

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 $g = 10 \text{ m/s}^2$

Planck constant $h = 6.6 \times 10^{-34} \text{ J-s}$

Charge of electron $e = 1.6 \times 10^{-19} \text{ C}$

Mass of electron $m_e = 9.1 \times 10^{-31} \text{ kg}$ Permittivity of free space $= 8.85 \times 10^{12} \text{ C}^2/\text{N}\cdot\text{m}^2$

Density of water $\rho_{\text{water}} = 103 \text{ kg/m}^3$ Atmospheric pressure $P_a = 105 \text{ N/m}^2$ Gas constant $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$

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

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

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

(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

(C) Linear momentum

(B) Power

(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) $ack\hat{k}$

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

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

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

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

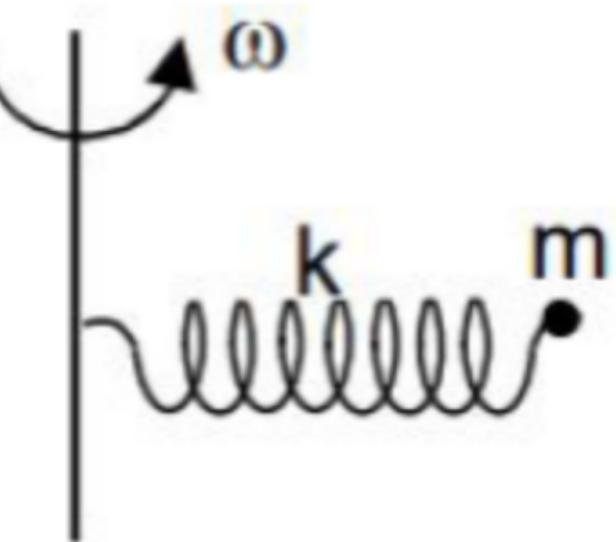
A particle of mass m is fixed to one end of a light spring of force constant k and unstretched length l . The system is rotated about the other end of the spring with an angular velocity ω , in gravity free space. The increase in length of the spring will be

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

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

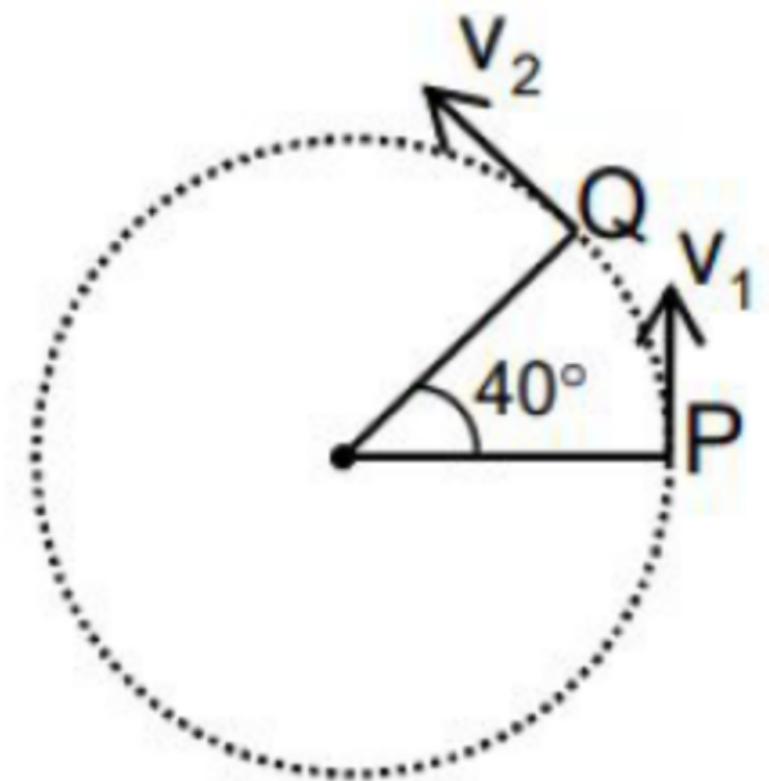
$$(B) \frac{ml\omega^2}{k - m\omega^2}$$

(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 ($\angle POQ = 40^\circ$) is

- (A) $2v\cos 40^\circ$
- (B) $2v\sin 40^\circ$
- (C) $2v\cos 20^\circ$
- (D) $2v\sin 20^\circ$



