Question no. 1

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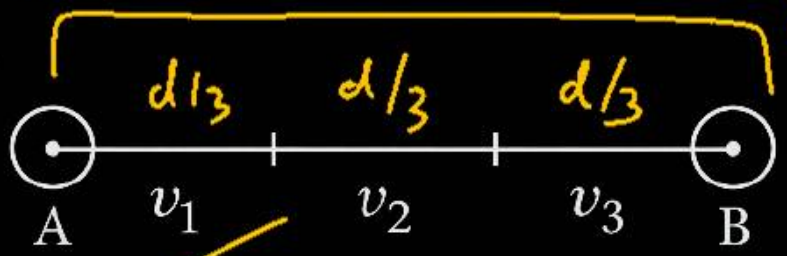
A car covers AB distance with first one–third at velocity v_1 ms^{-1}, second one–third at v_2 ms^{-1} and last one–third at v_3 ms^{-1}. If $v_3 = 3v_1$, $v_2 = 2v_1$ and $v_1 = 11$ ms^{-1} then the average velocity of the car is _____ ms^{-1}.



(1) 18 m/s
(2) 20 m/s
(3) 25 m/s
(4) None of these

$V_1 = 11\ m/s$

$V_2 = 22\ m/s$

$V_3 = 33\ m/s$

$$V_{avg} = \frac{d}{\frac{d}{3v_1} + \frac{d}{3v_2} + \frac{d}{3v_3}}$$

$$= \frac{3}{\frac{1}{11} + \frac{1}{22} + \frac{1}{33}}$$

$$= \frac{33}{1 + \frac{1}{2} + \frac{1}{3}} = \frac{33}{11/6} = 18\ m/s$$

Question no. 2

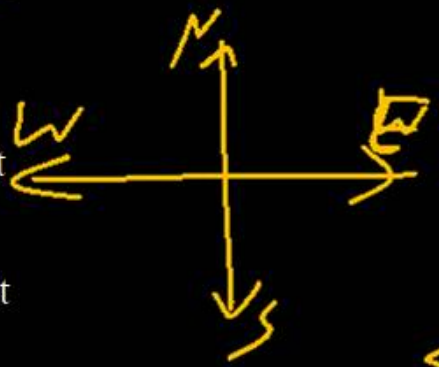
A particle is moving eastwards with a velocity of 5 ms^{-1}. In 10 seconds the velocity changes to 5 ms–1 northwards. The average acceleration in this time is

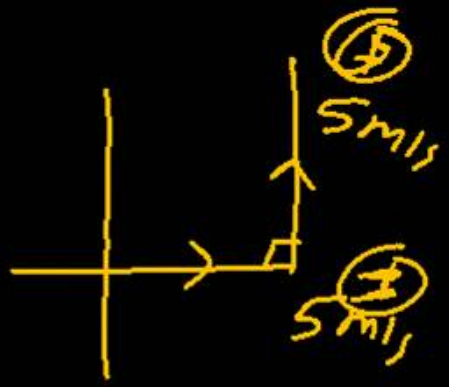
(1) $\frac{1}{2}\,ms^{-2}$ towards north

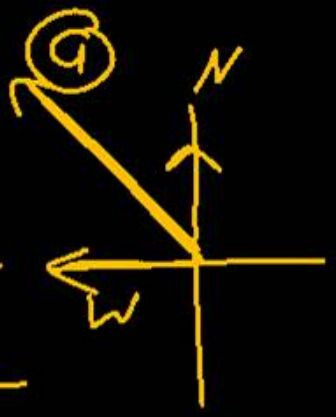
(2) $\frac{1}{\sqrt{2}}\,ms^{-2}$ towards north–east

(3) $\frac{1}{\sqrt{2}}\,ms^{-2}$ towards north-west

(4) zero







$$\langle \vec{a} \rangle = \frac{\Delta \vec{v}}{t} = \frac{\vec{v}_F - \vec{v}_I}{t}$$

$$\langle \vec{a} \rangle = \frac{5\hat{j} - 5\hat{i}}{10}$$

$$= \frac{-\hat{i}}{2} + \frac{\hat{j}}{2}$$

$$\langle a \rangle = \frac{1}{\sqrt{2}}$$

Question no. 3

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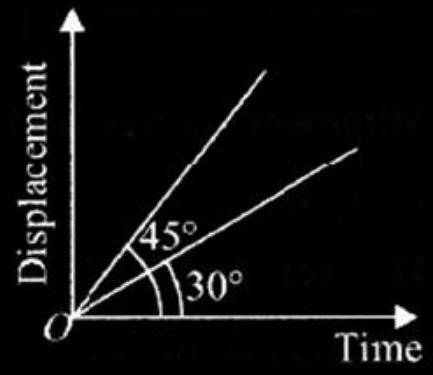
The displacement–time (x–t) graphs of two moving particles make angles of 30° and 45° with the X–axis. The ratio of their velocities is



(1) $\sqrt{3}:2$

(2) $1:1$

(3) $1:2$

(4) $1:\sqrt{3}$

$V_1 = \tan 30$

$V_2 = \tan 45$

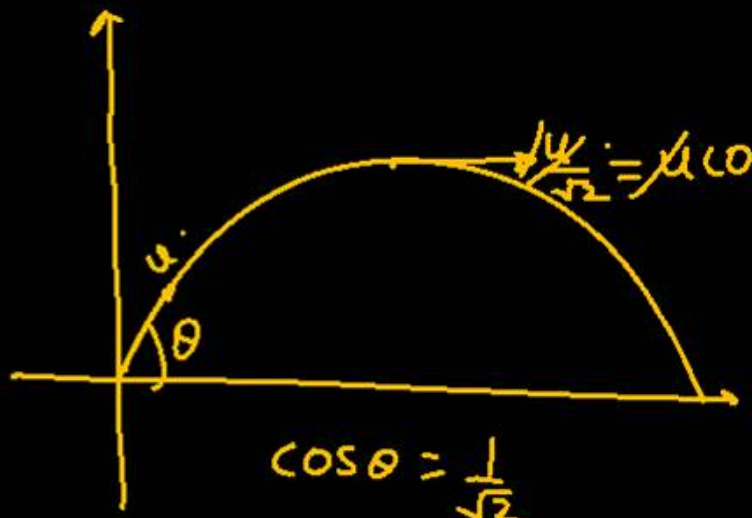
$\frac{V_1}{V_2} = \frac{1}{\sqrt{3}}$

Question no. 4

A body is thrown up with a speed u, at an angle of projectile θ. If the speed of the projectile becomes $\frac{u}{\sqrt{2}}$ on reaching the maximum height, the maximum vertical height attained by the projectile is?
(where θ is measured from horizontal)

(1) $\frac{u^2}{4g}$ (2) $\frac{u^2}{3g}$

(3) $\frac{u^2}{2g}$ (4) $\frac{u^2}{g}$



$\cos\theta = \frac{1}{\sqrt{2}}$

$\theta = 45^\circ$

$H_{max} = \frac{u^2 \sin^2\theta}{2g}$

$= \frac{u^2}{2g} \sin^2 45^\circ$

$= \frac{u^2}{4g}$

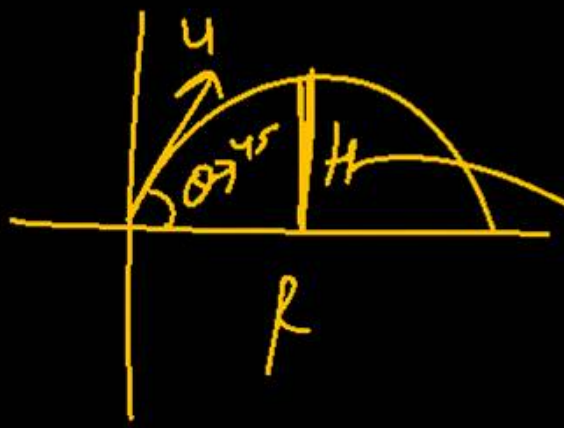
Question no. 5

AAYAM CAREER INSTITUTE

An object is projected so that its horizontal range R is maximum. If the maximum height attained by the object is H, then the ratio of R/H is

(1) 4 : 1 (2) 1 : 4

(3) 2 : 1 (4) 1 : 2



$R_{max} = R = \frac{u^2 \times 1}{g}$

$H = \frac{u^2 \sin^2\theta}{2g}$

$H = \frac{u^2}{2g} \times \frac{1}{2}$

$H = \frac{R}{4}$

$\frac{4}{1} = \frac{R}{H}$

Question no. 6

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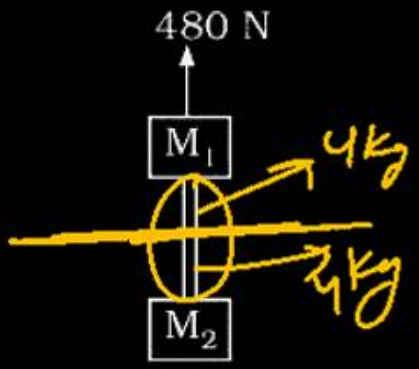
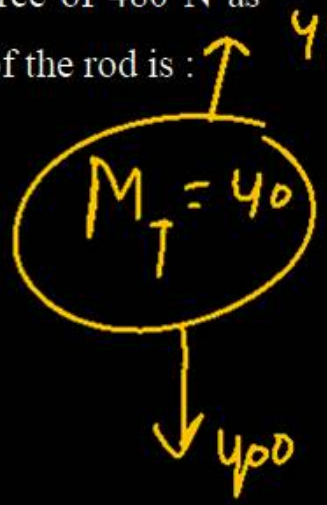
Two blocks of mass M_1 = 20 kg and M_2 = 12 kg are connected by a metal rod of mass 8 kg. The system is pulled vertically up by applying a force of 480 N as shown. The tension at the mid–point of the rod is :



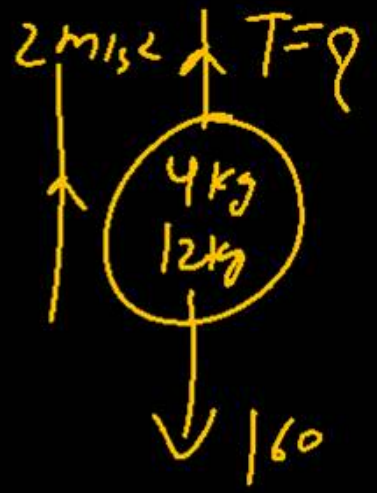
(1) 144 N (2) 96 N

(3) 240 N (4) 192 N



$a = \frac{480 - 400}{40}$

$a = \frac{80}{40} = 2\ m/s^2$



$T - 160 = 16 \times 2$

$T = 160 + 32$

Question no. 7

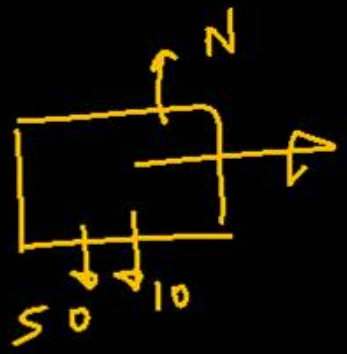
A block of mass 5 kg is pushed in case (A) and pulled in case (B), by a force F = 20 N, making an angle of 30° with the horizontal, as shown in the figures. The coefficient of friction between the block and floor is $\mu = 0.2$. The difference between the accelerations of the block, in case (B) and case (A) will be : ($g = 10\ ms^{-2}$)

(1) $0.4\ ms^{-2}$ (2) $3.2\ ms^{-2}$

(3) $0.8\ ms^{-2}$ (4) $0\ ms^{-2}$

3. B.)

A.)



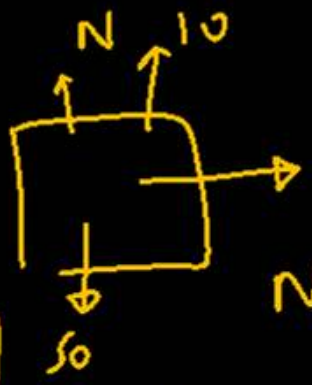
$10\sqrt{3} = 10\sqrt{3}$

$N = 60$ Newton

$f_L = 0.2 \times 60$

$f_L = 12\ N$

$a_A = \frac{10\sqrt{3} - 12}{5}$ — (1)



$N = 40N$

$f_L = 0.2 \times 40 = 8N$

$a_B = \frac{10\sqrt{3} - 8}{5}$ — (2)

$a_A - a_B = \frac{10\sqrt{3} - 12 - 10\sqrt{3} + 8}{5} = 0.8\ m/s^2$

Question no. 8

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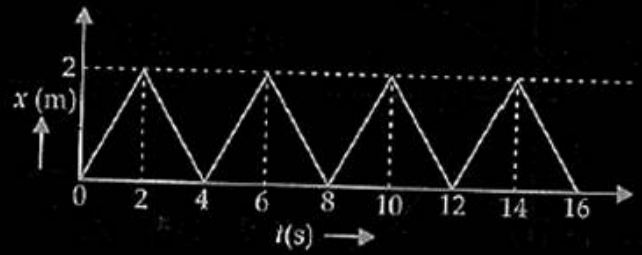
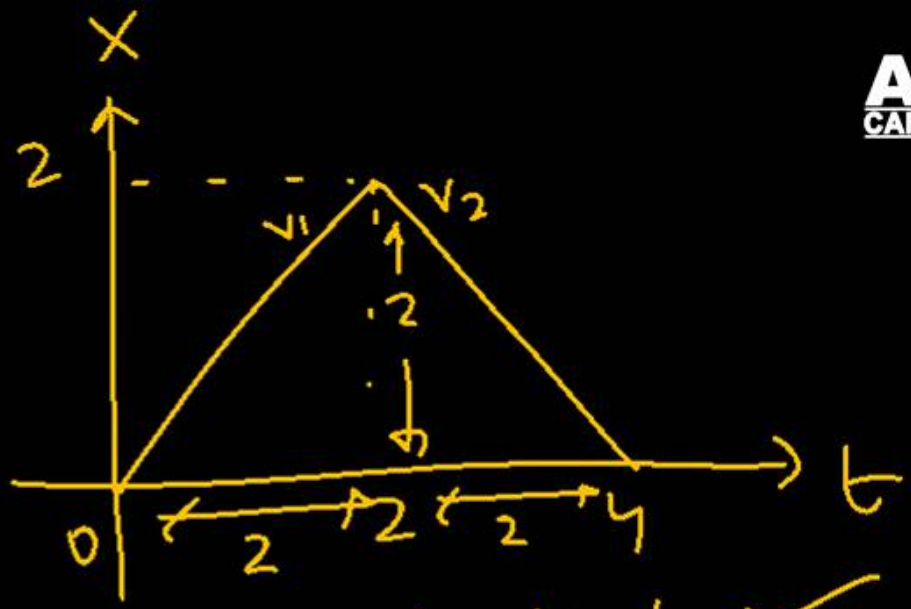
The figure shows the position – time (x–t) graph of one dimensional motion of a body of mass 0.4 kg. The magnitude of each impulse is



(1) 0.2 N s
(2) 0.4 N s
(3) 0.8 N s
(4) 1.6 N s

3



$V_1 = 2/2 = +1 m/s$

$V_2 = -2/2 = -1 m/s$

$I = \Delta P = P_f - P_i$

$= m(\Delta V)$

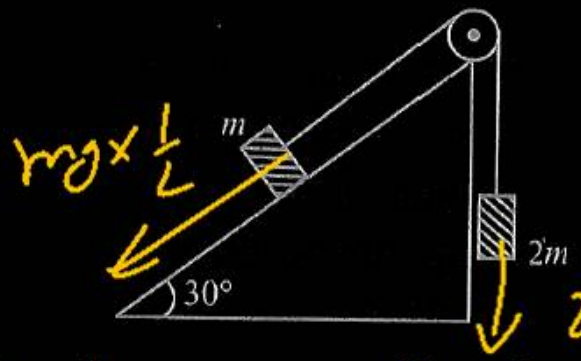
$= 0.4 \times (-2)$

$= -0.8 N\text{-sec}$

Question no. 9

AAYAM CAREER INSTITUTE

Two blocks of masses m and 2 m are connected by a light string passing over a frictionless pulley. As shown in the figure, the mass m is placed on a smooth inclined plane of inclination 30° and 2m hangs vertically. If the system is released, the blocks move with an acceleration equal to



$mg \times \frac{1}{2}$

$2mg$

$a = \frac{2mg - mg \times \frac{1}{2}}{3m}$

$a = \frac{\frac{3}{2}g}{3} = \frac{g}{2}$

(1) g/4
(2) g/3
(3) g/2
(4) g

Question no. 10

AAYAM CAREER INSTITUTE

If momentum (p), area (A) and time (T) are taken to be fundamental quantities, the energy has the dimensional formula

(1) $[pA^{-1}T^{1}]$ (2) $[p^{2}AT]$

(3) $[pA^{-1/2}T]$ (4) $[pA^{1/2}T^{-1}]$

$U = mgh \rightarrow$ Q

$U = kg.\frac{l}{T^2} \times l$

$P = mv$

$P = kg.\frac{l}{T}$

$\frac{PT}{A^{1/2}} = kg$

T

$l^2 \rightarrow A$

$l \rightarrow A^{1/2}$

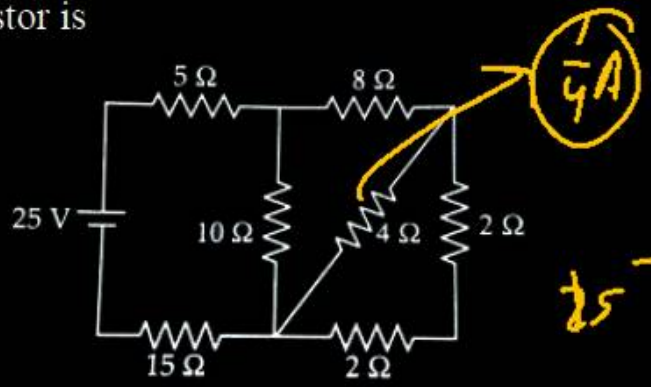
$U = \frac{PT}{A^{1/2}} \times \frac{A^{1/2}}{T \times 1}$

$U = P^{1}T^{-1}A^{1/2}$

Question no. 11

AAYAM CAREER INSTITUTE

For the circuit shown in the figure, the current in the 4Ω resistor is



(1) 0.5 A (2) 0.25 A

(3) 1 A (4) 1.5 A

Question no. 12

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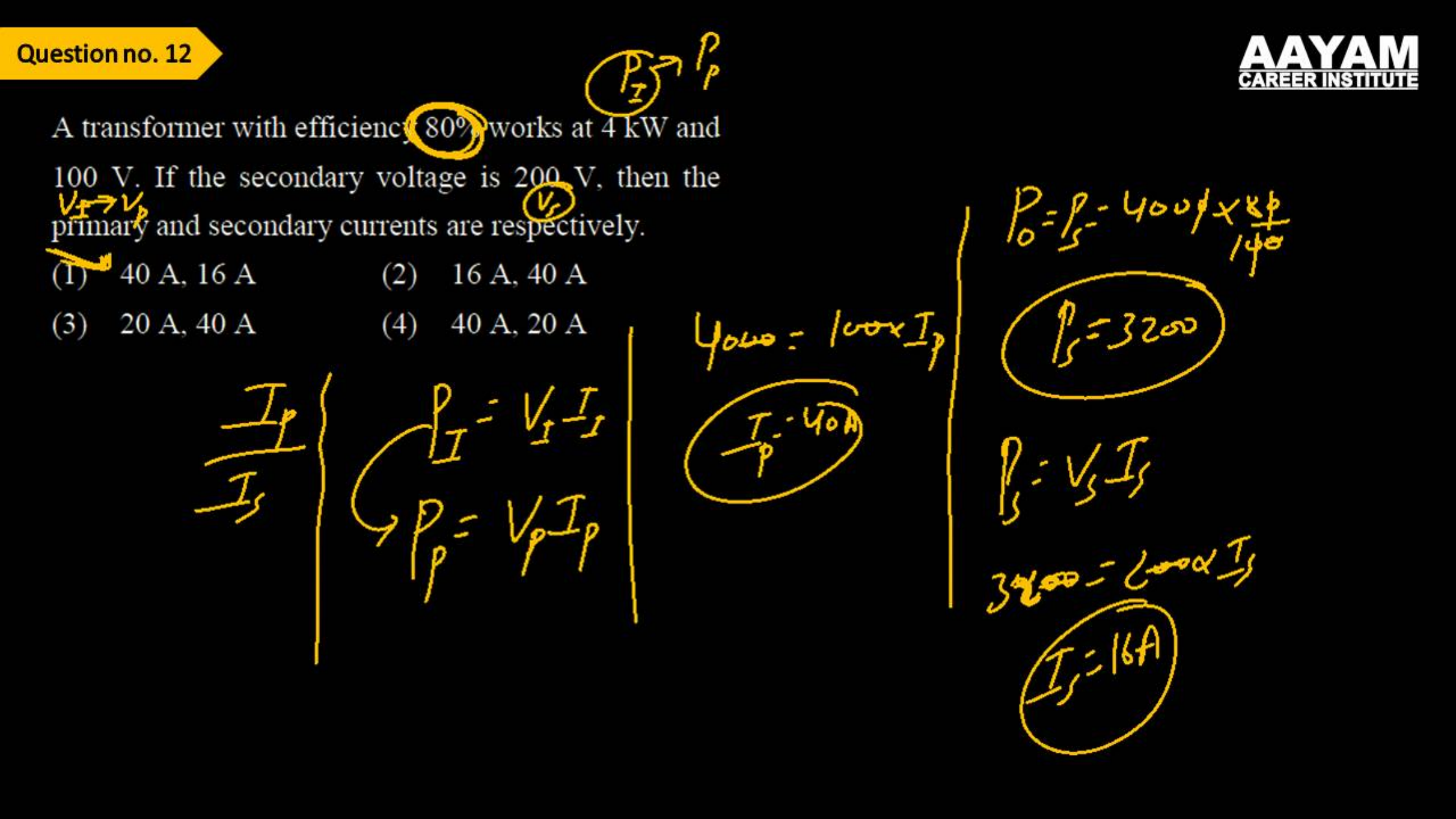
A transformer with efficiency 80% works at 4 kW and 100 V. If the secondary voltage is 200 V, then the primary and secondary currents are respectively.

(1) 40 A, 16 A (2) 16 A, 40 A

(3) 20 A, 40 A (4) 40 A, 20 A



Question no. 13

AAYAM CAREER INSTITUTE

The instantaneous velocity of a particle moving in a straight line is given as $v = \alpha t + \beta t^2$, where α and β are constants. The distance travelled by the particle between 1s and 2s is:

(1) $3\alpha + 7\beta$

(2) $\frac{3}{2}\alpha + \frac{7}{3}\beta$

(3) $\frac{\alpha}{2} + \frac{\beta}{3}$

(4) $\frac{3}{2}\alpha + \frac{7}{2}\beta$

$$\frac{ds}{dt} = \alpha t + \beta t^2$$

$$\int ds = \int_1^2 \left(\frac{\alpha t^2}{2} + \frac{\beta t^3}{3}\right)$$

$$S = \left(\frac{\alpha \times 4}{2} + \frac{\beta \times 8}{3}\right) - \left(\frac{\alpha}{2} + \frac{\beta}{3}\right)$$

$$S = 2\alpha - \frac{\alpha}{2} + \frac{8\beta}{3} - \frac{\beta}{3}$$

$$S = \frac{3\alpha}{2} + \frac{7\beta}{3}$$

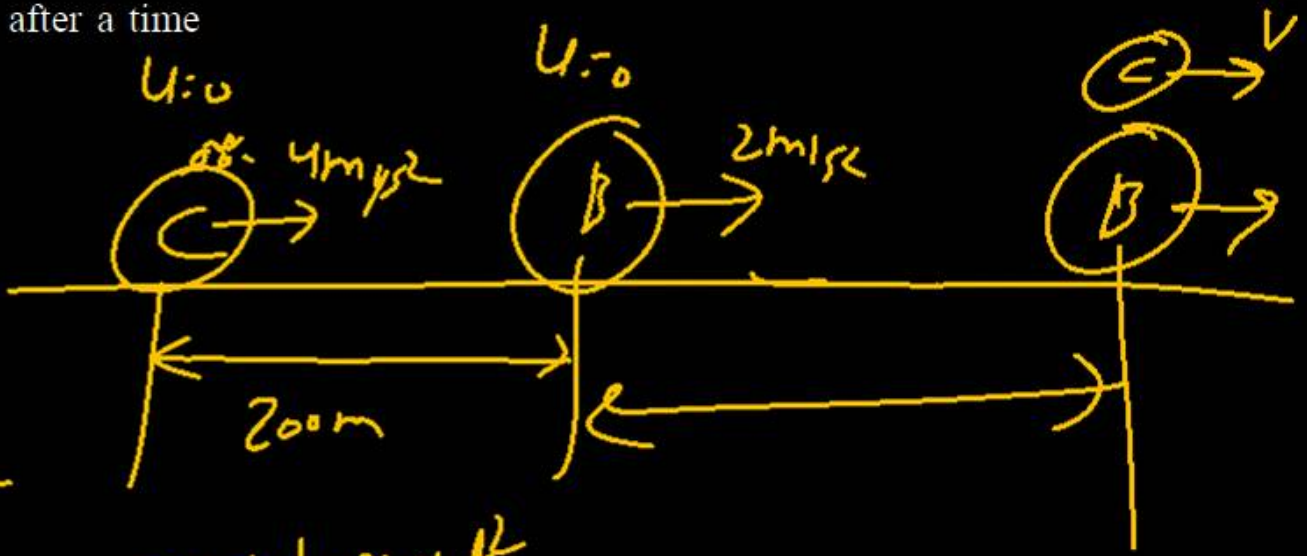
Question no. 14

AAYAM CAREER INSTITUTE

A car is standing 200 m behind a bus, which is also at rest. The two start moving at the same instant but with different forward acceleration. The bus has acceleration 2 m/s^2 and the car has acceleration 4 m/s^2. The car will catch up with the bus after a time of:

(1) $\sqrt{110}$s (2) $\sqrt{120}$s

(3) $10\sqrt{2}$s (4) 15 s



$u_g = 0$

$a_g = 4 - 2 = 2\,m/s^2$

$s_g = 200\,m$

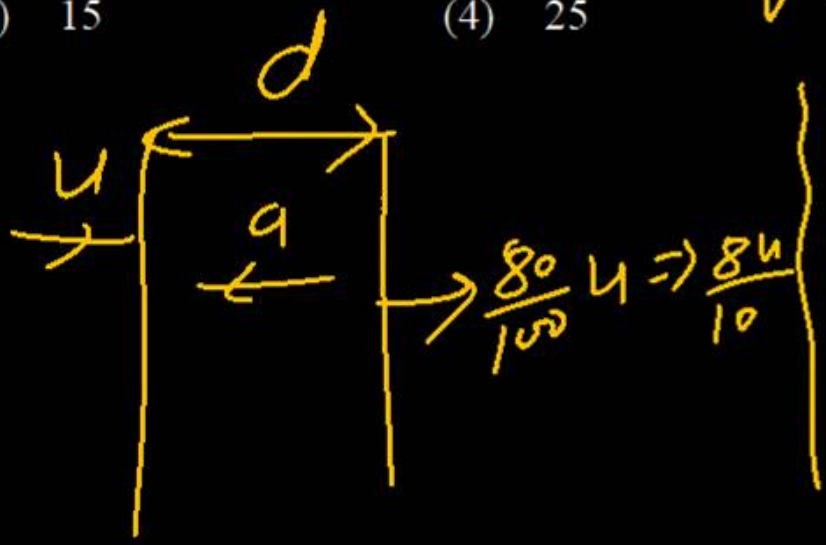
$200 = 0 + \frac{1}{2} \times 2 \times t^2$

