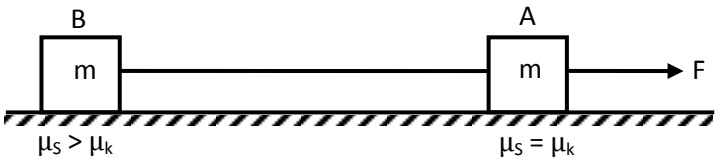
रिजल्ट व अन्य जानकारियाँ OMR शीट में भरे मोबाईल पर SMS से भेजी जाएगी।

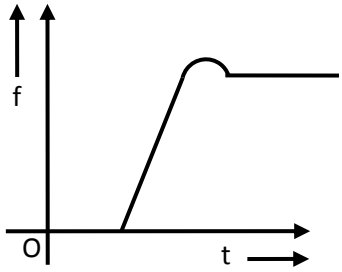
SECTION – A

1. The displacement of a body is given by $2s = gt^2$ where g is a constant. The velocity of the body at any time t is
(a) gt (b) gt/2 (c) $gt^2/2$ (d) $gt^3/6$

2. Two forces 6 N and 3 N are acting on the 2 blocks of 2 Kg and 1 kg kept on frictionaless floor. What is the force excerted on 2 kg block by 1 kg block?
(a) 1 N (b) 2 N (c) 4 N (d) 5 N

3. A force F = t is applied to block A as shown in figure. The force applied at t = 0 sec when the system was at rest and string is just taut without tension. Which of the following graphs give the friction force between B and horizontal surface as a function of time 't'



(a)


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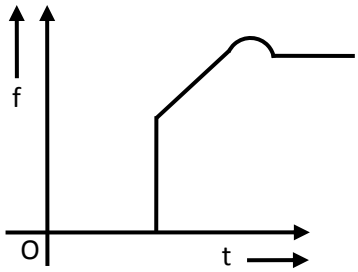

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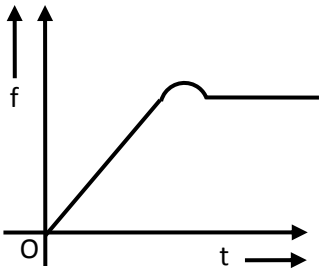
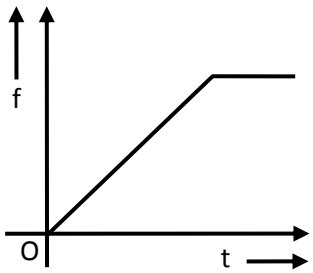


(d)


4. A spring when stretched by 2 mm its potential energy becomes 4 J. it is stretched by 100 mm, its potential energy is equal to
(a) 4 J (b) 54 J (c) 415 J (d) 100 J

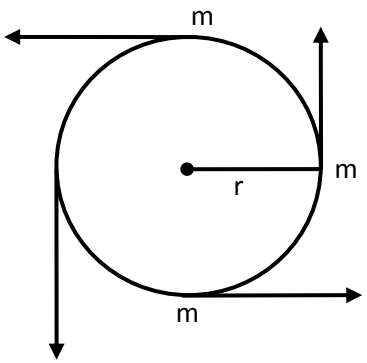
5. In a circus, stuntman rides a motorbike in a circular track of radius R in the vertical plane the minimum speed at highest point of track will be
(a) $\sqrt{2\,Rg}$ (b) 2 Rg (c) $\sqrt{3\,Rg}$ (d) none of these

6. If the net external force acting on a system is zero, then the centre of mass,
(a) may accelerate (b) must not accelerate (c) must not move (d) cannot be predicted

7. The spacecraft of mass M moves with a velocity V in free space at first then it explodes breaking into 2 pilces. If after explosion, a piece of mass m comes to rest, the other pilces of space craft will have a velocity.
(a) $\frac{MV}{(M-m)}$ (b) $\frac{MV}{(M+m)}$ (c) $\frac{mV}{(M-m)}$ (d) $\frac{mV}{(M+m)}$

8. A solid iron ball A of radius r collides head on with another stationary solid iron ball B of radius 2r. the ratio of their speeds just after the collision (e = 0.5) is
(a) 3 (b) 4 (c) 2 (d) 1

9. 4 similar particlies of mass m are orbiting in a circle of radius r in the same direction and same speed because of their mutual gravitational attractive force speed of particle is given by
(a) $\left[\frac{Gm}{r}\left(\frac{1+2\sqrt{2}}{r}\right)\right]^{1/2}$
(b) $\left[\frac{Gm}{r}\right]^{1/3}$
(c) $\left[\frac{Gm}{r}\left(1+2\sqrt{2}\right)\right]^{1/2}$
(d) zero