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
- (C) 8 N

- (B) 6 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
- (C) PbO

- (B) ZnO
- (D) Al₂O₃

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
(C) Silver

(B) Zinc
(D) Lead

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

(A) +13.7

(C) +18.0

(B) +57.3

(D) + 18×4.2

For the preparation of iodoform from acetone; we require

- (A) KI
- (C) KOI

- (B) KI_3
- (D) KIO_3

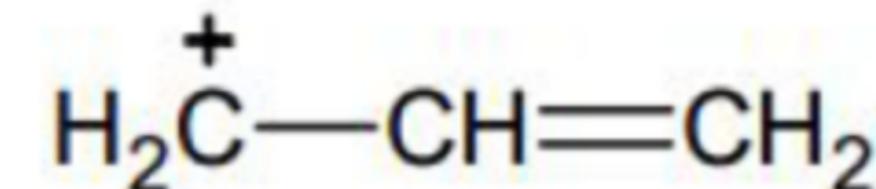
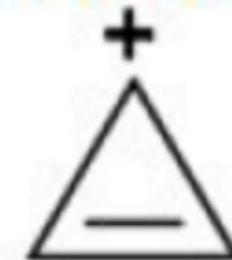
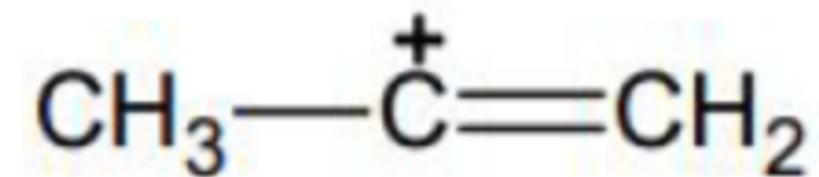
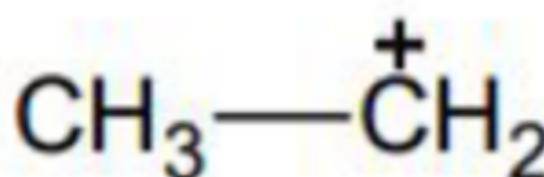
Cl_2 gas passed through Lassaigne's extract containing CCl_4 . If the extract contains both NaBr and NaI then which colour will appear in the CCl_4 layer?

- (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

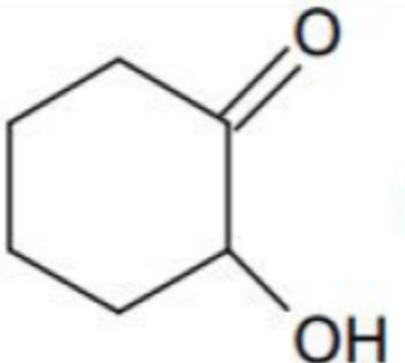
The increasing order of stability of the following carbocation is



