DEPARTMENT OF SCHOOL EDUCATION

Government JEE Coaching- 2019-20

UNIT TEST - 4

Time: 60 min

Marks: 180

Instructions:

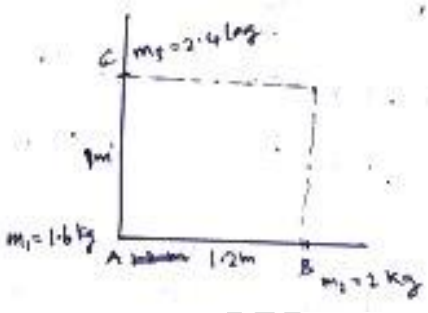
1) Answer all the questions

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. Three point masses m_1, m_2 and m_3 are placed at corners of a thin massless rectangular sheet (1.2m x 1m)as shown. Centre of mass will be located at the point



a) (0.8 , 0.6) m b) (0.6 , 0.8) m

c) (0.4 , 0.4) m d) (0.5 , 0.6) m

2. Two particles of equal mass have co–ordinates (2m,4m,6m) and (6m,2m,8m). Of these $V_1 = 2\hat{\imath}$ ms^{-1}, and another particle has velocity $V_2 = 2\hat{\jmath}$ ms^{-1} at time t = 0. The co–ordinator of mass at time t = 1 s will be

a) (4m,4m,7m) b) (5m,4m,7m) c) (2m,4m,6m) d) (4m,5m,4m)

3. From a circular disc of radius R, a square is cut out with radius as its diagonal. The centre of mass of remaining portion is at a distance (from the centre)

a) $\frac{R}{4\pi-2}$ b) $\frac{R}{2\pi}$ c) $\frac{R}{\pi-2}$ d) $\frac{R}{2\pi-2}$

4. A man of mass M stands at one end of a plank of length L which lies at rest on a friction less surface . The man walks to the other end of the plank. If the mass of the plank is $\frac{M}{3}$, the distance that man moves relative to the ground is

a) $\frac{3L}{4}$ b) $\frac{L}{4}$ c) $\frac{4L}{5}$ d) $\frac{L}{3}$

5 A ball falls freely from a height of 45m. When the ball is at a height of 20m, it explodes into two

equal pieces. One of them moves horizontally with the speed of $10ms^{-1}$ .The distance between the two pieces on the ground is

a) 20m b) 30m c) 40m d) 60m

6. A wheel which is initially at rest is subjected to a constant angular acceleration about its axis. It rotates through an angle of 15° in time 't' second . The increase in angle through which it rotates in the next '2t' s is

a) 90° b) 120° c) 30° d) 45°

7 The moment of inertia of a solid cylinder of mass M, length 2R and radius R about an axis passing through the centre of mass and perpendicular to the axis of the cylinder is I_1 and about an axis passing through one end of the cylinder and perpendicular to the axis of the cylinder is I_2

a) $I_2-I_1=MR^2$ b) $I_2=I_1$ c) $\frac{I2}{I1}=\frac{19}{12}$ d) $I_1-I_2=MR^2$

8 The radius of gyration of a solid sphere of radius R about its tangential is

a) $\sqrt{\frac{7}{5}}R$ b) $\sqrt{\frac{2}{5}}R$ c) $\sqrt{\frac{5}{7}}R$ d) R

9 The unit mass having ------ and ------- in its angular momentum is

a) 64 units in $-\hat{k}$ direction b) 64 units in $+\hat{k}$ direction

c) 64 units in $-\hat{j}$ direction d) 64 units in $+\hat{\imath}$ direction

10 A solid sphere of radius r is rolling on a horizontal surface. The ratio between the rotational kinetic energy and total energy

a) $\frac{5}{7}$ b) $\frac{2}{7}$ c) $\frac{1}{2}$ d) $\frac{1}{7}$

11 A disc and a sphere of same radius but different masses roll off on two inclined planes of the same altitude and length which one of the two objects get to the bottom of the plane first?