$t = \sqrt{200} \rightarrow 10\sqrt{2}$

Question no. 15

A bullet fired from a rifle loses 20% of its speed while passing through a wooden plank. Then minimum number of wooden planks required to completely stop the bullet is

(1) 9
(2) 5
(3) 15
(4) 25



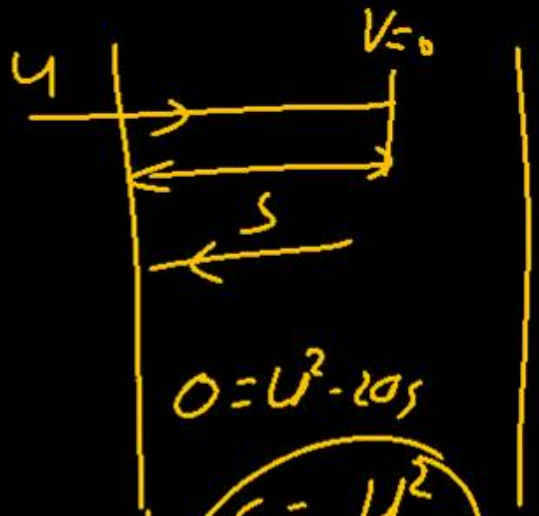
$\frac{80}{100}u \Rightarrow \frac{8u}{10}$

$v^2 = u^2 + 2as$

$\frac{64u^2}{100} = u^2 - 2ad$

$2ad = u^2 - \frac{64u^2}{100}$

$2ad = \frac{36u^2}{100}$



$0 = u^2 - 2as$

$s = \frac{u^2}{2a}$

$s = \frac{u^2 \times 100 \times d}{36u^2}$

$s = \frac{100}{36} \times d$

$n = \frac{s}{d}$

$n = \frac{100}{36} = 2.7$

Question no. 16

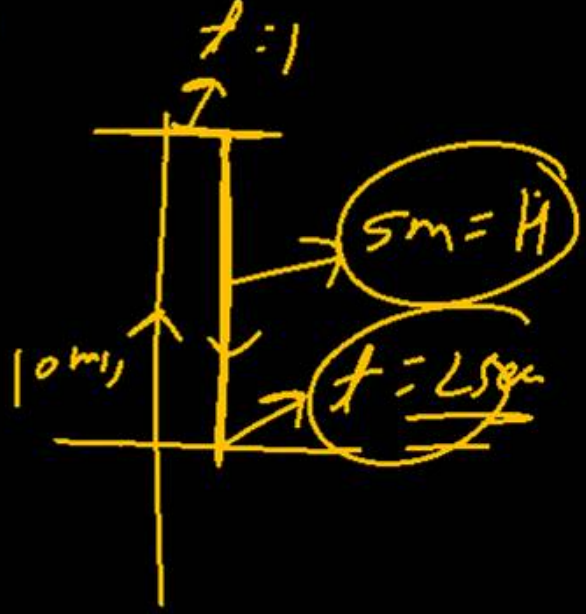
AAYAM CAREER INSTITUTE

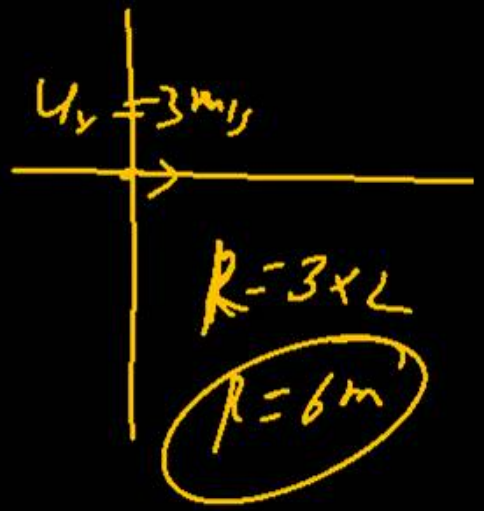
A body is projected from the ground with a velocity $\vec{v} = (3\hat{i} + 10\hat{j})\ ms^{-1}$. The maximum height attained and the range of the body respectively are (given g = 10 ms^{-2})

(1) 5 m and 6 m
(2) 3 m and 10 m
(3) 6 m and 5 m
(4) 3 m and 5 m

H = ?
R = ?

$u_x = 3$
$u_y = 10$



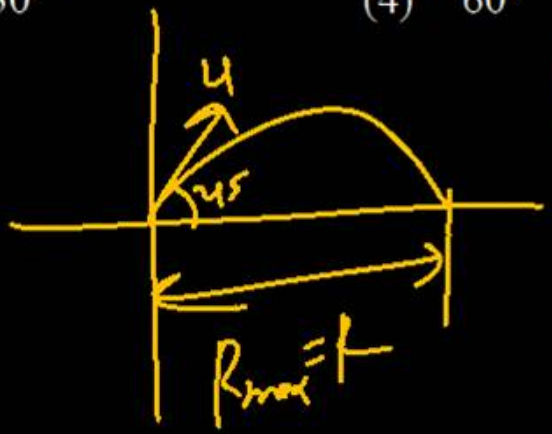


Question no. 17

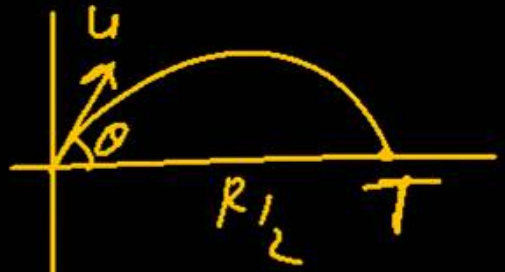
AAYAM CAREER INSTITUTE

An artillery piece which consistently shoots its shells with the same muzzle speed has a maximum range R. To hit a target which is R/2 from the gun and on the same level, the elevation angle of the gun should be

(1) 15°
(2) 45°
(3) 30°
(4) 60°



$$R = \frac{u^2 \times 1}{g}$$



$$\frac{R}{2} = \frac{u^2 \times \sin 2\theta}{g}$$

$$\frac{1}{2} \times \frac{u^2}{g} = \frac{u^2 \times \sin 2\theta}{g}$$

$$\frac{1}{2} = \sin 2\theta \Rightarrow \alpha$$

$\alpha = 30°$

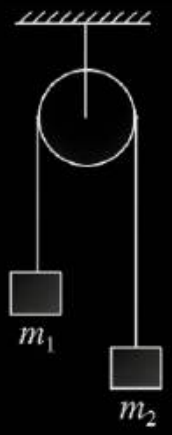
$2\theta = 30°$

$\theta = 15°$

Question no. 18

AAYAM CAREER INSTITUTE

Two masses $m_1 = 5$ kg and $m_2 = 4.8$ kg tied to a string are hanging over a light frictionless pulley. What is the acceleration of the masses when left free to move? ($g = 9.8$ m/s^2)



(1) 5 m/s^2 (2) 9.8 m/s^2

(3) 0.2 m/s^2 (4) 4.8 m/s^2

$$a = \frac{(m_1 - m_2)g}{m_1 + m_2}$$

$$a = \frac{(5 - 4.8) \times g}{5 + 4.8}$$

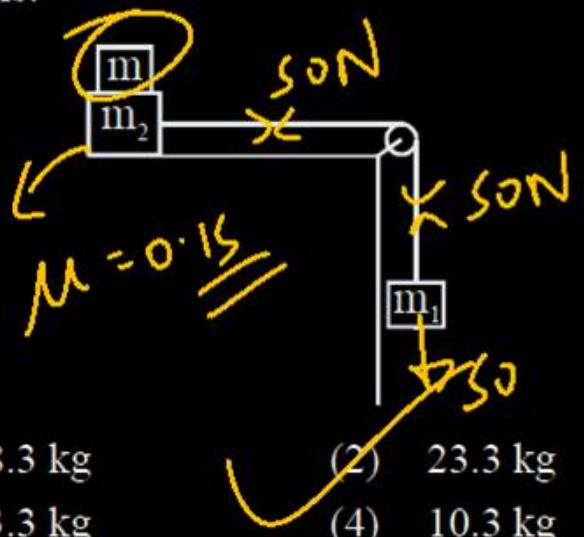
$$a = \frac{0.2 \times 9.8}{9.8}$$

$$a = 0.2 \text{ (m/s}^2\text{)}$$

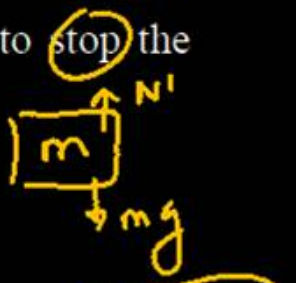
Question no. 19

AAYAM CAREER INSTITUTE

Two masses $m_1 = 5$ kg and $m_2 = 10$ kg, connected by an inextensible string over a frictionless pulley, are moving as shown in the figure. The coefficient of friction of horizontal surface is 0.15. The minimum mass m that should be put on top of m_2 to stop the motion is:

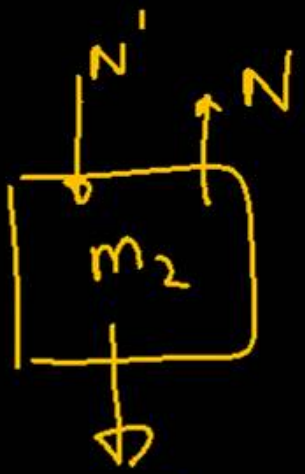


(1) 18.3 kg
(2) 23.3 kg
(3) 43.3 kg
(4) 10.3 kg



$N' = mg$

2.



100N

$N = 100 + N'$

$N = 100 + mg$

$f_L = \mu_s N$

$= 0.15(100 + 1.5m)$

$f_L = 15 + 1.5m$

$50 \leq f_L$

$50 \leq 15 + 1.5m$

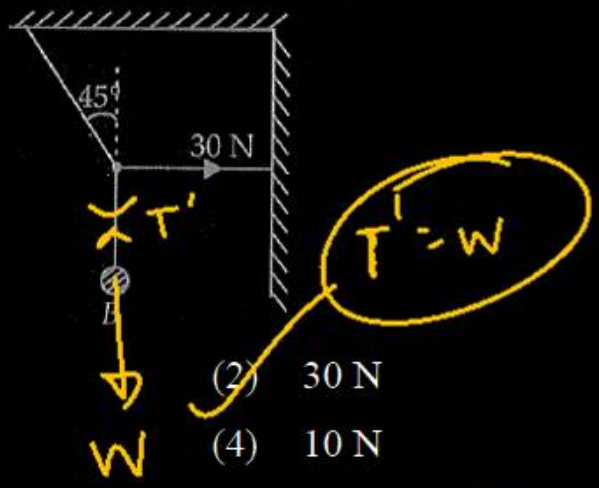
$35 \leq \frac{3}{2} m$

$\frac{70}{3} \leq m$

$23.3 \text{ kg} \leq m$

Question no. 20

In the figure shown, the tension in the horizontal cord is 30 N. Find the weight of the body B.

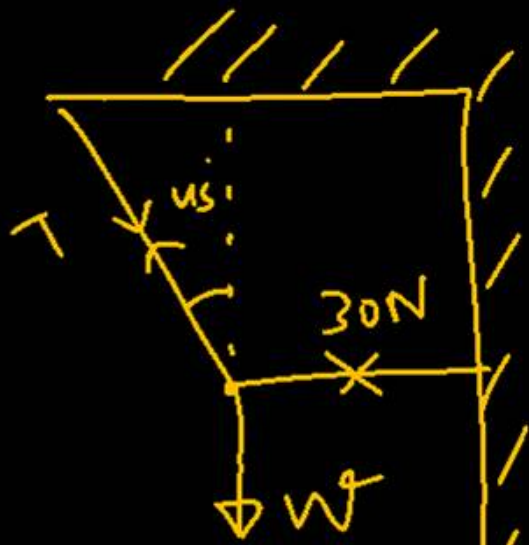


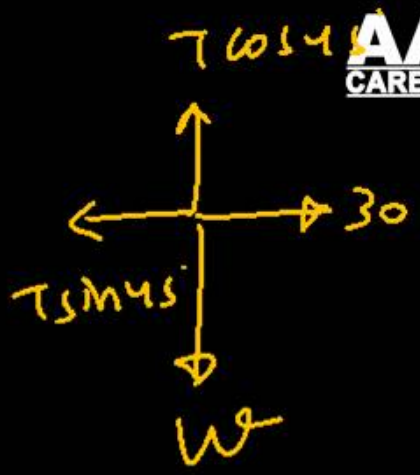
(1) 40 N (2) 30 N

(3) 20 N (4) 10 N

$T' = W$

2





$T\sin 45^\circ = 30$

$T\cos 45^\circ = W$

$\tan 45^\circ = 30/W$

$W = 30N$

Question no. 21

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A force F is given by $F = at + bt^2$, where t is time. The dimensions of a and b are

(1) $[MLT^{-3}]$ and $[MLT^{-4}]$

(2) $[MLT^{-4}]$ and $[MLT^{-3}]$

(3) $[MTL^{-1}]$ and $[MLT^{-2}]$

(4) $[MLT^{-2}]$ and $[MLT^{0}]$

$F \rightarrow M^1L^1T^{-2}$

$at \rightarrow M^1L^1T^{-2} : a \times T^1$

$a \rightarrow M^1L^1T^{-3}$

$bt^2 \rightarrow M^1L^1T^{-2}$

$b \rightarrow M^1L^1T^{-4}$

Question no. 22

Match the following columns

	Column I		Column II
(A)	Electrical resistance	(p)	$[M^{-1}L^{-2}T^{4}A^{2}]$
(B)	Capacitance	(q)	$[ML^{2}T^{-2}A^{-2}]$
(C)	Magnetic field	(r)	$[ML^{2}T^{-3}A^{-2}]$
(D)	Inductance	(s)	$[MT^{-2}A^{-1}]$

(1) A → r, B → p, C → s, D → q

(2) A → s, B → r, C → q, D → p

(3) A → p, B → s, C → r, D → r

(4) A → s, B → q, C → r, D → p

$A \to r$

$B \to p$

$C \to s$

$D \to q$

$V = \frac{W}{q} = \frac{ML^2T^{-2}}{AT}$

$V = ML^2T^{-3}A^{-1}$

$V = IR$

$R = \frac{V}{I}$

$R = \frac{ML^2T^{-3}A^{-1}}{A}$

$R = ML^2T^{-3}A^{-2}$

$Q = CV$

$C = \frac{Q}{V}$

$C = \frac{AT}{ML^2T^{-3}A^{1}}$

$C = M^{-1}L^{-2}T^{4}A^{2}$

$F = BIl\sin\theta$

$B = \frac{F}{Il}$

$B = \frac{MLT^{-2}}{A \cdot L}$

$B = ML^0T^{-2}A^{-1}$

$B = MT^{-2}A^{-1}$

$U = \frac{1}{2}Li^2$

$\frac{ML^2T^{-2}}{A^2} = L$

$L = ML^2T^{-2}A^{-2}$

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Question no. 23

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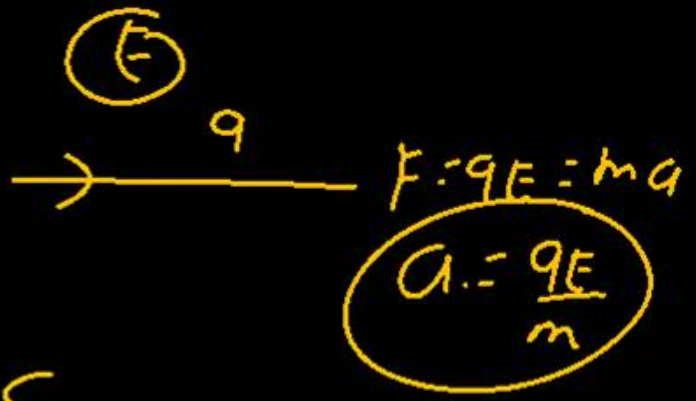
An electron of mass m_e initially at rest, moves through a certain distance in a uniform electric field in time t_1. A proton of mass m_p also initially at rest, takes time t_2 to move through an equal distance in this uniform electric field. Neglecting the effect of gravity, the ratio t_2/t_1 is nearly equal to



$S_e = S_p$

$0 + \frac{1}{2} \times \frac{eE}{m_e} \times t_1^2 = 0 + \frac{1}{2} \times \frac{eE}{m_p} \times t_2^2$

$\frac{t_2}{t_1} = \sqrt{\frac{m_p}{m_e}}$

(1) $\left(\frac{m_p}{m_e}\right)^{1/2}$

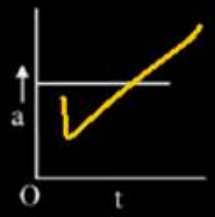
(2) $\left(\frac{m_e}{m_p}\right)^{1/2}$

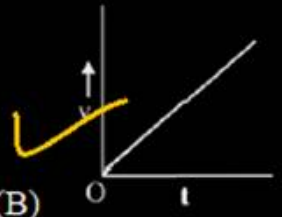
(3) 1

(4) 1836

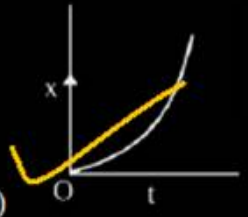
Question no. 24

A particle starts from origin O from rest and moves with a uniform acceleration along the positive x–axis. Identify all figures that correctly represents the motion qualitatively (a = acceleration, v = velocity, x = displacement, t = time)

(A) 

(B) 

(C) 

(D) 

(1) (B), (C)

(2) (A)

(3) (A), (B), (C)

(4) (A), (B), (D)

Question no. 25

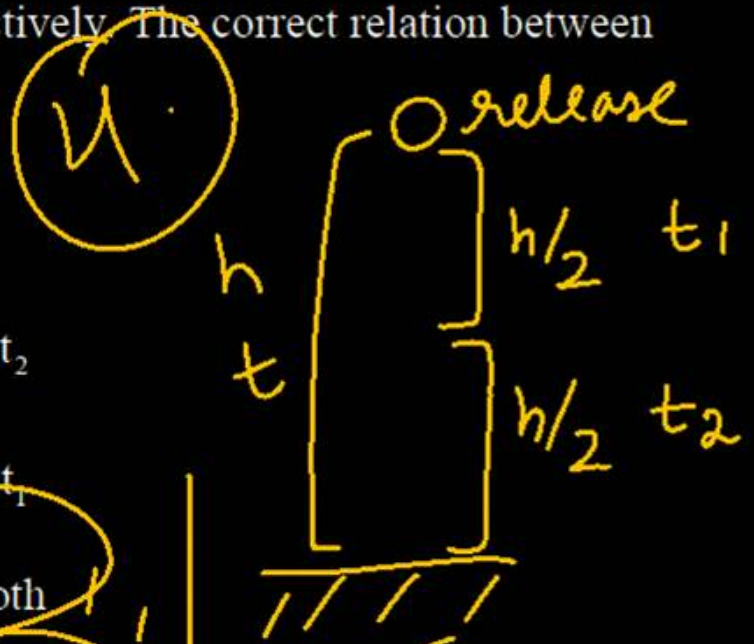
A ball is released from a height h. Let t_1 and t_2 be the time required to complete first half and second half of the distance respectively. The correct relation between t_1 and t_2 is –

(1) $t_1 = (\sqrt{2})\, t_2$

(2) $t_1 = (\sqrt{2}+1)\, t_2$

(3) $t_2 = (\sqrt{2}-1)\, t_1$

(4) (2) and (3) both



$t = \sqrt{\frac{2h}{g}}$

$t_1 = \sqrt{\frac{2h/2}{g}} = \sqrt{\frac{h}{g}}$

$t_1 + t_2 = t$

$t_2 = t - t_1$

$t_2 = \sqrt{\frac{2h}{g}} - \sqrt{\frac{h}{g}}$

$t_2 = (\sqrt{2}-1)\sqrt{\frac{h}{g}}$

$t_2 = (\sqrt{2}-1)\, t_1$

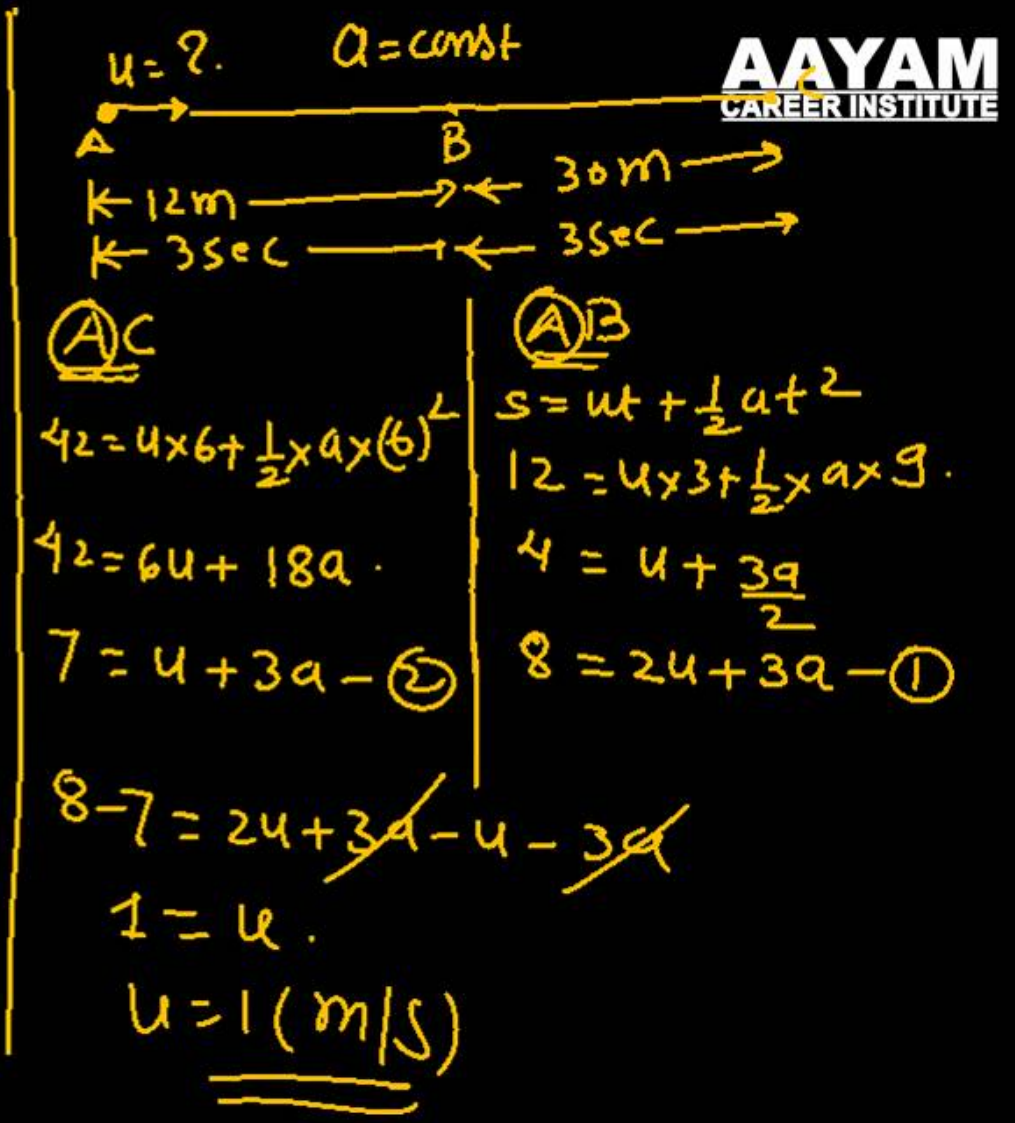
$t_2 = \frac{(\sqrt{2}-1)(\sqrt{2}+1)}{(\sqrt{2}+1)}\, t_1$

Question no. 26

A particle starting with certain initial velocity and uniform acceleration covers a distance of 12 m in first 3 seconds and a distance of 30 m in next 3 seconds. The initial velocity of the particle is

(1) 1 m s^{-1} (2) 2.5 m s^{-1}

(3) 2 m s^{-1} (4) 1.5 m s^{-1}

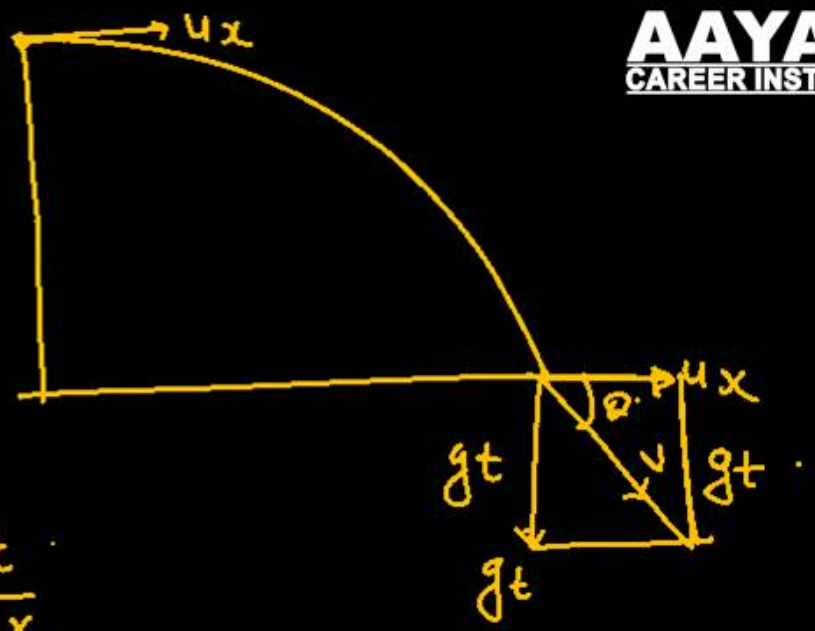


Question no. 27

AAYAM CAREER INSTITUTE

An aeroplane flying horizontally at a speed of 98 ms^{-1} releases an object which reaches the ground in 10 s. The angle made by the velocity of the object with the horizontal at the time of hitting the ground is

(1) 30°
(2) 45°
(3) 75°
(4) 60°



$$\tan\theta = \frac{gt}{ux}$$

$$\tan\theta = \frac{9.8 \times 10}{98}$$

$$\tan\theta = 1$$

$$\theta = 45^\circ$$

Question no. 28

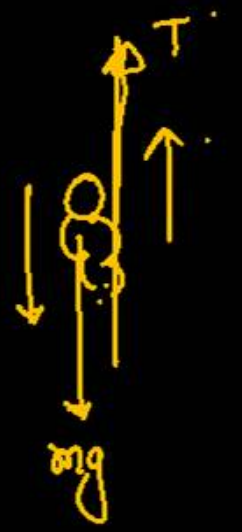
A monkey of mass 50 kg climbs on a rope which can withstand the tension (T) of 350 N. monkey initially climbs down with an acceleration of 5 m/s^2. Choose the correct option ($g=10\ m/s^2$)

(1) T = 700 N while climbing upward

(2) T = 350 N while going downward

(3) Rope will break while climbing upward

(4) Rope will break while going downward



$mg - T = ma$

$T = mg - ma$

$T = m(g - a)$

$T = 50(10 - 5)$

$T = 250\ N$

$T = m(g + a)$

$T = 50(10 + 5)$

$T = 50 \times 15$

$T = 750\ (N)\uparrow$

Question no. 29

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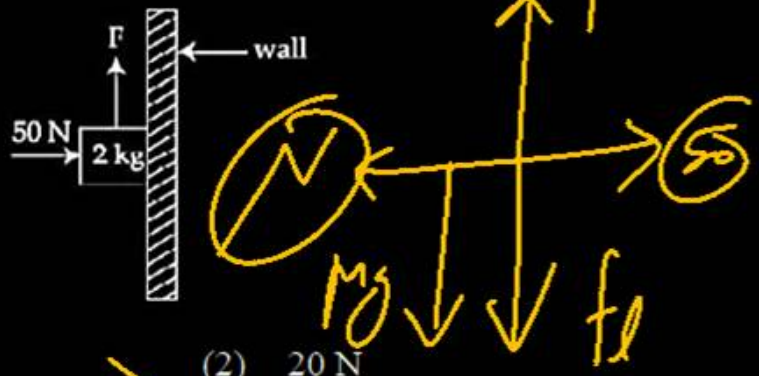
A 2 kg block is pushed against a vertical wall by applying a horizontal force of 50 N. The coefficient of static friction between the block and the wall is 0.5. A force F is also applied on the block vertically upward (as shown in figure). The maximum value of F applied, so that the block does not move upward, will be:

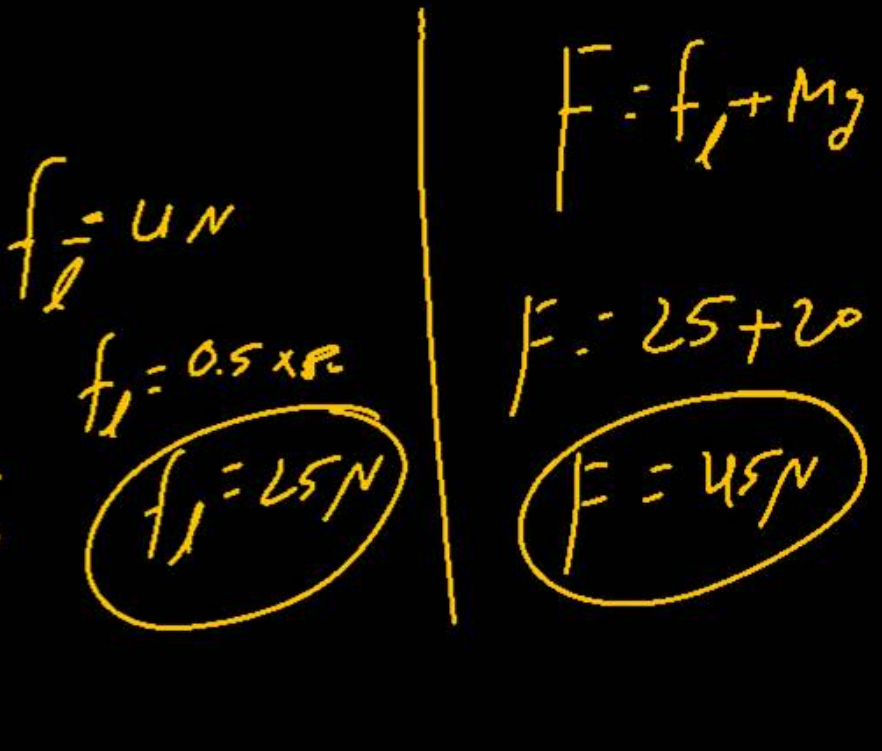


(1) 10 N

(2) 20 N

(3) 25 N

(4) 45 N

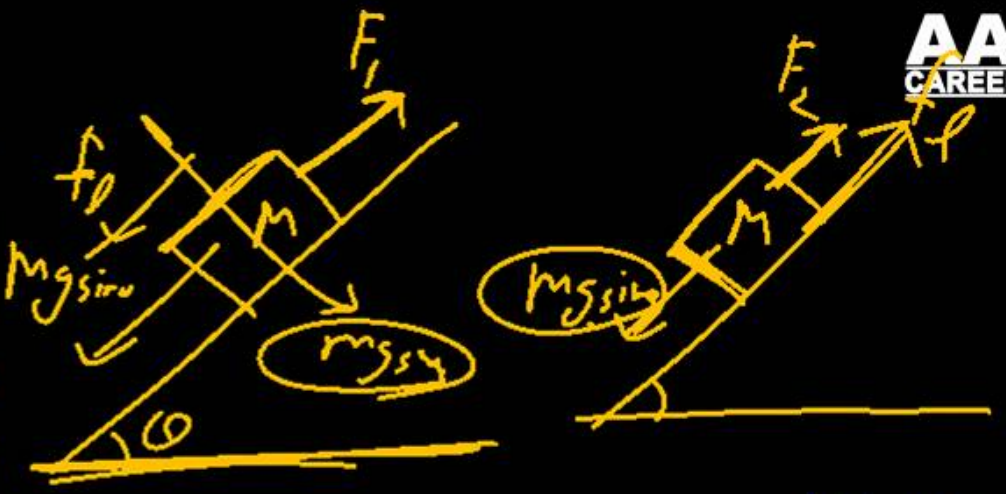


Question no. 30

The minimum force required to start pushing a body up rough (frictional coefficient μ) inclined plane is F_1 while the minimum force needed to prevent it from sliding down if F_2. If the inclined plane makes an angle θ from the horizontal such that $\tan\theta = 2\mu$ then the ratio $\frac{F_1}{F_2}$ is

(1) 1 (2) 2

(3) 3 (4) 4



$F_1 = f_k + Mg\sin\theta \rightarrow \mu mg\cos\theta + Mg\sin\theta$

$F_2 = mg\sin\theta - f_k \rightarrow mg\sin\theta - \mu mg\cos\theta$

$\frac{F_1}{F_2} = \frac{\mu\cos\theta + \sin\theta}{\sin\theta - \mu\cos\theta}$

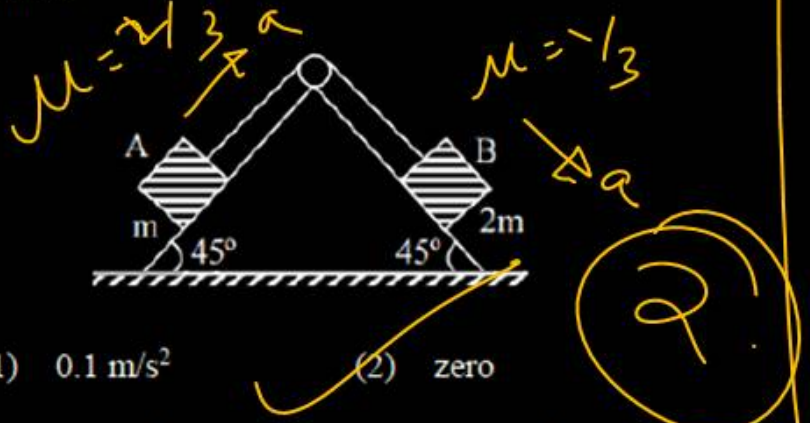
$\frac{F_1}{F_2} = \frac{\mu + \tan\theta}{\tan\theta - \mu}$

$\frac{F_1}{F_2} = \frac{3\mu}{\mu}$

$\frac{F_1}{F_2} = 3$

Question no. 31

Block A of mass m and block B of mass 2 m are placed on a fixed triangular wedge by means of a massless, inextensible string and a frictionless pulley as shown in the figure. The wedge is inclined at 45° to the horizontal on both the sides. The coefficient of friction between the block A and the wedge is 2/3 and that between the block B and the wedge is 1/3. Both A and B are released from rest, the acceleration of A will be



(1) 0.1 m/s²
(2) zero
(3) 0.2 m/s²
(4) 0.6 m/s²

A

$(f_L)_A = \mu N_A$

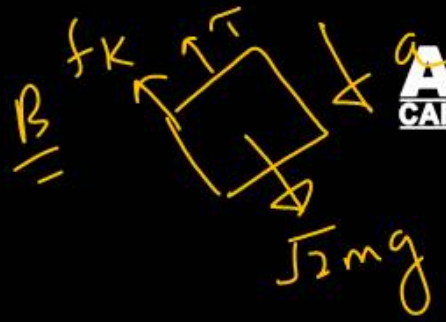
$= \frac{2}{3}\frac{mg}{\sqrt{2}}$

$= \frac{\sqrt{2}mg}{3}$

B

$(f_L)_B = \frac{1}{3} \times \frac{2mg}{\sqrt{2}}$

$= \frac{\sqrt{2}mg}{3}$



$\sqrt{2}mg - \frac{\sqrt{2}mg}{3} - T = 2ma$ ... (1)

$T - \frac{\sqrt{2}mg}{3} - \frac{mg}{\sqrt{2}} = ma$ ... (2)

(1) + (2)

$\sqrt{2}mg - \frac{\sqrt{2}mg}{3} \times 2 - \frac{mg}{\sqrt{2}} = 3ma$

$\frac{mg}{3m}\left(\sqrt{2} - \frac{2\sqrt{2}}{3} - \frac{1}{\sqrt{2}}\right) = a$ → -ve

a → Rest

Question no. 32

AAYAM CAREER INSTITUTE

If the dimensions of a physical quantity are given by $[M^aL^bT^c]$, then the physical quantity will be

(1) force, if $a = 0,\ b = -1, c = -2$

(2) pressure if $a = 1, b = -1, c = -2$

(3) velocity if $a = 1, b = 0, c = -1$

(4) acceleration if $a = 1, b = 1, c = -2$

Force $\rightarrow M^1L^1T^{-2}$

$a = 1; b = 1, c = -2$

$P = \frac{F}{A}$.

$P = \frac{MLT^{-2}}{L^2}$.

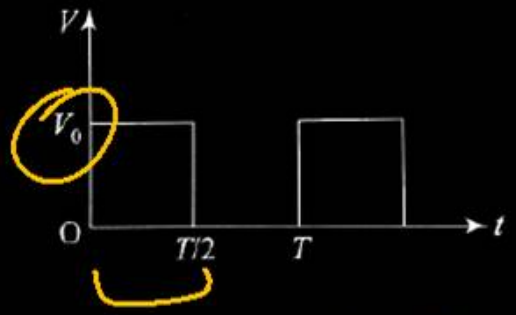
$P = M^1L^{-1}T^{-2}$

$a = 1, b = -1, c = -2$

Question no. 33

AAYAM CAREER INSTITUTE

The r.m.s. value of potential difference V shown in the figure is



(1) $V_0/2$

(2) $V_0/\sqrt{3}$

(3) V_0

(4) $V_0/\sqrt{2}$

$$V_{rms} = \sqrt{\frac{\int_0^T v^2 dt}{\int_0^T dt}} = \sqrt{\frac{\int_0^{T/2} V_0^2 dt + \int_{T/2}^{T} 0\, dt}{\int_0^T dt}}$$

$$V_{rms} = \sqrt{\frac{V_0^2 (t)_0^{T/2}}{(t)_0^T}} = \sqrt{\frac{V_0^2 \frac{T}{2}}{T}}$$

$= V_0/\sqrt{2}$ (4)

Question no. 34

AAYAM CAREER INSTITUTE

The binding energy per nucleon for C^{12} is 7.68 MeV and that for C^{13} is 7.47 MeV. What is the energy required to remove a neutron from C^{13}?

(1) 0.21 MeV (2) 2.52 MeV

(3) 4.95 MeV (4) 2.75 MeV

3

$$C^{12} + {}_0^1n \longrightarrow C^{13} + Q$$

$$Q = (BE)_p - (BE)_R$$

$$= 13 \times 7.47 - 12 \times 7.68$$

$$Q = 4.95 MeV$$

$$C^{13} + 4.95 MeV \longrightarrow C^{12} + {}_0^1n$$

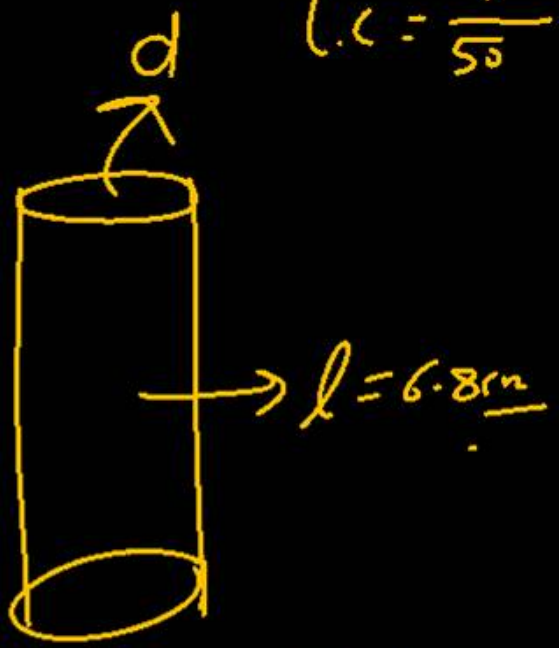
Question no. 35

A screw gauge of pitch 0.5 mm is used to measure the diameter of uniform wire of length 6.8 cm, the a main scale reading is 1.5 mm and circular scale reading is 7. The calculated curved surface area of wire to appropriate significant figures is :

[Screw gauge has 50 divisions on its circular scale]

(1) 6.8 cm^2 (2) 3.4 cm^2

(3) 3.9 cm^2 (4) 2.4 cm^2



$L.C = \frac{P}{50} = \frac{0.5\,mm}{50}$

$A = 2\pi \times l$

$A = \pi d \times l$?

$d = LSR + CSR \times L.C$

$d = 1.5mm + 7 \times \frac{0.5}{50}\,mm$

Question no. 36

AAYAM CAREER INSTITUTE

Two balls A and B are placed at the top of 180 m tall tower. Ball A is released from the top at t = 0 s. Ball B is thrown vertically down with an initial velocity 'u' at t = 2s. After a certain time, both balls meet 100 m above the ground. Find the value of 'u' in ms^{-1}. [use g = 10 ms^{-2}]:

(1) 10 (2) 15

(3) 20 (4) 30

$-80 = -u(2) - \frac{1}{2} 10 \times 4$

$-80 = -2u - 20$

$u = 30 m/s$

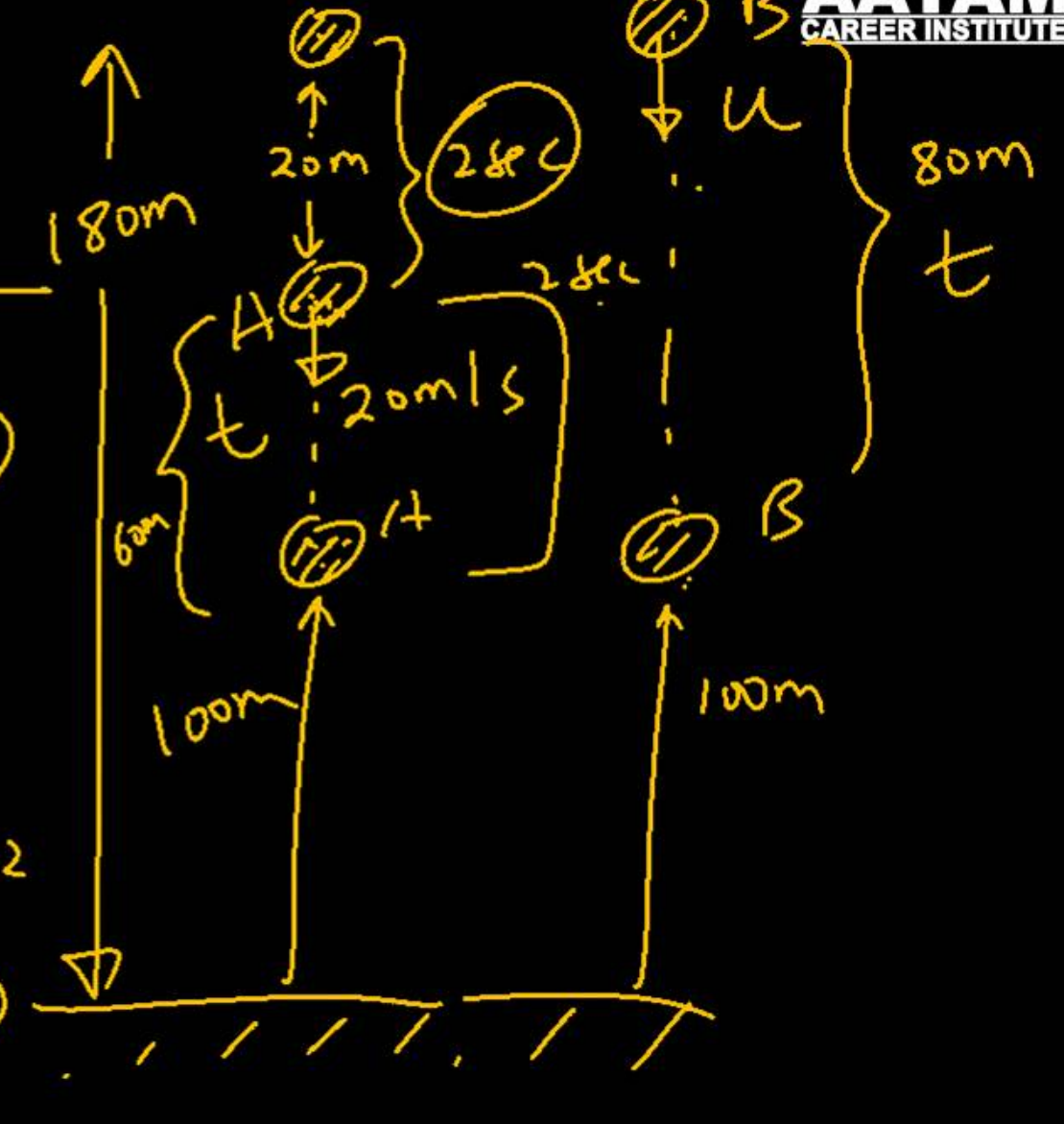
4.

$\frac{1}{2} \times 10 \times 4$

$= 20m$

$80 = \frac{1}{2} \times g t^2$

$t = 4sec$



Question no. 37

The expression of the trajectory of a projectile is given as $y = px - qx^2$, where y and x are respectively the vertical and horizontal displacements, and p and q are constants. The time of flight of the projectile is

(1) $\frac{p^2}{4q}$

(2) $\frac{p^2}{2q}$

(3) $\sqrt{\frac{2p}{qg}}$

(4) $p\sqrt{\frac{2}{qg}}$

$y = px - qx^2$

$y = x\tan\theta\left(1 - \frac{x}{R}\right)$

$y = x\tan\theta - \frac{\tan\theta}{R}x^2$

$\frac{u_y}{u_x}$

$\tan\theta = p \qquad \frac{\tan\theta}{R} = q$

$\frac{u_y}{u_x} = p$

$u_y = pu_x$

$\frac{u_x/u_x}{\frac{2u_x u_y}{g}} = q \Rightarrow \frac{g}{2u_x^2} = q$

$u_x = \sqrt{\frac{g}{2q}}$

$u_y = p\sqrt{\frac{g}{2q}}$

$T = \frac{2u_y}{g}$

$T = \frac{2p}{g}\sqrt{\frac{g}{2q}}$

$T = \frac{\sqrt{2}\,p}{\sqrt{g}\sqrt{q}}$

Question no. 38

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Two projectiles A and B thrown with speeds in the ratio $1:\sqrt{2}$ acquired the same height. If A is thrown at an angle of 45° with the horizontal, the angle of projection of B will be

(1) 0°
(2) 60°
(3) 30°
(4) 45°

$$\frac{U_A}{U_B} = \frac{1}{\sqrt{2}}.$$

$$H_A = H_B$$

$$\frac{U_A^2 \sin^2\theta_A}{2g} = \frac{U_B^2 \sin^2\theta_B}{2g}$$

$$\left(\frac{U_A}{U_B}\right)^2 = \left(\frac{\sin\theta_B}{\sin\theta_A}\right)$$

$$\left(\frac{1}{\sqrt{2}}\right)^2 = \frac{\sin^2\theta_B}{\sin 45^2}$$

$$\frac{1}{2}\cdot \sin^2 45 = \sin^2\theta_B.$$

$$\frac{1}{4} = \sin^2\theta_B.$$

$$\sin^2\theta_B = \frac{1}{2^2}$$

$$\sin\theta_B = \frac{1}{2}$$

$$\sin\theta_B = \sin 30$$

$$\theta_B = 30°$$

Question no. 39

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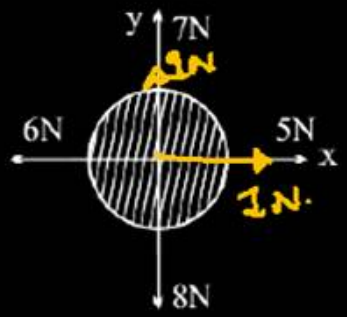
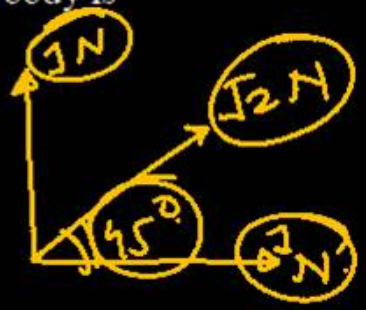
For a free body diagram shown in the figure, the four forces are applied in the 'x' and 'y' directions. What additional force must be applied and at what angle with positive x–axis so that net acceleration of body is zero?





(1) $\sqrt{2}$N, 45°

(2) $\sqrt{2}$N, 135°

(3) $\frac{2}{\sqrt{3}}$N, 30°

(4) 2N, 45°

Question no. 40

AAYAM CAREER INSTITUTE

The coefficient of static friction between two blocks is 0.5 and the table is smooth. The maximum horizontal force that can be applied to move the block together is

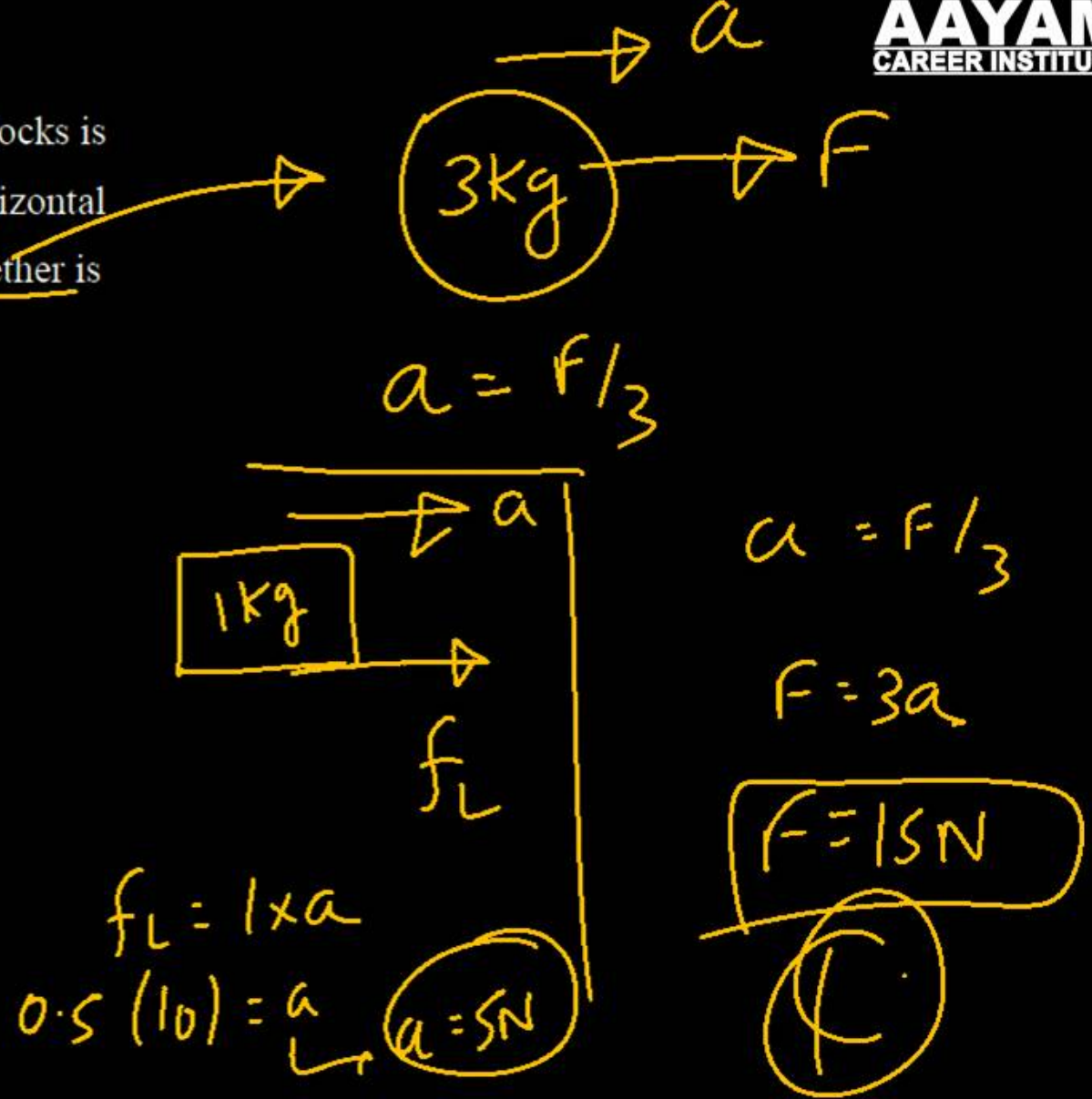
(take g = 10 ms^{-2})

(1) 15 N

(2) 20 N

(3) 25 N

(4) None of these



Question no. 41

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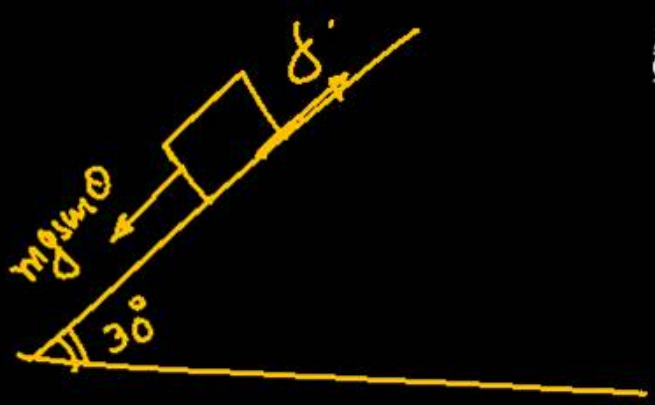
A block rests on a rough inclined plane making an angle of 30° with the horizontal. The coefficient of static friction between the block and the plane is 0.8. If the frictional force on the block is 10N, the mass of the block (in kg) is (take g = 10 m/s^2)

(1) 1.6 (2) 4.0

(3) 2.0 (4) 2.5



$mg\sin\theta = f$

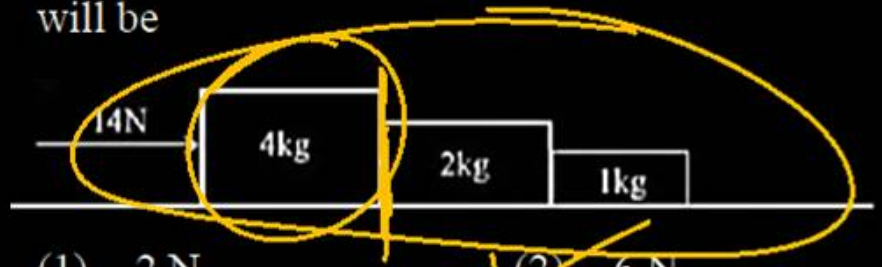
$m \times 10 \sin 30 = 10$

$m = 2\,kg$

Question no. 42

AAYAM CAREER INSTITUTE

Three blocks of mass 4 kg, 2kg, 1 kg, respectively are in contact on a frictionless table as shown in the figure. If a force of 14 N is applied on the 4 kg block, the contact force between the 4 kg and the 2 kg block will be



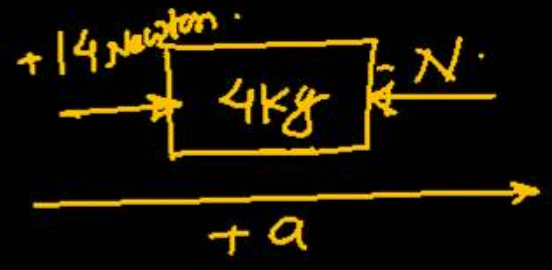
(1) 2 N (2) 6 N

(3) 8 N (4) 14 N

$F = ma_{net}$.