10. A force $\vec{F} = 4\,\hat{\imath} - 10\hat{\jmath}$ acts on a body at a point having position vector $-5\hat{\imath} - 3\hat{\jmath}$ relative to orgin. The torque on the body about the origin is
(a) $38\,\hat{f}$ (b) $-25\,\hat{f}$ (c) $62\,\hat{f}$ (d) none of these

11. A boy sitting firmly over a rotating stod has his arms folded. If he stretches his arms, his angular momentum about the axis of rotation
(a) increases (b) decreases (c) remains unchanged (d) connot be predicted

12. A particle moves with a constant velocity parallel to the Y – axis. Its angular momentum about the origin
(a) is zero (b) goes an increasing (c) goes on decreases (d) remains constant

13. A solid sphere, a hollow sphere and a solid cylinder, all having equal mass and radius, are placed at the top of an incline and released, the friction co-efficients between the object and the incline are equal but not sufficient to allow pure rolling. Greatest time will be taken in reaching the follow by
(a) the solid sphere (b) the hollow sphere
(c) the solid cylinder (d) all will take same time

14. The viscous force is equal to (symbols have their usual meamings)
(a) $6\pi rv$ (b) $6\pi\eta rv$ (c) $3\pi\eta v$ (d) $6\pi\eta v$

15. A body executing SHM passes through its equilibrium. At this instant, it has
(a) Maximum potential energy (b) Maximum kinetic energy
(c) Minimum Kinetic energy (d) Maximum acceleration

16. A particle performing SHM on the y-axis according to eq^{n} = A + B sin ωt. Its amplitude is
(a) A (b) B (c) A + B (d) $\sqrt{A^2 + B^2}$

17. A perdulum clock that keeps correct time on the earth is taken to the moon. It will seen
(a) at correct rate (b) 6 times faster
(c) $\sqrt{6}$ times faster (d) $\sqrt{6}$ times slower

18. 2 waves of amplitude A_1 and A_2 respectively and equal frequency travels through same point. The amplitude of the resultant wave is
(a) $A_1 + A_2$ (b) $A_1 – A_2$ (c) between $A_1 + A_2$ and $(A_1 – A_2)$
(d) can not say

19. When a sound wave is reflected from a wall the phase difference between the reffected and iniclent phressure wave is
(a) 0 (b) π (c) π/2 (d) π/4

20. Which of the following does not affect the apparent frequency in dopplu effect?
(a) speed of source (b) distance between source
(c) frequency of source (d) distance between source and observer

21. Molar heat capacity at costant pressure, C_p = ?
(a) $C_v - R$ (b) $C_v \times R$ (c) $C_v + R$ (d) none of these

22. In a sample of an ideal gas, the coverge momentum of a molecule depends on
(a) pressure (b) mass of gass (c) no. of moles (d) none of these

23. Keeping the no. of moles, volume and pressure the same, which of the following are the same for all ideal gas?
(a) rms speed of a molecule (b) density
(c) templerature (d) average of magnitude of momentum

24. Boiling water is changing into stem. Under this condition, the specific heat of water is
(a) zero (b) one (c) infinite (d) less than one

25. Which law can be understood in terms of stefan's law?
(a) Wien's displacement law (b) Kirchoff's law
(c) Newton's law of cooling (d) plank's law

SECTION – B

1. 4.4 g of CO_2 and 2.24 lt of H_2 and mixed in a container. The total no. of molecules present in the container
(a) 6.022×10^{23} (b) 1.2044×10^{23} (c) 6.023×10^{26} (d) 6.023×10^{24}

2. Which of the following has greatest no. of atoms?
(a) 1 g of C_4H_{10} (b) 1 g of N_2 (c) 1 g of (Ag) (d) 1 g of H_2O

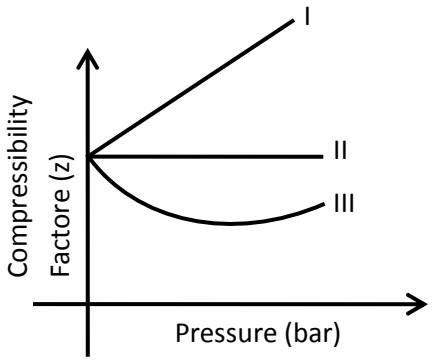
3. The no. of nodal plane in Px orbital is
(a) 1 (b) 2 (c) 3 (d) 4

4. Ionisation energy of He^+ is 19.6×10^{-18} J/atom. The energy of first stationary state (n = 1) of Li^{2+} is
(a) -2.2×10^{-15} J/atom (b) 8.82×10^{-17} J/atom (c) 4.41×10^{-16} J/atom (d) -4.41×10^{-17} atom