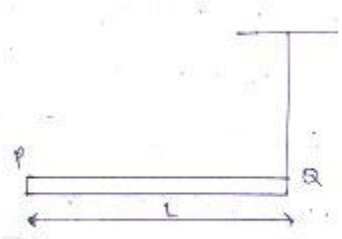
a) sphere b) both reach at same time

c) Depends on their mass d) Disc

12 A body having moment of inertia about its axis of rotation equal to $3kg\,m^2$ is rotating with angular velocity of $3rad\,s^{-1}$ kinetic energy of this rotating body is same as that of a body of mass 27kg moving with the velocity v . The value of v is

a) $1\,ms^{-1}$ b) $0.5\,ms^{-1}$ c) $2\,ms^{-1}$ d) $1.5\,ms^{-1}$

13 A rod PQ of mass M and length L is hinged at end P. Therod is kept horizontal by a massless string tied to a point Q as shown in the figure. When string is cut, the initial angular acceleration of the rod is



a) $\frac{3g}{2L}$ b) $\frac{g}{L}$ c) $\frac{2g}{L}$ d) $\frac{2g}{3L}$

14 A solid sphere of mass 2kg rolls up a 30° incline with an initial speed of $10\ ms^{-1}$. The maximum height reached by the sphere is ($g = 10\ ms^{-1}$)

a) 3.5m b) 7m c) 10.5m d) 14m

15 The rotational kinetic energy of a body is E and its moment of inertia is I. The angular momentum is

a) EI b) $2\sqrt{EI}$ c) $\sqrt{2EI}$ d) $\frac{E}{I}$

16 Change in volume of the system does not alter the number of moles in which of the following equilibrium

1) $N_{2(g)}+O_{2(g)} \rightleftharpoons 2NO(g)$ 2) $PCl_{5\,(g)} \rightleftharpoons PCl_{3\,(g)} + Cl_{2(g)}$

3) $N_{2(g)}+3H_{2(g)} \rightleftharpoons 2NH_{3\,(g)}$ 4) $SO_2Cl_{2(g)} \rightleftharpoons SO_{2(g)} + Cl_{2(g)}$

17 The exothermic formation of ClF_3 is represented by the equation $Cl2(g) + 3F_2(g) \rightleftharpoons 2clF_3(g)$ $\Delta H = -329KJ$ which of the following will increase the quantity of clF_3 in an equilibrium mixture of Cl_2, F_2 and ClF_3

1) Increasing the temperature 2) Removing Cl_2

3) Increasing the volume of the container 4) Adding F_2

18 What is the effect of having the pressure by doubling the volume on the following system at $500^\circ C$

$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

1) Shift to reactant side 2) Shift to product formation

3) Liquifaction of HI 4) No effect

19 Which of the following information can be obtained on the basis of Le – Chatelier's principle

1) Entropy change in a reaction

2) Dissociation constant of a weak acid

3) Equilibrium constant of a chemical reaction

4) Shift in equilibrium position on changing value of a constant

20 The yield of product in the reaction

$A_2(g) + 2B(g) \rightleftharpoons C(g) + Q.\ KJ$ would be high at

1) High temperature and high pressure 2) High temperature and low pressure

3) Low temperature and high pressure 4) Low temperature and low pressure

21 $H2(g) + I_2(g) \rightleftharpoons 2HI(g)$ $\Delta H = +q$ cal, then formation of HI

1) Is favoured by lowering the temperature 2) Is favoured by increasing the pressure

3) Is unaffected by change in pressure 4) Is unaffected by change in temperature

22 The equilibrium $SO_2cl_2(g) \rightleftharpoons SO_2(g) + Cl2(g)$ is attained at 25 C in a closed container and an inert gas helium is introduced

which of the following statement is correct

1) More chlorine is formed 2) Concentration of SO_2 is reduced

3) More SO_2Cl_2 is formed 4) Concentration of $SO_2Cl_2(So_2)$ and Cl_2 does not change

23 $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$ in closed container at equilibrium . What would be the effect of addition of $CaCO_3$ on the equilibrium concentration of CO_2

1)Increases 2) Decreases 3) Data is not sufficient 4) Remains unaffected

24 In which of the following the reaction proceeds towards completion

1)$K X 10^3$ 2) $K X 10^{-2}$ 3) $K X 10^1$ 4) K =1

25 According to Le – Chartelier principle , if heat is given to solid–liquid systes , then

1)Quantity of solid will reduce 2) Quantity of liquid will reduce

3) Increase in temperature *4) Decrease in temperature*

26 Which of the following statement is correct for a galvanic cell

1)Reduction occurs at cathode 2) Oxidation occurs at anode

3) Electrons flow from anode to cathode 4) All the statements are correct

27 In the reaction $VO+Fe_2O_3 \rightarrow FeO + V_2O_5$ the equivalent weight of V_2O_5 is equal to its

1) mol.wt 2) $\frac{\text{mol .wt}}{8}$ 3) $\frac{\text{mol .wt}}{6}$ 4) None of these