$14 = 7 \times a$

$a = 2\ (m/s^2)$

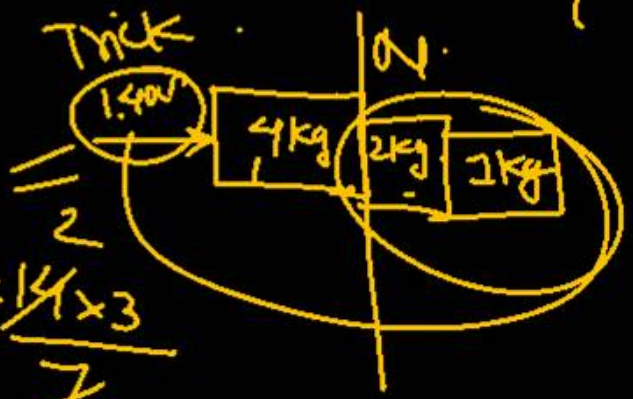


$14 - N = 4 \times a$

$14 - N = 4 \times 2$

$14 - 8 = N$.

$N = 6$ Newton.



$N = \frac{14 \times 3}{7}$

$N = 6$ Newton

Question no. 43

A physical quantity Q is calculated according to the expression

$$Q = \frac{A^3 B^3}{C\sqrt{D}}$$

If percentage errors in A, B, C, D are 2%, 1%, 3% and 4% respectively. What is the percentage error in Q?

(1) $\pm 8\%$ (2) $\pm 10\%$

(3) $\pm 14\%$ (4) $\pm 12\%$

$$Q = \frac{A^3 B^3}{C^1 \sqrt{D}}$$

$$\frac{\Delta Q}{Q} = 3\frac{\Delta A}{A} + 3\frac{\Delta B}{B} + 1\times\frac{\Delta C}{C} + \frac{1}{2}\frac{\Delta D}{D}$$

$$= \left(3\times 2 + 3\times 1 + 3 + \frac{1}{2}\times 4\right)\%$$

$$= \pm(6 + 3 + 3 + 2)$$

$$= \pm(9 + 5)$$

$$= \pm 14\%$$

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Question no. 44

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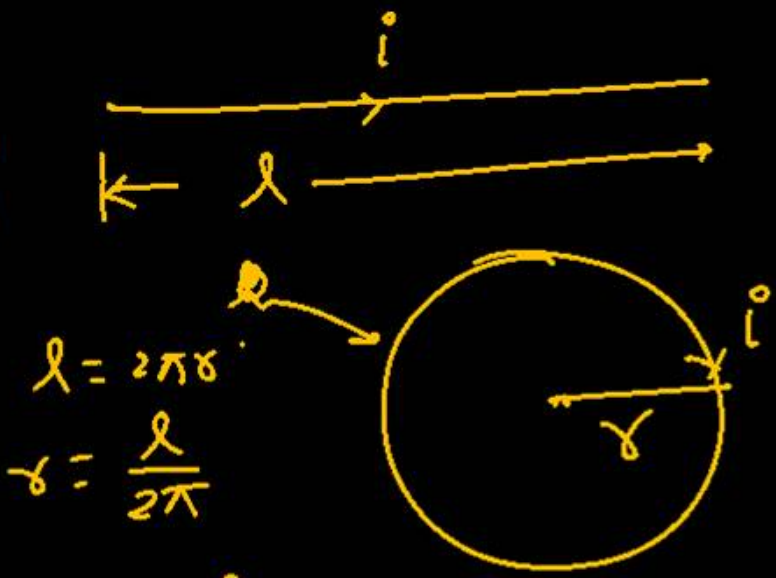
A straight wire carrying current I is turned into a circular loop. If the magnitude of magnetic moment associated with it is M, the length of wire will be

(1) $\frac{4\pi I}{M}$

(2) $\sqrt{\frac{4\pi M}{I}}$

(3) $\sqrt{\frac{4\pi I}{M}}$

(4) $\frac{M\pi}{4I}$



$l = 2\pi\gamma$

$\gamma = \frac{l}{2\pi}$

$M = iA$

$M = i \times \pi\gamma^2$

$M = \frac{i \times \pi \times l^2}{4\pi^2}$

$M = \frac{i l^2}{4\pi}$

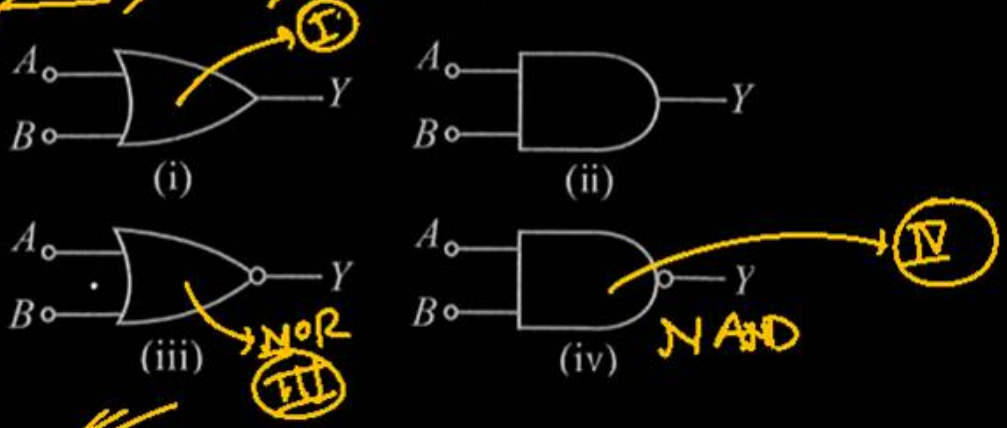
$l^2 = \frac{4\pi M}{i}$

$l = \sqrt{\frac{4\pi M}{i}}$

Question no. 45

AAYAM CAREER INSTITUTE

Given below are four logic gates symbols, Identify NAND, NOR and OR are respectively.



(1) (iv), (iii), (i)

(2) (ii), (iii), (iv)

(3) (i), (ii), (iii)

(4) (i), (iv), (ii)

Question no. 46

AAYAM CAREER INSTITUTE

In following pairs, the one in which both transition metal ions are colourless is

Diamagnetic / d^0 / d^{10}

(1) Sc^{3+}, Zn^{2+} ($3d^0$, $3d^9$)

(2) Ti^{4+}, Cu^{2+}

(3) V^{2+}, Ti^{3+} ($3d^3$, $3d^1$)

(4) Zn^{2+}, Mn^{2+} ($3d^{10}$, $3d^5$)

1

$Ti = [Ar]\ 4s^2\ 3d^2 = 3d^1$

$Sc^{+3} = [Ar]\ 4s^2\ 3d^1 = 3d^0$

$Zn^{+2} = [Ar]\ 4s^2\ 3d^{10} = 3d^{10}$

colourless

Question no. 47

AAYAM CAREER INSTITUTE

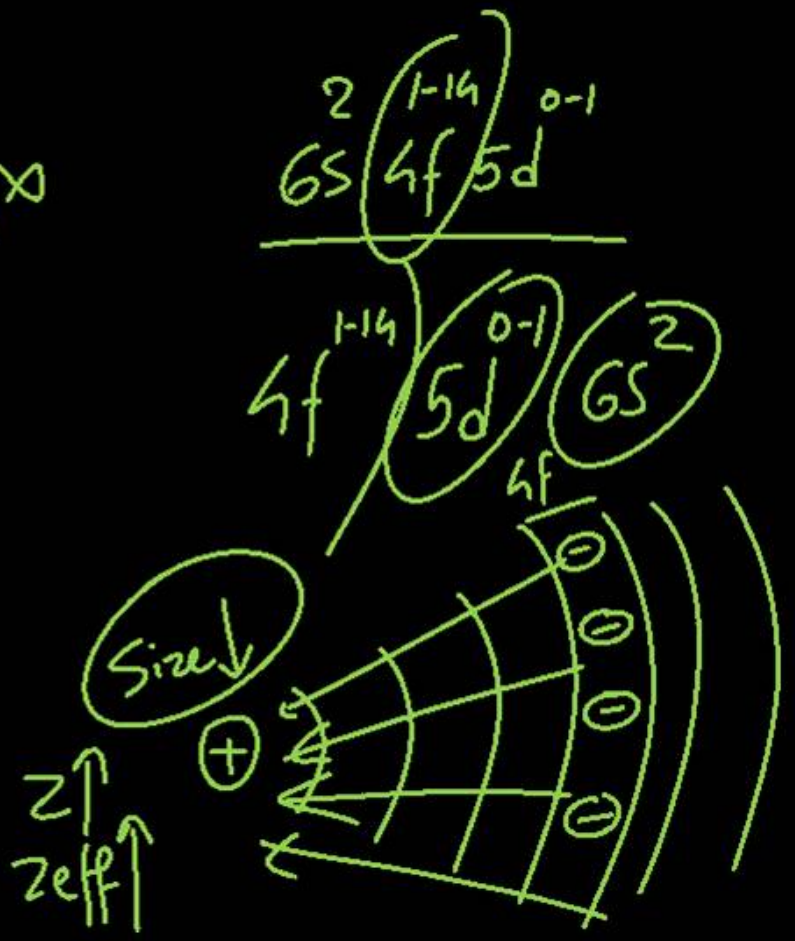
Which of the following factors may be regarded as the main cause of lanthanide contraction?

(1) Greater shielding of 5d electrons by 4f electrons

(2) Poor shielding of 5d electrons by 4f electrons

(3) Effective shielding of one of the 4f-electrons by another in the sub-shell

(4) Poor shielding of one of the 4f-electrons by another in the sub-shell



Question no. 48

AAYAM CAREER INSTITUTE

The correct order of $E^{\circ}_{M^{2+}/M}$ values with negative sign for the four successive elements Cr, Mn, Fe and Co is

(1) Fe > Mn > Cr > Co

(2) Cr > Mn > Fe > Co

(3) Mn > Cr > Fe > Co

(4) Cr > Fe > Mn > Co

3

$E^{\circ}_{M^{+2}/M}$	Cr	Mn	Fe	Co	Ni	Cu	Zn
	−0.90 V	−1.18 V	−0.50 V	−0.28 V	−0.25 V	+0.34 V	−0.76 V

+2

Mn > Cr > Fe > Co > Ni

Question no. 49

AAYAM CAREER INSTITUTE

Molar conductivity ∝ No. of ions

Which of the following has the highest molar conductivity under similar conditions?

(1) Diamminedichloridoplatinum (II) → 0 ion

(2) Tetraamminedichloridocobalt (III) chloride → 2 ions

(3) Potassium hexacyanido ferrate (II) → 5 ions

(4) Hexaaquachromium (III) chloride → 4 ions

3

① $\left[Pt(NH_3)_2Cl_2\right]^{0}$ → 4 ions

② $\left[Co(NH_3)_4Cl_2\right]^{+1}Cl^{-1}$ → 2 ions

③ $K_4^{+4}\left[Fe^{+2}(CN)_6^{-6}\right]^{-4}$ → 5 ions

④ $\left[Cr(H_2O)_6\right]^{+3}Cl_3$ → 4 ions

Question no. 50

AAYAM CAREER INSTITUTE

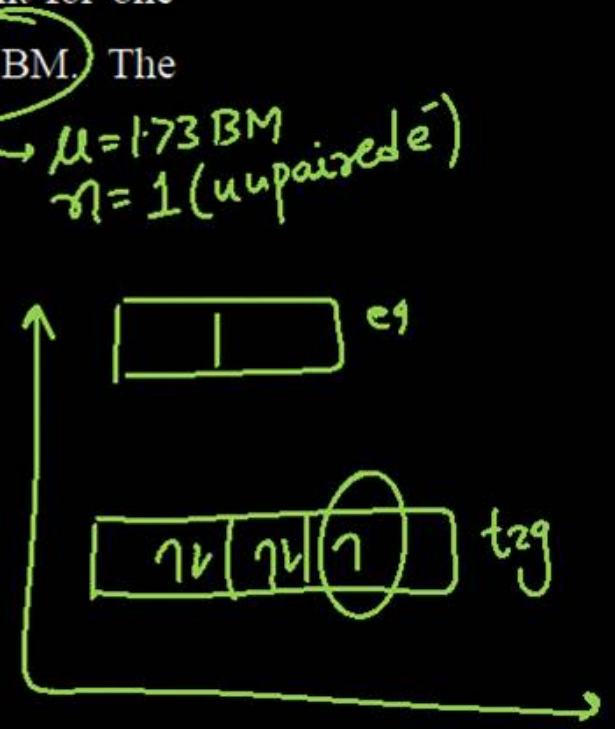
The value of the spin only magnetic moment for one of the following configurations is 1.73 BM. The correct one is

(1) d^4 (in strong ligand field)

(2) d^3 (in weak as well as strong fields)

(3) d^4 (in weak ligand field)

(4) d^5 (in strong ligand field)



Question no. 51

AAYAM CAREER INSTITUTE

. Which of the following set is not correctly matched about isomerism in given list?

	List–I	List–II
(1)	$[Cr(H_2O_6)]Cl_3$ $[Cr(H_2O)_5Cl]Cl_2H_2O$	Solvate isomerism / Hydration isomerism
(2)	$[Cr(H_2O)_5SCN]^{2+}$ $[Cr(H_2O)_5NCS]^{2+}$	Linkage isomer
(3)	$[Pt(NH_3)_4Cl_2][Br_2]$ $[Pt(NH_3)_4Br_2][Cl_2]$	Ionisation isomerism
(4)	$[Co(NH_3)_6]\ [Cr(CN)_6]$ $[Co(NH3)_6]\ [Co(CN)_6]$	Ionisation isomer / Co-ordination

$\leftarrow :\overset{\ominus}{S}-C\equiv N$

$\leftarrow :N\equiv C-\overset{\ominus}{S}$

4

Question no. 52

AAYAM CAREER INSTITUTE

BO ↑ ⇒ ABMO ↓ ⇒ Synergistic Bonding ↓ ⇒ Metal ed less ⇒ +ve charge

Metal Carbonyl / Synergistic Bonding

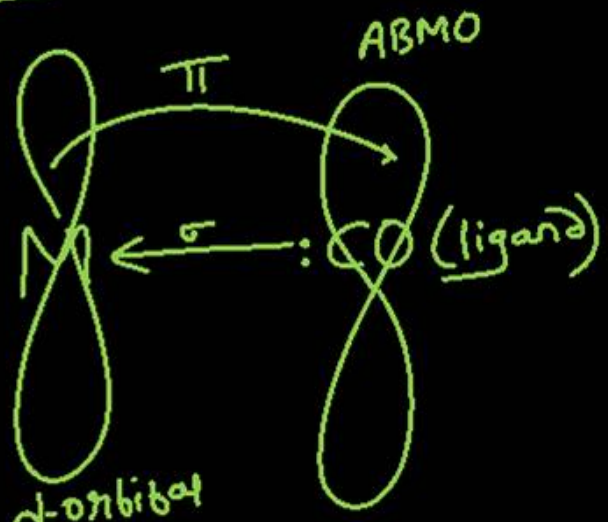
In which of the following metal carbonyl C-O bond order is highest?

(1) $[V(CO)_6]^{-1}$ (2) $[Mn(CO)_6]^{+1}$ (+1)

(3) $[Cr(CO)_6]^{0}$ (4) $[Ti(CO)_6]^{2-}$

2

Metal Has more e⊖ → -ve charge → more donation of e⁻ in ABMO of CO → no. of e⁻ in ABMO ↑ → B.O ↓ $\left(\frac{N_b - N_a}{2}\right)$ → BE ↓, BL ↑, Bond strength ↓ ← Bond



Question no. 53

AAYAM CAREER INSTITUTE

99% of a first order reaction was completed in 32 min.

When will 99.9% of the reaction complete?

(1) 50 min (2) 46 min

(3) 49 min (4) 48 min

$$t_{99\%} = \frac{20}{3} t_{1/2}$$

$$32 = \frac{20}{3} t_{1/2}$$

$$t_{1/2} = \frac{16 \times 3}{10} = \frac{48}{10}$$

$$t_{99.9\%} = 10\, t_{1/2}$$

$$= 10 \times 48/10$$

$$= 48 \text{ min}$$

Question no. 54

The freezing point of benzene decreases by 0.45° C when 0.2 g of acetic acid is added to 20g of benzene. If acetic acid associates to form a dimer in benzene, percentage association of acetic acid in benzene will be (K_f for benzene = 5.12 K kg mol^{-1})

(1) 64.6% (2) 80.4%

(3) 74.6% (4) 94.6%

$\Delta T_b = i K_b \times m$

$0.45 = i \times 5.12 \times \frac{0.2 \times 1000}{60 \times 20}$

1ϕ

$i = \frac{0.45 \times 6}{5.12} = 0.527$

$i < 1$ Association → Dimer form

$2CH_3COOH \xrightarrow{\text{Benzene}} (CH_3COOH)_2$ $n = 2$

Dimer = 2

$i = (1 - \alpha) + \alpha/n$

$0.527 = (1 - \alpha) + \alpha/2$

$0.527 = 1 - \alpha/2$

$\alpha/2 = 1 - 0.527$

$\alpha/2 = 0.473$

$\alpha = 0.946$

$\alpha = 94.6$

Question no. 55

AAYAM CAREER INSTITUTE

Consider following statements –

Assertion (A) : Cu^{2+} in water is more stable than Cu^{+}

Reason (R) : Enthalpy of hydration for Cu^{2+} is much less than that of Cu^{+}

In the light of the above statement, choose the correct answer from the options given below :

(1) Both (A) and (R) are correct but (R) is the correct explanation of (A)

(2) (A) is correct but (R) is not correct

(3) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(4) (A) is not correct but (R) is correct

Enthalpy of hydration — Cu^{+2} ↑↑ , Cu^{+1} ↓

Question no. 56

AAYAM CAREER INSTITUTE

Identify correct statement from below

(A) The chromate ion is square planar ✗

(B) Dichromates are generally prepared from chromates ✓

(C) The green manganate ion is diamagnetic ✗

(D) Dark green coloured K_2MnO_4 disproportionates in a neutral or acidic medium to give permanganate ✓

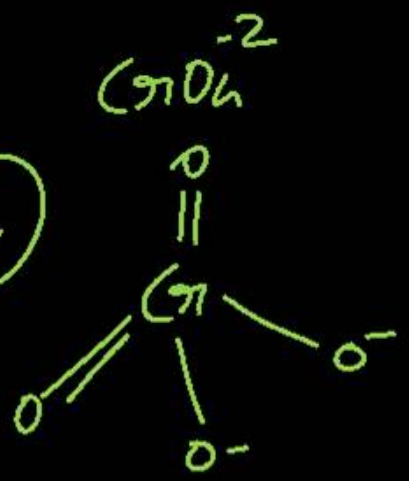
(E) With increasing oxidation number of transition metal, ionic character of the oxides decreases.

Choose the correct answer from the options given below :

(1) ~~A, D, E only~~ (2) B, D, E only ✓

(3) ~~B, C, D only~~ (4) ~~A, B, C only~~

2



MnO_4^{-2}

(+6)

$[Ar]4s^2 3d^{\times 1}$

$= 3d^1$ / Para / d-d

$K_2\overset{+6}{Mn}O_4 \longrightarrow \overset{(+7)}{MnO_4^-} + \overset{(+4)}{MnO_2}$

Higher O.S. → comp. ionic ↓

charge ↑ → polarization ↑ → CC ↑ ⇒ ionic character ↓

Question no. 57

AAYAM CAREER INSTITUTE

The correct order of absorbed wavelength (λ_{max}) of the Cr-complexes is–

(1) $[CrF_6]^{3-} > [Cr(H_2O)_6]^{3+} > [Cr(en)_3]^{3+} > [Cr(CN)_6]^{3-}$

(2) ~~$[Cr(H_2O)_6]^{3+} > [CrF_6]^{3-} > [Cr(en)_3]^{3+} > [Cr(CN)_6]^{3-}$~~

(3) ~~$[Cr(CN)_6]^{3-} > [Cr(en)_3]^{3+} > [Cr(H_2O)_6]^{3+} > [CrF_6]^{3-}$~~

(4) ~~$[Cr(en)_3]^{3+} > [Cr(CN)_6]^{3-} > [Cr(H_2O)_6]^{3+} > [CrF_6]^{3-}$~~

(1)

$\lambda_{absorbed} \propto \frac{1}{\text{Strength of ligand}}$

Stronger lig $\rightarrow$ λ less

F^- = Weakest lig - λ_{max}

Question no. 58

AAYAM CAREER INSTITUTE

The highest value of the calculated spin only magnetic moment (in BM) among all the transition metal complexes is

(1) 5.92 (2) 3.87

(3) 6.93 (4) 4.90

μ_{max}

d^{1-10}

max no. of unpaired $e^- = 5$

$\mu = \sqrt{n(n+2)}$

$= \sqrt{5(5+2)}$

$= \sqrt{35}$

$= 5.92$

Question no. 59

AAYAM CAREER INSTITUTE

Cerium (Z = 58) is an important member of the lanthanides. Which of the following statements about cerium is incorrect?

(1) The common oxidation states of cerium are +3 and +4

(2) The +3 oxidation state of cerium is more stable than the +4 oxidation state

(3) The +4 oxidation state of cerium is not known in solutions

(4) Cerium (IV) acts as an oxidising agent

3

$Ce = [Xe]\,6s^2\,4f^1\,5d^1$

$Z = 58 \quad 54$

$Ce^{+4} = [Xe]\,4f^0$

$Ce^{+4} \xrightarrow{\text{Red.}} Ce^{+3}$

Ce^{+4}: less Stable

Ce^{+3}: more Stable

Ce^{+4}: O. Agent

Question no. 60

AAYAM CAREER INSTITUTE

$KMnO_4$ oxidises I^- in acidic and neutral / faintly alkaline solution, respectively to

(1) I_2 & IO_3^-

(2) IO_3^- & I_2

(3) IO_3^- & IO_3^-

(4) I_2 & I_2

1

$$\overset{+7}{MnO_4^-} + I^{-1} \xrightarrow{\text{acidic}} \overset{0}{I_2} + Mn^{+2}$$

$$\overset{+7}{MnO_4^-} + I^{-1} \xrightarrow{\text{neutral}} IO_3^- + Mn^{+4}$$

Question no. 61

AAYAM CAREER INSTITUTE

The IUPAC name of $[Ni(NH_3)_4]\ [NiCl_4]$ is

(1) Tetrachloridonickel (II) ~~tetraammminenickel (II)~~

(2) Tetraammminenickel (II) ~~tetrachloridonickel (II)~~

(3) Tetraammminenickel (II) tetrachloridonickelate (II)

(4) ~~Tetrachloridonickel (II) tetraammminenickelate (0)~~

$x + 0 + x - 4 = 0$

$2x = 4$

$x = +2$

(3)

tetrammine nickel (II) tetrachloridonicklate (II)

Question no. 62

AAYAM CAREER INSTITUTE

Match Column I with Column II and choose the correct combination from the options given.

	Column I		Column II
(P)	SO_4^{2-}	(i)	Tetradentate
(Q)	$C_2O_4^{2-}$	(ii)	Hexadentate
(R)	$EDTA^{4-}$	(iii)	Tridentate
(S)	Diethylene triamine (dien)	(iv)	Monodentate
		(v)	Bidentate

(1) P–iv; Q–v; R–ii; S–iii

(2) P-iv; Q–ii; R–v; S–i

(3) P–i; Q–ii; R–iii; S–iv

(4) P-ii; Q–i; R–v; S–iv

Question no. 63

AAYAM CAREER INSTITUTE

EAN of Pt in potassium hexachloridoplatinate (IV) is

(1) 90 (2) 86

(3) 76 (4) 88

$EAN = K_2[Pt^{+4}(Cl^{-})_6]^{-2}$

$EAN = Z - O.N. + 2 \times Co.No.$

$78 - 4 + 12$

$74 + 12$

86

Question no. 64

AAYAM CAREER INSTITUTE

Among (A) – (D), the complexes that can display geometrical isomerism are

(A) $[Pt(NH_3)_3Cl]^+$ ⟶ Ma_3b

(B) $[Pt(NH_3)Cl_5]^-$ ⟶ Ma_5b

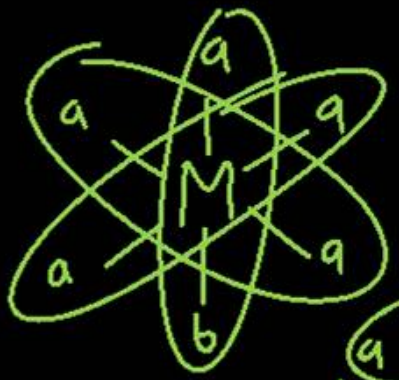
(C) $[Pt(NH_3)_2Cl(NO_2)]$ ⟶ Ma_2bc (2)

(D) $[Pt(NH_3)_4ClBr]^{2+}$ ⟶ Ma_4bc

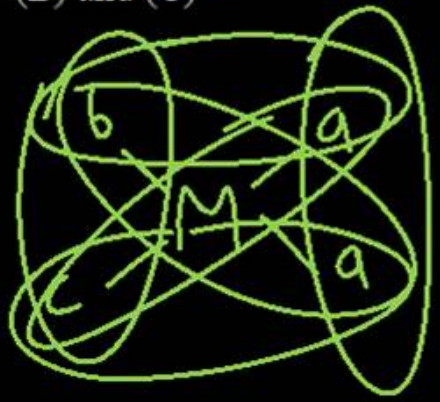
(1) (D) and (A) (2) (C) and (D)

(3) (A) and (B) (4) (B) and (C)

(aa) (ab)



(aa) (aa) (ab)



(ac) (ab)
(aa) (bc)

(ab) (ac) (aa)
(bc) (aa) (aa

Question no. 65

Compound A contains 8.7% hydrogen, 74% carbon and 17.3% nitrogen. The molecular formula of the compound is

(Given – molar mass of compound A is 162 g mol^{-1}.)

