Andhra Pradesh State Council of Higher Education

Notations:

1. Options shown in green color and with ✓ icon are correct.

2.Options shown in red color and with * icon are incorrect.

Question Paper Name: Mining Engineering 19th Sep 2021 Shift2

Duration: 180

Total Marks: 200

Display Marks: No

Calculator: None

Magnifying Glass Required?: No

Ruler Required?: No

Eraser Required?: No

Scratch Pad Required?: No

Rough Sketch/Notepad Required?: No

Protractor Required?: No

Show Watermark on Console?: Yes

Highlighter: No

Auto Save on Console? (SA type of questions will

be always auto saved):

Yes

Is this Group for Examiner?: No

Mathematics

Section Id: 477203421

Section Number:

1

Mandatory or Optional:

Mandatory

Number of Questions:

50

Section Marks:

50

Yes

Enable Mark as Answered Mark for Review and

Clear Response:

Question Number: 1 Question Id: 47720321433 Display Question Number: Yes Is Question Mandatory: No

If $k \neq -5$ is a real number, then, the number of solutions to the following system of equations

$$3x - y + 4z = 3$$

$$x + 2y - 3z = -2$$

$$6x + 5y + kz = -3$$
 is

Options:

1. * 0

4. * infinitely many

Question Number: 2 Question Id: 47720321434 Display Question Number: Yes Is Question Mandatory: No

$$\begin{vmatrix} 1 & 1+p & 1+p+q \\ 2 & 3+2p & 4+3p+2q \\ 3 & 6+3p & 10+6p+3q \end{vmatrix} =$$

Options:

1. * 0

2. 🗸 1

3. * 2

4. * 3

Question Number : 3 Question Id : 47720321435 Display Question Number : Yes Is Question Mandatory : No

Let |A| denote the determinant of the matrix A. If A is a square matrix of order 3, and |4A| = r|A|, then the value of r is

Options:

1. ** 0

2 💥

3. * 16

4. 🗸 64

Question Number : 4 Question Id : 47720321436 Display Question Number : Yes Is Question Mandatory : No

If
$$\begin{vmatrix} y & y \\ 1 & y \end{vmatrix} = \begin{vmatrix} 3 & 4 \\ 1 & 2 \end{vmatrix}$$
, then the value of y is

Options:

1. * 0

Question Number : 5 Question Id : 47720321437 Display Question Number : Yes Is Question Mandatory : No

Let
$$\begin{vmatrix} 2 & 3+i & -1 \\ 3-i & 0 & -1+i \\ -1 & -1-i & 1 \end{vmatrix} = a+ib$$
, where a and b are real numbers. Then the value of b is

Options:

Question Number : 6 Question Id : 47720321438 Display Question Number : Yes Is Question Mandatory : No

If
$$\frac{y^2-5y+1}{(y+1)(y+2)(y+3)} = \frac{a}{y+1} + \frac{b}{(y+1)(y+2)} + \frac{c}{(y+1)(y+2)(y+3)}$$
, then,

$$a = 1, b = 10, c = 25$$

$$a = 1, b = -10, c = 25$$

$$a = 5, b = 10, c = 25$$

$$a = 5, b = -10, c = 25$$

Question Number : 7 Question Id : 47720321439 Display Question Number : Yes Is Question Mandatory : No

$$\frac{2x+3}{(x^2+1)(x+4)} =$$

Options:

$$\frac{5}{17(x+4)} + \frac{5x+14}{17(x^2+1)}$$

$$\frac{-5}{17(x+4)} - \frac{5x+14}{17(x^2+1)}$$
2. **

$$\frac{-5}{17(x+4)} + \frac{5x+14}{17(x^2+1)}$$

$$\frac{-5}{17(x+4)} + \frac{5x-14}{17(x^2+1)}$$

Question Number : 8 Question Id : 47720321440 Display Question Number : Yes Is Question Mandatory : No

If x and y are two distinct real numbers, then, the number of values of θ in $[0,2\pi]$ for which cosec $\theta = \frac{x^2 - y^2}{x^2 + y^2}$ is

Options:

- 1. 🗸 0
- 2. * 1
- 3. ** 2
- **⊿ ¥** 3

Question Number : 9 Question Id : 47720321441 Display Question Number : Yes Is Question Mandatory : No

If $\cos(\alpha - \beta) + \cos(\beta - \gamma) + \cos(\gamma - \alpha) = -\frac{3}{2}$, then $\cos \alpha + \cos \beta + \cos \gamma =$

Options:

- _ 3 1 **%**
- 2 * -1
- 3. 🗸 0
- ₁ 1

Question Number : 10 Question Id : 47720321442 Display Question Number : Yes Is Question Mandatory : No

For all real numbers θ , the value of $\sin^2\theta + \cos^4\theta$ is greater than or equal to

Options:

Question Number : 11 Question Id : 47720321443 Display Question Number : Yes Is Question Mandatory : No

Let x be a real number such that $tan\left(\frac{\pi}{4} + x\right) + tan\left(\frac{\pi}{4} - x\right) = 2$. Then x is of the form $x = n\pi + a$, where $n \in \mathbb{Z}$, and $a = n\pi + a$

Options:

2. *
$$\frac{\pi}{3}$$

3. *
$$\frac{\pi}{4}$$

Question Number : 12 Question Id : 47720321444 Display Question Number : Yes Is Question

Mandatory: No

If $(sin^{-1}x) > (cos^{-1}x)$, then x belongs to the interval

Options:

1. *
$$[0,\frac{1}{\sqrt{2}})$$

$$(\frac{1}{\sqrt{2}}, 1]$$

$$\left[\frac{1}{\sqrt{2}},1\right]$$

$$\left[0,\frac{1}{\sqrt{2}}\right]$$

Question Number : 13 Question Id : 47720321445 Display Question Number : Yes Is Question Mandatory : No

Consider a triangle $\triangle ABC$, with sides of length a,b and c, and angles A,B and C. If a,b,c and the area of the triangle $\triangle ABC$ are all rational, then

Options:

$$\tan \frac{B}{2}$$
 is rational and $\tan \frac{C}{2}$ is irrational.

$$\tan \frac{B}{2}$$
 is irrational and $\tan \frac{C}{2}$ is rational.

$$\tan \frac{B}{2}$$
 and $\tan \frac{C}{2}$ are both rational.

$$\tan \frac{B}{2}$$
 and $\tan \frac{C}{2}$ are both irrational.

4. *

Question Number : 14 Question Id : 47720321446 Display Question Number : Yes Is Question

Mandatory: No

Consider a triangle $\triangle ABC$, with sides of length a,b and c, and angles A,B and C. If

3a=b+c, then the value of $\cot \frac{B}{2} \cdot \cot \frac{C}{2}$ is

Options:

1. * 0

2 **x** 2

3. **×** √3

4 🗸 2

Question Number : 15 Question Id : 47720321447 Display Question Number : Yes Is Question Mandatory : No

$$2 \tan^{-1} \left(\frac{3}{4} \right) - \tan^{-1} \left(\frac{17}{31} \right) =$$

Options:

1. * 0

 $2. \checkmark \frac{\pi}{4}$

 $\frac{\pi}{2}$

1 %

Question Number : 16 Question Id : 47720321448 Display Question Number : Yes Is Question Mandatory : No

Consider a triangle $\triangle ABC$ with angles A,B and C. If $\cos A + \cos B + \cos C = \frac{3}{2}$, then the triangle $\triangle ABC$ is

Options:

1. **✓** equilateral.

isosceles, and right-angled.

isosceles, with one of the angles equal to $\frac{\pi}{6}$.

4. * scalene

Question Number : 17 Question Id : 47720321449 Display Question Number : Yes Is Question Mandatory : No

The value of $\cos^2 x + \cos^2 \left(x + \frac{\pi}{3}\right) + \cos^2 \left(x - \frac{\pi}{3}\right)$ is

Options:

1. * 1

 $2. \checkmark \frac{3}{2}$

3 💥 2

Question Number : 18 Question Id : 47720321450 Display Question Number : Yes Is Question Mandatory : No

The value of
$$\left(\frac{\sqrt{3}+i}{\sqrt{3}-i}\right)^3$$
 is

Options:

Question Number : 19 Question Id : 47720321451 Display Question Number : Yes Is Question Mandatory : No

If
$$x + iy = \frac{a+ib}{a-ib}$$
, then $x^2 + y^2 =$

Question Number : 20 Question Id : 47720321452 Display Question Number : Yes Is Question Mandatory : No

If a circle of radius 5 touches the circle $x^2 + y^2 - 2x - 4y = 20$ at the point (5,5), then, its center is

Options:

- 1. * (8,8)
- 2. * (8,9)
- 3. 🗸 (9,8)
- 4. * (9,9)

Question Number : 21 Question Id : 47720321453 Display Question Number : Yes Is Question Mandatory : No

The equation $9x^2 - 24xy + 16y^2 - 20x - 15y = 60$ represents

- 1. a parabola
- 2. * an ellipse
- a hyperbola
- 3. 🥗
- 4. a circle

Question Number : 22 Question Id : 47720321454 Display Question Number : Yes Is Question Mandatory : No

Let (x_j,y_j) , j=1,2,3,4, be points of intersection of the parabola $y^2=4ax$ and the circle $x^2+y^2+2gx+2fy+c=0$.

Then $y_1 + y_2 + y_3 + y_4 =$

Options:

$$-\frac{1}{2}$$

Question Number : 23 Question Id : 47720321455 Display Question Number : Yes Is Question Mandatory : No

The length of the major axis of the ellipse $9x^2 + 5y^2 - 30y = 0$ is

Question Number : 24 Question Id : 47720321456 Display Question Number : Yes Is Question Mandatory : No

If S (-1, 1) is one of the foci of a hyperbola, x - y + 3 = 0 is its directrix corresponding to S and 3 is its eccentricity, then, the equation of the hyperbola is

Options:

$$7x^2 + 18xy + 7y^2 + 50x + 50y + 77 = 0$$

$$7x^2 + 18xy + 7y^2 + 50x - 50y + 77 = 0$$

$$7x^2 - 18xy + 7y^2 + 50x - 50y + 77 = 0$$

$$7x^2 - 18xy - 7y^2 - 50x + 50y + 77 = 0$$

Question Number : 25 Question Id : 47720321457 Display Question Number : Yes Is Question Mandatory : No

The equation $4(x-2y+1)^2 + 9(2x+y+2)^2 = 25$ represents

4. * a circle

Question Number : 26 Question Id : 47720321458 Display Question Number : Yes Is Question

Mandatory: No

Let f be a twice differentiable function such that f''(x) + f(x) = 0, and f'(x) = g(x). If $h(x) = [f(x)]^2 + [g(x)]^2$,

and h(10) = 20, then h(40) =

Options:

1. 🗸 20

2 * 40

3. * 80

4. * 160

Question Number : 27 Question Id : 47720321459 Display Question Number : Yes Is Question Mandatory : No

$$\lim_{x \to \frac{\pi}{2}} \left(\frac{\cot x - \cos x}{\cos^2 x} \right) =$$

Options:

-

2 🗸 0

3. *****
$$\sqrt{3}$$

Question Number : 28 Question Id : 47720321460 Display Question Number : Yes Is Question Mandatory : No

Let \mathbb{R} be the set of all real numbers. Let $f: \mathbb{R} \to \mathbb{R}$ satisfy the condition:

$$|f(x)-f(y)| \le |x-y|^{2021}$$
, for all $x,y \in \mathbb{R}$. Then the value of $f'(2022)$ is

Options:

Question Number : 29 Question Id : 47720321461 Display Question Number : Yes Is Question Mandatory : No

The number of real roots of the equation $x + e^x = 0$ is

Question Number : 30 Question Id : 47720321462 Display Question Number : Yes Is Question Mandatory : No

If
$$y = \operatorname{Tan}^{-1}\left(\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}}\right)$$
, then $\frac{dy}{dx} = \frac{1}{2}$

Options:

$$\cot^2 x$$

Question Number : 31 Question Id : 47720321463 Display Question Number : Yes Is Question Mandatory : No

The equation of the tangent to the curve $x = \sin 3t$, $y = \cos 2t$, at $t = \frac{\pi}{4}$ is given by

Options:

$$\sqrt{2}x - 3y - 2 = 0$$

1 %

$$\sqrt{2} x + 3y - 2 = 0$$

$$2\sqrt{2} x - 3y - 2 = 0$$

$$2\sqrt{2} x - 3y + 2 = 0$$

Question Number : 32 Question Id : 47720321464 Display Question Number : Yes Is Question Mandatory : No

An open tank with a square base (with side x) and vertical sides (with height y) is to be constructed from a metal sheet so as to hold a given quantity of water. The cost of the material will be the least if

Options:

Question Number : 33 Question Id : 47720321465 Display Question Number : Yes Is Question Mandatory : No

The function $f(x) = x^3 - 12x^2 + 36x + 48$, is decreasing in the interval

Question Number : 34 Question Id : 47720321466 Display Question Number : Yes Is Question Mandatory : No

A shopkeeper can buy x items for Rs. $\left(\frac{x}{5} + 500\right)$. He can sell the x items at the rate

Rs. $\left(5 - \frac{x}{100}\right)$ per item. Then the number of items he should sell to make maximum profit is

Options:

Question Number : 35 Question Id : 47720321467 Display Question Number : Yes Is Question Mandatory : No

If
$$z = ax^2 + 2hxy + by^2$$
, then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} =$

Options:

$$\frac{1}{2}$$

Question Number : 36 Question Id : 47720321468 Display Question Number : Yes Is Question Mandatory : No

$$\int_{-1}^{1} \frac{x \sin^{-1} x}{\sqrt{1 - x^2}} \ dx =$$

Options:

Question Number : 37 Question Id : 47720321469 Display Question Number : Yes Is Question Mandatory : No

The area of the region bounded by the curve $y = x^2 + 4$, the x-axis and the ordinates at x=1 and x=5 is

Options:

Question Number : 38 Question Id : 47720321470 Display Question Number : Yes Is Question Mandatory : No

$$\lim_{n\to\infty} \textstyle\sum_{k=0}^{n-1} \, \frac{1}{\sqrt{n^2-k^2}} =$$

$$2. \checkmark \frac{\pi}{2}$$

Mandatory: No

$$\int_0^1 \frac{2x}{1+x^2} \ dx =$$

Options:

- 1. * 1
- 2. * 2
- 3. **✓** log 2
- 4. * 3 log 2

Question Number : 40 Question Id : 47720321472 Display Question Number : Yes Is Question Mandatory : No

$$\int \frac{e^{ax} - e^{-ax}}{e^{ax} + e^{-ax}} dx =$$

(In the following, c is a constant.)

$$\frac{1}{a}\log|e^{ax} + e^{-ax}| + c$$

$$\frac{1}{a} \log |e^{ax} - e^{-ax}| + c$$

$$\frac{1}{2a} \log |e^{ax} + e^{-ax}| + c$$

$$\frac{1}{2a}\log|e^{ax}-e^{-ax}|+c$$

Question Number : 41 Question Id : 47720321473 Display Question Number : Yes Is Question Mandatory : No

$$\int_0^\pi \frac{e^{\cos x}}{e^{\cos x} + e^{-\cos x}} \ dx =$$

Options:

- _π
- 2 **
- $3 \checkmark \frac{\pi}{2}$
- Λ 💥 π

Question Number : 42 Question Id : 47720321474 Display Question Number : Yes Is Question Mandatory : No

$$\int_{-\pi}^{\pi} \sin^5 x \, dx =$$

- 1. **v** 0
- $\frac{\pi}{2}$
- α 💥 π

4. ***** 2π

Question Number : 43 Question Id : 47720321475 Display Question Number : Yes Is Question Mandatory : No

The area of the region bounded by y=|x+3|, the x-axis and the lines x=-6 and x=0 is

Options:

3 square units

9 square units 2. ✔

12 square units

18 square units

Question Number : 44 Question Id : 47720321476 Display Question Number : Yes Is Question Mandatory : No

The degree of the differential equation $7x\left(\frac{dy}{dx}\right)^2 - \frac{d^2y}{dx^2} + 10y = \log x$ is

Options:

1. 🗸 1

2. * 2

4. * 4

Question Number : 45 Question Id : 47720321477 Display Question Number : Yes Is Question Mandatory : No

The solution of the differential equation $\frac{dy}{dx} = y \tan x$, given that y=1 when x=0, is given by

Options:

 $y = \cos x$

 $y = \cos 2x$

 $y = \sec x$

 $y = \sec 2x$

Question Number : 46 Question Id : 47720321478 Display Question Number : Yes Is Question Mandatory : No

The solution to the differential equation $(3x^2 + y)\frac{dx}{dy} = x$, (x > 0), such that y=1 if x=1 is

Options:

 $y = 2x^2 - x$

 $y = 3x^2 - 2x$

$$y = 4x^2 - 3x$$

$$y = 5x^2 - 4x$$

Question Number : 47 Question Id : 47720321479 Display Question Number : Yes Is Question Mandatory : No

The differential equation of the family of parabolas having vertex at the origin and axis along the positive y-axis is

Options:

$$xy' = 2$$

$$2 \checkmark xy' = 2y$$

$$xy' = -2y$$

$$xy' = 2y^2$$

Question Number : 48 Question Id : 47720321480 Display Question Number : Yes Is Question Mandatory : No

The solution of the differential equation $\frac{dy}{dx} + y \cot x = 4x \csc x$, $(x \neq 0)$, given that y=0 when $x = \frac{\pi}{2}$ is

Options:

$$y \csc x = x^2 - \frac{\pi^2}{4}$$

1. 🗱

$$y \csc x = 2x^2 - \frac{\pi^2}{2}$$

$$y \sin x = x^2 - \frac{\pi^2}{4}$$

$$y\sin x = 2x^2 - \frac{\pi^2}{2}$$

Question Number: 49 Question Id: 47720321481 Display Question Number: Yes Is Question Mandatory: No

The general solution of the differential equation $log_e\left(\frac{dy}{dx}\right) = ax + by$ is given by

Options:

$$ae^{ax} + be^{-by} + C = 0$$

$$ae^{ax} - be^{-by} + C = 0$$

2. **

$$\frac{1}{a}e^{ax} + \frac{1}{b}e^{-by} + C = 0$$
3.

$$\frac{1}{a}e^{ax} - \frac{1}{b}e^{-by} + C = 0$$

Question Number: 50 Question Id: 47720321482 Display Question Number: Yes Is Question

Mandatory: No

The particular integral of the differential equation $(D^2 + D - 2)y = \sin x$ is given by

Options:

$$-\frac{1}{10}\left(\cos x + \sin x\right)$$

$$-\frac{1}{10}\left(\cos x + 3\sin x\right)$$

$$-\frac{1}{10} (\cos 3x + \sin 3x)$$

$$-\frac{1}{10} (3 \cos x + \sin x)$$

Physics

Section Id: 477203422

Section Number: 2

Mandatory or Optional: Mandatory

Number of Questions: 25

Section Marks: 25

Enable Mark as Answered Mark for Review and

Clear Response:

Yes

Question Number: 51 Question Id: 47720321483 Display Question Number: Yes Is Question

Mandatory: No

The dimensional formula for gravitational constant, G is

$$1. \times M^{1}L^{3}T^{-2}$$

2.
$$\checkmark$$
 $M^{-1}L^3T^{-2}$

3.
$$\times$$
 $M^0L^3T^{-2}$

4. *
$$M^2L^3T^{-2}$$

Question Number : 52 Question Id : 47720321484 Display Question Number : Yes Is Question Mandatory : No

Which of the following quantities have not been expressed in proper units?

Options:

electric field = Newton/Coulomb

2. * surface tension = Newton/meter

4. * pressure = Newton/m²

Question Number : 53 Question Id : 47720321485 Display Question Number : Yes Is Question Mandatory : No

A vector A is along positive x-axis. If B is another vector such that AxB is zero, then B could be

Options:

1. ***** 4ĵ

3. *
$$-(\hat{\imath}+\hat{\jmath})$$

4.
$$(\hat{j} + \hat{k})$$

Question Number : 54 Question Id : 47720321486 Display Question Number : Yes Is Question Mandatory : No

The scalar product of two vectors is $2\sqrt{3}$ and the magnitude of their vector product is 2. The angle between them is

Options:

Question Number : 55 Question Id : 47720321487 Display Question Number : Yes Is Question Mandatory : No

The work done by a force is defined as W=F.S. In a certain situation F and S are not zero but the work done is zero when

Options:

F and S are in the same direction

F and S are in opposite direction

F and S are at right angles

F and **S** are at 45⁰

Question Number : 56 Question Id : 47720321488 Display Question Number : Yes Is Question Mandatory : No

A body starts from rest and travels a distance x in first two seconds and a distance y in next two seconds. The relation between x and y is

Options:

$$y = 3x$$

Question Number : 57 Question Id : 47720321489 Display Question Number : Yes Is Question Mandatory : No

A projectile is projected with initial velocity $(6\hat{\imath} + 8\hat{\jmath})$ m/s. If g = 10 m/s² then horizontal range is

Question Number : 58 Question Id : 47720321490 Display Question Number : Yes Is Question Mandatory : No

The maximum range of a projectile fired with some initial velocity is found to be 1000 m/s, in the absence of wind and air resistance. The maximum height reached by this projectile is

Options:

Question Number : 59 Question Id : 47720321491 Display Question Number : Yes Is Question Mandatory : No

The force of friction between two bodies is

Options:

1. parallel to the contact surface

perpendicular to the contact surface

inclined at 300 to the contact surface

inclined at 600 to the contact surface

Question Number : 60 Question Id : 47720321492 Display Question Number : Yes Is Question Mandatory : No

A body is sliding down an inclined plane under its own weight at constant speed. If the inclination of the plane to the horizontal is 30°, the angle of friction is

Options:

Question Number : 61 Question Id : 47720321493 Display Question Number : Yes Is Question Mandatory : No

A block of mass 5 kg is resting on a smooth surface. At what angle, a force of 20 N be acted on the body so that it will acquire a kinetic energy of 40 J after moving 4m

Question Number : 62 Question Id : 47720321494 Display Question Number : Yes Is Question Mandatory : No

Two men with the weights in the ratio 4:3 run up a staircase in time, in the ratio 12:11. The ratio of power of the first to that of second is

Options:

Question Number : 63 Question Id : 47720321495 Display Question Number : Yes Is Question Mandatory : No

Energy harnessed from flowing water is called-----energy

Solar

2. ✔ Hydel

3. * Tidal

4. * Geothermal

Question Number : 64 Question Id : 47720321496 Display Question Number : Yes Is Question Mandatory : No

The total mechanical energy of a spring-mass system in simple harmonic motion is $E = 0.5 \text{ m}\omega^2 A^2$. If the oscillating particle is replaced by another particle of double the mass while the amplitude A remains the same. The new mechanical energy is

Options:

1. **×** 2E

2. ₩ 0.5 E

3. **≈** √2 E

4. 🗸 E

Question Number : 65 Question Id : 47720321497 Display Question Number : Yes Is Question

Mandatory: No

Sound of frequency 1000 Hz from a stationary source is reflected from an object approaching the source at 30 m/s back to a stationary observer located at the source. The speed of sound in air is 330 m/s. The frequency of the sound heard by the observer is

Options:

- 1200 Hz
- 2. ***** 1000 Hz
- 3. ***** 1090 Hz
- 4. × 1100 Hz

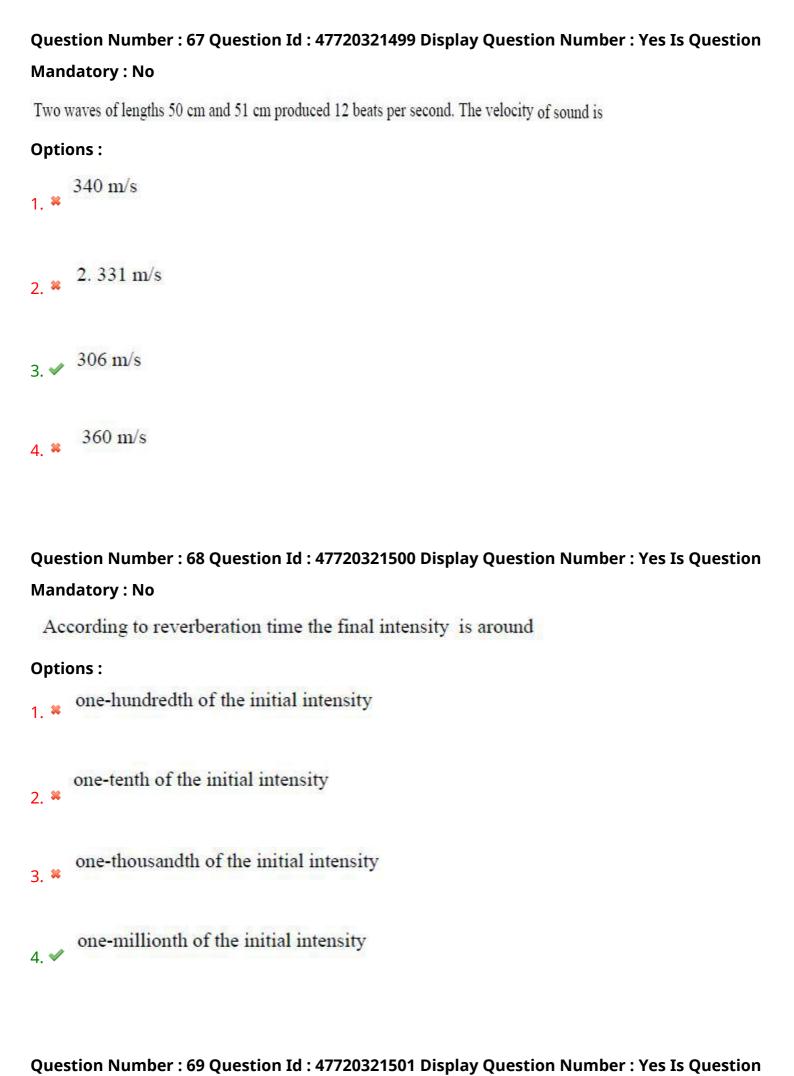
Question Number : 66 Question Id : 47720321498 Display Question Number : Yes Is Question Mandatory : No

The frequency of a pendulum if it is taken from the earth's surface to deep into a mine

Options:

4. 💥

- increases
- decreases
- first increases then decreases
 - remains unchanged



Mandatory: No

An ideal gas has volume V at pressure P and temperature T. Mass of each molecule is m. The density of the gas is

Options:

- 1. * mKT
- P KT
- P KTV
- 4. **✓** Pm
 KT

Question Number : 70 Question Id : 47720321502 Display Question Number : Yes Is Question Mandatory : No

Work done by 0.1 mole of a gas at 27^oC to double its volume at constant pressure is (R=2 cal/mol/K)

- 54 cal
- 600 cal
- 3. **6**0 cal
- 4. ***** 546 cal

Question Number : 71 Question Id : 47720321503 Display Question Number : Yes Is Question

Mandatory: No

If the pressure of a gas contained in a closed vessel is increased by 0.4%, when heated by 1°C, its initial temperature is

Options:

Question Number : 72 Question Id : 47720321504 Display Question Number : Yes Is Question Mandatory : No

A monoatomic ideal gas, initially at temperature T_1 is enclosed in a cylinder fitted with a frictionless piston. The gas is allowed to expand adiabatically to a temperature T_2 by releasing the piston suddenly. If L_1 and L_2 are the lengths of the gas column, before and after expansion respectively, T_1/T_2 is given by

1. *
$$\left(\frac{L_1}{L_2}\right)^{2/3}$$

$$2. \checkmark \left(\frac{L_2}{L_1}\right)^{2/3}$$

$$\frac{L}{L}$$

$$L_2$$
 L_1

Question Number : 73 Question Id : 47720321505 Display Question Number : Yes Is Question Mandatory : No

A Carnot's engine operates with source at 127°C and sink at 27°C. If the source supplies 40 kJ of heat energy, the work done by the engine is

Options:

- 30 kJ
- 2. ✓ 10 kJ
- 3. **¾** 4 kJ
- 4. ¥ 1 kJ

Question Number : 74 Question Id : 47720321506 Display Question Number : Yes Is Question Mandatory : No

The optical fibre consisting of a central core is cladded by material of

Options:

slightly lower refractive index

- slightly higher refractive index
- 3. **

			300 4	
equa.	refrac	tive	inc	lex

very high refractive index

Question Number: 75 Question Id: 47720321507 Display Question Number: Yes Is Question

Mandatory: No

The susceptibility of the superconductor is

Options:

positive and small

2. * negative and small

positive and unity

and unity negative and unity

Chemistry

Section Id: 477203423

Section Number:

Mandatory or Optional: Mandatory

Number of Questions: 25

Section Marks: 25

Enable Mark as Answered Mark for Review and

Yes

Clear Response:

Question Number : 76 Question Id : 47720321508 Display Question Number : Yes Is Question

Mandatory: No

The nucleus of tritium consists of -----

Options:

1 proton + 1 neutron

1 proton + 3 neutrons

3. * 1 proton + zero neutron

4. 1 proton + 2 neutrons

Question Number : 77 Question Id : 47720321509 Display Question Number : Yes Is Question Mandatory : No

Which of the following electronic configuration is not possible?

Options:

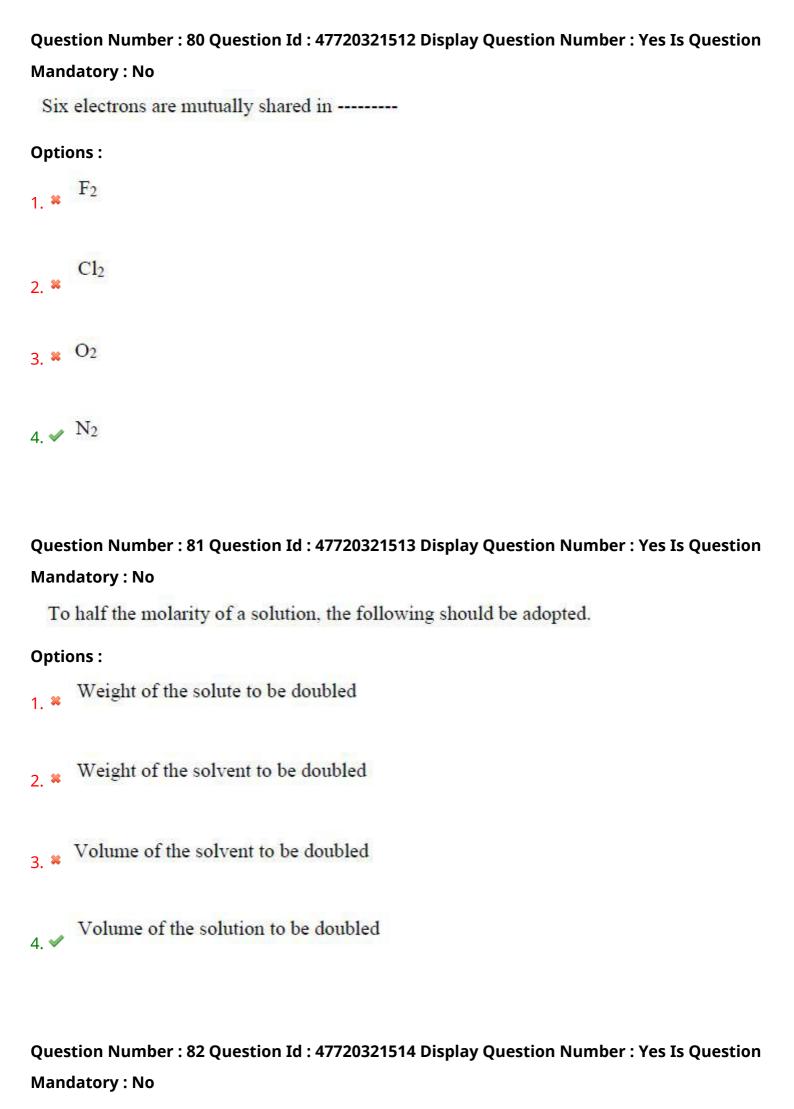
1s² 2s² 2p⁶

 $2. \checkmark 1s^2 2s^2 2p^7$

3. ***** 1s² 2s²

4. * 1s² 2s² 2p⁵

Question Number : 78 Question Id : 47720321510 Display Question Number : Yes Is Question				
Mandatory : No				
Radius of 3 rd Bohr orbit of hydrogen atom is				
Options:				
6.529A ⁰ 1. ₩				
2. ✓ ^{4.761A⁰}				
2.116A ⁰				
4. * 8.464A ⁰				
Question Number : 79 Question Id : 47720321511 Display Question Number : Yes Is Question				
Mandatory : No				
Covalent compounds are generally soluble in				
Options:				
1. ✓ Non-polar solvents				
2. ** Polar solvents				
3. ** Concentrated acids				
All solvents 4. *				



The molecular weight of KMnO ₄ is "M". In a reaction KMnO ₄ is reduced to K ₂ MnO ₄ . The equivalent weight of K	MnO4 is
Options:	

1. ✓ M

Question Number : 83 Question Id : 47720321515 Display Question Number : Yes Is Question Mandatory : No