28 Equivalent weight of MnO_4^- in acidic, neutral and basic media are in ratio of

1) 3:5:15 2) 5:3:1 3) 5:1:13 4) 3:15:5

29 In the balanced chemical reaction $IO_3^- + aI^- + bH^- \rightarrow CH_2O + dI_2$

a, b, c and d respectively corresponds to

1)5,6,3,3 2) 5,3,6,3 3) 3,5,3,6 4) 5,6,5,5

30 Consider the following standard reaction potentials

$Ca^{2+} + 2e^- \rightleftharpoons Ca \quad E^\circ = -2.76\,V$

$Pb^{2+} + 2e^- \rightleftharpoons Pb \quad E^\circ = -0.13\,V$

$Cu^{2+} + 2e^- \rightleftharpoons Cu \quad E^\circ = 0.34V$

$Hg^{2+} + 2e^- \rightleftharpoons Hg \quad E^\circ = 0.80\,V$

$Pt^{2+} + 2e^- \rightleftharpoons Pt \quad E^\circ = -1.20\,V$

Which of the following metals is the strongest reducing agent

1)Ca 2) Pb 3) Cu 4) Hg

1. If $\begin{bmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{bmatrix} = K \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ then k =

1) 1 2) 2 3) 4 4) 8

2. $\begin{vmatrix} a^2+1 & a\ b & a\ c \\ a\ b & b^2+1 & b\ c \\ a\ c & b\ c & c^2+1 \end{vmatrix} =$

1)1+a+b+c 2) $1+a^2+b^2+c^2$ 3) abc+ab+bc+ca 4) None

3. The value of $\begin{vmatrix} 1 & 1 & 1 \\ (2^X+2^{-X})^2 & (3^X+3^{-X})^2 & (5^X+5^{-X})^2 \\ (2^X-2^{-X})^2 & (3^X-3^{-X})^2 & (5^X-5^{-X})^2 \end{vmatrix}$

1)0 2) 30^x 3) 30^{-x} 4) None of these

4. If p+q+r = 0 and $\begin{vmatrix} pa & qb & rc \\ qc & ra & pb \\ r\,b & pc & qa \end{vmatrix}$ = k $\begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix}$ then k =

1)0 2) abc 3) pq$r$ 4) a+b+c

5 If Δ = $\begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$ then Δ lies in the interval

1)$[2,3]$ 2) $[3,4]$ 3) $[2,4]$ 4) $(2,4)$

6. If a+b+c = 0, then one root of $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix}$ = 0 is

1)x = 1 2) x = 2 3) x = $a^2+b^2+c^2$ 4) x = 0

7 If s = a+b+c then the value of Δ = $\begin{vmatrix} x+c & a & b \\ c & x+a & b \\ c & a & x+b \end{vmatrix}$ is

1) $2S^2$ 2) $2S^3$ 3) S^3 4) $3S^3$

8 If $\begin{vmatrix} \lambda^2+3\lambda & \lambda-1 & \lambda+3 \\ \lambda+1 & 2-\lambda & \lambda-4 \\ \lambda-3 & \lambda+4 & 3\lambda \end{vmatrix}$ = p (λ^4) + q (λ^3) + rλ^2 + Sλ+6, then t =

1)16 2) 17 3) 18 4) 19

9 The number of number that are divisible by 9 between 1&1000 is

1)101 2) 110 3) 111 4) 100

10 If 100 times the 100th term of an AP with non – zero common difference equals to 50 times 50th term, then the 150th term of AP is

1)150 2) zero 3) -150 4) 150 times 50th term

11 If a and x are positive integers such that x < a and $\sqrt{a-x}$, $\sqrt{x}$, $\sqrt{a+x}$ are in AP then least possible value of a is

1) 5 2) 7 3) 11 4) None of these

12 In a GP consisting of positive terms, each term equals the sum of the next two terms. Then the common ratio of their progression equals

1) $\frac{1}{2}\left(1-\sqrt{5}\right)$ 2) $\frac{1}{2}\sqrt{5}$ 3) $\sqrt{5}$ 4)) $\frac{1}{2}$ ($\sqrt{2}$ -1)

13 The sum of an infinite GP is 2. If the sum of their squares is 4/3 , then the third term is

1) 1/2 2) 1 3) ¼ 4) 1/8

14 (6,6,6 ……n digits)^2 + (8,8,8 ……. n digits) =

1) $\frac{4}{9}$ (10^n - 1) 2) $\frac{4}{9}$ (10^{2n} - 1) 3) $\frac{4}{9}$ (10^n - 1) ^{2} 4) None of these

15 If $2p^{th}$ term of a G.P is q^2 and $2q^{th}$ term is p^2 then (p+q) th term is

1)0 2) 1 3) p + q 4) pq

ANSWER KEY

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