(1) $C_4H_6N_2$ (2) C_2H_3N

(3) C_5H_7N (4) $C_{10}H_{14}N_2$

C	74	12	$74/12 = 6.2$	$6.2/6.2 = 5$
H	8.7	1	$8.7/1 = 8.7$	$8.7/1.23 = 7$
N	17.3	14	$17.3/14 = 1.23$	$1.23/1.23 = 1$

$EF = C_5H_7N_1$

EF Mass $= 60 + 7 + 14 = 81$

$$n = \frac{MF\ Mass}{EF\ Mass} = \frac{162}{81} = 2$$

$$Mf = n \times Ef = 2 \times C_5H_7N$$

$$Mf = C_{10}H_{14}N_2$$

Question no. 66

Λ_m^∞ for NaCl, HCl and NaA are 126.4, 425.9 and 100.5 S cm^{-2} mol^{-1}, respectively. Molar conductivity of 0.001 M HA is 5×10^{-5} S cm^{-1}, degree of dissociation of HA is

(1) 0.25 (2) 0.50

(3) 0.75 (4) 0.125

$HA = (HCl + NaA) - NaCl$

$(\Lambda_m^\infty)_{HA} = (425.9 + 100.5) - 126.4$

$\boxed{(\Lambda_m^\infty)_{HA} = 400}$

$\Lambda_m^c = \frac{k \times 1000}{c} = \frac{5\times10^{-5}\times1000}{10^{-3}}$

$10^{-3} = \frac{10^3}{10^6} = 10^3$

$= 5\times10^1 = 50$

$\alpha = \frac{\Lambda_m^c}{\Lambda_m^\infty} = \frac{50}{400} = 1/8$

$= 0.125$

Question no. 67

AAYAM CAREER INSTITUTE

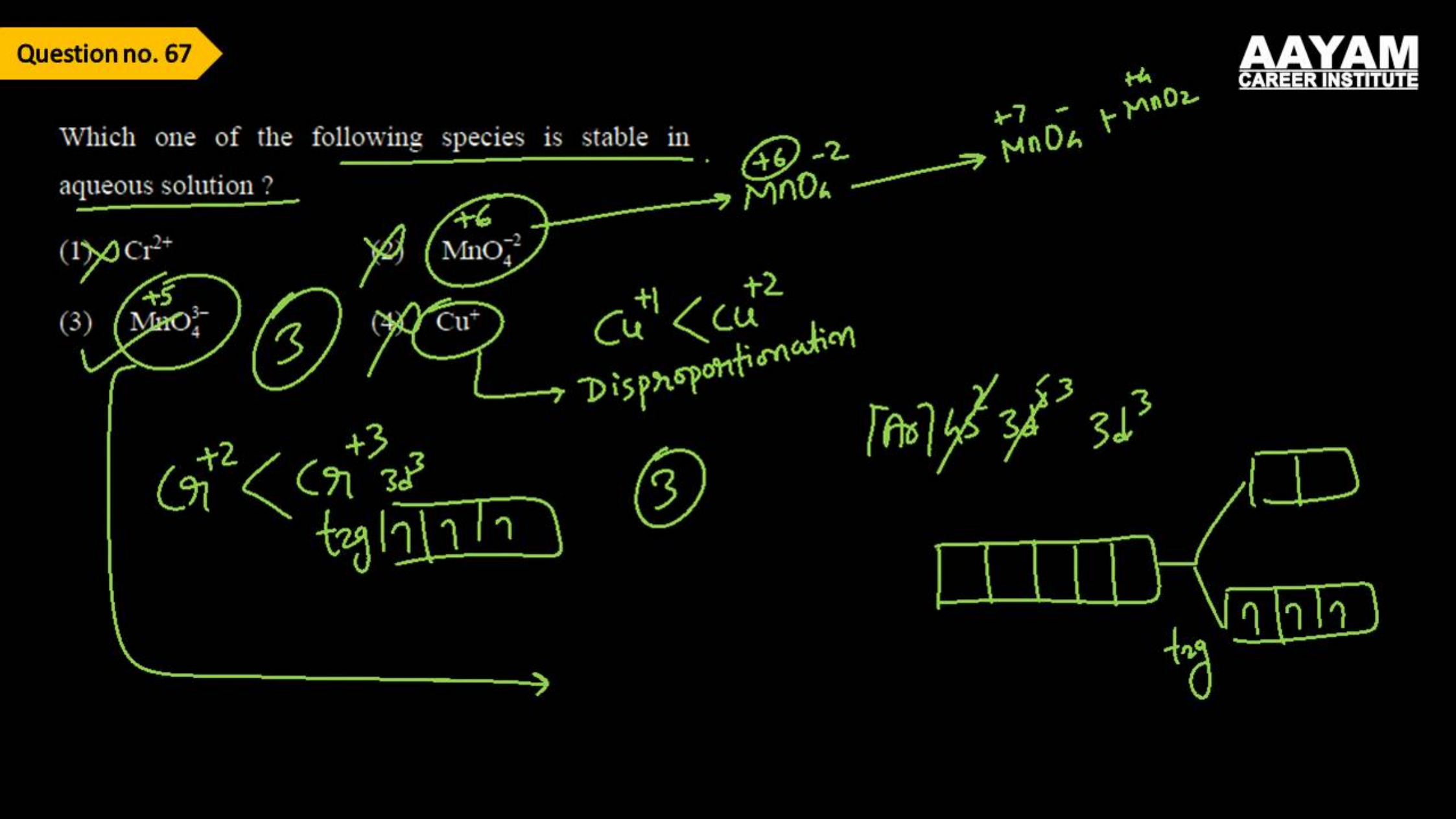
Which one of the following species is stable in aqueous solution ?

(1) Cr^{2+}

(2) MnO_4^{-2}

(3) MnO_4^{3-}

(4) Cu^{+}

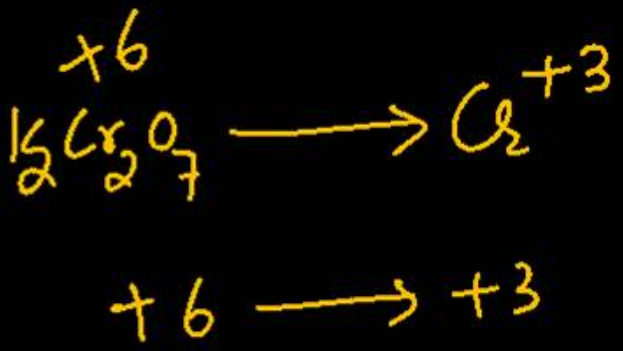


Question no. 68

Potassium dichromate acts as a strong oxidising agent in acidic solution. During this process, the oxidation state changes from

(1) +6 to +3 (2) +6 to +2

(3) +3 to +1 (4) +2 to +1



Question no. 69

AAYAM CAREER INSTITUTE

In context of the lanthanoids, which of the following statements is not correct?

(1) There is a gradual decrease in the radii of the members with increasing atomic number in the series.

(2) All the member exhibit +3 oxidation state.

(3) Because of similar properties the separation of lanthanoids is not easy.

(4) Availability of 4f electrons results in the formation of compound in +4 state for all the members of the series.

La ⟶ Lu

(4)

Question no. 70

AAYAM CAREER INSTITUTE

Why is oxygen superior to fluorine in stabilizing high oxidation states of transition metals?

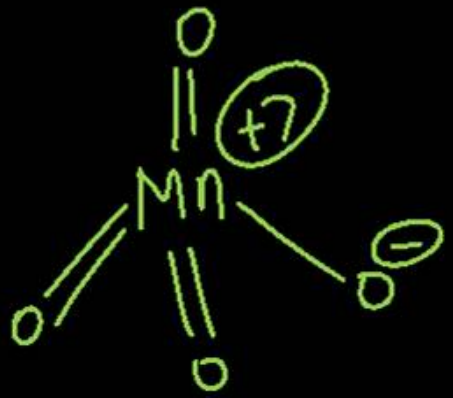
(1) Because oxygen is less electronegative than fluorine

(2) Because of larger size of oxygen as compared to fluorine

(3) Because of the ability of oxygen to form multiple bonds to metals

(4) Both (1) and (3)

3



Highest O.S. → stabilized by EN atoms like F, O

Mn_2O_7 (+7)

OsO_4 (+8)

MnF (+5)

Question no. 71

AAYAM CAREER INSTITUTE

The incorrect statement is:

(1) Manganate ion is green in colour and permanganate ion is purple in colour.

(2) Manganate and permanganate ions are paramagnetic.

(3) In manganate and permanganate, ions, the π – bonding takes place by overlap of p–orbitals of oxygen and d–orbitals of manganese.

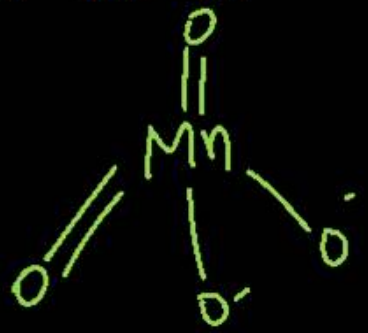
(4) Manganate and permanganate ions are tetrahedral.

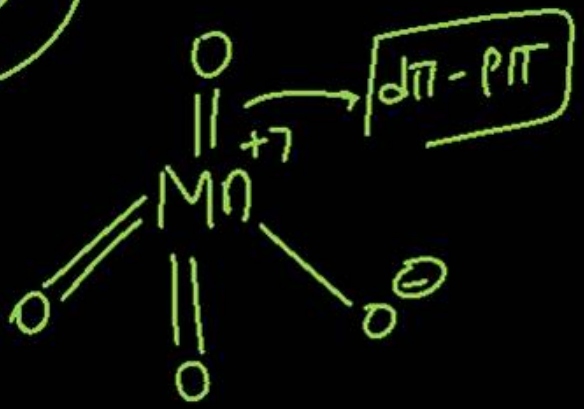
MnO_4^{2-} (+6, −2) → d/d → green

MnO_4^{-} (+7) → No d/d → Purple

→ $3d^0$ → Dia

2





Question no. 72

Which statement is incorrect?

(1) $[Ni(CO)_4]$ tetrahedral, paramagnetic

(2) $[Ni(CN)_4]^{2-}$, square planar, diamagnetic

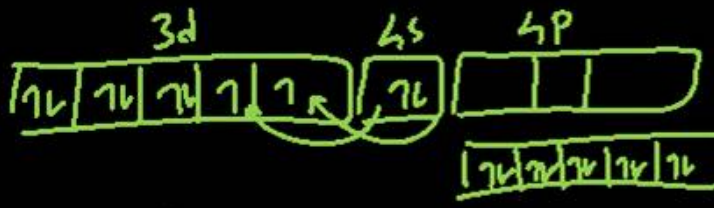
(3) $[Ni(CO)_4]$ tetrahedral, diamagnetic

(4) $[NiCl_4]^{-2}$, tetrahedral, paramagnetic

(1)

$Ni^0 = [Ar]4s^2 3d^8$

CO/SFL



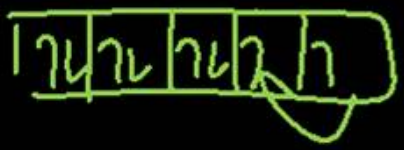
$[NiCl_4]^{-2}$ = O.N = +2, CO.NO = 4 → dsp^2, sp^3

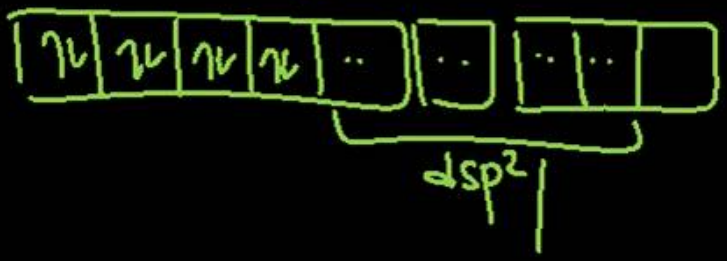
WFL

$Ni^{+2} = [Ar]4s^0 3d^8$

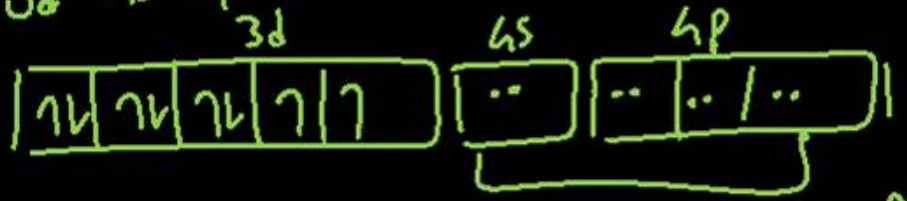
dsp^2 Sq. planar DOM

$[Ni(CN)_4]^{-2}$ $3d^8$





$3d^8\ 4s^0\ 4p^0\ 4d^0$



$n = 2$ Paramagnetic

sp^3 / Tetrahedral

Question no. 73

AAYAM CAREER INSTITUTE

For an octahedral complex, which of the following d–electron configuration will give maximum CFSE?

(1) High spin, d^6 (WFL)

(2) Low spin, d^5 (SFL)

(3) Low spin, d^4 (SFL)

(4) High spin, d^7 (WFL)

$$CFSE = (-0.4 n_{t_{2g}} + 0.6 n_{e_g})\Delta_o + x\Delta P$$

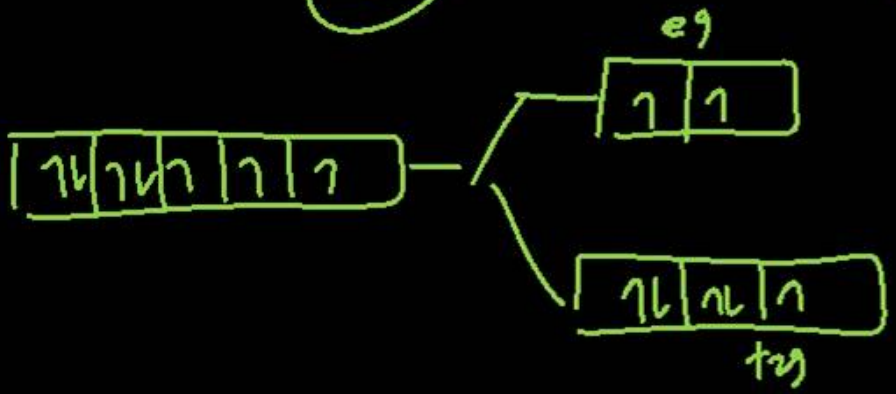
↓ new pairs

(2)

(1)

t_{2g} (4), e_g (2) = $(-1.6 + 1.2)\Delta_o + 0$

$-0.4\Delta_o$



(2) = $(-2\Delta_o) + 2\Delta P$

(3) t_{2g} (6), e_g = $-1.6\Delta_o + \Delta P$

(4) t_{2g}^5, e_g^2 = $(-2 + 1.2)\Delta_o +$

$-0.8\Delta_o$

Question no. 74

AAYAM CAREER INSTITUTE

If Δ_0 is crystal field splitting energy and P is mean pairing energy per pair then stabilizing energy of complex $[Fe\ F_6]^{4-}$ is :

(1) $-2.4\ \Delta_0 + 3P$ (2) $-2.0\ \Delta_0 + 3P$

(3) $-1.6\ \Delta_0 + P$ (4) $-0.4\ \Delta_0$

t_{2g} → e^- e_g → e^- no. of pairs

$CFSE = (-0.4 n_{t_{2g}} + 0.6 n_{e_g})\Delta_0 + x\Delta P$

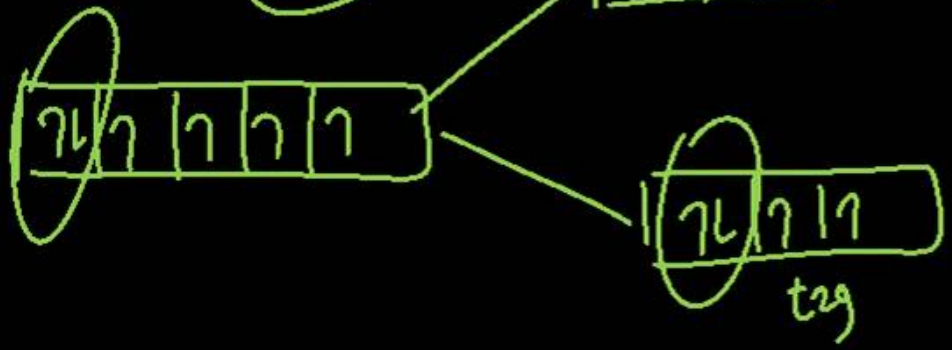
$= (-0.4 \times 4 + 0.6 \times 2)\Delta_0 + 0 \times \Delta P$

$= (-1.6 + 1.2)\Delta_0 + 0$

$= -0.4\Delta_0$

4

$Fe^{+2} = [Ar]\ 4s^2\ 3d^6$ WFL



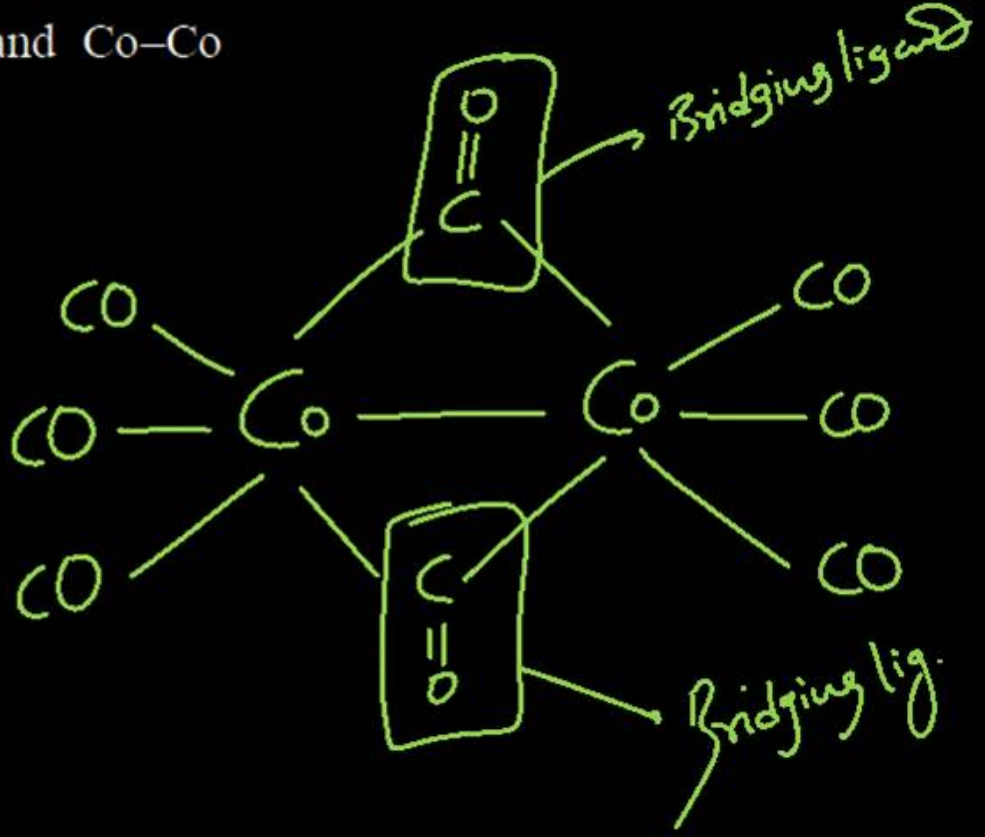
Question no. 75

AAYAM CAREER INSTITUTE

The number of bridging CO ligand(s) and Co–Co bond(s) in $Co_2(CO)_8$, respectively are

(1) 2 and 0 (2) 0 and 2

(3) 4 and 0 (4) 2 and 1



Question no. 76

The mole fraction of glucose ($C_6H_{12}O_6$) in an aqueous binary solution is 0.1. The mass percentage of water in it, to the nearest integer, is.....

(1) 28 (2) 47

(3) 65 (4) 82

$x_B = 0.1 \quad x_A = 0.9$

$x_B = \frac{n_B}{n_A + n_B} = \frac{1}{10}$

Mole ratio

$n_B = 1, \quad n_A = 9$

wt. of H_2O = mol × Mw = 9 × 18 = 162 gm

wt. of glucose = 1 × 180 = 180 gm

Total mass of soln = Solute + Solvent = 162 + 180

wt. of soln = 342 gm

$\% w/w = \frac{w_{water}}{w_{soln}} \times 100$

$= \frac{162}{342} \times 100$

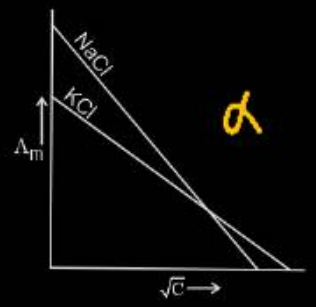
$= 47\%$

Question no. 77

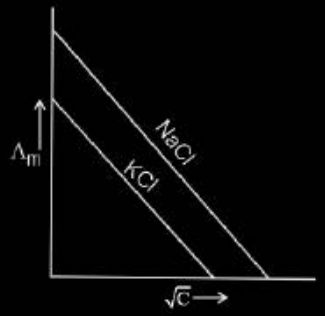
AAYAM CAREER INSTITUTE

Which one of the following graphs between molar conductivity (Λ_m) versus $\sqrt{C}$ is correct?

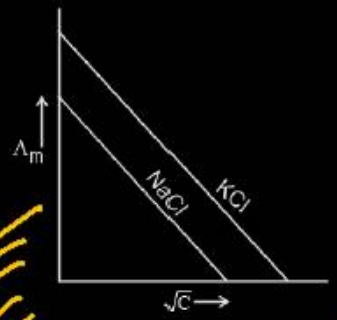
(1)



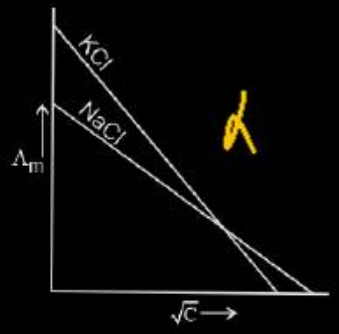
(2)



(3)



(4)

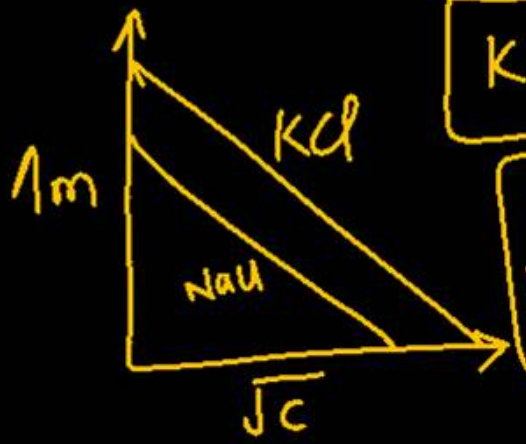


$\Lambda_m \rightarrow$ strong max.

$c \uparrow$ & $\Lambda_m \downarrow$

KCl > NaCl

$M = \frac{10 \times 1000}{M_w \times V_{ml}}$



Question no. 78

AAYAM CAREER INSTITUTE

Match the catalysts to the correct processes

Catalyst		Process	
(A)	$TiCl_4$	(i)	Wacker process
(B)	$PdCl_2$	(ii)	Ziegler – Natta polymerization
(C)	$CuCl_2$	(iii)	Contact process
(D)	V_2O_5	(iv)	Deacon's process

(1) (A) – (ii), (B) – (iii), (C) – (iv), (D) – (i)

(2) (A) – (iii), (B) – (i), (C) – (ii), (D) – (iv)

(3) (A) – (iii), (B) – (ii), (C) – (iv), (D) – (i)

(4) (A) – (ii), (B) – (i), (C) – (iv), (D) – (iii)

4

Ziggler-Natta Catalyst → $TiCl_4 + Al(CH_3)_3$

V_2O_5 — Contact process H_2SO_4

$CuCl_2$ → Deacon's process Cl_2

$PdCl_2$ → Wacker's process

Question no. 79

AAYAM CAREER INSTITUTE

Diamagnetic lanthanoid ions are

(1) La^{3+} and Ce^{4+}

(2) Lu^{3+} and Eu^{3+}

(3) Nd^{3+} and Eu^{3+}

(4) Nd^{3+} and Ce^{4+}

Z=71 63

63

60

1

La^{+3} Z=57 $= [Xe]_{54}\, 6s^2\, 4f^0\, 5d^0\, 4f^0$

$Ce^{+4} = [Xe]_{54}\, 6s^2\, 4f^0\, 5d^0\, 4f^0$

Question no. 80

AAYAM CAREER INSTITUTE

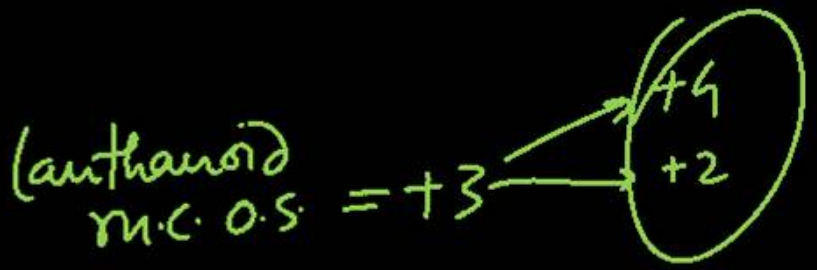
the reason for greater range of oxidation states in actinoids is attributed to

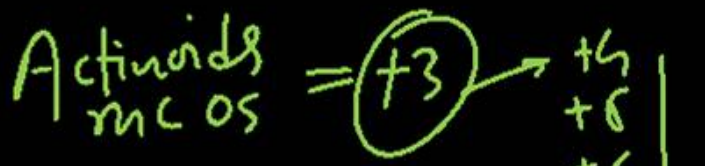
(1) actinoid contraction

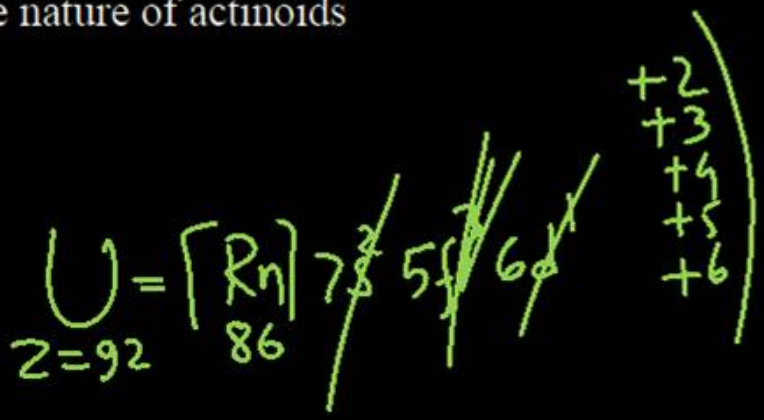
(2) 5f, 6d and 7s levels having comparable energies

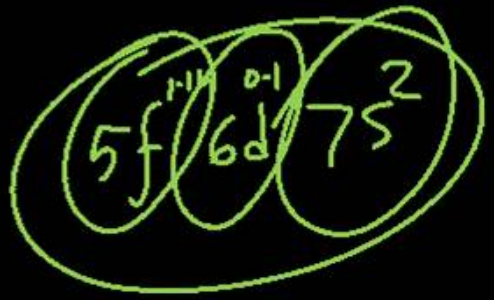
(3) 4f and 5d levels being close in energies

(4) the radioactive nature of actinoids









Question no. 81

AAYAM CAREER INSTITUTE

Which of the following is the approximate radius of Hf (in Å unit), if radius of Zr is 1.45 Å ?

(1) 0.45 Å

(2) 1.32 Å

(3) 1.44 Å

(4) 2.45 Å

Zr ≃ Hf

3

Question no. 82

AAYAM CAREER INSTITUTE

The bromination of acetone that occurs in acid solution is represented by

$$CH_3COCH_3(aq) + Br_2(aq) \longrightarrow CH_3COCH_2Br(aq) + HBr(aq)$$

Given

Initial concentrations			Initial Rate of Disappearance of Br_2, M s^{-1}
$[Br_2]$	$[CH_3COCH_3]$	$[H^+]$	
0.050	0.30	0.050	5.7×10^{-5}
0.10	0.30	0.050	5.7×10^{-5}
0.10	0.30	0.10	1.2×10^{-4}
0.050	0.40	0.20	3.1×10^{-4}

Based on the given data, rate law is:

(1) $\left(\frac{dx}{dt}\right) = k\,[CH_3COCH_3]\,[Br_2]\,[H^+]$

(2) $\left(\frac{dx}{dt}\right) = k\,[CH_3COCH_3]\,[H^+]$

(3) $\left(\frac{dx}{dt}\right) = k\,[CH_3COCH_3]\,[Br_2]$

(4) $\left(\frac{dx}{dt}\right) = k\,[CH_3COCH_3]\,[Br_2]\,[H^+]^2$

Question no. 83

AAYAM CAREER INSTITUTE

Which of the following is most likely structure of $CrCl_3.6H_2O$ if 1/3 of total chlorine of the compound is precipitated by adding $AgNO_3$ to its aqueous solution?