Calculate the weight of NaOH present in 500 ml of 0.5 N Solution

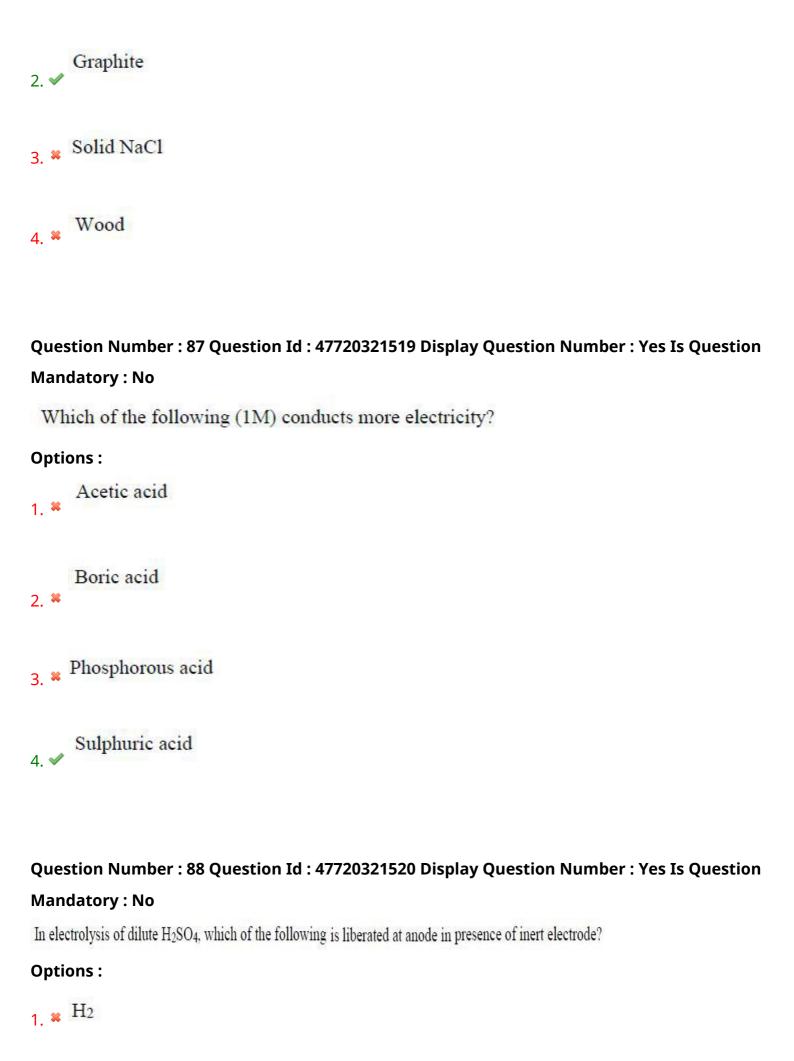
Options:

Question Number : 84 Question Id : 47720321516 Display Question Number : Yes Is Question Mandatory : No

On addition of NaOH to water

Ionic product will increase 1. **
2. * Ionic product will decrease
3. No change in ionic product of water
H ₃ O ⁺ concentration increases 4. ■
Question Number : 85 Question Id : 47720321517 Display Question Number : Yes Is Question Mandatory : No
Which of the following is not a buffer solution?
Options: 1. * (CH ₃ COOH/CH ₃ COONa)
2. (HCl/NaCl)
3. * (HCOOH/HCOONa)
(NH4OH/NH4Cl) 4. *
Question Number: 86 Question Id: 47720321518 Display Question Number: Yes Is Question Mandatory: No Which of the following is a good conductor of electricity?
Options :

1. Diamond



Question Number : 89 Question Id : 47720321521 Display Question Number : Yes Is Question Mandatory : No

The EMF of the cell Ni/Ni $^{2+}$ (0.01M)/Cl 2 (0.01M)/Cl 2 , Pt is ---V if the SRP of nickel and chlorine electrodes are -0.25V and +1.36V respectively

Options:

Question Number : 90 Question Id : 47720321522 Display Question Number : Yes Is Question Mandatory : No

Which of the following is correct relation used to measures the hardness of water?

$$1 \text{ mg/L} = 1 \text{ ppm} = 0.07^{\circ}\text{Cl} = 0.1^{\circ}\text{Fr}$$

$$1 \text{ mg/L} = 0.1 \text{ ppm} = 0.7^{\circ}\text{Cl} = 0.1^{\circ}\text{Fr}$$

$$1 \text{ mg/L} = 1 \text{ ppm} = 0.7^{\circ}\text{Cl} = 0.01^{\circ}\text{Fr}$$

$$1 \text{ mg/L} = 1 \text{ ppm} = 0.7^{\circ}\text{Cl} = 1^{\circ}\text{Fr}$$

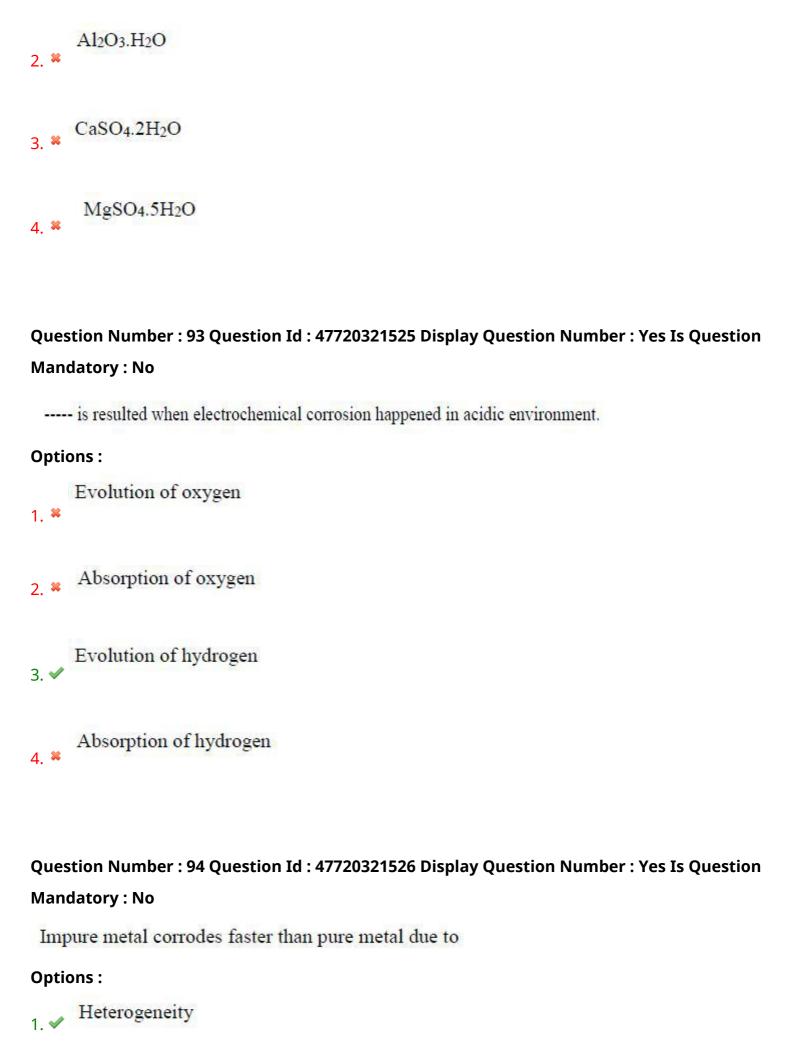
Question Number : 91 Question Id : 47720321523 Display Question Number : Yes Is Question Mandatory : No

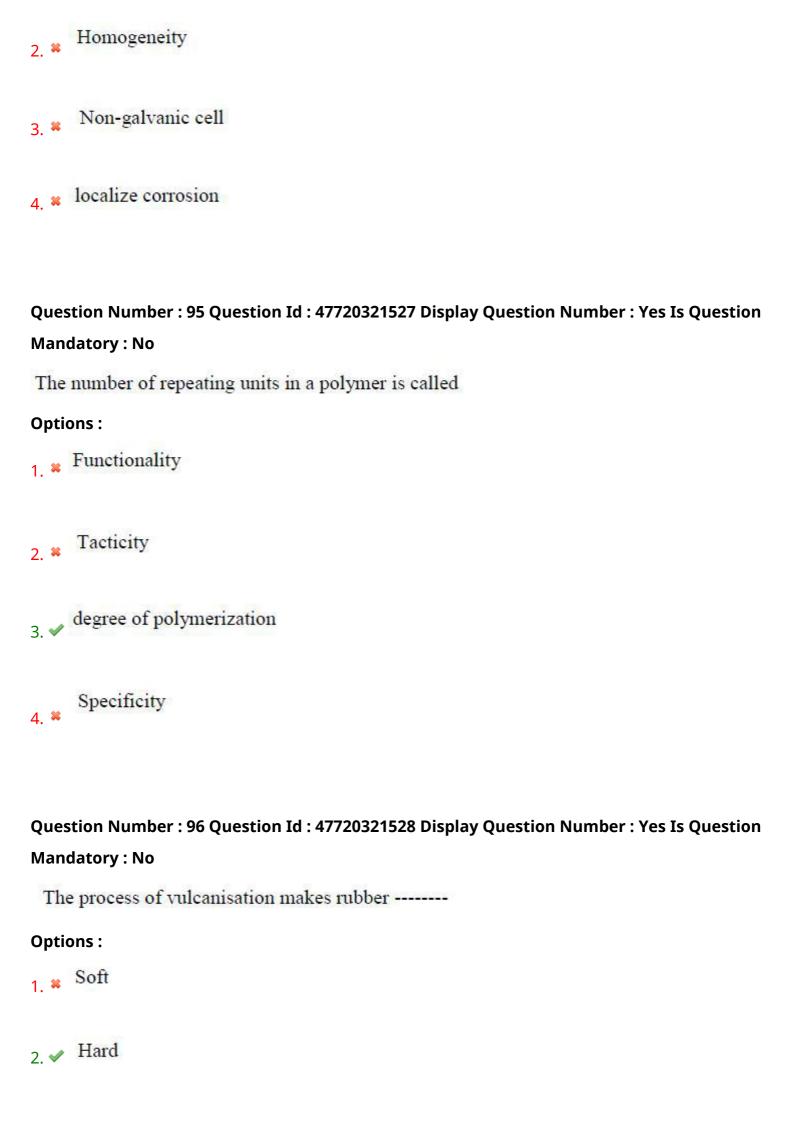
Which of the following is used as effective coagulant in the municipal water treatment to remove fine suspended and colloidal impurities?

Options:

Question Number : 92 Question Id : 47720321524 Display Question Number : Yes Is Question Mandatory : No

The general chemical formula of zeolite is





- 3. * Elastic
- 4. Swells oils

Question Number : 97 Question Id : 47720321529 Display Question Number : Yes Is Question Mandatory : No

Which of the following is thermosetting plastic

Options:

- 1. PVC
- 2. * Polystyrene
- 3. * Teflon
- 4. Bakelite

Question Number : 98 Question Id : 47720321530 Display Question Number : Yes Is Question

Mandatory : No

The boiling range of petrol fraction is found to be

- 1. * 120°C-180°C
- 250°C-320°C
- 3. ✓ 40⁰C-120⁰C

4. * 180°C-250°C Question Number: 99 Question Id: 47720321531 Display Question Number: Yes Is Question Mandatory: No Which of the following is not a common component of photochemical smog? **Options:** 1. Ozone 2. Acrolein 3. * Peroxyacetyl nitrate 4. Chlorofluorocarbons Question Number: 100 Question Id: 47720321532 Display Question Number: Yes Is Question Mandatory : No White lung cancer is caused by **Options:** 1. * Asbestos 2. Textiles

3. Paper

4. * Silica

Mining Engineering

Section Id: 477203424

Section Number: 4

Mandatory or Optional: Mandatory

Number of Questions: 100

Section Marks: 100

Enable Mark as Answered Mark for Review and

Yes Clear Response:

Question Number: 101 Question Id: 47720321533 Display Question Number: Yes Is Question

Mandatory: No

Which of the following is the correct order with respect to the core sizes?

Options:

1. ✓ NX>BX>AX>EX

2. * AX>BX>EX>NX

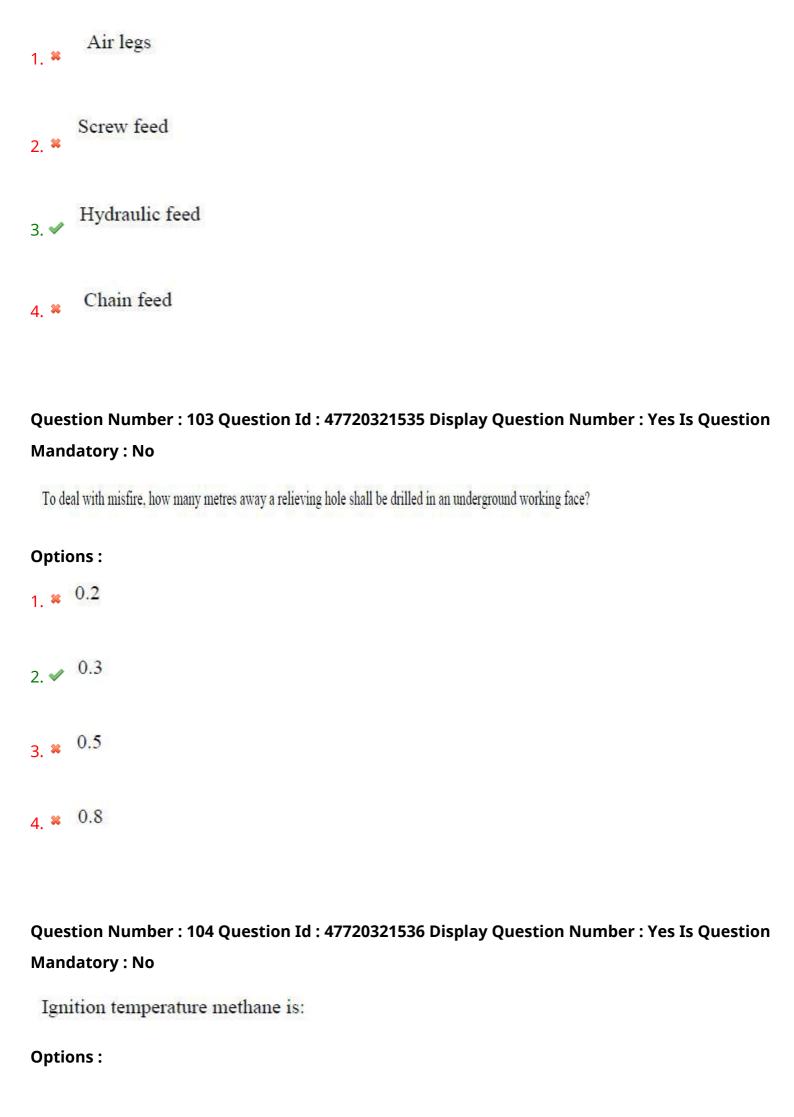
3. * AX>BX>NX>EX

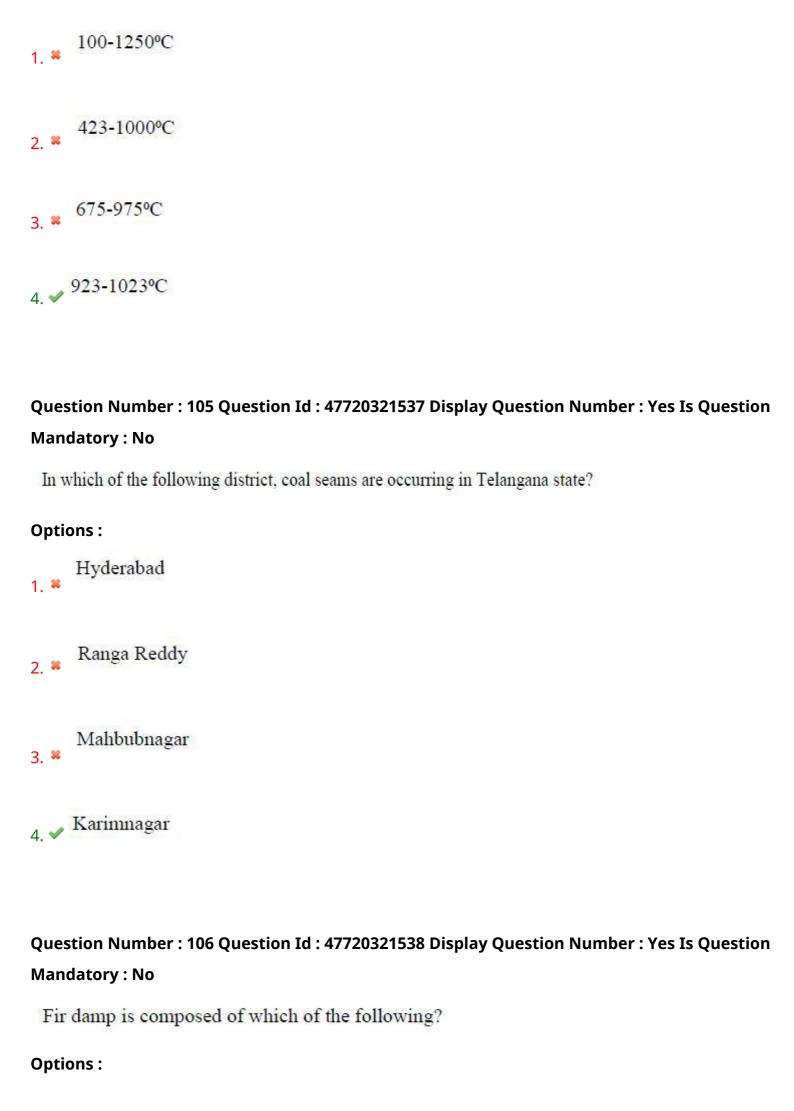
4. * EX>AX>BX>NX

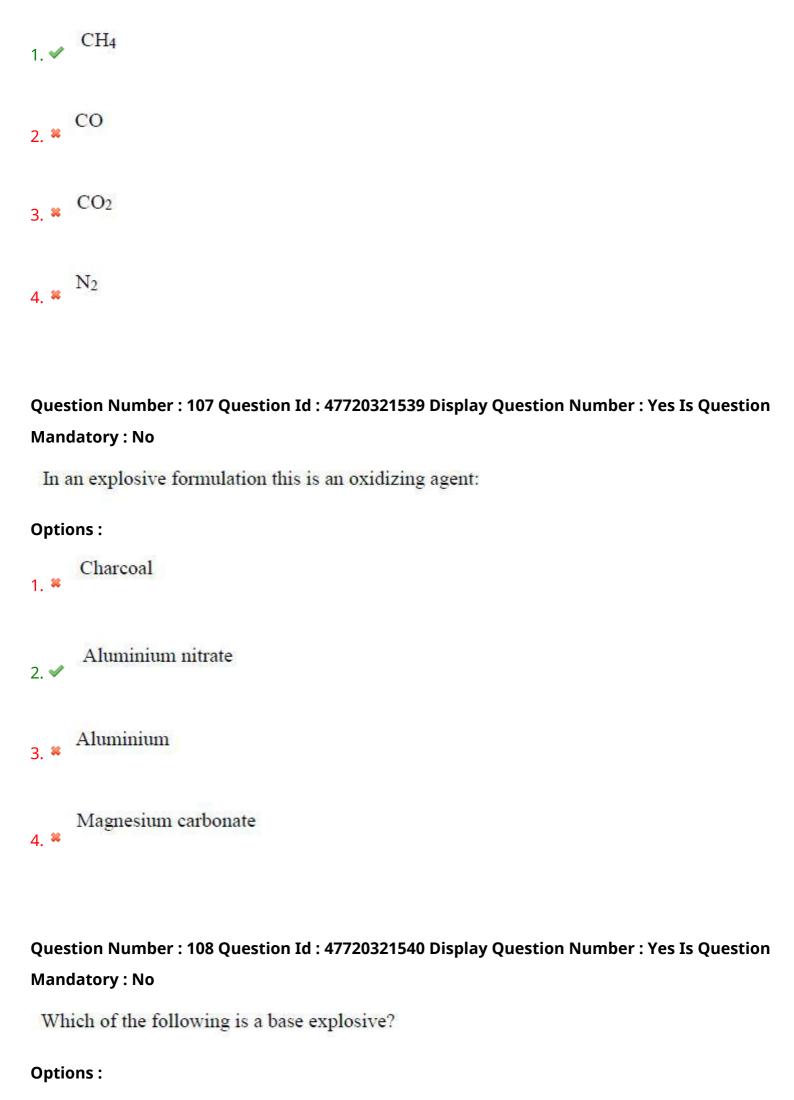
Question Number: 102 Question Id: 47720321534 Display Question Number: Yes Is Question

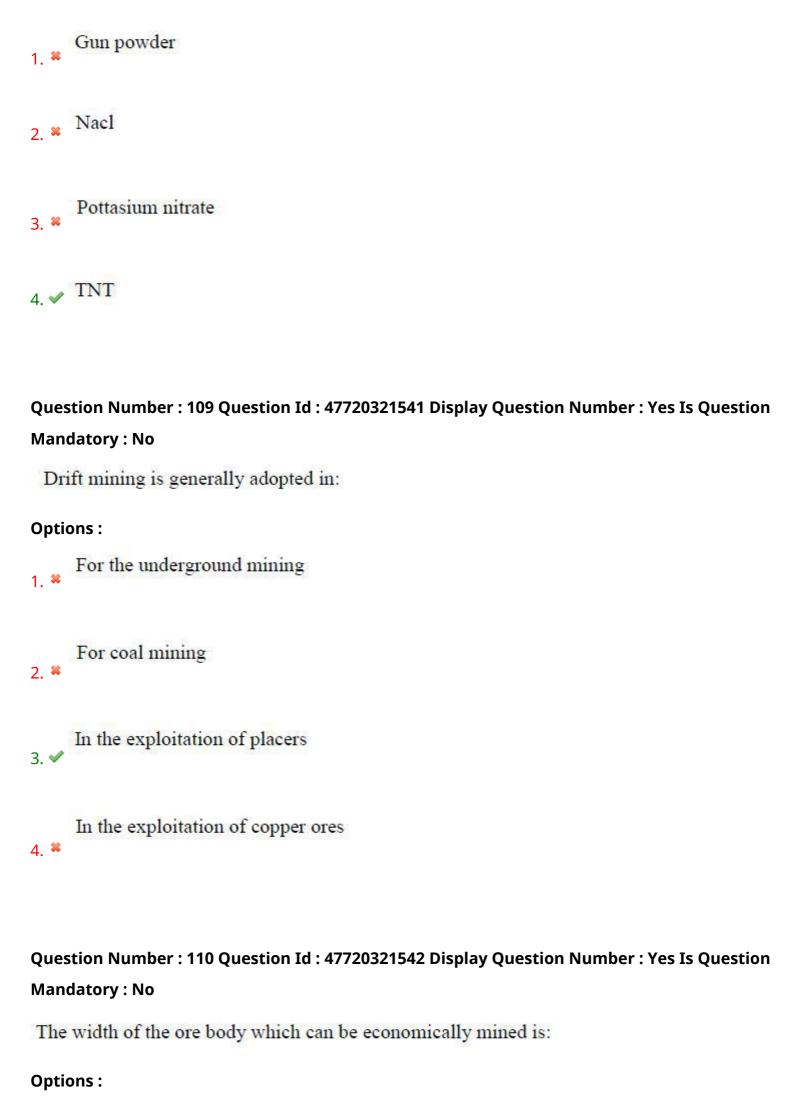
Mandatory: No

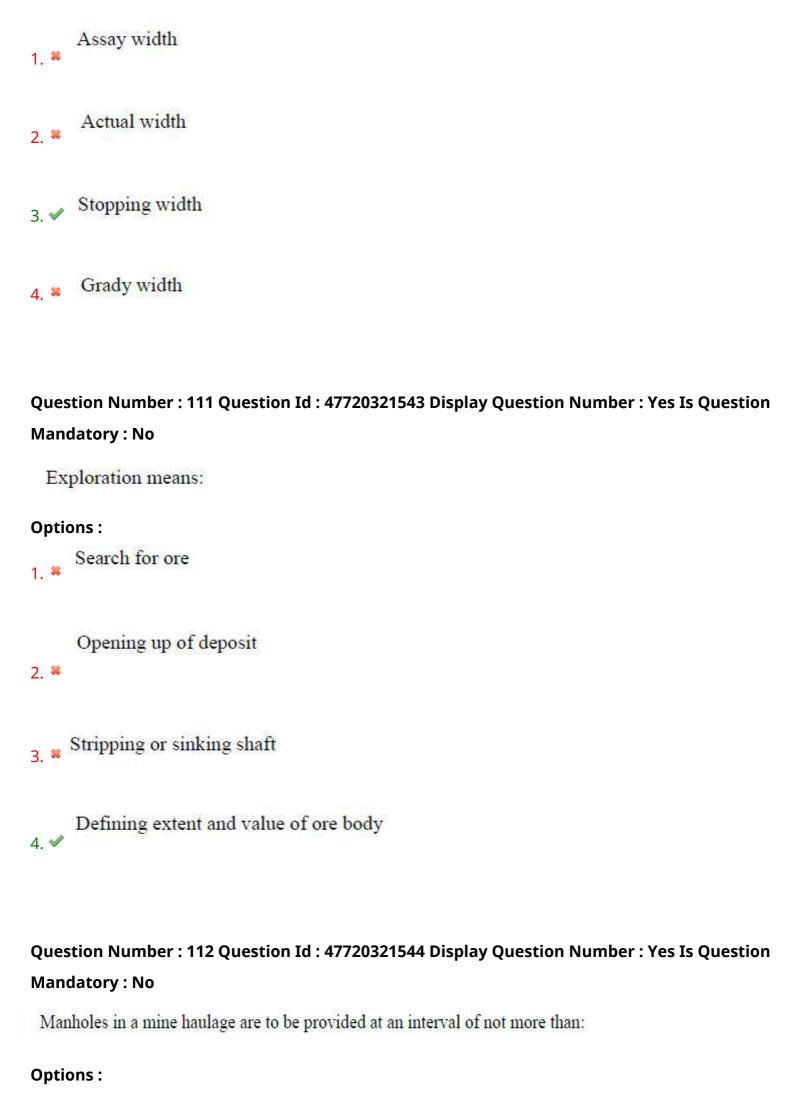
The energy transfer is smooth and more efficient in which of the following feed mechanism?







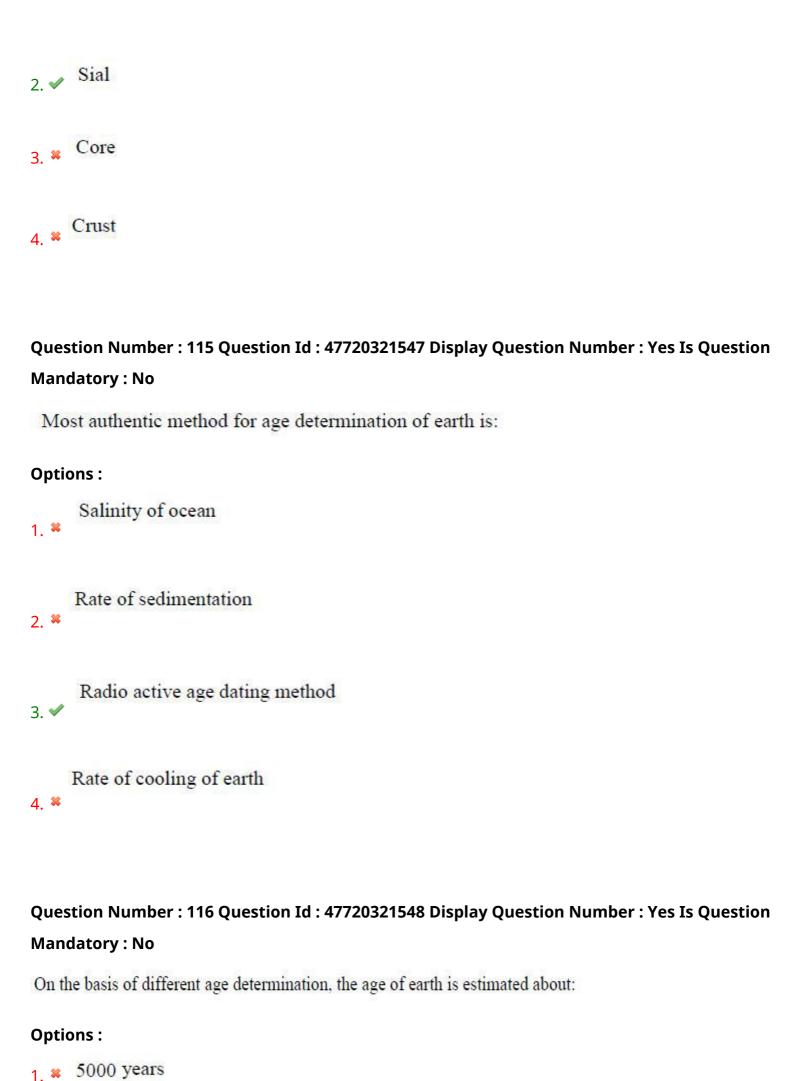




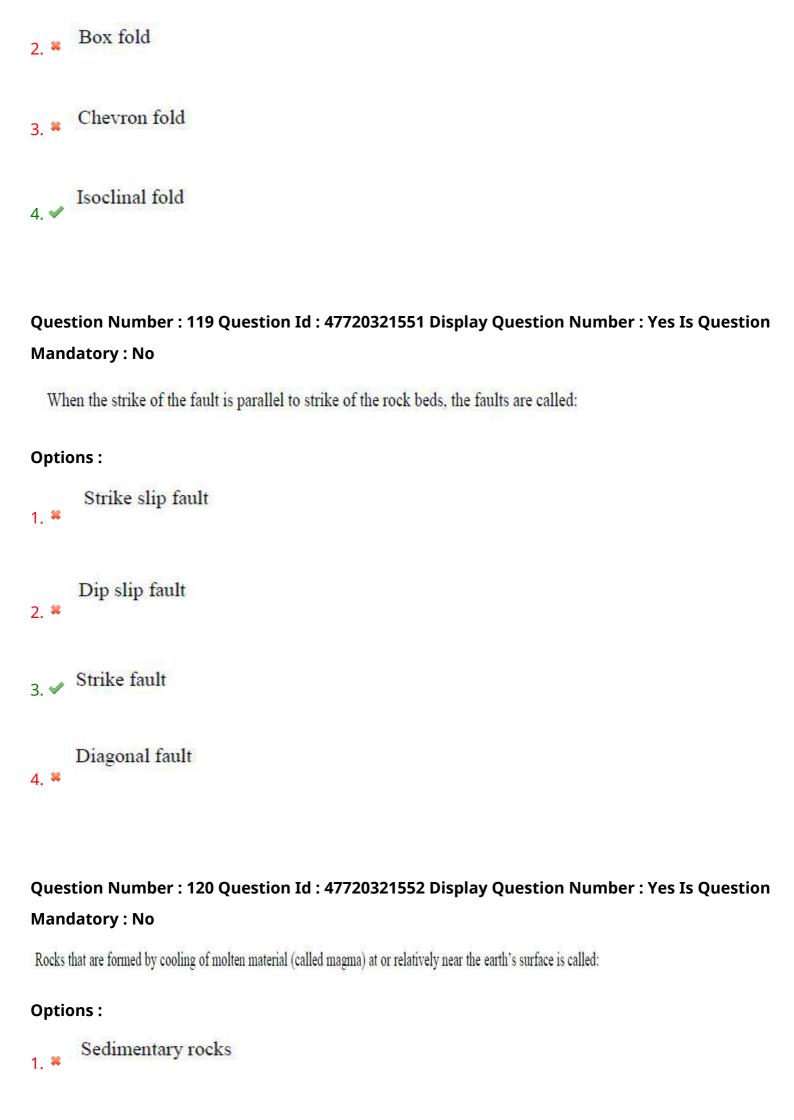
1. ** 05 m
2. ✓ ^{10 m}
3. * 15 m
4. * ^{20 m}
Question Number : 113 Question Id : 47720321545 Display Question Number : Yes Is Question
Mandatory : No
Spacing of blast holes should be how many times the burden of holes in opencast mining?
Options :
1. × ^{1.2}
2. * 1.4
3. ✓ 1.5
4. * 1.6
Question Number: 114 Question Id: 47720321546 Display Question Number: Yes Is Question
Mandatory : No
Outer surficial layer of the earth crust is called:

Options:

Mantle



```
2. 4600 million years
3. * 1000 years
4. * 100 million years
Question Number: 117 Question Id: 47720321549 Display Question Number: Yes Is Question
Mandatory: No
 A part of any stream or rock that is exposed at the surface is known as:
Options:
1. ✓ Outcrop
2. * Fault
3. * Fold
    Dyke
Question Number: 118 Question Id: 47720321550 Display Question Number: Yes Is Question
Mandatory: No
Which fold has got two hinges?
Options:
    Fan fold
```

