Each Section (01 to 30) contains **30** multiple choice questions which have only one correct answer. Each question carries **+4** marks for correct answer and **– 1** mark for wrong answer.

Useful Informations

Acceleration due to gravity g = 10 m/s2 Planck constant h = 6.6 1034 J-s
Charge of electron e = 1.6 1019 C Mass of electron me = 9.1 1031 kg Permittivity of free space = 8.85 1012 C 2 /N-m 2 Density of water water = 103 kg/m3 Atmospheric pressure Pa = 105 N/m2 Gas constant R = 8.314 J K1 mol1

1. Atomic No:H=1, He = 2, Li=3, Be=4, B=5, C=6, N=7, O=8, N=9, Na=11, Mg=12, Si=14, Al=13, P=15, S=16, Cl=17, Ar=18, K =19, Ca=20, Cr=24, Mn=25, Fe=26, Co=27, Ni=28, Cu = 29, Zn=30, As=33, Br=35, Ag=47, Sn=50, I=53, Xe=54, Ba=56, Pb=82, U=92.

2. Atomic masses: H=1, He=4, Li=7, Be=9, B=11, C=12, N=14, O=16, F=19, Na=23, Mg=24, Al = 27, Si=28, P=31, S=32, Cl=35.5, K=39, Ca=40, Cr=52, Mn=55, Fe=56, Co=59, Ni=58.7, Cu=63.5, Zn=65.4, As=75, Br=80, Ag=108, Sn=118.7, I=127, Xe=131, Ba=137, Pb=207, U=238.

There are some passengers inside a stationary railway compartment. The centre of mass of the compartment itself (without the passengers) is C_1, while the centre of mass of the 'compartment plus passengers' system is C_2. If the passengers move about inside the compartment,

(A) both C_1 and C_2 will move with respect to the ground

(B) neither C_1 nor C_2 will move with respect to the ground

(C) C_1 will move but C_2 will stationary with respect to the ground

(D) C_2 will move but C_1 will be stationary with respect to the ground

A false balance has equal arms. An object weighs x when placed in one pan and y in the other pan. The true weight of the object is equal to

(A) $\sqrt{xy}$

(B) $\frac{x+y}{2}$

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

(D) $\frac{\sqrt{x^2+y^2}}{2}$

Two identical cylindrical vessels with their bases at the same level, each contains a liquid of density ρ. The height of the liquid in one vessel is h_1 and that in the other h_2. The area of either base is A. The work done by gravity in equalizing the levels when the vessels are inter connected is

(A) $A\rho g\left(\frac{h_1 - h_2}{2}\right)$

(B) $A\rho g\left(\frac{h_1 - h_2}{2}\right)^2$

(C) $A\rho g\left(\frac{h_1 - h_2}{4}\right)$

(D) $A\rho g\left(\frac{h_1 - h_2}{4}\right)^2$

Dimensional formula for Plank's constant is identical to that of

(A) Torque

(B) Power

(C) Linear momentum

(D) Angular momentum

A wheel of radius r rolls without slipping with a speed v on a horizontal road. When it is at a point A on the road, a small blob of mud separates from the wheel at its highest point and lands at point B on the road

(A) $AB = v\sqrt{\frac{r}{g}}$

(B) $AB = 2v\sqrt{\frac{r}{g}}$

(C) $AB = 4v\sqrt{\frac{r}{g}}$

(D) $AB = 8v\sqrt{\frac{r}{g}}$

A particle moves along the parabolic path $y = ax^2$ in such a way that the x-component of the velocity remains constant, say c. The acceleration of the particle is

(A) $ac\hat{k}$

(B) $2ac^2\hat{j}$

(C) $ac^2\hat{k}$

(D) $a^2c^2\hat{j}$

A radioactive nucleus of mass number A, initially at rest, emits an α particle with speed v. The recoil speed of the daughter nucleus is

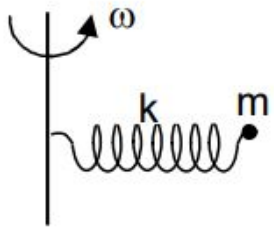
(A) $\frac{4v}{A-4}$

(B) $\frac{4v}{A}$

(C) $\frac{(A-4)v}{A}$

(D) $\frac{(A-4)v}{4}$

A particle of mass m is fixed to one end of a light spring of force constant k and unstretched length l. The system is rotated about the other end of the spring with an angular velocity ω, in gravity free space. The increase in length of the spring will be