(1) $CrCl_3.6H_2O$

(2) $[Cr(H_2O)_3Cl_3](H_2O)_3$

(3) $[CrCl_2(H_2O)_4]Cl.2H_2O$

(4) $[CrCl(H_2O)_5]Cl_2.H_2O$

$CrCl_3 \cdot 6H_2O$

$[Cr(H_2O)_4Cl_2]Cl \cdot 2H_2O$

3

Question no. 84

AAYAM CAREER INSTITUTE

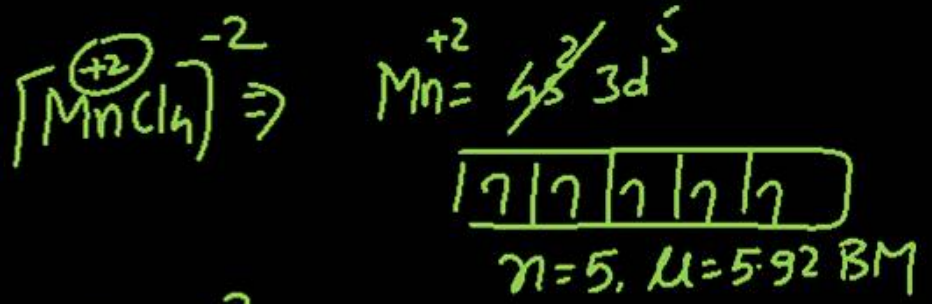
The correct order of magnetic moment is

(1) $[MnCl_4]^{2-} > [CoCl_4]^{2-} > [Fe(CN)_6]^{4-}$

(2) $[MnCl_4]^{2-} > [Fe(CN)_6]^{4-} > [CoCl_4]^{2-}$

(3) $[Fe(CN)_6]^{4-} > [MnCl_4]^{2-} > [CoCl_4]^{2-}$

(4) $[Fe(CN)_6]^{4-} > [CoCl_4]^{2-} > [MnCl_4]^{2-}$



Question no. 85

AAYAM CAREER INSTITUTE

Which of the following complex species is not expected to exhibit optical isomerism?

(1) $[Co(NH_3)_3Cl_3]$ a_3b_3

(2) $[Co(en)(NH_3)_2Cl_2]^+$ $M(AA)a_2b_2$

(3) $[Co(en)_3]^{3+}$ $M(AA)_3$

(4) $[Co(en)_2Cl_2]^+$ $M(AA)_2a_2$

1

$M(AA)abcd$
$M(AA)_2a_2$
$M(AA)_2ab$
$M(AA)_3$
$M(AB)_3$

$Ma_2b_2C_2$
Ma_2b_2cd
Ma_2bcde
$Mabcdef$

a_3b_3

Question no. 86

AAYAM CAREER INSTITUTE

Which of the following complex ions has electrons that are symmetrically filled in both t_{2g} and e_g orbitals?

(1) $[CoF_6]^{3-}$ (2) $[Mn(CN)_6]^{4-}$

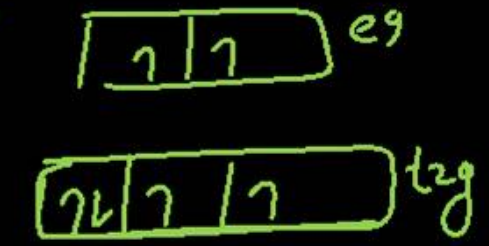
(3) $[FeF_6]^{3-}$ (4) $[Co(NH_3)_6]^{2+}$

3

$Co^{+3} = 4s^2 3d^7$

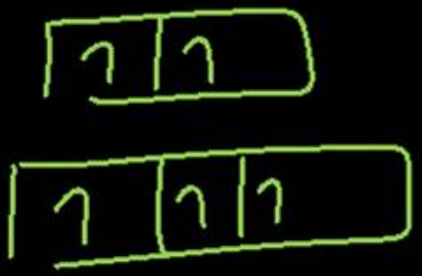
$= 3d^6$

WFL



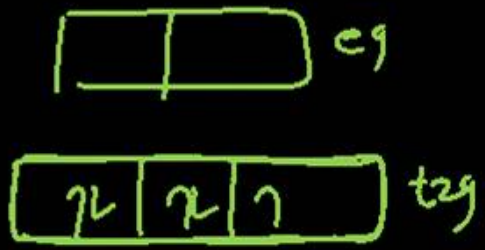
$Fe^{+3} = 4s^2 3d^5$

WPL



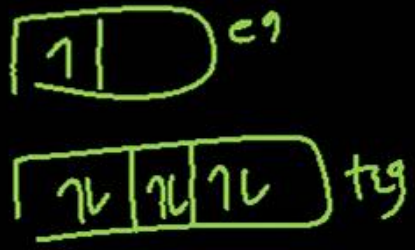
$Mn^{+2} (3d^5)$

SFL



$Co^{+2} = 3d^7$

SFL



Question no. 87

AAYAM CAREER INSTITUTE

The frequency of light emitted for the transition n = 4 to n = 2 of He^+ is equal to the transition in H atom corresponding to which of the following?

(1) n = 3 to n = 1 (2) n = 2 to n = 1

(3) n = 3 to n = 2 (4) n = 4 to n = 3

Energy difference

$\Delta E = 13.6 \times Z^2 \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

$= 13.6 \times 2^2 \left[\frac{1}{2^2} - \frac{1}{4^2}\right]$

$= 13.6 \times 4 \left[\frac{1}{4} - \frac{1}{16}\right]$

$\frac{4-1}{16}$

3.4

$= 13.6 \times 4 \times 3/16$

$\Delta E = 10.2$ eV/atom

$\Delta E \longrightarrow$ Hydrogen $= 10.2$

ΔE Hydrogen $= 10.2$

n = 2 to n = 1

$\downarrow$ $\downarrow$

-3.4 -13.6

$\Delta E = -3.4 - (-13.6) = 10.2$

Question no. 88

AAYAM CAREER INSTITUTE

Consider following statements –

Assertion (A) and the other is labelled as Reason (R)

Assertion (A) : In aqueous solution Cr^{2+} is reducing while Mn^{3+} is oxidising in nature

Reason (R) : Extra stability to half filled electronic configuration is observed than incompletely filled electronic configuration.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) (A) is true but (R) is false

(2) Both (A) and (R) are true and (R) is the correct explanation of (A)

(3) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(4) (A) is false but (R) is true

2

Cr^{+2} oxid → Cr^{+3} (more stable O.S.)
Cr^{+2} → R.Agent
$3d^3$ → Cr^{+3} → Half filled t_{2g}

Mn^{+3} Red → Mn^{+2}
Mn^{+3} → O.A
$3d^4$ → Mn^{+2} → Half filled

Question no. 89

AAYAM CAREER INSTITUTE

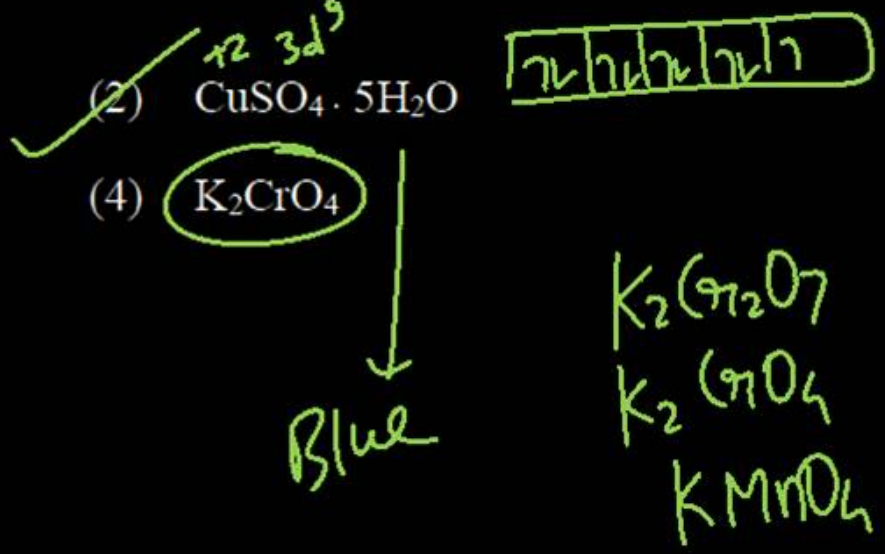
Which of the following compounds show colour due to d – d transition ?

(1) $K_2Cr_2O_7$

(2) $CuSO_4 \cdot 5H_2O$

(3) $KMnO_4$

(4) K_2CrO_4



Question no. 90

AAYAM CAREER INSTITUTE

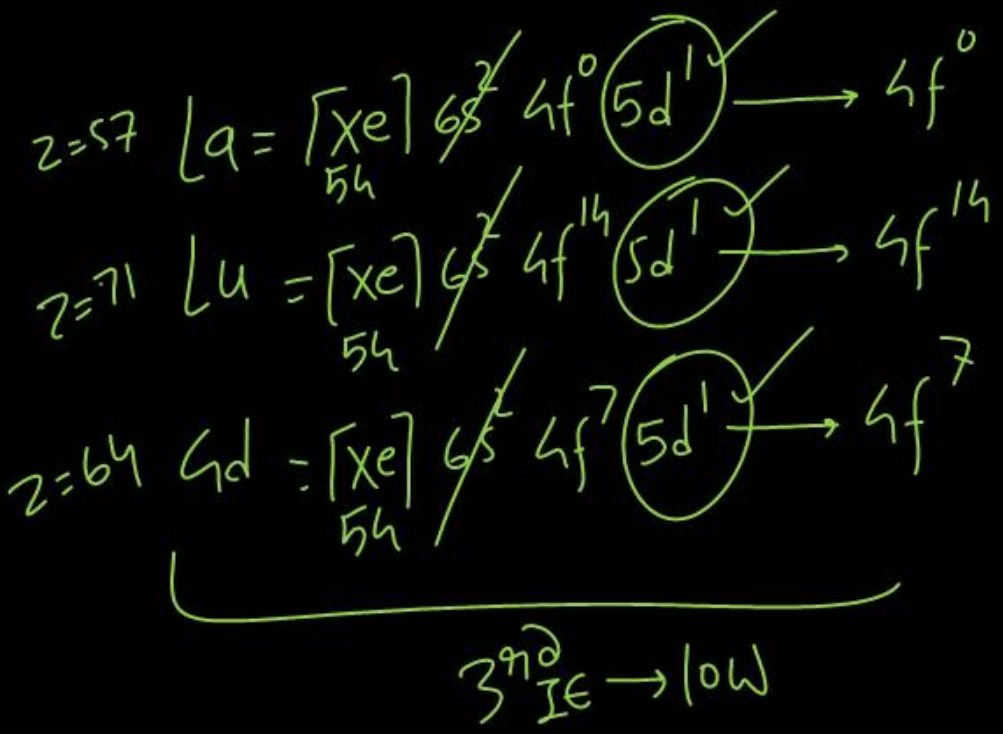
The pair of lanthanides in which both elements have high third – ionization energy is

(1) Eu, Yb

(2) Lu, Yb

(3) Dy, Gd

(4) Eu, Gd



Question no. 91

AAYAM CAREER INSTITUTE

n = No. of Heterozygous pair

n = 3

No. of types of Gametes = 2^n

$= 2^3 = 8$

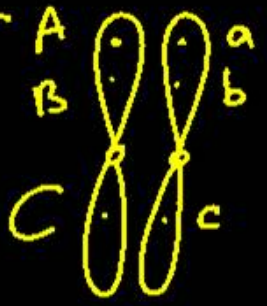
A plant is having genotype AaBbCc. What will be the percentage of gametes having at least one dominant allele?

(1) 37.5%

(2) 6.25%

(3) 27.5%

(4) 87.5%



ABC abc

aBC Abc

AbC aBc

ABc abC

$= \frac{7}{8} \times 100\%$

$= 87.5\%$

12.5 × 7 = 87.5

3

1

4

Question no. 92

AAYAM CAREER INSTITUTE

A colour blind man marries the daughter of a colour blind father. Then in the offspring:

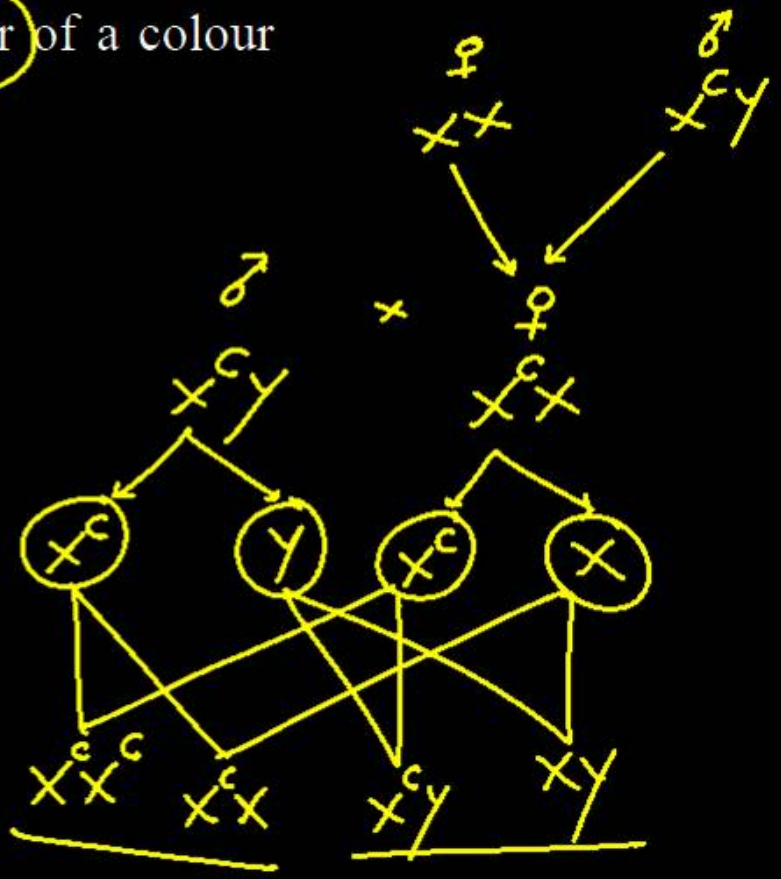
(1) ~~All sons are colour blind~~

(2) ~~All daughters are colour blind~~

(3) Half sons are colour blind

(4) ~~No daughter is colour blind~~

3



Question no. 93

AAYAM CAREER INSTITUTE

How many of the following trait(s) in pea plant is/are dominant?

Axial flower position, Violet flower colour, Dwarf stem height, Inflated pod shape, Green pod colour, Wrinkled seed shape.

(1) Five
(2) Three
(3) Four
(4) Two

3

Tall / Dwarf
Axial / Terminal
Violet / White
Inflated / Constricted
Green / Yellow
Round / Wrinkled
Yellow / Green

Question no. 94

Starch synthesis in pea (Pisum sativum) seed is controlled by one gene having two alleles B and b. For starch grain, the genes show incomplete dominance and for seed shape, the gene show complete dominance. Choose correct option for (Bb) genotype expression in pea.

(a) ~~Large size starch grains~~.

(b) Round seed

(c) ~~Wrinkled seeds~~

(d) ~~Small size starch grains~~

(e) Intermediate size starch grains

(1) (a) and (b) (2) (b) and (e)

(3) (c) and (e) (4) (b) and (d)

2

starch → B & b → starch Grain

BB - large

Bb = medium

bb : small

shape of seed

BB - Round

Bb

bb : wrinkled

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Question no. 95

AAYAM CAREER INSTITUTE

If both parents of a male child are normal, what are the chances of the child being colourblind?

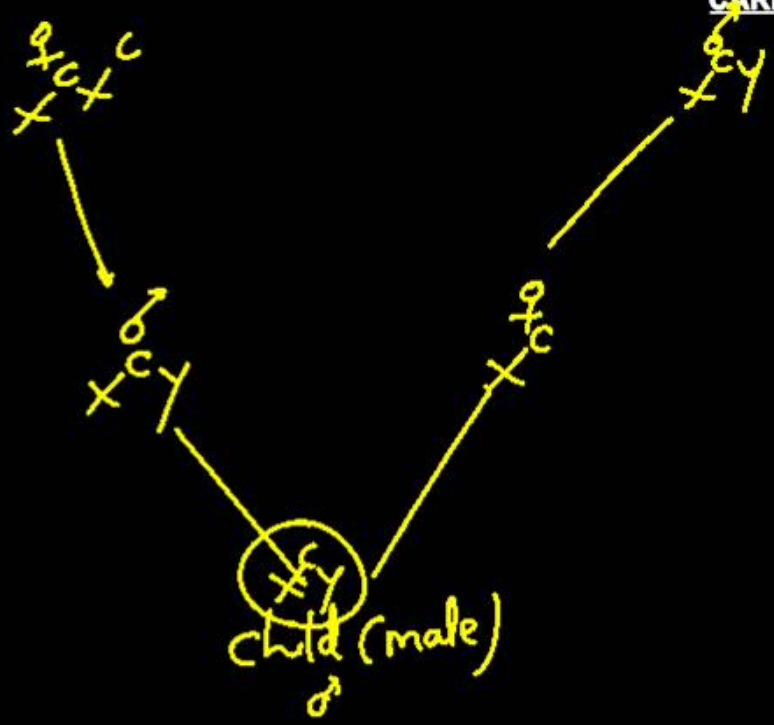
(1) It is impossible

(2) ~~It is possible only if father's mother was colour blind.~~

(3) It is possible only if mother's father was colour blind.

(4) It is possible even when all the four grandparnets had normal vision.

3



Question no. 96

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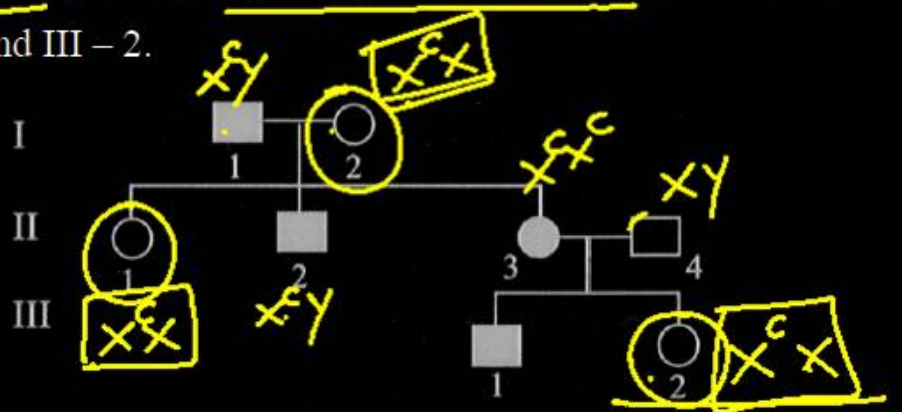
From the given pedigree for inheritance of colour blind ness, predict the genotype of individuals : I – 2, II – 1 and III – 2.



(1) X^CX, X^CX, XX

(2) X^CX, X^CX, X^CX

(3) XX, XX, XX

(4) XX, X^CX, XX

2

Question no. 97

AAYAM CAREER INSTITUTE

Heterochromatin is

A. Darkly stained region

B. Densely packed chromatin

C. Transcriptionally active

(1) Only A (2) Only A and B

(3) Only B and C (4) All A, B and C

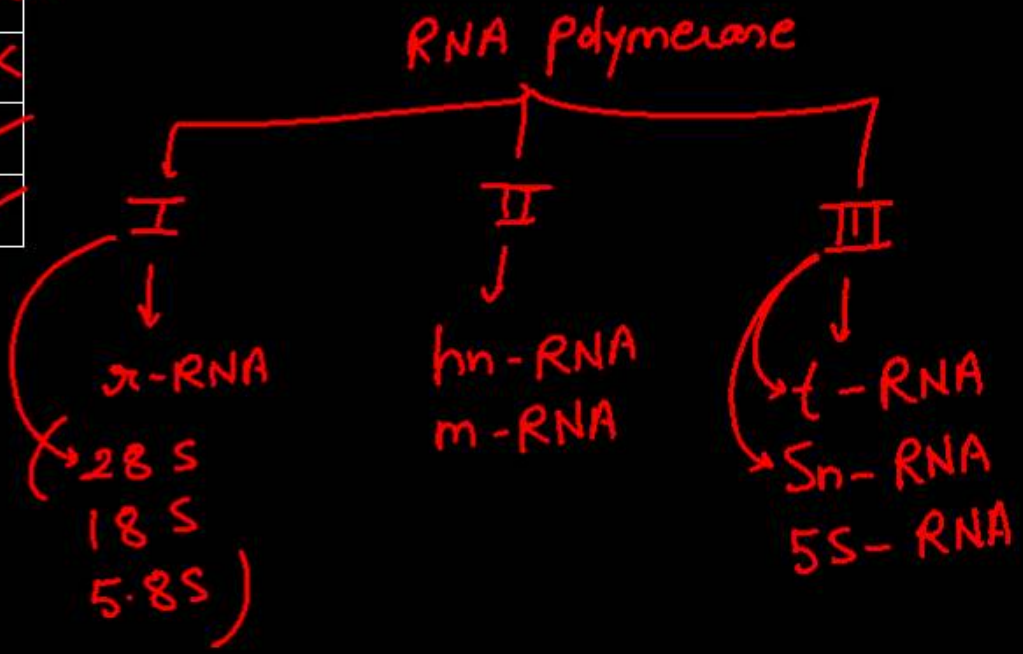
Question no. 98

AAYAM CAREER INSTITUTE

Select the incorrect match.

(1)	RNA polymerase I	28S rRNA synthesis
(2)	RNA polymerase II	5S rRNA synthesis
(3)	RNA polymerase III	snRNA synthesis
(4)	RNA polymerase III	tRNA synthesis

2



Question no. 99

AAYAM CAREER INSTITUTE

Consider the following pairs.

A.	UTR	Requirements for efficient translation process
B.	Release factor	Dissociation of polypeptides from ribosome
C.	Peptidyl transferase	Helps in activation of amino acids
D.	Rho factor	Helps in elongation of polypeptide chain

Select the option representing correctly matched pair.

(1) A and B

(2) A and C

(3) B and D

(4) C and D

Question no. 100

AAYAM CAREER INSTITUTE

Repetitive DNA → Non coding

Satellite DNA –

(1) Codes for proteins which are needed for post-transcriptional modification.

(2) Codes enzyme for Krebs' cycle

(3) Does not code for proteins

(4) Forms a little portion of human genome

3

Question no. 101

AAYAM CAREER INSTITUTE

Which of the following vector is best for gene transfer in animal are cell?

(1) Microinjection ×

(2) Gene gun ×

(3) Agrobacterium tumefaciens ×

(4) Disarmed Retrovirus ✓

4

Question no. 102

AAYAM CAREER INSTITUTE

Which one of the following is not a critical research area of biotechnology?

(1) The improvement of organism, usually a microbe or a pure enzyme by providing best catalyst.

(2) The development of optimal conditions through engineering for a catalyst to act.

(3) The downstream processing which includes separation of desired product and formulation with preservatives.

(4) The improvement of quality of agrochemicals through genetic engineering.

4

Question no. 103

AAYAM CAREER INSTITUTE

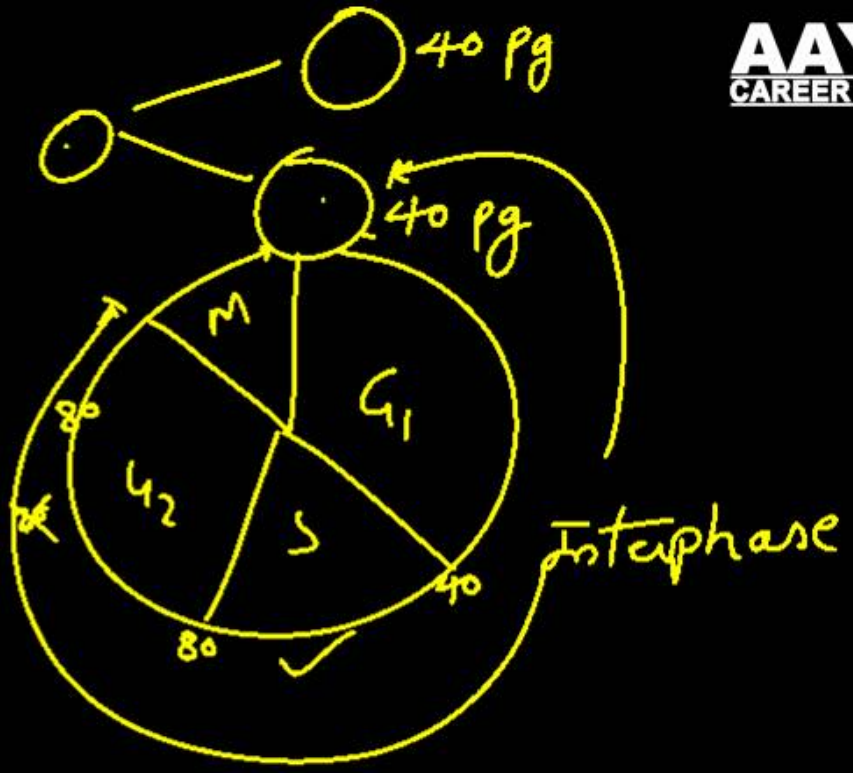
If the content of DNA after mitosis is 40pg, which of the following represents the correct amount of DNA in the cell at the following stages?

Stages	Amount of DNA (in pg)
G_1	80
G_2	20
S	80
Late telophase	80

(1) G_1 (2) G_2

(3) S (4) Late telophase

3



Question no. 104

AAYAM CAREER INSTITUTE

In recombinant DNA technology plasmid is widely used as vectors because they

(1) are autonomusly replicating DNA

(2) lack selectable markers

(3) can deliver host DNA into the bacteria

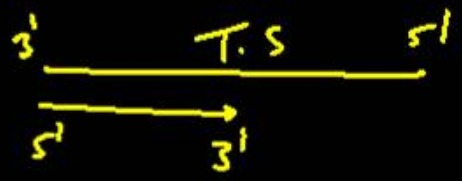
(4) have low copy number.

Question no. 105

AAYAM CAREER INSTITUTE

Select the correct option.

	Direction of RNA synthesis	Direction of reading of the template DNA strand
(1)	5' – 3'	3' – 5'
(2)	3' – 5'	5' – 3'
(3)	5' – 3'	5' – 3'
(4)	3' – 5'	3' – 5'



1

Question no. 106

AAYAM CAREER INSTITUTE

Which of the following nematode infects the roots of tobacco plants and causes a great reduction in yield?

(1) Wuchereria

(2) Ancylostoma

(3) Meloidogyne incognita

(4) Enterobius

3

Question no. 107

AAYAM CAREER INSTITUTE

cryII Ab and cryIAb produce a toxin that controls

(1) cotton bollworms and corn borer respectively

(2) corn borer and cotton bollworm respectively

(3) cotton borers and corn bollworms respectively

(4) corn borer and tobacco budworms respectively

(1)

Cry IAb – for Corn borer

Cry II Ab, Cry IAc – for cotton boll worm

Question no. 108

AAYAM CAREER INSTITUTE

In India, the organisation responsible for assessing the safety of introducing genetically modified organisms for public use is

(1) Indian Council of Medical Research (ICMR)

(2) Council for Scientific and Industrial Research (CSIR)

(3) Research Committee on Genetic Manipulation (RCGM)

(4) Genetic Engineering Approval Committee (GEAC)

4

Question no. 109

AAYAM CAREER INSTITUTE

Maximum number of existing transgenic animals is of

(1) Cow
(2) Pig
(3) Mice
(4) Fish

3

Question no. 110

Triplet A, G, C & U

AAYAM CAREER INSTITUTE

Out of 64 codons, 61 codons code for 20 types of amino acid. It is called

(1) Wobbling of codon

(2) Overlapping of gene

(3) Universality of codons

(4) Degeneracy of genetic code

4

Question no. 111

AAYAM CAREER INSTITUTE

Human Genome Project (HGP) was closely associated with the rapid development of a new area in biology called as

(1) Biotechnology
(2) Bioinformatics
(3) Biogeography
(4) Bioscience

2

Question no. 112

AAYAM CAREER INSTITUTE

Match the disease given in column I with the appropriate items (pathogen/prevention/treatment) given in column II.