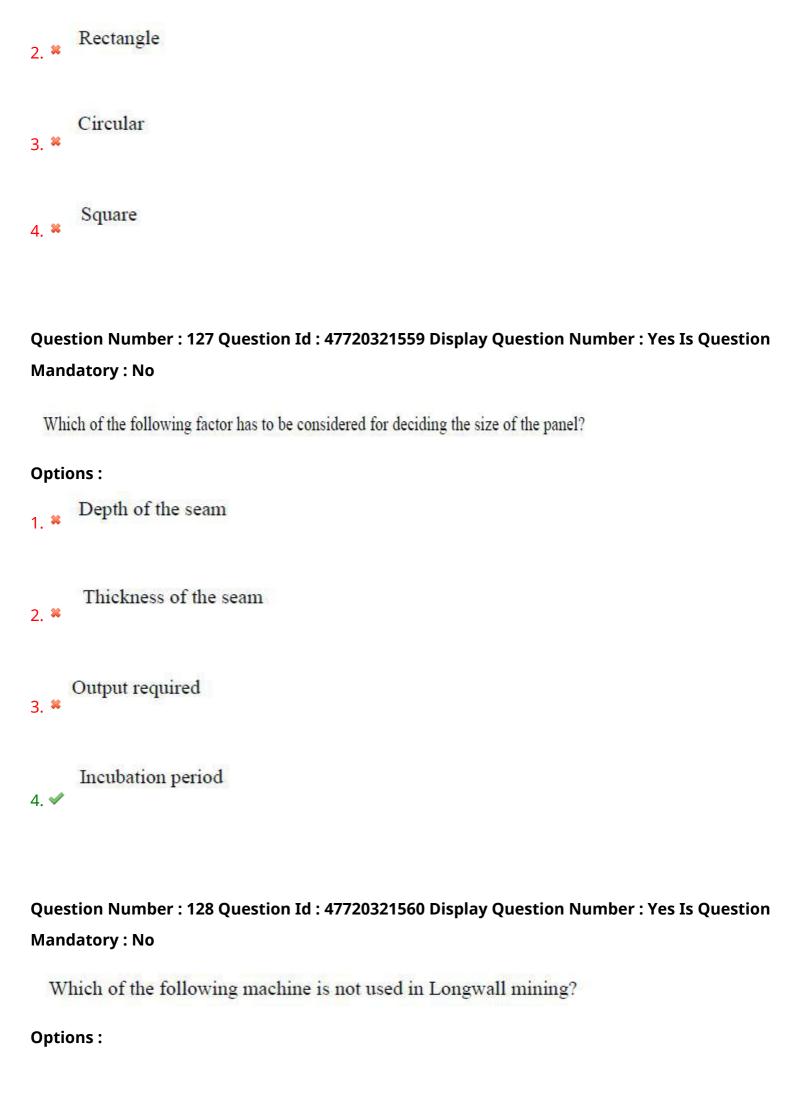


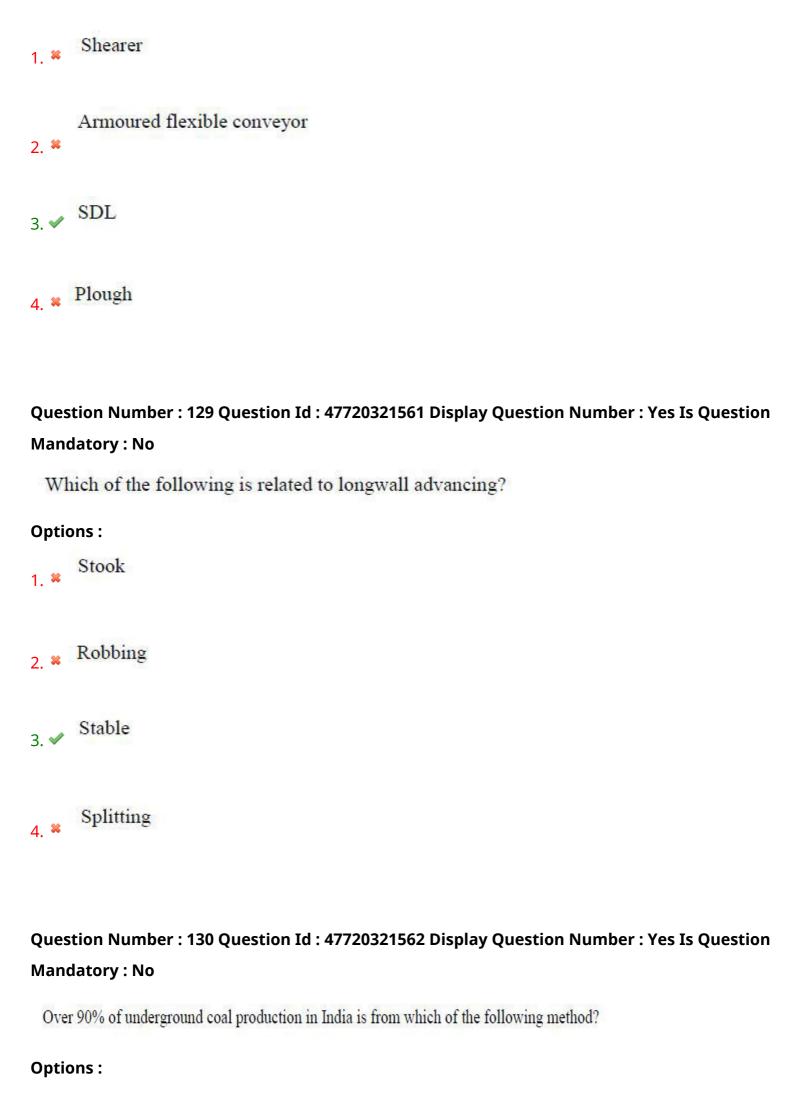
2. ✓ Igneous rocks
Metamorphic rocks 3. **
4. * Crystalline
Question Number: 121 Question Id: 47720321553 Display Question Number: Yes Is Question Mandatory: No The geological age of Gondwana rocks is believed to be during:
Options:
1. ✓ Cargoniferous to Jurassic
Archaeans to Cambrians 2. **
Cambrian to Sulirian 3. **
Cretaceous to Pliocene
Question Number : 122 Question Id : 47720321554 Display Question Number : Yes Is Question Mandatory : No
The study of fossils and their proper utilization in elucidating the past history of earth is called:
Options:

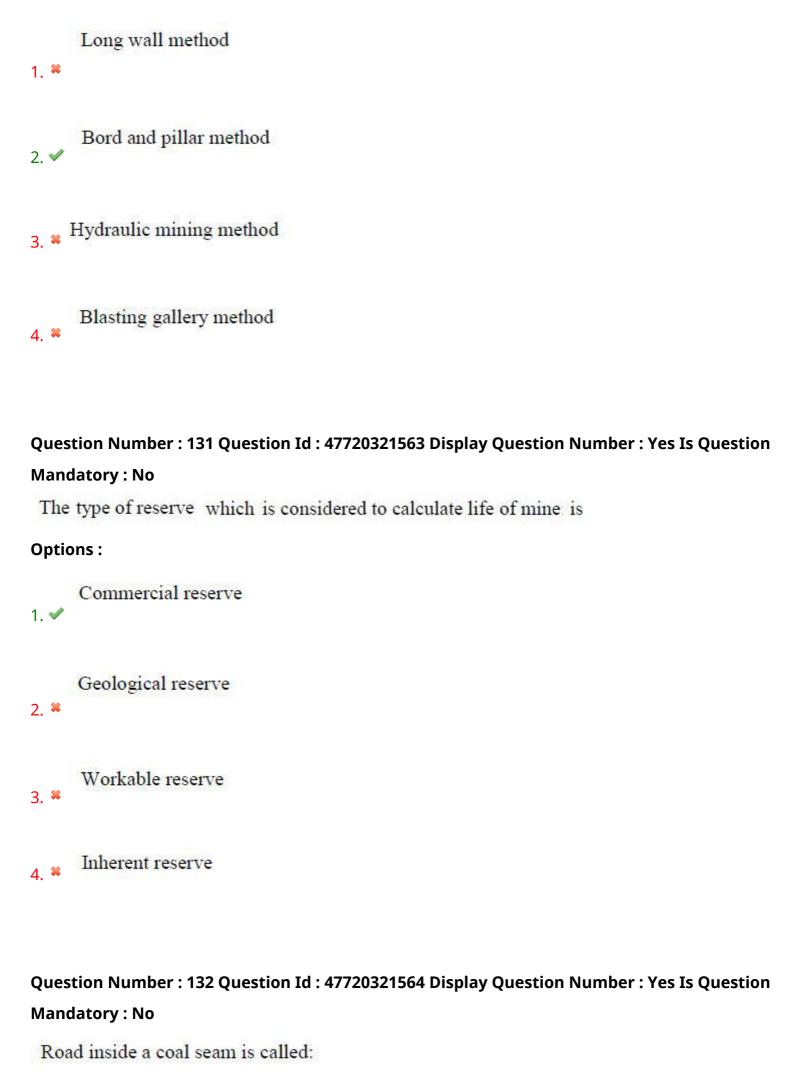
Palaeontology

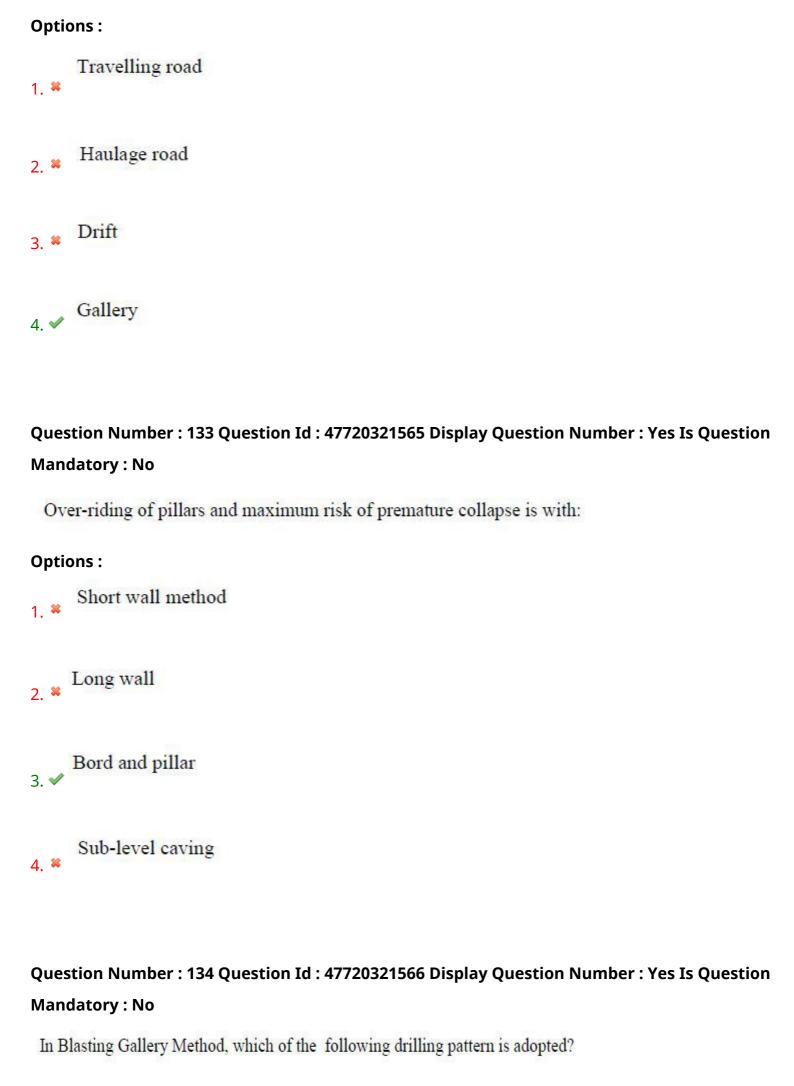
2. 🗱	Minerology
3. 🗱	Structural geology
4. **	Petrology
	tion Number : 123 Question Id : 47720321555 Display Question Number : Yes Is Question
Mand	latory : No
Wh	ich mineral is an iron ore?
Optio	ns:
1. *	Bauxite
2. 🗸	Haematite
3. **	Malachite
4. 🗱	Galena
	tion Number : 124 Question Id : 47720321556 Display Question Number : Yes Is Question
	latory : No
Bau	xite is related to which of the following:
Optio	ns:
	Aluminium

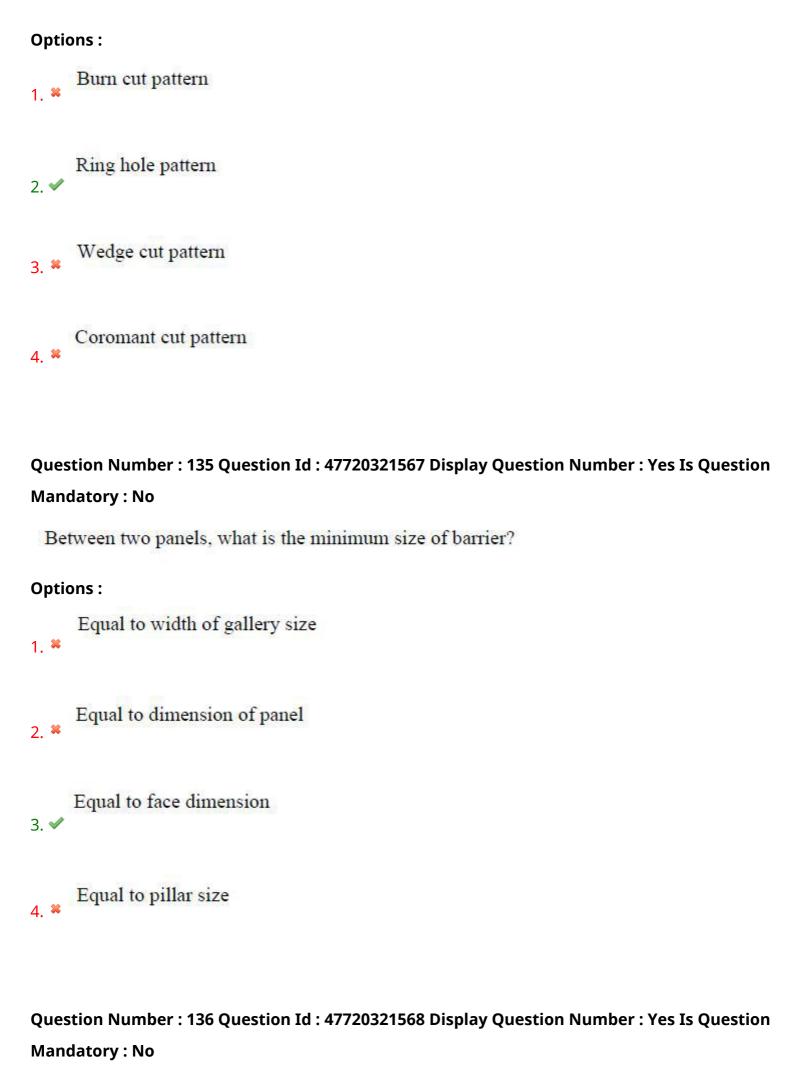
2. * Manganese
3. * Lead
4. * Tin
Question Number : 125 Question Id : 47720321557 Display Question Number : Yes Is Question
Mandatory : No
Coal seams are normally found in:
Options :
1. ** Metamorphic rocks
Igneous rocks 2. **
Sedimentary rocks 3. ✓
Crystalline 4. **
Question Number : 126 Question Id : 47720321558 Display Question Number : Yes Is Question
Mandatory : No
While using shuttle cars and joy loader in inclined coal seams, the shape of the pillar shall be:
Options:
Rhombus 1. ✔