(A) $\frac{ml\omega^2}{k}$

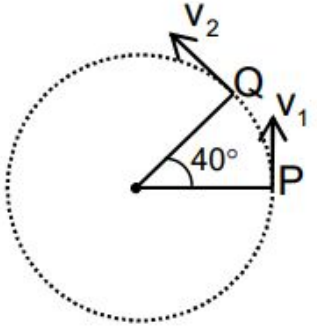
(B) $\frac{ml\omega^2}{k-m\omega^2}$

(C) $\frac{ml\omega^2}{k+m\omega^2}$

(D) None of these

A particle is moving in a circle of radius r centred at O with constant speed v. The change in velocity in moving from P to Q ($\angle POQ = 40°$) is

(A) $2v\cos 40°$
(B) $2v\sin 40°$
(C) $2v\cos 20°$
(D) $2v\sin 20°$



The electric potential (in volt) in a region is given by

$$V = 6x - 8xy^2 - 8y + 6yz - 4x^2$$

Then electric force acting on a point charge of 2C placed at the origin will be

(A) 2 N
(B) 6 N
(C) 8 N
(D) 20 N

Which of the following tests you would perform to identify the functional group present in salicylic acid?

(A) $FeCl_3$ and $NaHCO_3$ test
(B) $FeCl_3$ and NaOH test
(C) $FeCl_3$ and 2, 4-dinitrophenylhydrazine test
(D) $FeCl_3$ and Schiff's reagent test

A metal oxide is yellow when hot and white when cold. The metal oxide is

(A) CuO
(B) ZnO
(C) PbO
(D) All

A metal chloride solution on mixing with K_2CrO_4 solution gives a yellow ppt. insoluble in acetic acid. The metal may be.

(A) Mercury
(B) Zinc
(C) Silver
(D) Lead

Enthalpy of dissociation of water in kJ mol^{-1} is

(A) +13.7

(B) +57.3

(C) +18.0

(D) $+18 \times 4.2$

For the preparation of iodoform from acetone; we require

(A) KI

(B) KI_3

(C) KOI

(D) KIO_3

Cl_2 gas passed through Lassaigne's extract containing CCl_4. If the extract contains both NaBr and NaI then which colour will appear in the CCl_4 layer?

(A) Violet colour
(B) Brown colour
(C) Green colour
(D) Yellow colour

Which one of the following does not involve peptisation?

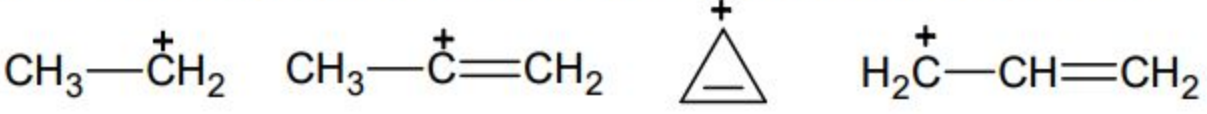
(A) $Fe(OH)_3$ precipitate shaken with a small amount of dil. HCl

(B) $Fe(OH)_3$ precipitate shaken with $FeCl_3$ solution

(C) $AuCl_3$ solution shaken with $SnCl_2$ solution

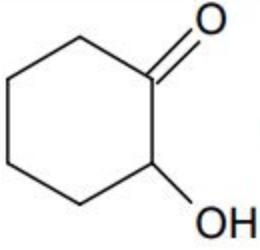
(D) $AgNO_3$ solution shaken with KI solution

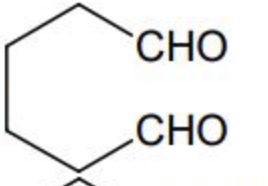
The increasing order of stability of the following carbocation is

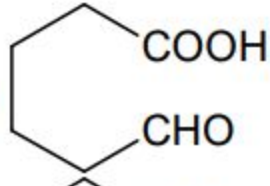


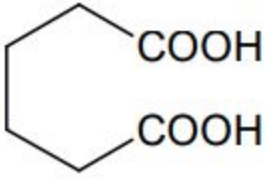
I II III IV

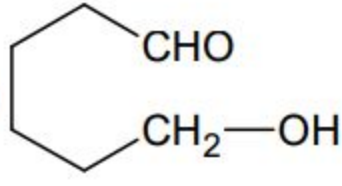
(A) IV < I < III < II
(B) II < I < IV < III
(C) I < II < III < IV
(D) III < I < IV < II