	Column - I		Column - II
A.	Physical barrier	I.	Interferons
B.	Cellular barrier	II.	Natural killer cells
C.	Physiological barrier	III.	Tears from eyes
D.	Cytokine barrier	IV.	Skin

Choose the correct answer from the options given below.

(1) A-I, B-IV, C-III, D-II

(2) A-II, B-I, C-IV, D-III

(3) A-III, B-IV, C-I, D-III

(4) A-IV, B-II, C-III, D-I

4

Question no. 113

AAYAM CAREER INSTITUTE

Which of the following is an incorrect statement with respect to EcoRI? — Endonuclease

(1) It is a nuclease that recognizes specific palindromic sequence. ✓

(2) It is an endonuclease that breaks phosphodiester bonds of a DNA molecule. ✓

(3) It is an endonuclease that breaks sugar-phosphate backbone of dsDNA. ✓

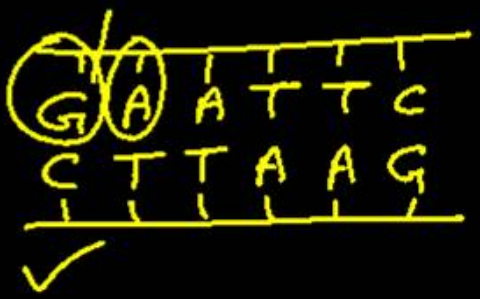
(4) It is an exonuclease that cleaves phosphoester bond. ✗

4

Restriction (family) nuclease

R. Exonuclease

R. Endonuclease



Question no. 114

AAYAM CAREER INSTITUTE

Haemophilia is more common in males because it is a

(1) Recessive character carried by ~~Y-chromosome~~

(2) Dominant character carried by ~~Y-chromosome~~

(3) Dominant trait carried by X-chromosome

(4) Recessive trait carried by X-chromosome

4

X^hY

X^hX – Carrier & X^hX^h .. Haemophilia

Question no. 115

AAYAM CAREER INSTITUTE

Which of the following characteristics represent Inheritance of blood group in humans?

(a) Dominance ✓

(b) Co-dominance ✓

(c) Multiple alleles ✓

(d) ~~Incomplete dominance~~

(e) ~~Polygenic inheritance~~

(1) (b), (c) and (e)

(2) (b), (d) and (e)

(3) (a), (b) and (c)

(4) (a), (c) and (e)

3

ABO Blood Grp system
↳ multiple Alleliism / Dominance / Co-Dominance

I^AI^A — A

I^AI^o — A

I^BI^B — B

I^BI^o — B

I^AI^B — AB

I^oI^o — O

Question no. 116

AAYAM CAREER INSTITUTE

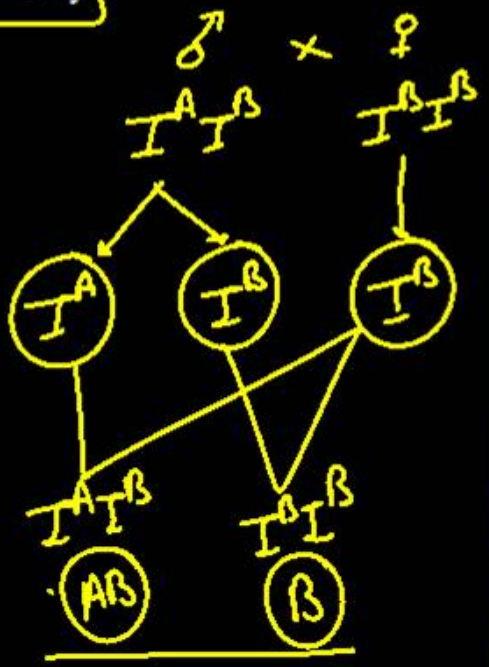
A man with blood group AB marries a woman with blood group B. What are all the possible blood groups of their offspring?

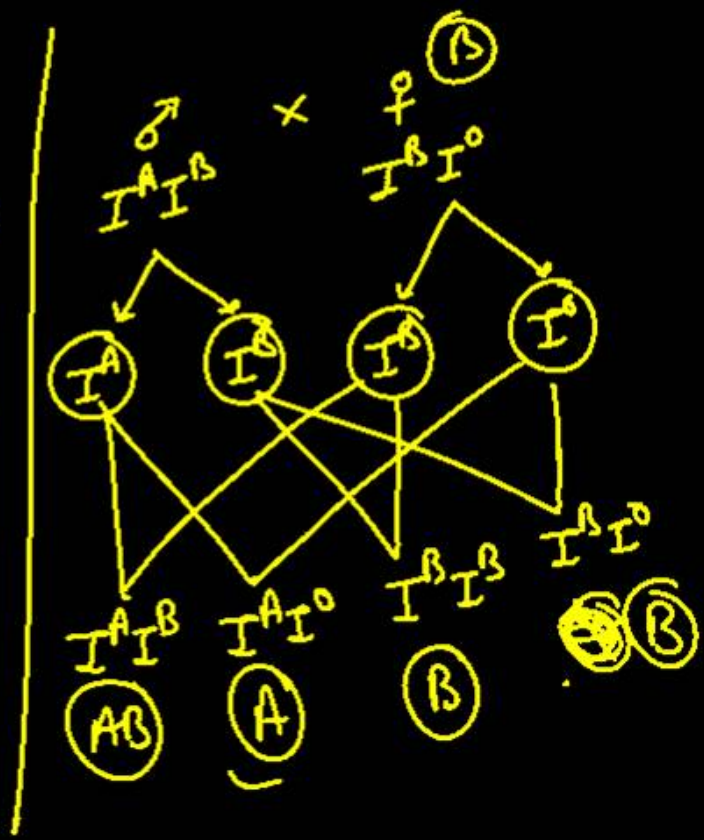
(1) A and B only
(2) AB and B only
(3) A, B, AB and O
(4) A, B and AB only

4

♂ AB I^AI^B

♀ B (I^BI^B / I^BI^O)





Question no. 117

AAYAM CAREER INSTITUTE

Read the following statements w.r.t mutation.

a. Frame shift mutation may be due to deletion or insertion of one or more bases in a nucleotide chain.

b. When a purine base is substituted by a pyrimidine base, then it is transition mutation.

c. Transfer of gene segment during crossing over between homologous chromosome results in chromosomal ~~mutation.~~

d. Many physical and chemical factors act as mutagen.

How many of the above statements are correct?

(1) Two
(2) Three
(3) One
(4) Four

Question no. 118

AAYAM CAREER INSTITUTE

A gene responsible for disorder phenylketonuria is

(a) A pleiotropic gene

(b) An autosomal dominant trait

(c) A gene related disorder

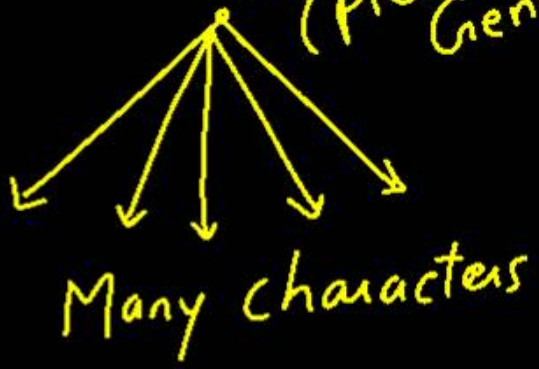
(d) Lack enzyme which converts tyrosine into phenylalanie.

(1) (a) and (b) (2) (a) and (c)

(3) (b) and (d) (4) (c) and (d)

2

Pleiotropy



SCA

PKU

Question no. 119

AAYAM CAREER INSTITUTE

How many statement(s) is/are correct regarding linkage?

a. Linkage is an exception to Mendel's law of independent assortment.

b. Linkage reduces the incidence of recombination.

c. Closer the linked genes, stronger the tendency of linkage.

d. The number of linkage group is equivalent to number of chromosomes of its somatic cell.

(1) Two (2) One

(3) Four (4) Three

RY

Ryx

n

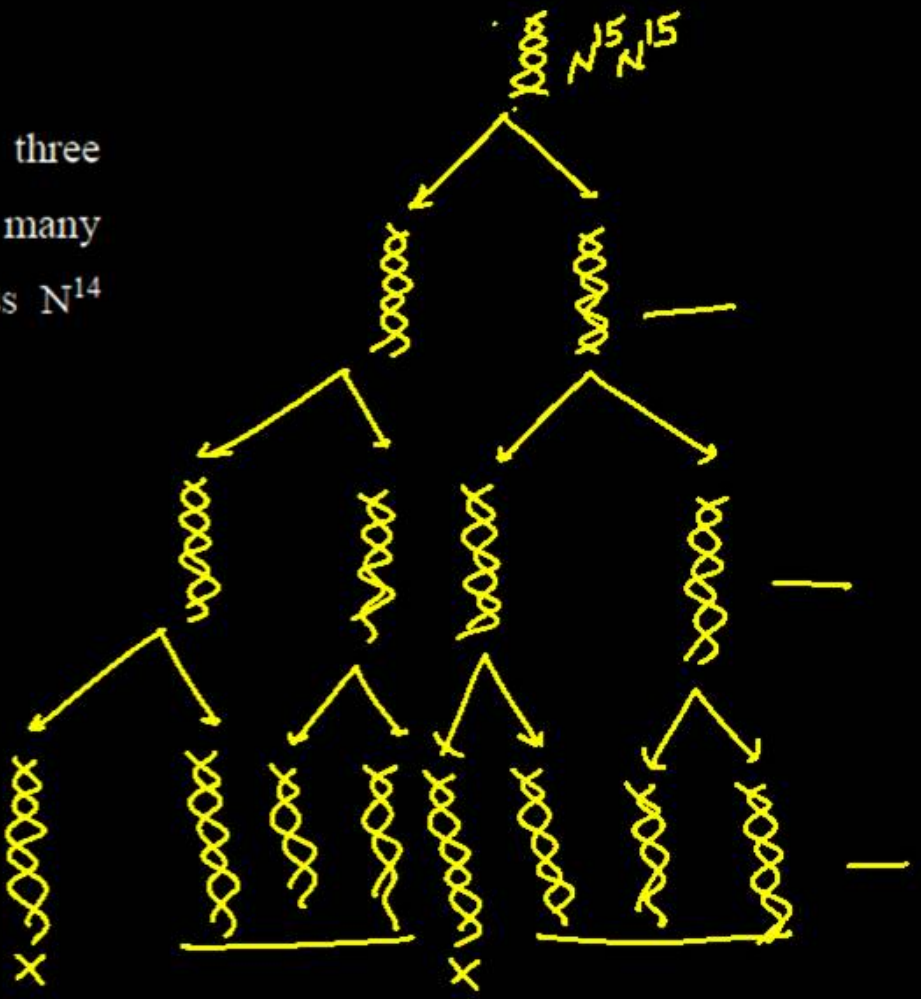
4

Question no. 120

AAYAM CAREER INSTITUTE

A heavy DNA is made to replicate for three generations in N^{14} containing medium. How many double stranded DNA molecules shall possess N^{14} nucleotides?

(1) 6
(2) 8
(3) 4
(4) 2



Question no. 121

AAYAM CAREER INSTITUTE

Which one of the following mRNA can be translated completely?

(1) AUG UUC UCC UGG UAA UAU ×

(2) AUG UUC UCC UGA UGG UAU ×

(3) AUG ACG UAU UUC UGA CUC ×

(4) AUG UAU UUC UGC CUC UAG ✓

UAA
UAG
UGA
] Non-Sense Codon

4

Question no. 122

AAYAM CAREER INSTITUTE

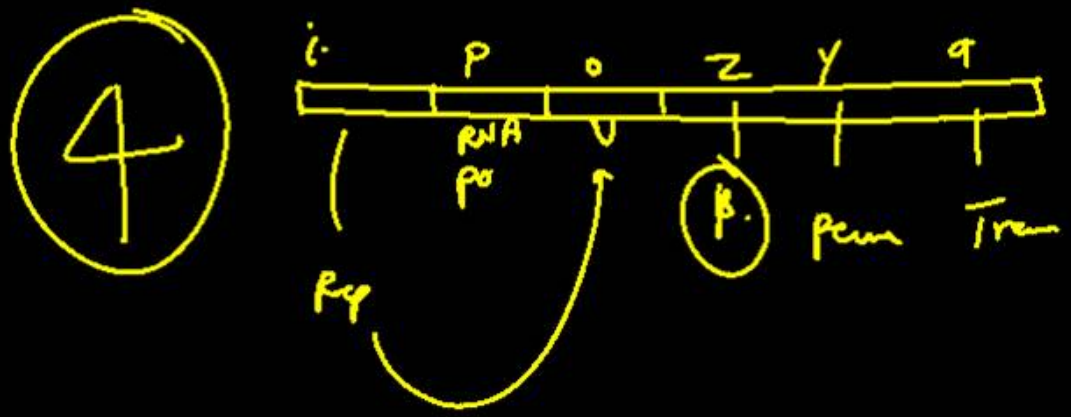
If lactose is absent in the E.coli growing medium, then

(1) There will be no synthesis of repressor protein ✗

(2) There will be synthesis of mRNA ✗

(3) Repressor protein will bind to the RNA polymerase ✗

(4) There will be no synthesis of β-galactoside ✓



Question no. 123

AAYAM CAREER INSTITUTE

For transformation with recombinant DNA, the bacterial cells must first be made 'competent' which means

(1) Should increase their metabolic reactions.

(2) Should decrease their metabolic reactions.

(3) Increase efficiency with which DNA enters the bacterium.

(4) Ability to divide fast.

3

Question no. 124

AAYAM CAREER INSTITUTE

Match the following columns.

	Column I		Column II
A.	Totipotency	i.	Any part of a plant take out and grown in culture medium
B.	Micropropagation	ii.	Plant grown from hybrid protoplast
C.	Somaclone	iii.	Producing large number of plants through tissue culture
D.	Somatic hybrid	iv.	Capacity to generate a whole plant from an explant
E.	Explant	v.	Plants genetically identical to original plant

Explant

Somatic hybridization

micropropagation

2

(1) ~~A – ii, B – iv, C – iii, D – i, E – v~~

(2) A – iv, B – iii, C – v, D – ii, E – i

(3) ~~A – iii, B – iv, C – ii, D – v, E – i~~

(4) A – iv, B – iii, C – i, D – ii, E – v

Question no. 125

AAYAM CAREER INSTITUTE

In the ribose of RNA, unlike DNA, every nucleotide residue has an additional

(1) COOH group in the 2' position

(2) OH group in the 5' position

(3) OH group in the 2' position

(4) phosphate group in the 2' position

3

Question no. 126

AAYAM CAREER INSTITUTE

If a person obtains transformants by inserting a recombinant DNA within the coding sequence of enzyme β–galactosidase, he will separate out recombinants from non–recombinants by which of the following observation?

(1) Non–recombinant colonies do not produce any colour whereas recombinants give blue coloured colonies.

(2) Recombinant colonies do not produce any colour whereas non–recombinants give blue coloured colonies.

(3) Recombinants and non–recombinants both produce blue coloured colonies.

(4) No colonies are formed due to insertional inactivation.

β-galactosidase Enzyme → Blue colour (Non recombinant)

Recombinant - colourless

2

Question no. 127

AAYAM CAREER INSTITUTE

Select the correct palindromic sequence for the given DNA sequence.

5' – GACATGTC–3'

(1) 3' – GACATGTC – 5'

(2) 5' – GACATGTC – 3'

(3) 3' – CTGTACAG – 5'

(4) 3' – CUGUACAG – 5'

5' GACATGTC 3'

3' CTGTACAG 5'

3

Question no. 128

AAYAM CAREER INSTITUTE

In eukaryotes, the gene regulation could be exerted at following levels:

A. Transport of mRNA from nucleus to the cytoplasm. (3)

B. Transcription level (1)

C. Processing level (2)

D. Translational level (4)

B → C → A → D

The correct sequence of regulation is

(1) A → B → C → D (2) D → B → A → C

(3) B → C → A → D (4) B → A → D → C

3

Question no. 129

AAYAM CAREER INSTITUTE

The trigger of activation of toxin produced by Bacillus thuringiensis requires

(1) Acidic pH of gut

(2) Alkaline pH of gut

(3) High temperature

(4) Mechanical action in the insect gut

2

Question no. 130

AAYAM CAREER INSTITUTE

With regard to insulin, choose correct options.

(a) C-peptide is not present in mature insulin.

(b) The insulin produced by rDNA technology has C-peptide

(c) The pro-insulin has C-peptide.

(d) A-peptide and B-peptide of insulin are interconnected by disulphide bridges.

Choose the correct answer from the options given below.

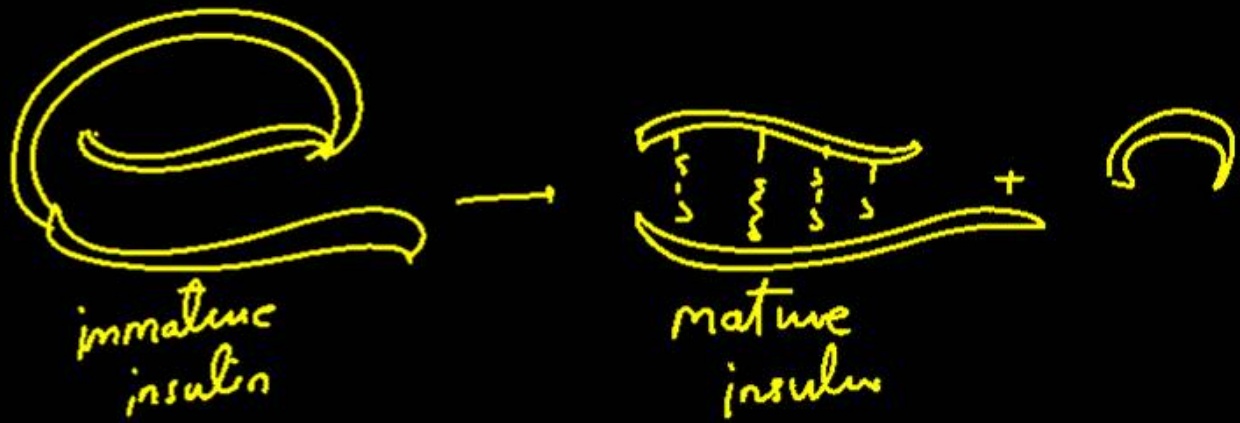
(1) (b) and (d) only

(2) (b) and (c) only

(3) (a), (c) and (d) only

(4) (a) and (d) only

3



Question no. 131

AAYAM CAREER INSTITUTE

A person is in the initial stage of a bacterial infection; hence the concentration of the pathogen is very low in the body.

Which of the following would be the perferable diagnostic method for this person from the beginning?

(1) Serum analysis (2) Urine analysis

(3) PCR (4) Blood test

Question no. 132

AAYAM CAREER INSTITUTE

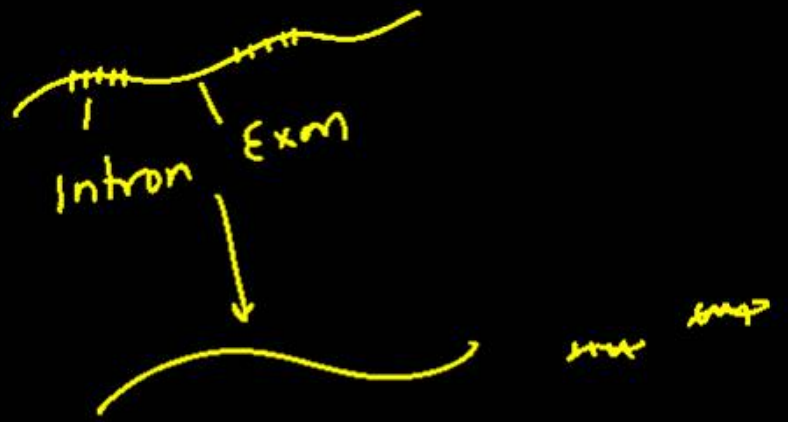
Select the incorrect statement from the following

(1) Cistron is a segment of DNA coding for a polypeptide.

(2) The coding sequence or expressed sequences are defined as exons.

(3) Introns or intervening sequences appears in mature or processed RNA.

(4) Split gene arrangement is present in eukaryotes.



3

Question no. 133

AAYAM CAREER INSTITUTE

The commonly used 'DNA fingerprinting technique' in forensic science is simply a method called

(1) Southern blotting (2) Northern blotting

(3) Western blotting (4) Eastern blotting

Question no. 134

AAYAM CAREER INSTITUTE

Cocaine is obtained from_____

(1) Erythroxylum coca

(2) Cannabis sative

(3) Papaver somniferum

(4) Atropa belladona

Question no. 135

In a population of 1000 individuals, 360 belong to genotype aa, 480 to (AA) and remaining 160 to (Aa). Based on this data, the frequency of allele A in the population is

(1) 0.5 (2) 0.6

(3) 0.7 (4) 0.4

aa = 360
AA = 480
Aa = 160

P

4

$q^2 = \frac{\text{Number}}{\text{Total}}$

$q^2 = \frac{360}{1000}$

$q = \sqrt{\frac{36}{100}}$

$q = \frac{6}{10} = 0.6$

$P + q = 1$

$P + 0.6 = 1$

$P = 1 - 0.6$

$P = 0.4$

P =

q =

pp =

2pq =

qq =

Question no. 136

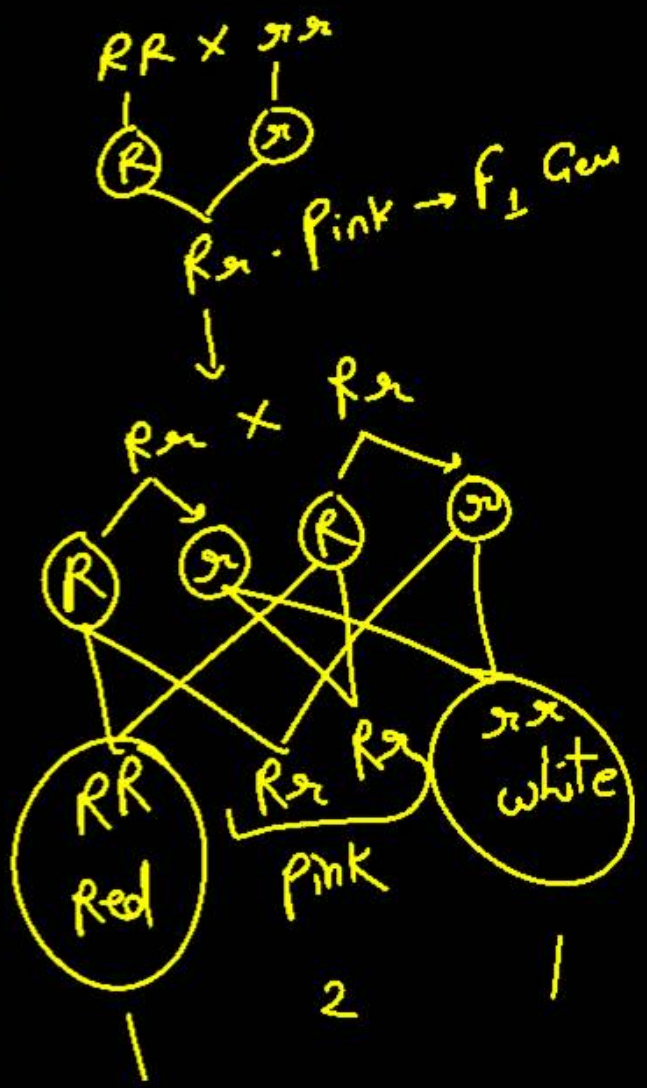
AAYAM CAREER INSTITUTE

Red flowered plant (RR) of Antirrhinum crossed with white flowered plant (rr) In F_1 generation, all the progeny were pink flowered plants on selfing of F_1 generation, F_2 generation obtained what will be the ratio of Red & white flowered plants in F_2 generation?

(1) 3 : 1 (2) 1 : 2

(3) 2 : 1 (4) 1 : 1

4



Question no. 137

AAYAM CAREER INSTITUTE

Match the terms in Column I with their description in Column II and choose the correct option.

	Column I		Column II
A.	Dominance	i.	Many genes govern a single character
B.	Codominance	ii.	In a heterozygous organism, only one allele expresses it self
C.	Pleiotropy	iii.	In a heterozygous organism, both alleles express themselves fully
D.	Polygenic influences	iv.	A single gene may affect many characters

(1) A – iv, B – i, C – ii, D – iii

(2) A – iv, B – iii, C – i, D – ii

(3) A – ii, B – i, C – iv, D – iii

(4) A – ii, B – iii, C – iv, D – i

Question no. 138

AAYAM CAREER INSTITUTE

Recessive trait is due to

(a) Normal functional enzyme

(b) Less efficient enzyme

(c) A non-functional enzyme ✗

(d) No enzyme ✗

(1) Only (a)

(2) Both (b) and (c)

(3) Only (d)

(4) Both (c) and (d)

4

Question no. 139

AAYAM CAREER INSTITUTE

When two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of the other pair of character.

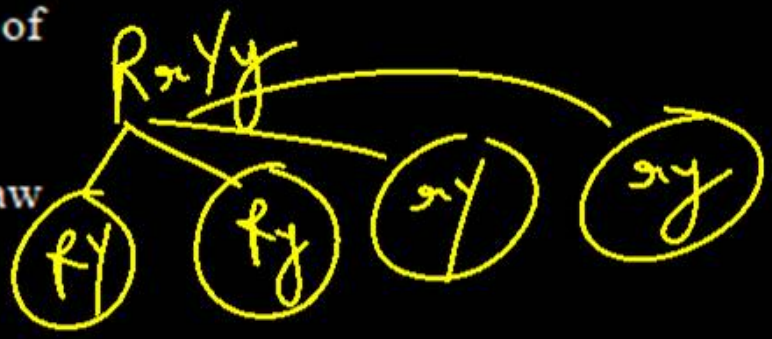
The above given statement is explained by which law of Mendel?

(1) Law of dominant

(2) Law of independent assortment

(3) Law of segregation

(4) This statement cannot be explained by any law of Mendel.



