DEPARTMENT OF SCHOOL EDUCATION

Government JEE Coaching- 2019-20

UNIT TEST- 3

Time: 60 min

Marks: 180

Instructions:

1) Answer all the questions

2) For Every correct answer Four marks will be given

3) For Every wrong answer One mark will be deducted

CHOOSE THE CORRECT ANSWER **45x4=180**

1 A body subjected to three concurrent forces is found to be in equilibrium. The resultant of any two forces
1)Is equal to third force 2) Is opposite to third force
3) is collinear with the third force 4) all of these

2. When focus $\overrightarrow{F1}$, $\overrightarrow{F2}$ and $\overrightarrow{F3}$ are acting on a particle of mass m such that $\overrightarrow{F2}$ and $\overrightarrow{F3}$ are mutually perpendicular, then the particle remains stationary. If the force is now removed, then the magnitude of acceleration of particles
1)$\frac{F1}{m}$ 2) $\frac{F2\,F3}{mF}$ 3) $\frac{F2-F3}{m}$ 4) F_2/m

3. A weight w rests on a rough horizontal plane. If the angle of friction be θ, the least force that will move along the plane will be
1) $w\cos\theta$ 2) $w\tan\theta$ 3) $w\cot\theta$ 4) $w\sin\theta$

4. A marble block of mass 2kg lying on ice when given velocity of 6 ms^{-1} is stopped by friction in los . Then the coefficient of friction is
1) 0.02 2) 0.03 3) 0.06 4) 0.01

5 If reaction is R and coefficient of friction is μ, what is work done against friction in moving a body by distance d ?
1)$\frac{\mu Rd}{4}$ 2) $2\mu Rd$ 3) μRd 4) $\frac{\mu Rd}{2}$

6. A 500kg car takes a round turn of radius 50m with a velocity of 36km/h. The centripetal force is
1)250N 2) 750N 3) 1000N 4) 1200N

7 What will be the maximum speed of a car on a road turn of radius 30m if the coefficient of friction between the tyres and the road is 0.4 Taking 9=9.8m/s^2
1)10.84 m/s 2) 9.84 m/s 3) 8.84 m/s 4) 6.84 m/s

8 An unbanked curvehas a radius of 60m. The maximum speed at which a car can make a turn if the coefficient of static friction is 0.75 is
1) 2.1 m/s 2) 14 m/s 3) 21 m/s 4) 7 m/s

9 A bus turns a corner on a slippery road at a constant speed of 12 m/s, If the coefficient of friction is 0,6, the minimum radius of the arc in metres in which the bus turns is
1)72m 2) 24m 3) 36m 4) 9m

10 A stone tied to string is rotated with a uniform speed in a vertical plane. If mass of the stone is m, length of the string is r and linear speed of the stone is v, then tension in the string when the stone is at its lowest point is
1)mg 2) $\frac{mv^2}{r}$ 3)$\frac{mv^2}{r}$ - mg 4) $\frac{mv^2}{r}$ +mg

11 A body of mass4kg is moving with momentum of 8kg ms^{-1}. A force of 0.2N acts on it in the direction of motion of the body for 10s. The increase in kinetic energy is
1)10 J 2) 8.5 J 3) 4.5 J 4) 4J

12 A particle acted upon by constant forces $4\hat{i} + \hat{j} - 3k$ and $3\hat{i} + \hat{j} - k$is displaced from the point $\hat{i} + 2\hat{j} + 3\hat{k}$ to point $5\hat{i} + 4\hat{j} + \hat{k}$. The total work done by the forces in SI unit is
1)20J 2) 49J 3) 50J 4) 30J

13 When a long spring is stretched by 2cm, its potential energy is V. If the spring is stretched by 10cm, the potential energy in it will be
1)10V 2) 25V 3) $\frac{V}{5}$ 4) 5V

14 Two spherical shaped solid masses undergo inelastic collision. Then
1)Total kinetic energy is constant
2) Total mechanical energy is not a constant
3)Linear momentum will change
4) Linear Momentum will not change