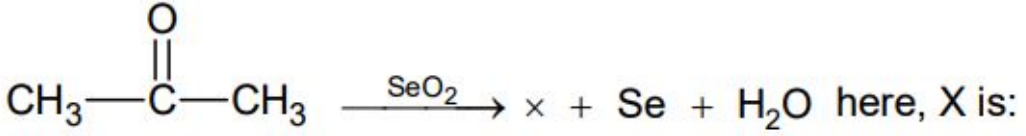
The product obtained when  is oxidized with HIO_4 is

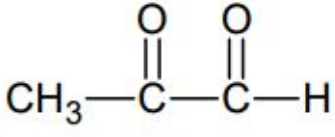
(A) 

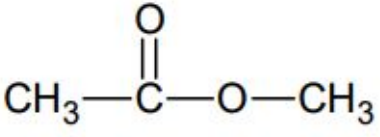
(B) 

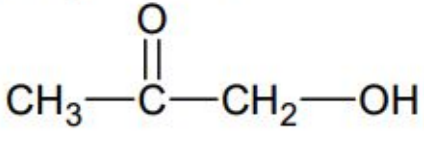
(C) 

(D) 



(A) 

(B) 

(C) 

(D) None of the above

The value of $\int_{-1}^{1} \tan^{-1}\left[x^2+\frac{1}{2}\right]dx+\int_{-1}^{1} \cot^{-1}\left[x^2-\frac{1}{2}\right]dx$ is equal to (where [.] denotes greatest integer function)

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

(B) $\frac{3\pi}{4}\left(1+\frac{1}{\sqrt{2}}\right)$

(C) $\frac{\pi}{4}\left(1-\frac{1}{\sqrt{2}}\right)$

(D) none of these

The number of ordered pairs of positive integers (m, n) satisfying $m \leq 2n \leq 60$, $n \leq 2m \leq 60$ is

(A) 240
(B) 480
(C) 900
(D) none of these

Let 'P' be a point which does not lie outside the triangle ABC, $A \equiv (3, 2)$, $B \equiv (0, 0)$, $C \equiv (0, 4)$ and satisfies $d(P, A) \geq$ maximum $\{d(P, B), d(P, C)\}$, then maximum distance of P from side BC where d(P, A) gives the distance between P and A, is

(A) $\frac{3}{4}$

(B) $\frac{4}{3}$

(C) 3

(D) 0

The m^{th} term of an arithmetic progression is x and the n^{th} term is y. Then the sum of the first (m + n) terms is

(A) $\frac{m+n}{2}\left[(x+y)+\frac{x-y}{m-n}\right]$

(B) $\frac{m+n}{2}\left[(x-y)+\frac{x+y}{m-n}\right]$

(C) $\frac{1}{2}\left[\frac{x+y}{m+n}+\frac{x-y}{m-n}\right]$

(D) $\frac{1}{2}\left[\frac{x+y}{m+n}-\frac{x-y}{m-n}\right]$

$\lim_{n\to\infty} \frac{5^{n+1}+3^n-2^{2n}}{5^n+2^n+3^{2n+3}}$ is equal to

(A) 5
(B) 3
(C) 1
(D) zero

If the point $P(x_1 + t(x_2 - x_1), y_1 + t(y_2 - y_1))$ divides the join of $A(x_1, y_1)$ and $B(x_2, y_2)$ internally then

(A) $t < 0$
(B) $0 < t < 1$
(C) $t > 1$
(D) $t = 1$

If x_1, x_2, x_3 as well as y_1, y_2, y_3 are in G. P with the same common ratio, then the points $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3)

(A) Lie on a straight line
(B) Lie on an ellipse
(C) Lie on a circle
(D) are vertices of a triangle

If in a ΔABC, $\cos A + 2\cos B + \cos C = 2$, then a, b, c are in

(A) AP
(B) HP
(C) GP
(D) none of these

If $f(x) = \int_0^1 \frac{x^2 + t^2}{2 - t}\, dt$, then the curve $y = f(x)$ represents a

(A) Straight line
(B) Parabola
(C) Hyperbola
(D) None of these