2

Question no. 140

AAYAM CAREER INSTITUTE

How many of the given below is/are autosomal recessive disorder(s)?

i. Phenylketonuria ✓ 12

ii. Sickle cell anaemia – 11

iii. Haemophilia ✗

iv. ~~Myotonic dystrophy~~ – Dominant

(1) One (2) Two

(3) Three (4) Four

2

Question no. 141

AAYAM CAREER INSTITUTE

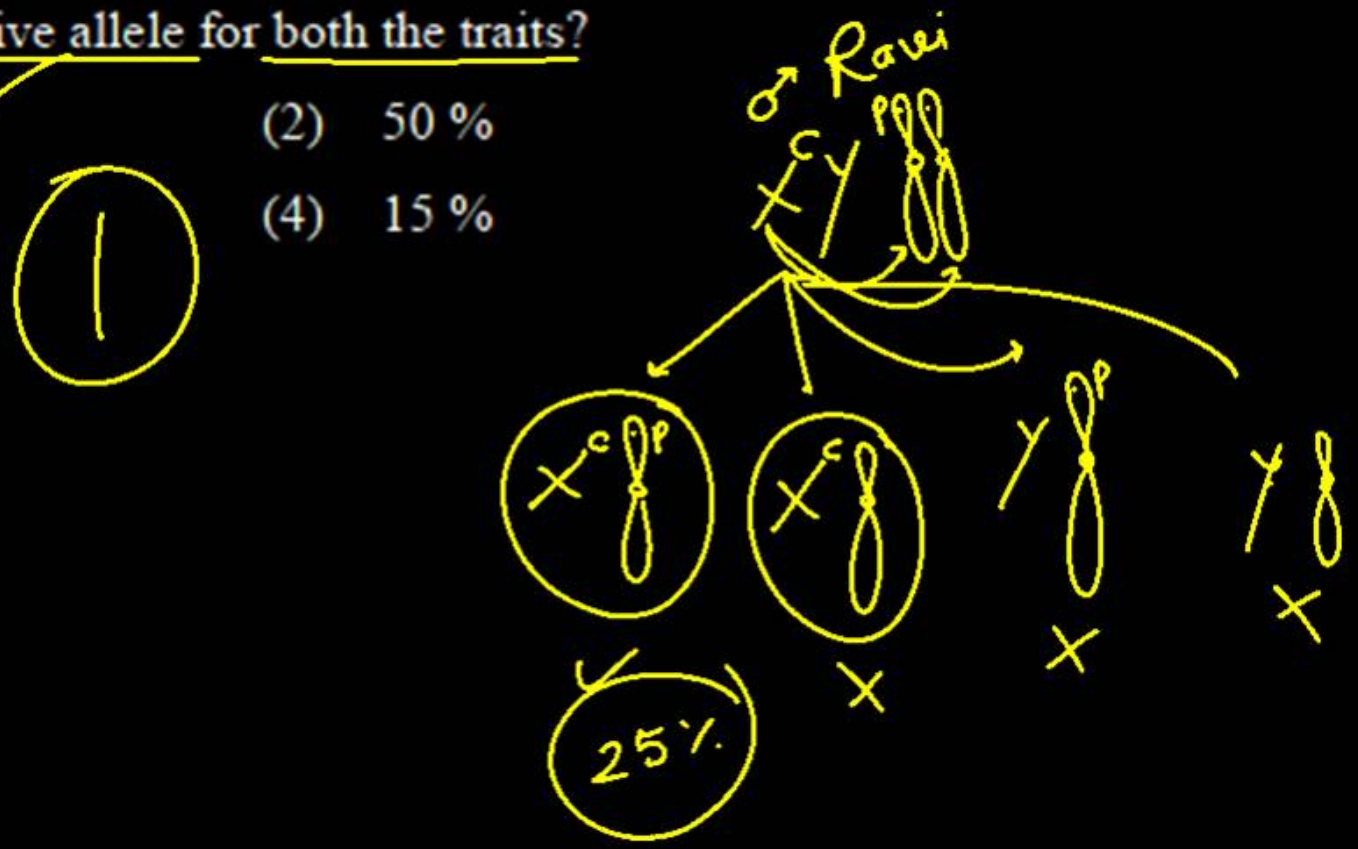
Mr. Ravi is colour-blind and carrier for phenylketonuria. What percentage of sperm will possess defective allele for both the traits?

(1) 25 %

(2) 50 %

(3) 75 %

(4) 15 %



Question no. 142

AAYAM CAREER INSTITUTE

Histone proteins are

(1) Rich in nucleic acids

(2) Positively charged basic proteins

(3) ~~Negatively charged acidic proteins~~

(4) Rich in lysine and tryptophan

2

Question no. 143

AAYAM CAREER INSTITUTE

Read the following statements w.r.t. genetic code.

A. One codon codes for only one amino acid. — Non-ambiguous

B. Some amino acids are coded by more than one codon. — Degeneracy

C. The codon is read in mRNA in a continuous fashion without any punctuations. — Commaless

Select the correct option as per the above statements:

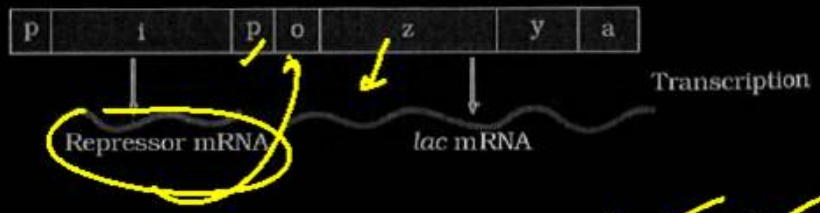
	A	B	C
(1)	~~Ambiguous~~	Specific codon	Universal code
(2)	~~Ambiguous~~	Universal code	Commaless
(3) ✓	Unambiguous	Degenerate	Commaless
(4) ✗	Unambiguous	Degenerate	~~Non-overlapping~~

3

Question no. 144

AAYAM CAREER INSTITUTE

Examine the figure given below and select the incorrect match.



(1) *i* gene : Constitutive expression.

(2) *o* gene : Binding site for i-gene product.

(3) *p* gene : Binding site for RNA polymerase enzyme.

(4) *z* gene : Produce β-galactoside

Question no. 145

AAYAM CAREER INSTITUTE

If an inheritable mutation is observed in a population at high frequency it is referred to as

(1) Sequence annotation ×

(2) DNA polymorphism ✓

(3) Expressed sequence Tag ×

(4) Linkage ×

2

Question no. 146

AAYAM CAREER INSTITUTE

'Rosie' cow known to produce a type of milk which has all the following characteristics

I. Protein content of 2.4 g/L

II. Human α-lactalbumin

III. More nutritionally balanced for human babies than natural cow milk.

Human α-lactalbumin
2.4 gm/l

Which of the above statements are correct?

(1) I & II only (2) I & III only

(3) II & III only (4) I, II & III

4

Question no. 147

AAYAM CAREER INSTITUTE

Match Column I with Column II and choose the correct combination from the options given.

	Column I		Column II
A.	Biopatent	i.	Set of standards used to regulate our activities in relation to biological world
B.	Bioethics	ii.	Gene silencing
C.	Biopiracy	iii.	Use of bioresources for organisations without proper authorisation from people concerned
D.	RNAi	iv.	Right granted for biological entities

A – iv
B – i
C – iii
D – ii

(1) A – iii, B – iv, C – ii, D – i

(2) A – iv, B – i, C – iii, D – ii

(3) A – iii, B – iv, C – i, D – ii

(4) A – ii, B – iv, C – i, D – iii

2

Question no. 148

AAYAM CAREER INSTITUTE

Assertion (A) :Adjacent monosaccharides are held by glycosidic bonds to from polysachharides.

Reason (R) : Monosaccharides cannot be hydrolysed further into smaller components.

(1) Both A and R are true and R is the correct explanation of A.

(2) Both A and R are true and R is not the correct explanation of A.

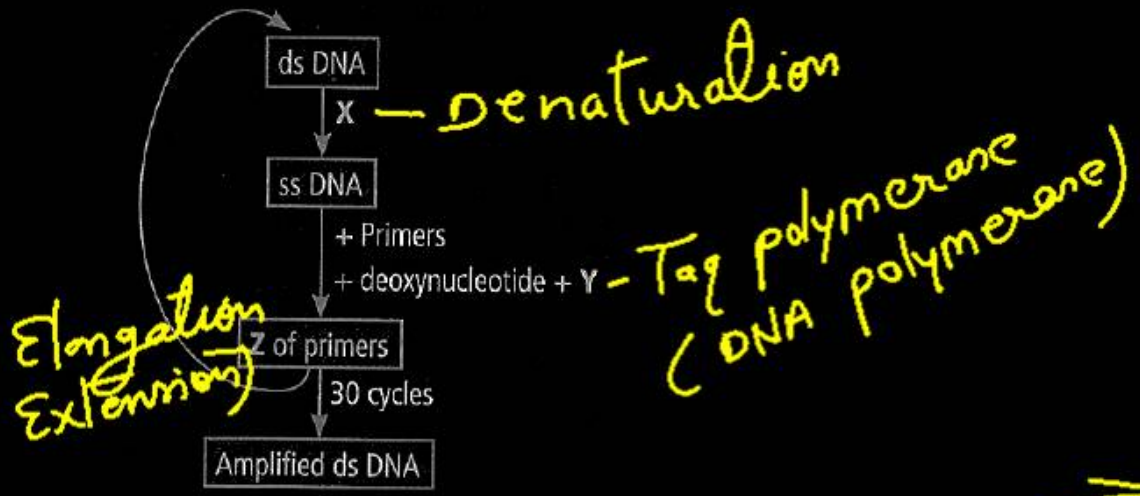
(3) A is true but R is false.

(4) A is false but R is true.

Question no. 149

AAYAM CAREER INSTITUTE

Study the flow chart of PCR given below and select the correct words for X, Y and Z.



	X	Y	Z
(1)	Denaturation	DNA ligase	Extension
(2)	Denaturation	DNA polymerase	Extension
(3)	Melting	RNA polymerase	Annealing
(4)	Melting	DNA ligase	Annealing

2

Question no. 150

AAYAM CAREER INSTITUTE

A molecule to act as a genetic material has the following properties

(i) Should be able to replicate

(ii) should be structurally more stable

(iii) should be more reactive and labile

(iv) should provide scope for slow changes

Choose the correct option.

(1) (i), (ii) and (iii) are correct.

(2) (iii) alone is correct.

(3) (iii) and (iv) are correct.

(4) (i), (ii) and (iv) are correct

4

Question no. 151

AAYAM CAREER INSTITUTE

In RNAi, the genes are silenced using

(1) ds-RNA

(2) ss-DNA

(3) ss-RNA

(4) ds-DNA

Question no. 152

AAYAM CAREER INSTITUTE

In recombinant DNA technology, probe refers to

(1) Rediolabelled antibody

(2) An oligonucleotide sequence used as a primer in PCR

(3) A single stranded RNA/DNA molecule tagged with radioactive material

(4) A fermenter or bioreactor

3

Question no. 153

AAYAM CAREER INSTITUTE

Which of the following statements about transgenic animals is/are false?

(i) Transgenic animals are designed to study how genes are regulated

(ii) They are specially made to serve as models for human diseases.

(iii) Transgenic cow Rosie was created to produce the human protein α-1 antitrypsin

(iv) Transgenic mice are used to test the safety of vaccines.

(1) (iii) only
(2) (i) and (iii) only
(3) (ii) only
(4) (ii) and (iii) only

1

Question no. 154

AAYAM CAREER INSTITUTE

Main enzyme of DNA replication is

DNA → DNA

(1) DNA dependent RNA polymerase

(2) DNA dependent DNA polymerase

(3) RNA dependent RNA polymerase

(4) RNA dependent DNA polymerase

2

Question no. 155

AAYAM CAREER INSTITUTE

Complete the central dogma of molecular basis of inheritance (by Crick) –

	A	B	C
(1)	Replication	Transcription	Translation
(2)	Replication	Termination	Translation
(3)	Replication	Translocation	Translation
(4)	Replication	Transposition	Translation

Question no. 156

AAYAM CAREER INSTITUTE

Which one of the following in not a property of cancerous cells whereas the remaining three are?

(1) They divide in an uncontrolled manner.

(2) They show contact inhibition

(3) They compete with normal cells for vital nutrients.

(4) They do not remain confined in the area of formation.

2

Question no. 157

AAYAM CAREER INSTITUTE

Match the hormone is column I with their function in column II.

	Column - I		Column - II
A.	FSH	I.	prepare endometrium for implantation
B.	LH	II.	develops female secondary sexual characters
C.	progesterone	III.	contraction of uterine wall
D.	estrogen	IV.	maintain corpus luteum
		V.	development of ovarian follicles

Choose the correct answer from the options given below.

(1) A-V, B-IV, C-I, D-II

(2) A-IV, B-V, C-II, D-I

(3) A-IV, B-III, C-II, D-V

(4) A-V, B-I, C-II, D-IV

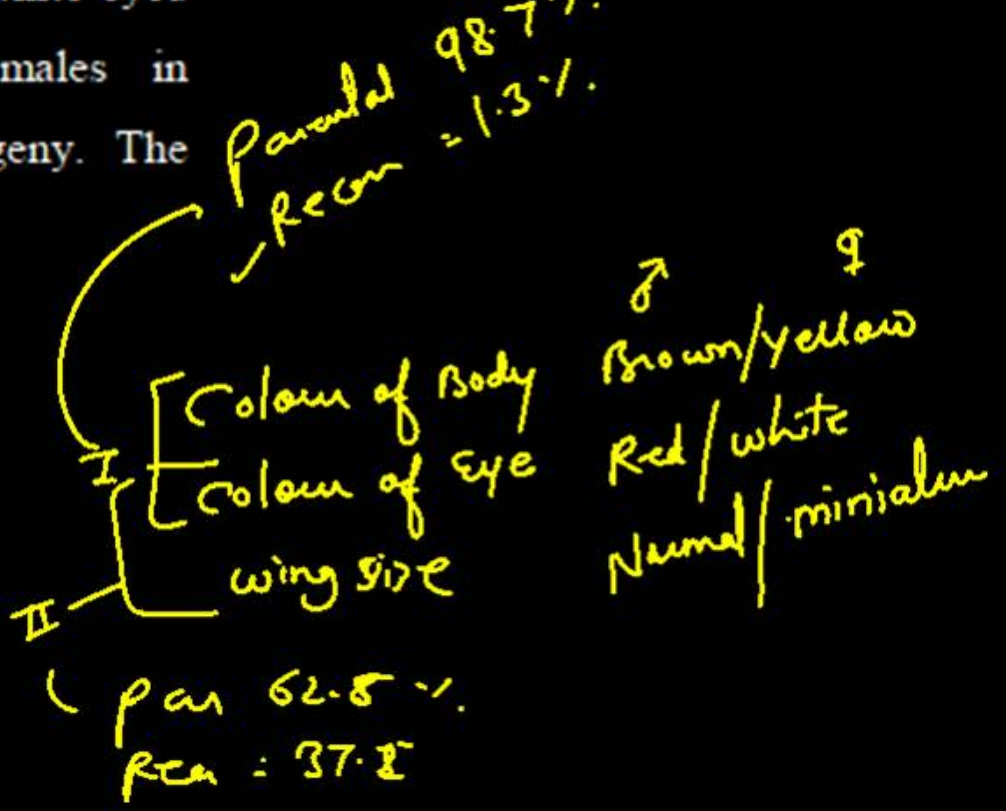
Question no. 158

AAYAM CAREER INSTITUTE

Morgan hybridised yellow-bodied, white-eyed females to brown bodied, red-eyed males in Drosophila and intercross their F_1, progeny. The percentage of recombinants was.

(1) 37.2 %
(2) 98.7 %
(3) 1.3 %
(4) 62.8 %

3



Question no. 159

AAYAM CAREER INSTITUTE

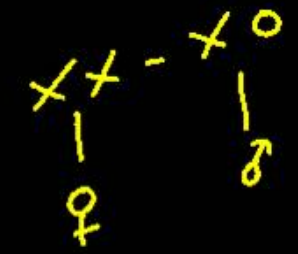
Which chromosome set is found in a male grasshopper?

(1) 2A + XX

(2) 2A + XO

(3) 2A + YY

(4) 2A + XXX



2

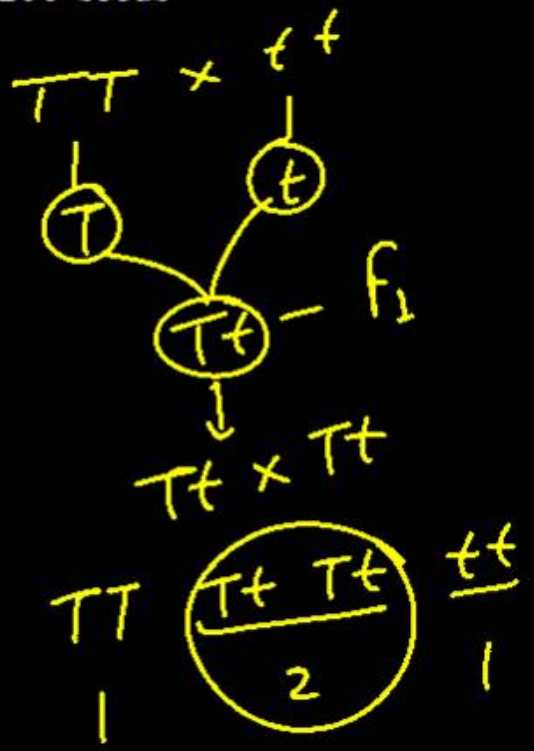
Question no. 160

AAYAM CAREER INSTITUTE

In a monohybrid cross performed by Mendel between tall and dwarf plants, how many progenies are genotypically similar to F_1 individual, if 1200 seeds are collected in F_2 generation?

(1) 600
(2) 300
(3) 500
(4) 1100

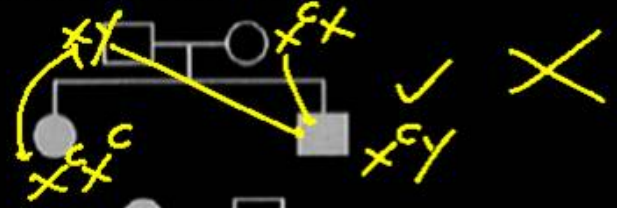
1

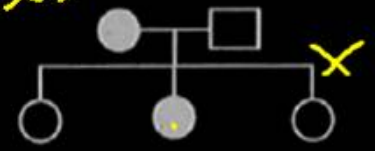


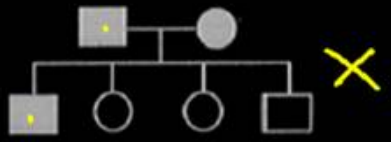
Question no. 162

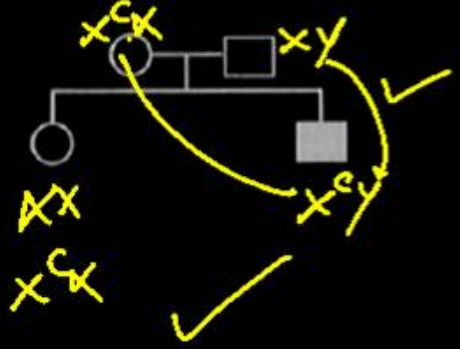
AAYAM CAREER INSTITUTE

Mark the pedigree which shows the inheritance of disorder like haemophilia.

(1) 

(2) 

(3) 

(4) 

Question no. 163

AAYAM CAREER INSTITUTE

Sickle cell anaemia is an autosomal linked recessive trait. Identify the mutated gene segment responsible for this disorder.

(1) 3' – GAG – 5'
5' – CTC – 3'

(2) 3' – GTG – 5'
5' – CAC – 3'

(3) 3' – GAT – 5'
5' – CTA – 3'

(4) 5' – GTG – 3'
3' – CAC – 5'

4

Question no. 164

AAYAM CAREER INSTITUTE

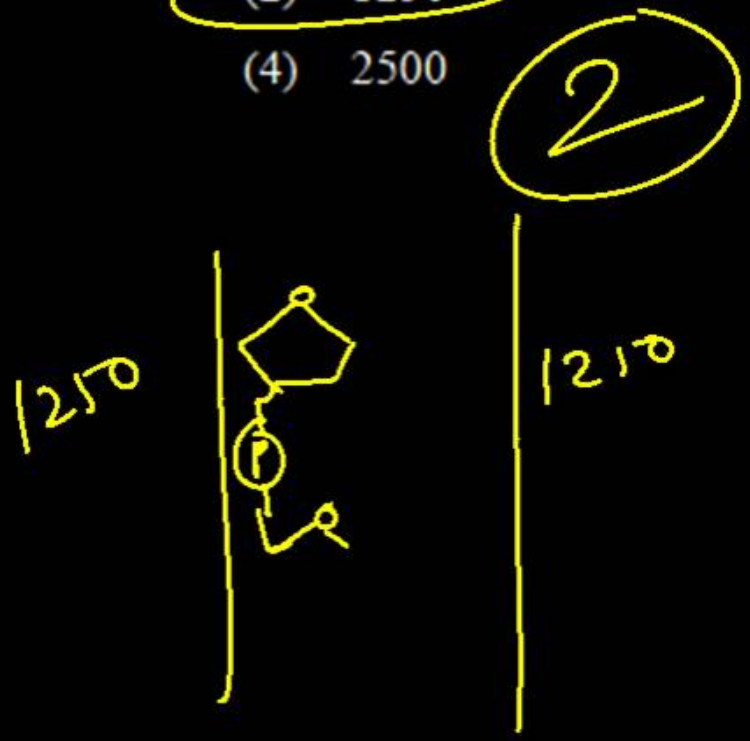
If 2500 phosphodiester bond are found in DNA of a bacteria, then how many base pairs are present in it?

(1) 2498

(2) 1250

(3) 1252

(4) 2500



Question no. 165

AAYAM CAREER INSTITUTE

Read the following statements w.r.t post-transcriptional modifications in eukaryotes and select the right option.

A. Methyl guanosine triphosphate is added to the 5' end of primary transcript.

B. In tailing, adenylate residues are added at 3' end of hnRNA in a template-independent manner.

C. Splicing is the process where exons are removed and introns are joined in a defined order.

(1) Only A is correct

(2) B and C are correct

(3) A, B and C are correct

(4) A and B are correct

Question no. 166

AAYAM CAREER INSTITUTE

With response to translation process, consider the following statements:

A. Translocation

B. Activation of amino acid

C. Formation of aminoacyl-tRNA complex

D. Peptidyl transferase activity

E. Binding of aminoacyl-tRNA with complex mRNA.

What is the correct sequence of the above events in translation process?

(1) BCEDA

(2) CBDEA

(3) ACBED

(4) BCAED

1

B → C → E → D → A

Question no. 167

AAYAM CAREER INSTITUTE

Match Column I with Column II and choose the correct combination from the options given.

	Column I		Column II
A.	Bacteriophage Lambda	i.	5386 nucleotides
B.	Bacteriophage ϕ 174	ii.	48502 bp
C.	Escherichia coli	iii.	4.6×10^6 bp
D.	Homo sapiens	iv.	6.6×10^9 bp

(1) A – i, B – ii, C – iii, D – iv

(2) A – ii, B – i, C – iii, D – iv

(3) A – i, B – ii, C – iv, D – iii

(4) A – ii, B – i, C – iv, D – iii

2

Question no. 168

AAYAM CAREER INSTITUTE

Which of the following transgenic human protein product has been used to treat emphysema?

(1) α-1 antitrypsin (2) α-1 globulin

(3) cry I Ab protein (4) cry II Ac protein

Question no. 169

AAYAM CAREER INSTITUTE

ELISA is an unconventional method of early diagnosis.

Choose the statement which hold correct for this method.

(1) It always detects antigens in serum sample.

(2) It is based on nucleic acid amplification.

(3) It is based on antigen-antibody interaction.

(4) It involves recombinant DNA technology.

3

Question no. 170

AAYAM CAREER INSTITUTE

Which enzyme is involved in the crossing over between two homologous chromosomes?

(1) Nuclease
(2) RNA polymerase
(3) Recombinase
(4) DNA polymerase

3

Question no. 171

AAYAM CAREER INSTITUTE

Which statement is not correct regarding Hind III?

(1) 'H' refers to the genus of the bacteria from which the enzyme is isolated.

(2) 'd' refers to the strain of bacteria.

(3) 'III' refers to the order of discovery of enzyme in particular strain.

(4) 'in' refers to the [illegible] bacteria

4

Hind III
Genus spe Strain 5-eg

Question no. 172

AAYAM CAREER INSTITUTE

Cranial capacity with 1400 cc is found in _____.

(1) Homo habilis ✓

(2) Homo erectus ✗

(3) Homo neanderthalensis

(4) Homo sapiens fossilis ✗

Question no. 173

AAYAM CAREER INSTITUTE

Which of the following features of genetic code does allow bacteria to produce human insulin by recombinant DNA technology?

(1) Genetic code is redundant

(2) Genetic code is nearly universal

(3) Genetic code is specific

(4) Genetic code is not ambiguous

2

Question no. 174

AAYAM CAREER INSTITUTE

If the gene of interest in inserted at the BamHI site in pBR322, the recombinant plasmid will

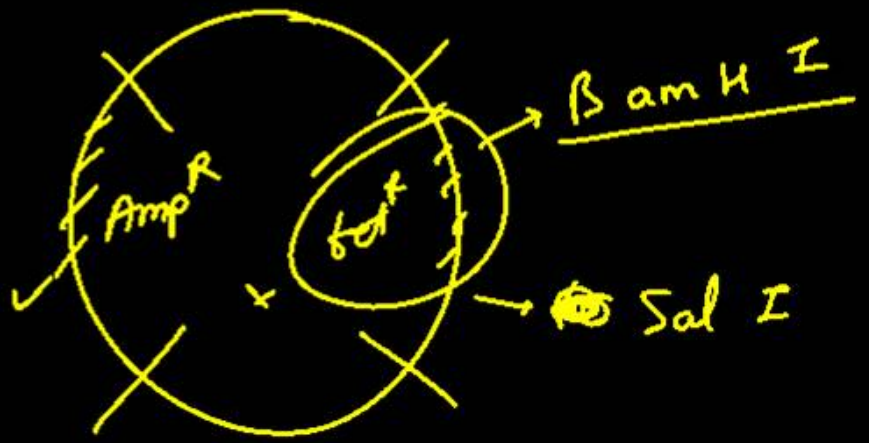
(1) Show ampicillin and tetracycline resistance only

(2) Show tetracycline resistance

(3) Will grow well on tetracycline containing medium

(4) Will not grow on tetracycline containing medium

4



Question no. 175

AAYAM CAREER INSTITUTE

The genetic defect, adenosine deaminase (ADA) deficiency may be cured permanently by

Gene therapy

(1) Administering adenosine deaminase through injection ✗

(2) Bone marrow transplantation ✗

(3) Enzyme replacement therapy ✗

(4) Introducing isolated gene from marrow cells producing ADA into the cells at early embryonic stages. ✓

4

Question no. 176

AAYAM CAREER INSTITUTE

The unequivocal proof that DNA is the genetic material came from the experiments of

(1) Hershey and Chase (1952)

(2) Frederic Griffith (1928)

(3) Waston and Crick

(4) Meselson and Stahl (1958)

Question no. 177

AAYAM CAREER INSTITUTE

Consider the following

a. 44 + XXY

b. Sterile male with gynaecomastia

c. Overall masculine development

d. Presence of one barr body

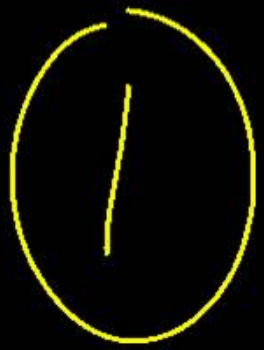
Above given traits show presence of :

(1) Klinefelter's syndrome

(2) Turner's syndrome

(3) Down syndrome

(4) Edward syndrome



Question no. 178

AAYAM CAREER INSTITUTE

The result of which of the following reaction experiments carried out a very et. al on Streptococcus pneumoniae has proved conclusively that DNA is the genetic material.

(1) Live 'R' strain + DNA from 'S' strain + RNase

(2) Live 'R' strain + DNA from 'S' strain + DNase

(3) Live 'R' strain + Denatured DNA of 'S' strain + protease

(4) Heat killed 'R' strain + DNA from 'S' strain + DNase

2

Question no. 179

AAYAM CAREER INSTITUTE

If receptor molecule is removed from target organ for hormone action, the target organ will

(1) continue to respond but require higher concentration of hormone ✗

(2) continue to respond but in opposite away ✗

(3) continue to respond without any difference ✗

(4) no respond to hormone

Question no. 180

AAYAM CAREER INSTITUTE

Which of the following is the criteria for DNA fragments movements on agarose gel during gel electrophoresis?

(1) Positively charged fragment move to the farther end.

(2) The larger the fragment size, the farther it moves.

(3) Negatively charged fragments do not move.

(4) The smaller the fragment size, the farther it moves.