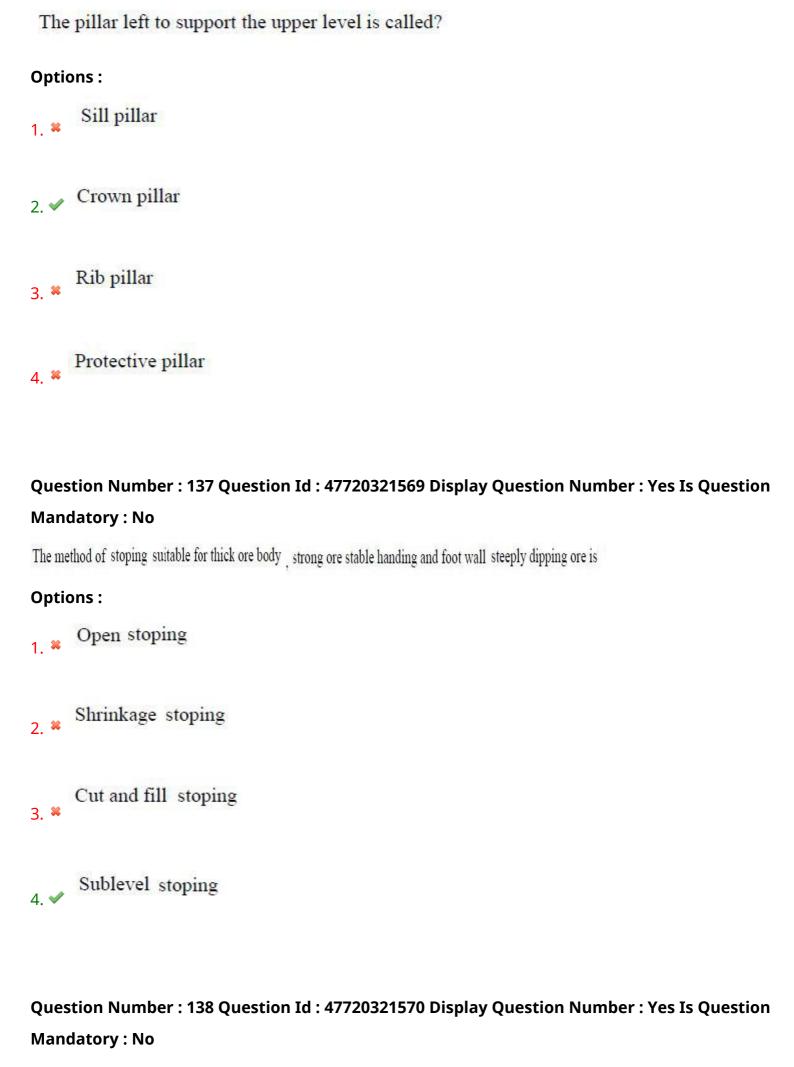


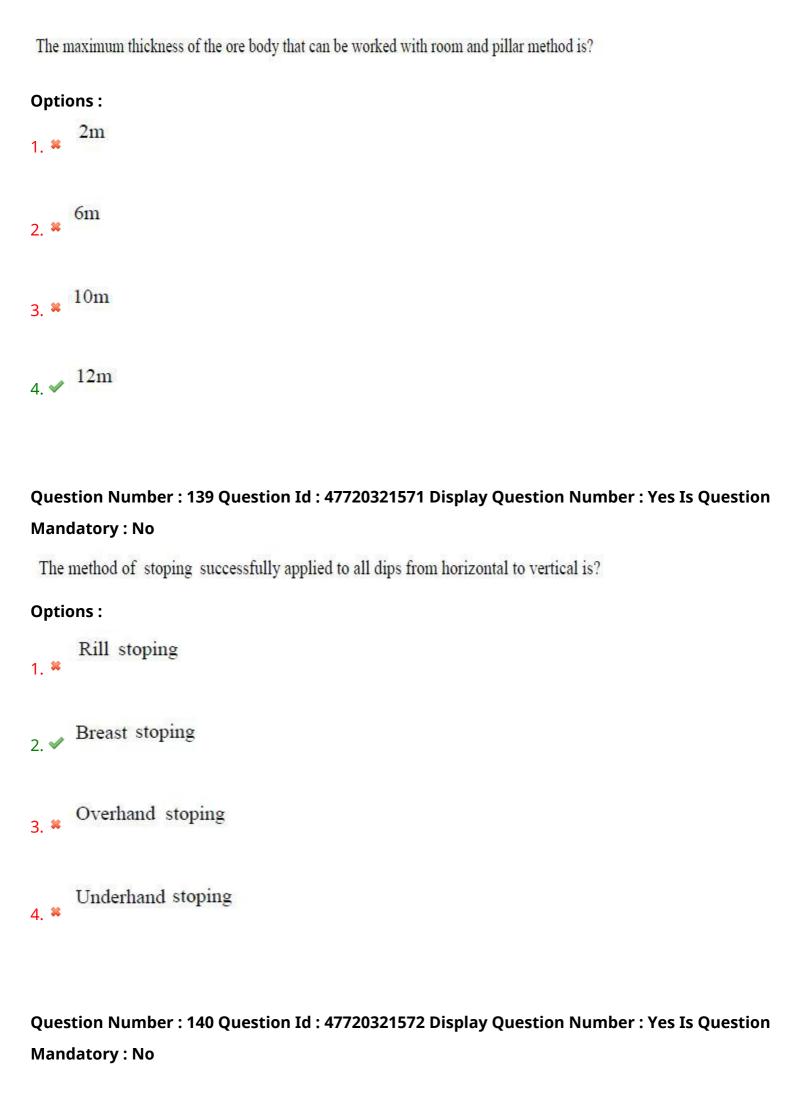


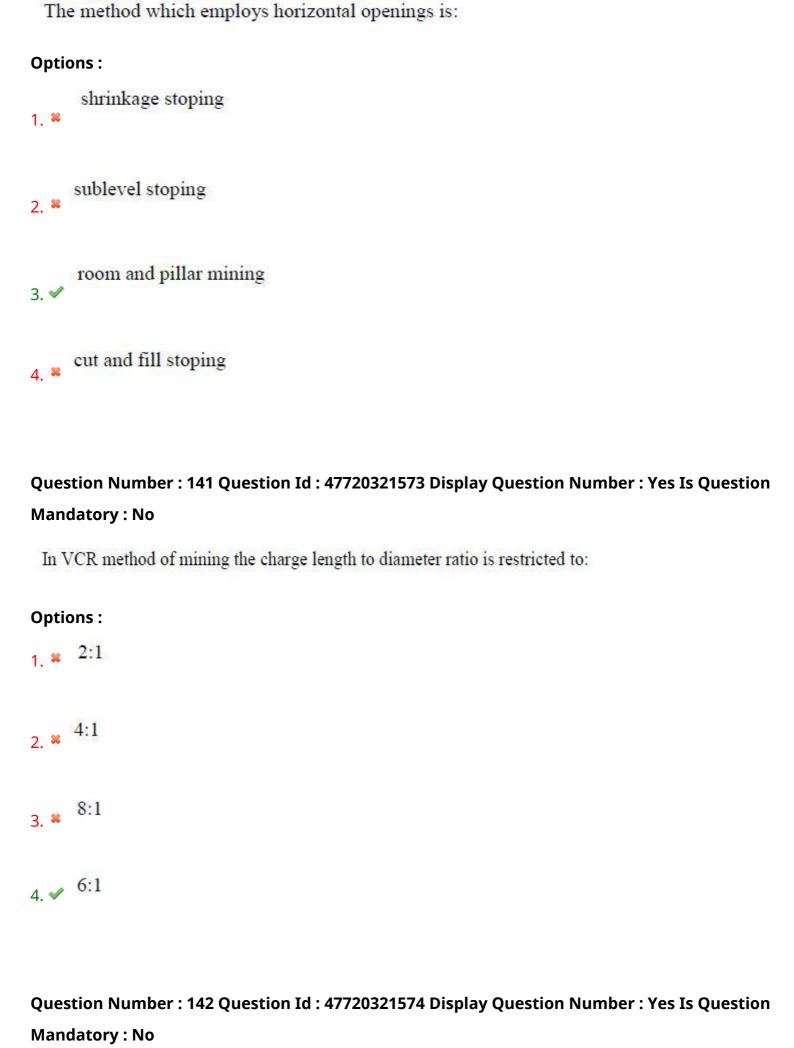










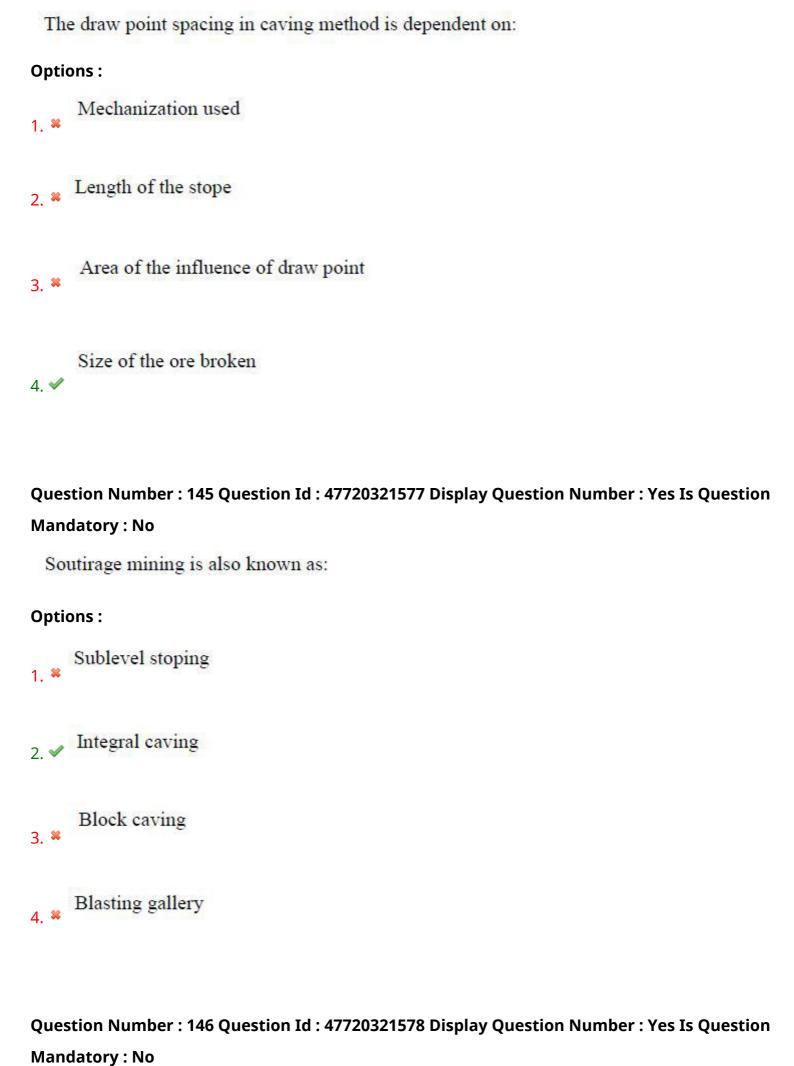


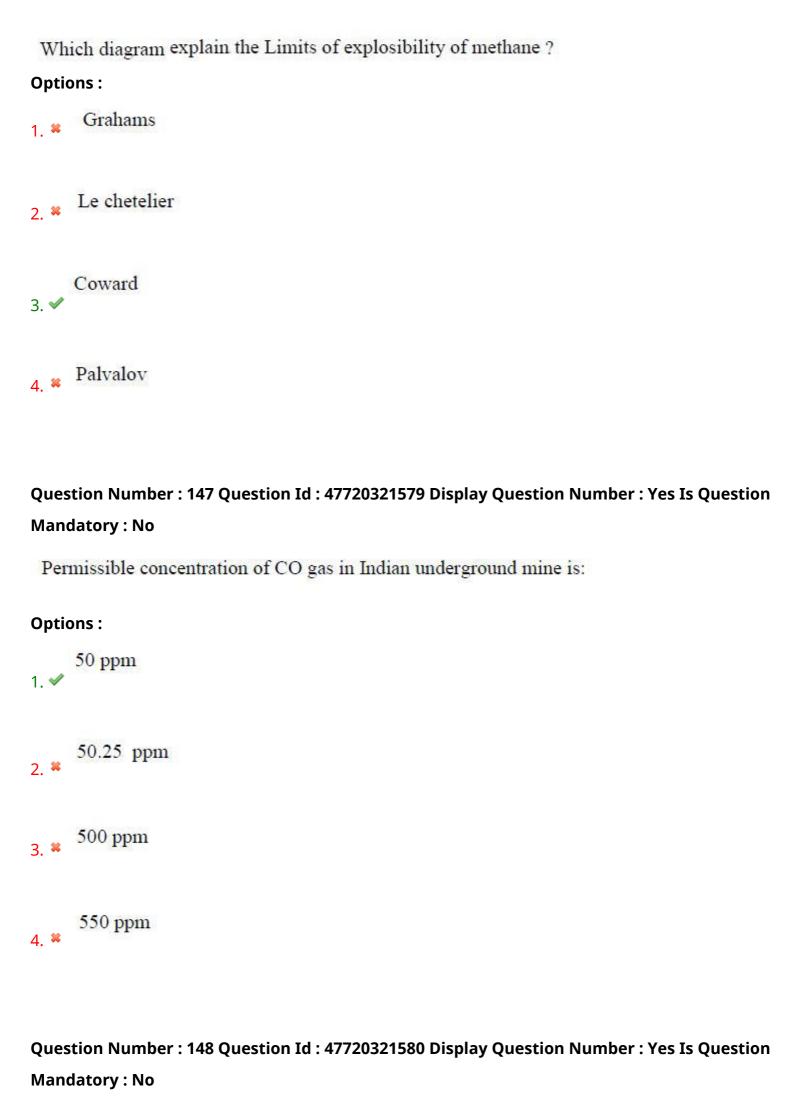
Options: Shrinkage stoping Block caving 3. * Sub level stoping Cut and fill stoping Question Number: 143 Question Id: 47720321575 Display Question Number: Yes Is Question Mandatory : No Vertical crater retreat method is a modified version of: **Options:** Sublevel Cut and fill Block caving Stope

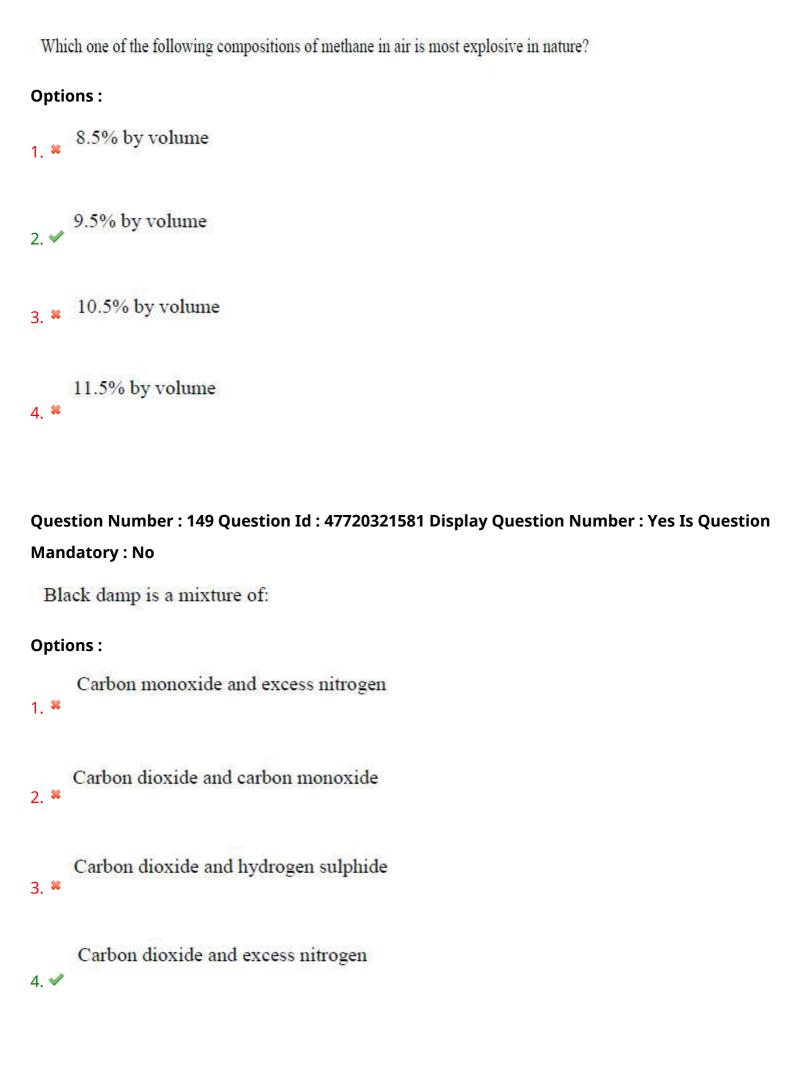
Question Number: 144 Question Id: 47720321576 Display Question Number: Yes Is Question