5. The Boyle temperature of three gases are given in the table

Ethene	735 K
Oxygen	400 K
Hydrgoen	110 K

If the compressibility factor was measured at 400 K, the gases are
(a) I – ethene, II oxygen, III hydrogen
(b) I – hydrogen, II ethene, III oxygen
(c) I hydrogen, II oxygen, III ethene
(d) I oxygen, II ethene, III hydrogen



6. Which of the following exhibites weakest intermolecular forces?
(a) NH_3 (b) HCl (c) He (d) H_2O

7. An example of extensive property is
(a) Temperature (b) internal energy (c) viscosity (d) molar heat capacity

8. For the reaction
$$H_2(g) + I_2(g) \rightleftharpoons 2HI(g),$$
The equilibrium constant Kp changes with
(a) total pressure (b) catalyst
(c) amount of H_2 & I_2 taken (d) Temperature

9. In the reaction
$AlCl_3 + Cl^{\ominus} \rightarrow AlCl^{\ominus}_4$, $AlCl_3$. Can be classified as
(a) acid (b) base (c) a salt (d) none of these

10. Which of the following salt when dissolved in water will hydrolyse
(a) NaCl (b) KCl (c) NH_4Cl (d) Na_2SO_4

11. Oxidation no. of Mn in $KMnO_4$
(a) +4 (b) +7 (c) -4 (d) +3

12. Which one of the following is a reducing agent?
(a) zero (b) chlorine (c) $FeCl_3$ (d) Na_2SO_3

13. Oxidation state of phosphorous varies from
(a) -1 to +1 (b) -3 to +3 (c) -3 to +5 (d) -5 to +1

14. Oxidation number of P in $Mg_2P_2O_7$
(a) +3 (b) +2 (c) +5 (d) -3

15. No. of lone pair present in oxygen in H_2O is
(a) 2 (b) 1 (c) 3 (d) None

16. Which of the following in paramagnetic?
(a) O_2 (b) He (c) N_2 (d) H_2

17. What is the hyridisation of the central atom is NH_3
(a) sp^2 (b) sp^3 (c) sp (d) sp^3d

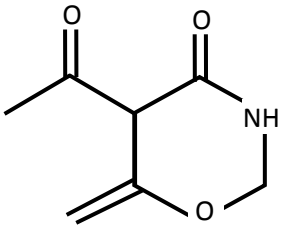
18. In the context of carbon, which of the following is arranged in correct order of electronegativity?
(a) $sp > sp^2 > sp^3$ (b) $sp^3 > sp^2 > sp$ (c) $sp^2 > sp > sp^3$ (d) $sp^3 > sp > sp^2$

19. Which of the following mainly forms superoxide on reaction with oxygen
(a) Na (b) K (c) Ca (d) N

20. $CaCO_3 . 2H_2O$ is commonly known as

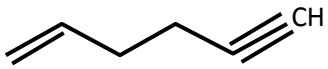
(a) Plaster of paris (b) Gypum (c) Epsum salt (d) Dolomite

21. Identify which function group is not present in following compound



(a) ketone (b) Ester (c) Amide (d) Ether

22. The IUPAC name of

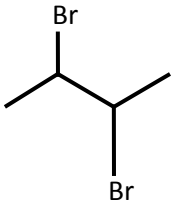


is

(a) Hex – 5 – en – 1 – yne (b) Hex – 1 – en – 5 – yne

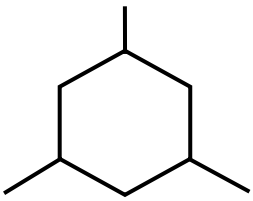
(c) Hex – 6 – en – 1 – yne (d) Hex – 1 – en – 6 –yne

23. How many secondry carbon and hydrogen atoms are present in the molecule given below

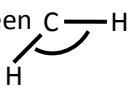


(a) 2, 3 (b) 2, 2 (c) 3, 3 (d) 2, 0

25. Total no. of steroisomer formed by the given compound



(a) 2 (b) 3 (c) 4 (d) 8

25. Bond ange between  in CH_4

(a) 90^0 (b) $109^0\ 29'$ (c) $104^0\ 30'$ (d) $107^0\ 8'$

SECTION – C

1. If the line $y = 2x + c$ neither cuts the circle $(x-2)^2 + (y-3)^2 = 4$ nor the ellipse $x^2 + 6y^2 = 6$ then the range of c is
(a) [5, 5] (b) $(-\infty, 0) \cup (1, \infty)$ (c) $(7, 10)$ (d) none of these

2. No. of perpendicular tangents that can be drawn on the ellips $\frac{x^2}{16} - \frac{y^2}{25} = 1$ from point (6, 7) is
(a) 2 (b) 4 (c) 0 (d) 1

3. A normal to a parabola $y^2 - 4ax$ makes an angle θ with the $x - axis$ where $\tan\theta = 2^0$. If it cuts the curve again at an angle θ then. Θ =
(a) π/4 (b) π/6 (c) π/3 (d) π/2