15 A mass of 5kg is moving along a circular path of radius 1m. If the mass with 300 revolutions per minute, its kinetic energy would be
1)$250\pi^2$ 2) $100\pi^2$J 3) $5\pi^2$J 4) 0J

16 Which type of bond is present in Xe molecule?
1)Covalent 2) Ion dipole 3) Vander waal's 4) dipole- dipole

17 Weight of CH_4 in 9 L cylinder at 16 atm and 27° C is
1) 0.92g 2) 93.5g 3) 3.84g 4) 16g

18 2 grams of hydrogen diffuse from a container in 10 minutes. How many grams of oxygen would diffuse through the same container in the same time under similar conditions?
1)0.5g 2) 4g 3) 6g 4) 8g

19 The kinetic energy of 4 moles of nitrogen gas at 127° C ---- cal. (R = 2 cal mol^{-1} K^{-1})
1) 4400 2) 3200 3) 4800 4) 1524

20 At high pressure the compressibility factor 'Z' is equal to
1)Unity 2) $\frac{1-Pb}{RT}$ 3) $\frac{1+Pb}{RT}$ 4) zero

21 With rise in temperature, viscosity of a liquid
1)increases 2) decreases 3) remains constant 4)may increase or decrease

22 The average kinetic energy of an ideal gas per module in SI unit at 25° C will be
1) $6.13X10^{-21}$KJ 2) $6.13X10^{-21}$J 3) $6.13X10^{-20}$KJ 4) $6.13X10^{20}$J

23 The gas occupies 2L volume at STP. It is provided 300 Joule heat so that its volume becomes 2.5L at 1 atm. Change in its internal energy will be
1) 239 J 2) 205 J 3) 249.37 J 4) 220.37 J

24 If bond energies of H-H, Br-Br and H-Br are 433, 192 and 304 KJ moi^{-1} respectively. $\Delta H°$ for the reaction $H_{2(g)} + Br_{2(g)} \rightarrow 2HBr_{(g)}$ is
1)-261KJ 2)+103KJ 3) 261KJ 4) -103KJ

25 Two moles of an ideal gas is expanded isothermally and reversibly from 1L to 10L at 300K. The enthalpy of change (in KJ) for the process
1) 11.4KJ 2) -11.4KJ 3) 0 KJ 4) 4.8 KJ

26 For a certain process ΔH = 280 KJ and ΔS = 140 JK^{-1} mol^{-1} what is the minimum temperature at which the process will be spontaneous?
1)2000K 2) 200 K 3) 14 0 K 4) 420 K

27 The signs of $\Delta H, \Delta S$ and ΔG for a non spontaneous reaction at all temperatures would be
1) +,+,- 2) +,-,+ 3) -,-,- 4) +,+,+

28 In monotonic gases, ratio of specific heat at constant pressure to that of constant volume is
1) 3/5 2) 5/3 3) 7/5 4) 4/5

29 Following reaction occurs at 25° C 2 NO (g,$1X10^{-5}$atm) + Cl_2 (g, $1X10^{-2}$atm) $\rightleftharpoons$ 2NOCl (g,$1X10^{-2}$atm)

$\Delta G°$ is

1) -45.65 RJ 2) -66.53 RJ 3) -22.82 RJ 4) -35.65 RJ

30 Which one of the following has the maximum entropy of vaporization?

1) water 2) Toluene (l) 3) Diethylether (l) 4) Acetone (l)

31 1*1!+2*2! + --- +n*n! =

1) (n+1) ! - 1 2) (n-1) ! + 1 3) (n+1) ! + 1 4) (n-1) ! -1

32 1.2.3 + 2.3.4 +3.4.5 + ------- . n terms

1) n (n+1)(n+2)(3n+5) / 12 2) n(n+1)(n+2)(n+3)/ 4

3) 2n(n+1) (n+2) (n+3) 4) n(n+1) (n+2) (3n+1) / 12

33 $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} +$..... n terms

1) n($2n^2$+9n+13) 24 2) n($2n^3$+9n+13) / 8 3) n(n^2+9n+B) / 24 4) None

34 $\cos \emptyset \cos 2\emptyset \cos 4\emptyset \ldots\ldots\ldots \cos 2^{n-1} \emptyset$ =