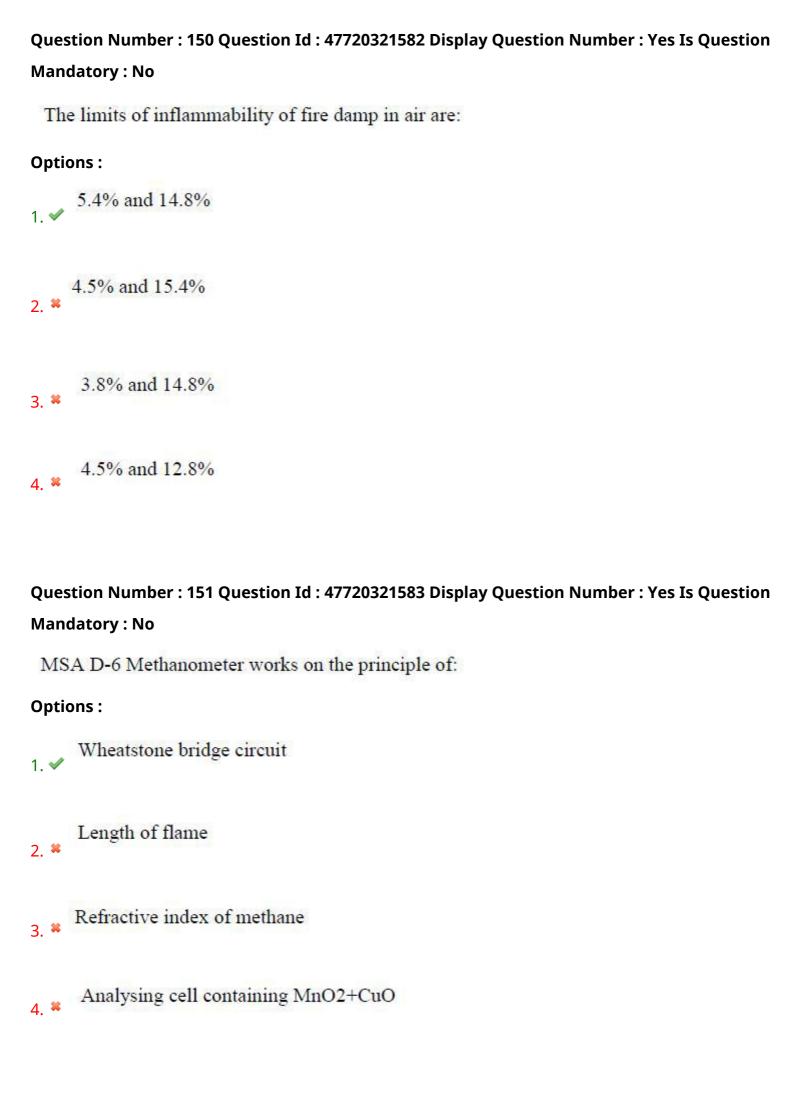
Mandatory: No

When the core sample from the ore and wall is tested low, we adopt:



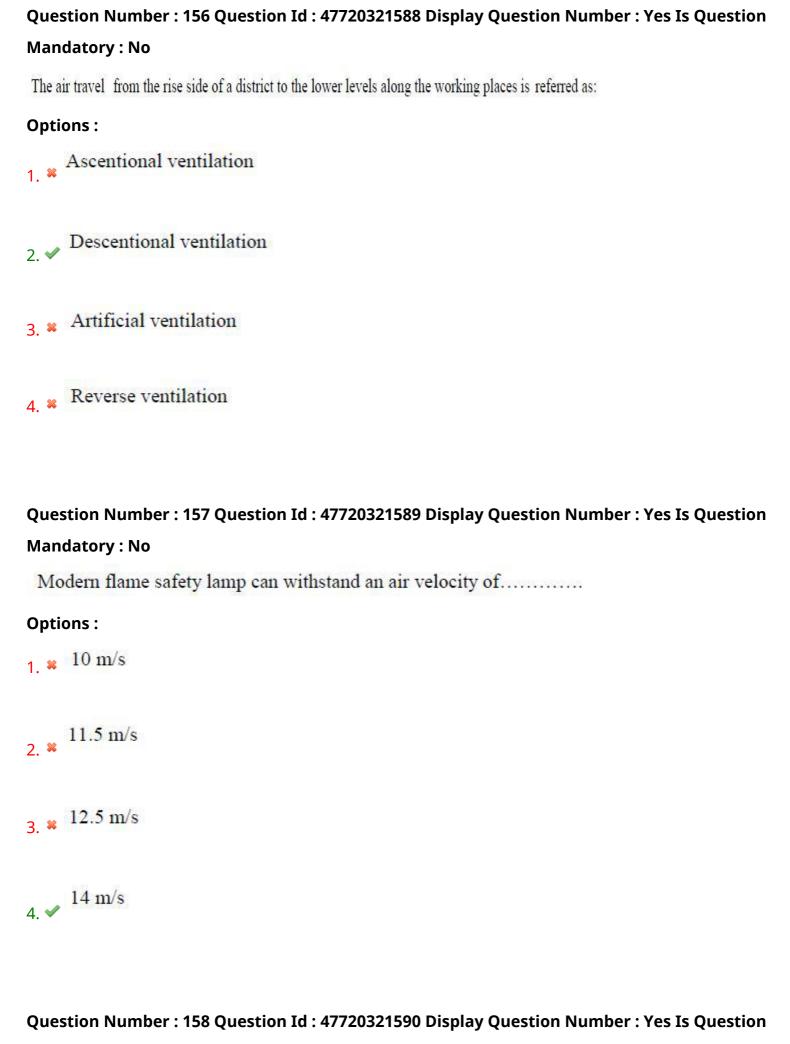




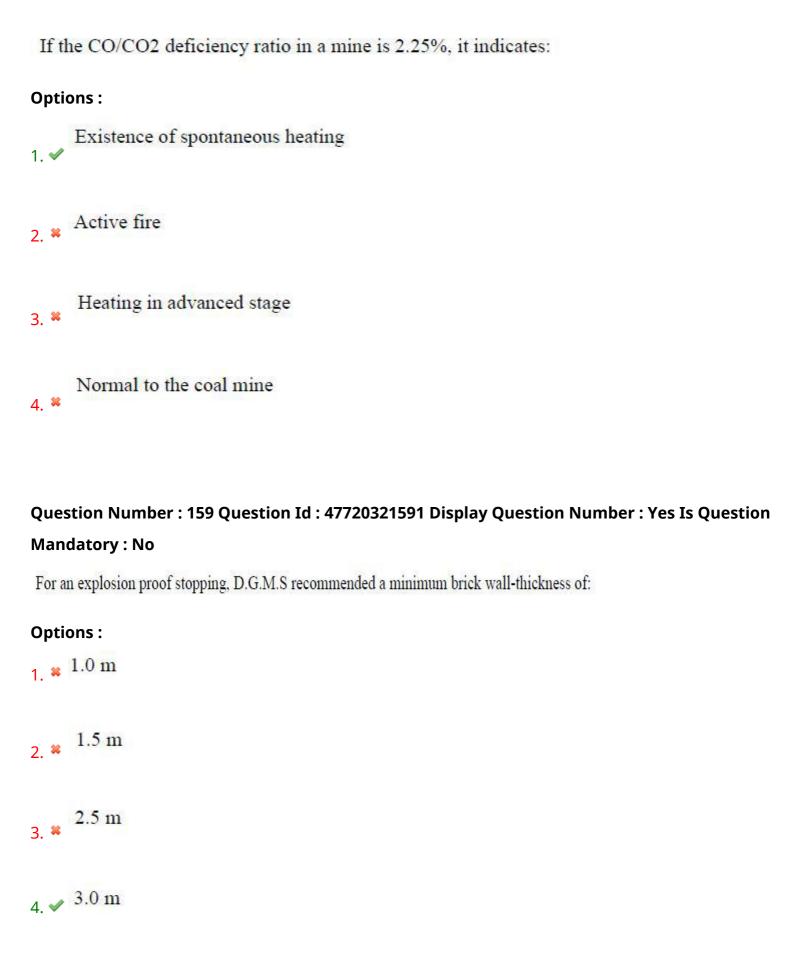


Question Number : 152 Question Id : 47720321584 Display Question Number : Yes Is Question
Mandatory : No
Which of the following instrument is used to measure the cooling power of mine air?
Options:
Manometer 1. **
Velometer 2. **
Kata Thermometer 3. ✓
Pitot tube 4. **
Question Number : 153 Question Id : 47720321585 Display Question Number : Yes Is Question Mandatory : No
Mandatory : No
Mandatory : No Class B fires involves:
Mandatory: No Class B fires involves: Options: Gaseous fuels like LPG gas, butane etc.
Mandatory: No Class B fires involves: Options: Gaseous fuels like LPG gas, butane etc. 1. **

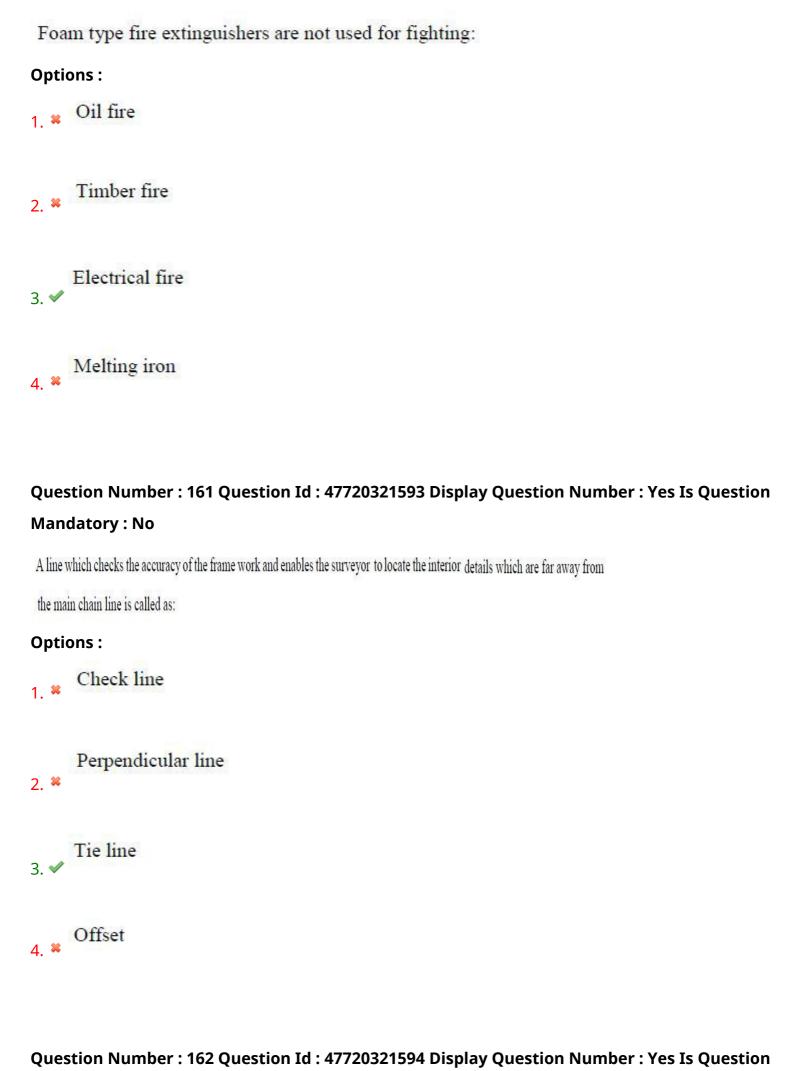
Question Number : 154 Question Id : 47720321586 Display Question Number : Yes Is Question
Mandatory : No
In a gas mask, cotton wool removes:
Options:
1. **
2. * Ammonia
3. Dust and smoke
Hydrogen sulphide 4. **
Question Number : 155 Question Id : 47720321587 Display Question Number : Yes Is Question Mandatory : No
Mandatory : No
Mandatory: No In a self-contained breathing apparatus, which valve allows the escape of any oxygen in excess of the wearers requirement?
Mandatory: No In a self-contained breathing apparatus, which valve allows the escape of any oxygen in excess of the wearers requirement? Options:
Mandatory: No In a self-contained breathing apparatus, which valve allows the escape of any oxygen in excess of the wearers requirement? Options: Inhalation valve
Mandatory: No In a self-contained breathing apparatus, which valve allows the escape of any oxygen in excess of the wearers requirement? Options: Inhalation valve Relief valve Except of any oxygen in excess of the wearers requirement?



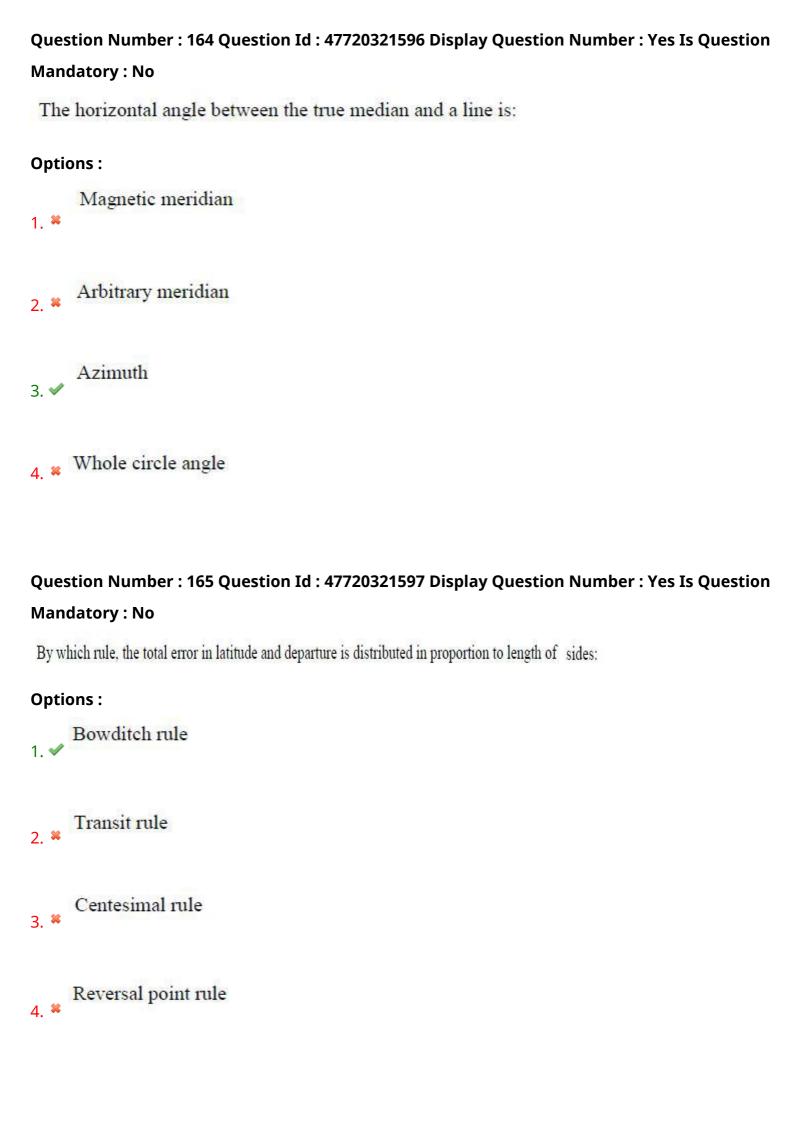
Mandatory : No



Question Number : 160 Question Id : 47720321592 Display Question Number : Yes Is Question Mandatory : No



Mandatory: No When the instrument is correctly levelled, the height of plane of collimation is synonymous with: Options: Height of instrument Plus sight Turning point Intermediate sight Question Number: 163 Question Id: 47720321595 Display Question Number: Yes Is Question Mandatory: No Which of the following system is used to working out the reduced levels of points from the staff readings taken in field? Options: 1. * Bench marking Rise and fall system Ranging system Reconnaissance



Question Number : 166 Question Id : 47720321598 Display Question Number : Yes Is Question
Mandatory : No
Fixed hair rule and modified hair rule methods are the classifications of which method of tachometry:
Options:
Inclined sights 1. **
Tangential method 2. **
3. * Vernier scaling method
Stadia method 4. ✓
Question Number : 167 Question Id : 47720321599 Display Question Number : Yes Is Question
Question Number : 167 Question Id : 47720321599 Display Question Number : Yes Is Question Mandatory : No
Mandatory : No
Mandatory: No Which is the instrument used in in finding the area of plots, especially when the boundaries are irregular or curved?
Mandatory: No Which is the instrument used in in finding the area of plots, especially when the boundaries are irregular or curved? Options:
Mandatory: No Which is the instrument used in in finding the area of plots, especially when the boundaries are irregular or curved? Options: Compass Coniometer
Mandatory: No Which is the instrument used in in finding the area of plots, especially when the boundaries are irregular or curved? Options: Compass Coniometer Theodolite