- (A) IV < I < III < II
(C) I < II < III < IV

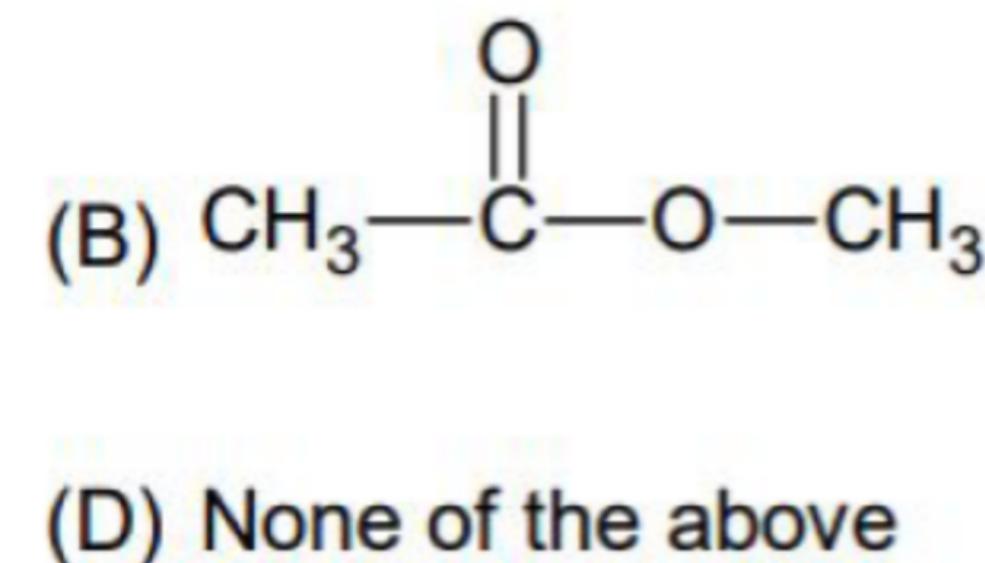
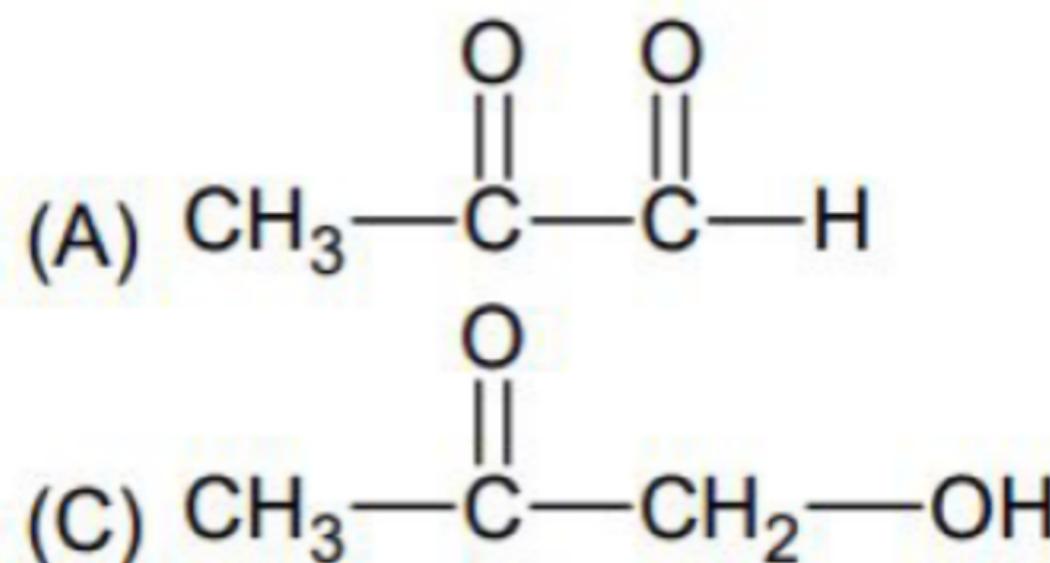
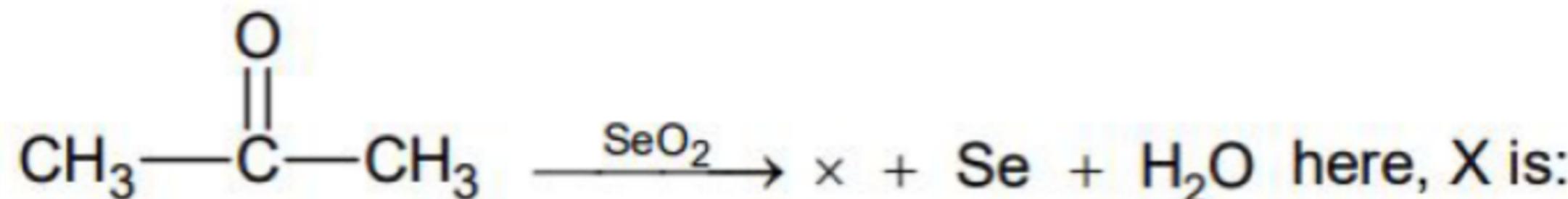
- (B) II < I < IV < III
(D) III < I < IV < II

The product obtained when



is oxidized with HIO_4 is

- (A)
The structure is a cyclohexane ring with two aldehyde groups (CHO) at adjacent positions (C2 and C3).
- (B)
The structure is a cyclohexane ring with a carboxylic acid group (COOH) at one position and an aldehyde group (CHO) at the adjacent position.
- (C)
The structure is a cyclohexane ring with two carboxylic acid groups (COOH) at adjacent positions (C2 and C3).
- (D)
The structure is a cyclohexane ring with a hydroxymethyl group (CH_2OH) at one position and an aldehyde group (CHO) at the adjacent position.



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

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

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

(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

(C) 900

(B) 480

(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 $d(P, A) \geq \max\{d(P, B), d(P, C)\}$, then maximum distance of P from side BC where $d(P, A)$ gives the distance between P and A, is

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

(C) 3

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

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

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

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

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

$$\lim_{n \rightarrow \infty} \frac{5^{n+1} + 3^n - 2^{2n}}{5^n + 2^n + 3^{2n+3}}$$

is equal to

- (A) 5
- (C) 1

- (B) 3
- (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

(C) Lie on a circle

(B) Lie on an ellipse

(D) are vertices of a triangle

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

(A) AP

(C) GP

(B) HP

(D) none of these

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

- (A) Straight line
- (B) Parabola
- (C) Hyperbola

- (D) None of these