4. If $x + 4y = 14$ is a normal to the curve $y^2 = ax^3 - b$ at 2, 3 then value of a + b is
(a) 9 (b) -5 (c) 7 (d) -7

5. Evaluate $\lim_{n\to\infty} \frac{[x]+[2x]+[3x]+\cdots\ldots\ldots+[nx]}{n^2}$ where [.] denote greatest integer function
(a) x/4 (b) x/2 (c) x (d) none

6. If $f(x) = xe^x - 2$ then $f(x) = 0$ has roots in the interval
(a) (0, 1) (b) (2, 3) (c) (-1, 0) (d) (10, 11)

7. $f\left(\frac{x+y}{2}\right) = \frac{f(x)+f(y)}{2} \forall x, y \epsilon R$ and $f(0) = 1$ and $f'(0) = -1$ and function is differentialbe for all (x) then f(1) = ?
(a) 0 (b) 1 (c) 2 (d) -1

8. $\sqrt{3 + \sqrt{3} + \sqrt{2 + \sqrt{3} + \sqrt{7 + \sqrt{48}}}}$ = ?
(a) $\sqrt{3} - 1$ (b) $\sqrt{3} + 1$ (c) $\sqrt{3}$ (d) none

9. No. of real solution(s) of the equation $|x-3|^{3x^2-10x+3} = 1$ is
(a) 1 (b) 3 (c) 2 (d) none

10. Let (x_0, y_0) be the solution of following equations.
$$(2x)^{ln2} = (3y)^{ln3},\ \ 3^{\ln x} = 2^{\ln y}$$
then x_0 is
(a) 1/6 (b) 1/3 (c) 1/2 (d) 6

11. In an equilateral triangle, 3 coins of radii 1 unit each are kept so that they touch each other and also the sides of the triangle. Area of the triangle is
(a) $4 + 2\sqrt{3}$ (b) $6 + 4\sqrt{3}$ (c) $12 + \frac{7\sqrt{3}}{4}$ (d) $3 + \frac{7\sqrt{3}}{4}$

12. How many divisors of 21600 are divisible by 10 but not by 15
(a) 10 (b) 30 (c) 40 (d) none

13. The numbers of words that can be formed by using the letters of the words 'MATHEMATICS' that start as well as and with T, is
(a) 80720 (b) 90720 (c) 20860 (d) 37528

14. The sum of all the numbers which can be formed by using the digits 1, 3, 5, 7 all at a time and which have no digit repreated, is
(a) 16 x 4! (b) 1111 x 3! (c) 16 x 1111 x 3! (d) none

15. In how many ways 5 boys & 5 girls can sit at a round table so that girls & boys sit alternate
(a) 290 (b) 92 (c) 29 (d) 209

16. In how many way we can select 4 letters from the letters of the word MISSISSIPI
(a) 20 (b) 18 (c) 19 (d) 21

17. The radius of the circle passing through the points (1, 2), (5, 2) & (5, -2) is
(a) $5\sqrt{2}$ (b) $2\sqrt{5}$ (c) $3\sqrt{2}$ (d) $2\sqrt{2}$

18. The intercept made by the circle $x^2 + y^2 - 5x - 13y - 14 = 0$ on the x – axis & y – axis are respectively
(a) 9, 13 (b) 5, 13 (c) 9, 15 (d) none

19. The curve represented by $Re(z^2) = 4$ is a
(a) parabola (b) ellipse (c) circle (d) none

20. If $x^2 + x + 1 = 0$ the $\left(x + \frac{1}{x}\right)^2 + \left(x^2 + \frac{1}{x^2}\right)^2 + \cdots \ldots \ldots \ldots + \left(x^{27} + \frac{1}{x^{27}}\right)^2$ is equal to
(a) 54 (b) 36 (c) 27 (d) 18

21. Number of roots of the equation $z^{10} - z^5 - 992 = 0$ with real part negative is
(a) 3 (b) 4 (c) 5 (d) 6

22. If $|z| = 1$ and $\omega = \frac{z-1}{z+1}$ $(z \neq 1)$ then Re(ω) is
(a) 0 (b) $\frac{-1}{|z+1|^2}$ (c) 2 (d) none

23. set A and B have 3 and 6 elements respectively, what can be minimum number of elements in A ∪ B
(a) 3 (b) 6 (c) 9 (d) 18

24. The number of subsets of the power set A = {7, 10, 11} is
(a) 32 (b) 16 (c) 64 (d) 256

25. $A = \sin^2 x + \cos^4 x$ then for all real x
(a) $\frac{3}{4} \leq A \leq 1$ (b) $\frac{13}{16} \leq A \leq 1$ (c) $1 \leq A \leq 2$ (d) $\frac{3}{4} \leq A \leq \frac{13}{16}$