1) $\frac{\sin 2^n \emptyset}{2^n \sin \emptyset}$ 2) $\frac{\sin 2^n \emptyset}{\sin \emptyset}$ 3) $\frac{\cos 2^n \emptyset}{2^n \cos \emptyset}$ 4) $\frac{\cos 2^n \emptyset}{2^n \sin \emptyset}$

35 $7^{2n}+3^{n-1}2^{2n-3}$ is divisible by

1) 7 2) 9 3) 25 4) 26

36 If AB=A,BA=B, then A^2+B^2=

1)A+B 2) A-B 3) AB 4) 0

37 If A = $\begin{bmatrix} -8 & 5 \\ 2 & 4 \end{bmatrix}$ satisfies the equation x^2+4x-p=0, then p is

1) 64 2) 42 3) 36 4) 24

38 If A = $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$, I = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then which of the following holds for n ≥ 1 by the principles of mathematical induction

1) A^n = nA– (n-1) I 2) $A^n = 2^{n-1}$ A-(n-1) I 3) A^n = nA+ (n-1) I 4) $A^n = 2^{n-1}$ A+(n-1) I

39 If A = $\begin{bmatrix} \cos \emptyset & \sin \emptyset \\ -\sin \emptyset & \cos \emptyset \end{bmatrix}$, then $\lim_{n\to\infty} \frac{1}{n} A^n$ is

1) a null matrix 2) an identity matrix 3) $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ 4) none of these

40 If A(∝)=$\begin{bmatrix} \cos \propto & \sin \propto \\ -\sin \propto & \cos \propto \end{bmatrix}$, then A(∝) A($\beta$)=

1) A(∝)-A(β) 2) A(∝)+A(β) 3) A($\propto -\beta$) 4) A($\propto +\beta$)

41 If A and B are square matrices of size n x n such that A^2-B^2 =(A-B) (A+B) ; then which of the following will be always true

1) either of A or B is a zero matrix 2) either of A or B is an identity matrix

3) A = B 4) AB = BA

42 If A = $\begin{bmatrix} \cos \emptyset & \sin \emptyset & 0 \\ -\sin \emptyset & \cos \emptyset & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then

1) $AA^T = A^TA$ = I 2) $AA^T = A^TA$ = 0 1) $AA^T = A^TA$ = -I 4) none

43 If A = $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a matrix satisfying the equation AA^T = 9I, then (a,b) is

1) (2,-1) 2) (-2,1) 3) (2,1) 4) (-2,-1)

44 If A,B are symmetric matrices of the same order then AB-BA is

1) a symmetric matrix 2) skew symmetric matrix 3) diagonal matrix 4) none

45 Express A = $\begin{bmatrix} 2 & 0 & -3 \\ 4 & 3 & 1 \\ -5 & 7 & 2 \end{bmatrix}$ as a sum of symmetric and skew symmetric matrices

1) $\begin{bmatrix} 2 & 2 & -4 \\ 2 & 3 & 4 \\ -4 & 4 & 2 \end{bmatrix} + \begin{bmatrix} 0 & -2 & 1 \\ 2 & 0 & -3 \\ -1 & 3 & 0 \end{bmatrix}$

2) $\begin{bmatrix} 1 & 0 & -1 \\ 2 & 1 & 1 \\ -3 & 5 & 1 \end{bmatrix} + \begin{bmatrix} 1 & 0 & -2 \\ 2 & 2 & 0 \\ -2 & 2 & 1 \end{bmatrix}$

3) $\begin{bmatrix} 0 & 0 & -3 \\ 4 & 0 & 1 \\ -5 & 7 & 0 \end{bmatrix} + \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

4) None

ANSWER KEY

1	4	16	3	31	1
2	1	17	2	32	2
3	2	18	4	33	1
4	3	19	3	34	1
5	3	20	3	35	3
6	3	21	2	36	1
7	1	22	2	37	2
8	3	23	3	38	1
9	2	24	4	39	1
10	4	25	3	40	4
11	3	26	1	41	4
12	2	27	2	42	1
13	2	28	2	43	4
14	4	29	1	44	2
15	1	30	1	45	1