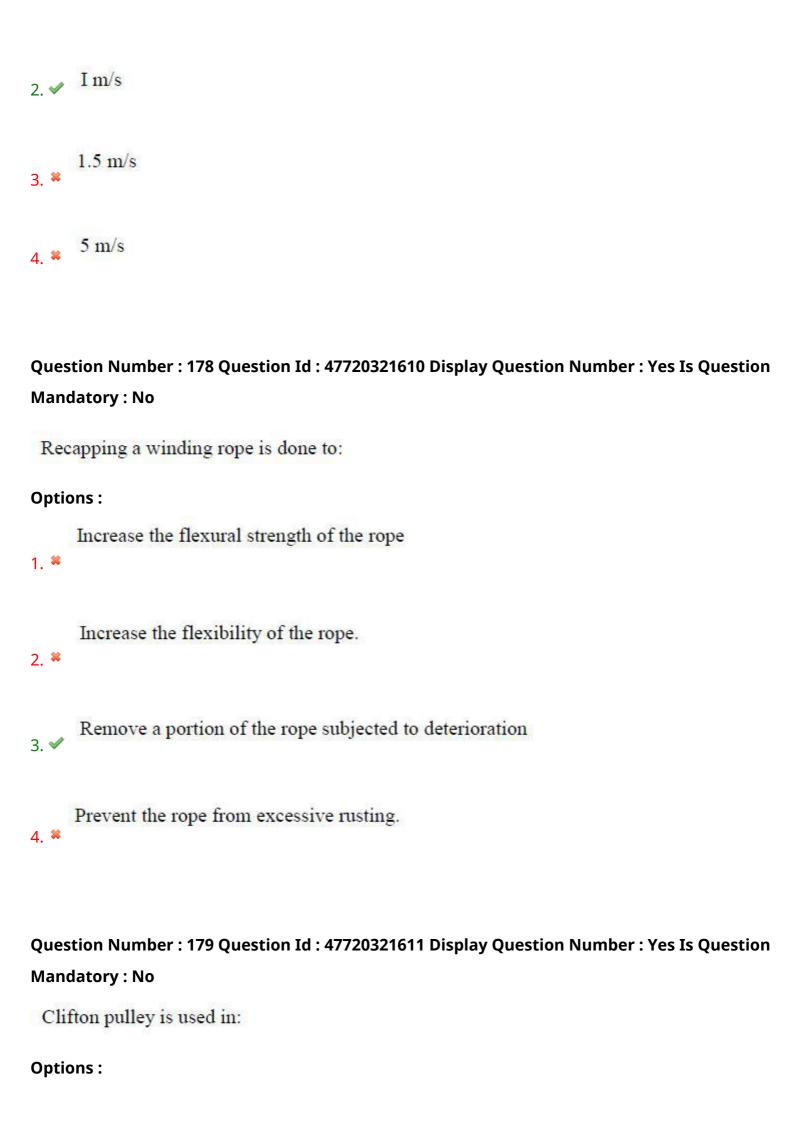
Question Number : 168 Question Id : 47720321600 Display Question Number : Yes Is Question
Mandatory : No
In weissbach triangle method of correlation, the number of shafts used for correlation are:
Options:
1. * Two
2. ✓ one
Three 3. **
Four 4. **
Question Number : 169 Question Id : 47720321601 Display Question Number : Yes Is Question
Mandatory : No
The main principle of surveying is to work from:
Options:
1. * Part to whole
Whole to part 2. ✔
Whole to part
2. ✔ Whole to part Higher to lower level

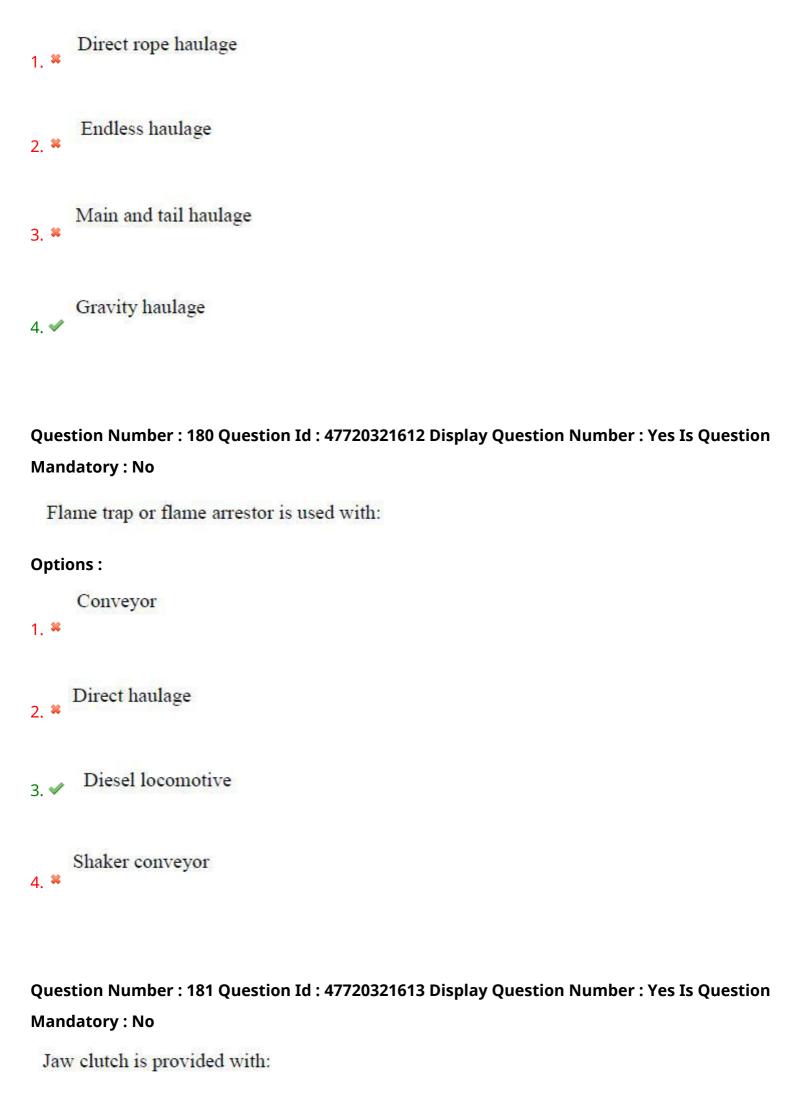
Question Number : 170 Question Id : 47720321602 Display Question Number : Yes Is Question Mandatory : No
The upper plate of theodolite is fixed to:
Options:
inner spindle 1. ✓
Levelling head 2. **
outer spindle 3. **
Tripod 4. **
Question Number : 171 Question Id : 47720321603 Display Question Number : Yes Is Question Mandatory : No
Mandatory : No
Mandatory : No The parallax can be removed by:
Mandatory: No The parallax can be removed by: Options: Focusing the eyepiece
Mandatory: No The parallax can be removed by: Options: Focusing the eyepiece 1. ** Focusing the objective

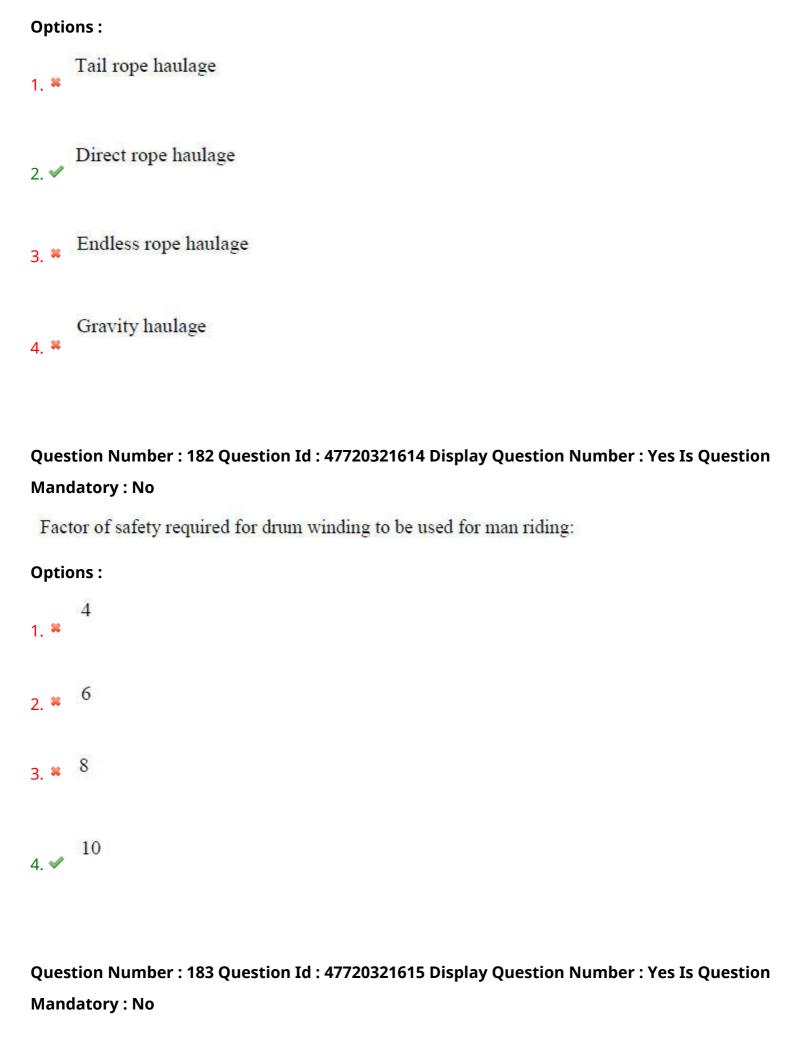
Question Number : 172 Question Id : 47720321604 Display Question Number : Yes Is Question Mandatory : No
A deflection angle is:
Options: Always between 90 and 180 degrees 1. **
Difference between included angle and 180 degrees 2. ✓
Less than 90 degrees 3. **
Difference between 360 degree and included angle 4. *
Question Number : 173 Question Id : 47720321605 Display Question Number : Yes Is Question Mandatory : No
While taking a back sight, the screw used is:
Options :
Upper tangent 1. **
Upper clamp 2. **
Vertical clamp 3. **

Lower clamp 4. ✓
Question Number : 174 Question Id : 47720321606 Display Question Number : Yes Is Question Mandatory : No
The horizontal angle between two lines is generally measured:
Options :
Clockwise from the backward station 1. ✓
Counter-clockwise from the forward station 2. **
Counter-clockwise from the back station 3. **
Clockwise from the forward station 4. **
Question Number : 175 Question Id : 47720321607 Display Question Number : Yes Is Question Mandatory : No
Which of the following sentence is incorrect?
Options :
The axes of the plate level is perpendicular to the vertical axis 1. **
The axis of the altitude level is parallel to the line of collimation when it is horizontal and the vertical circle reads zero 2. **

The line of collimation is parallel to the horizontal axis 3. ✓
The horizontal axis is perpendicular to the vertical axis 4. **
Question Number : 176 Question Id : 47720321608 Display Question Number : Yes Is Question Mandatory : No
Which one of the following haulages is preferred for undulating roadways:
Options:
Direct rope haulage 1. ✓
Endless 'haulage 2. **
Tail rope haulage 3. **
Main and tail rope haulage 4. 4. 4. 4. 4. 4. 4. 4.
Question Number : 177 Question Id : 47720321609 Display Question Number : Yes Is Question
Mandatory : No
As per mining regulation, for every shaft exceeding 100 m depth and during hoisting men' the speed should not exceed:
Options:
0.5 m/s







With DERD shearer the cut coal is thrown on the armoured face conveyor by: Options: Centrifugal face 1. * By the movement of the machine By the gummer 3. ** Deflected by the plough 4. Question Number: 184 Question Id: 47720321616 Display Question Number: Yes Is Question Mandatory: No By varying the pitch of the blades, the pressure generated by axial flow fan Options: Remains same 1. * Decreases

Increases

4. * Decreases to zero

Question Number : 185 Question Id : 47720321617 Display Question Number : Yes Is Question
Mandatory : No
The space factor for stranded rope is:
Options:
30 to 40 %
1. W
2. ✓ 40 to 50 %
50 to 60 %
3. **
65 to 75 %
4. **
Question Number : 186 Question Id : 47720321618 Display Question Number : Yes Is Question
Mandatory : No
The correct place for tensioning arrangement in endless rope haulage is:
Options:
At the top of the incline
1. *
At the bottom of the incline 2. **
Any point on the level roadway
3. *

At the point where slack rope is most likely to occur
4. ✓
Question Number : 187 Question Id : 47720321619 Display Question Number : Yes Is Question
Mandatory : No
Which of the following is correct regarding limiting fleet angle to 1.5°?
Options :
To reduce wear of the winding rope
1. ❖
To reduce side travel on the pulley
2. **
To allow maximum persons to travel
3. *
Allowing the use of lesser diameter winding rope
4. **
Question Number : 188 Question Id : 47720321620 Display Question Number : Yes Is Question
Mandatory : No
A continuous miner is a:
A continuous fillier is a.
Options :
Cutting-cum-loading equipment.
1. ✓
Cutting equipment 2. **

```
Loading equipment.
     Transporting equipment
Question Number: 189 Question Id: 47720321621 Display Question Number: Yes Is Question
Mandatory: No
The equipment which is not used in Bord and Pillar system of working is:
Options:
     side discharge loader.
    load haul dumper.
     scraper
coal plough
Question Number: 190 Question Id: 47720321622 Display Question Number: Yes Is Question
Mandatory: No
Which one of the following powered roof supports does not contain a canopy?
Options:
1. Chock support
```

2. **

Pure shield support Chock shield support Question Number: 191 Question Id: 47720321623 Display Question Number: Yes Is Question Mandatory: No How many litres of water (minimum) per day per person shall be provided to workers by Owner/Agent/ Manager, as per The Mines Rules, 1956? Options: 1. * 1 Question Number: 192 Question Id: 47720321624 Display Question Number: Yes Is Question Mandatory: No

Which of the following option is correct regarding quality assurance (QA) and quality control (QC)

Shield support

Options:

1. 🗸

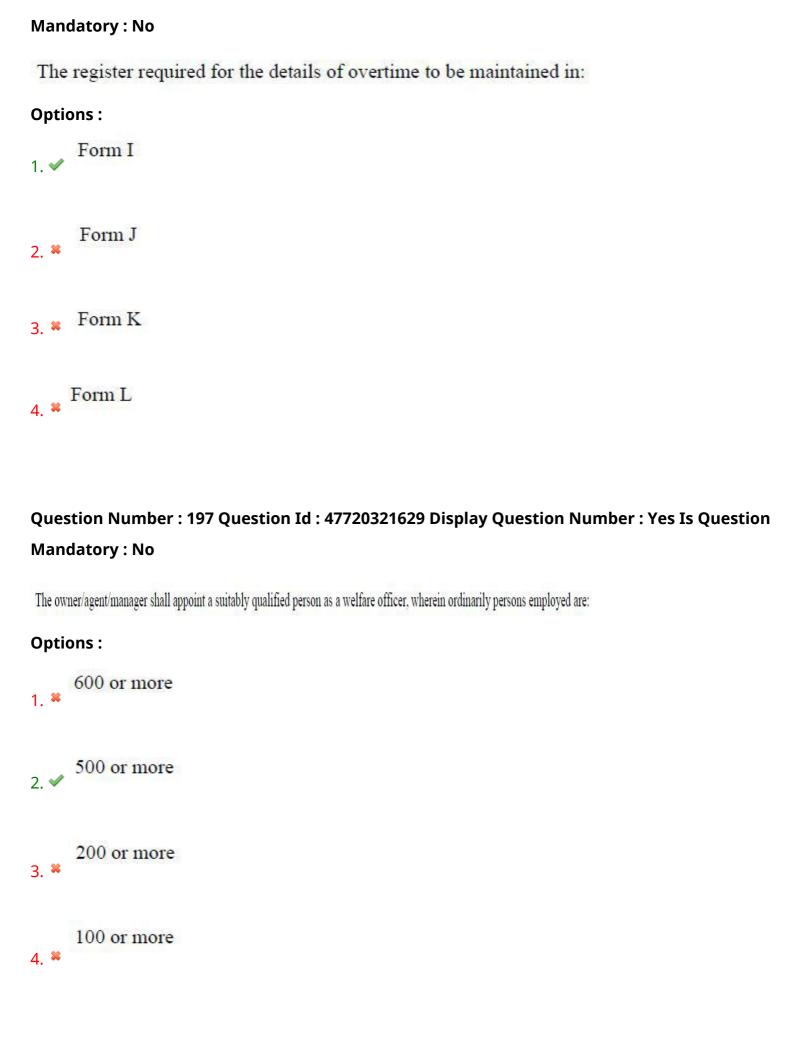
QC is an integral part of QA
QA is an integral part of QC
QA and QC are independent to each other 3. **
QC may or may not depend on QA
Question Number : 193 Question Id : 47720321625 Display Question Number : Yes Is Question Mandatory : No
Which Act provides for appointment of conciliation officers and adjudication authorities?
Options:
The Factories Act,1948 1. **
The Industrial Disputes Act, 1947 2. ✓
The Trades Unions Act, 1926
The Mines Act, 1952
Question Number : 194 Question Id : 47720321626 Display Question Number : Yes Is Question

Mandatory : No

Which one of the following is correct regarding minimum standard of illumination in lux for haul roads, for dumper trucks in an opencast mine? Note: H-horizontal Options: 1. **✓** 10 H 15 H 3. ***** 20 H 4. ***** 25 H Question Number: 195 Question Id: 47720321627 Display Question Number: Yes Is Question **Mandatory: No** With permission of Chief Inspector, number of hours of work (including interval for rest) in any one day for above ground shall not exceed: **Options:** 1. * 12 2. 🗸 14

3. * 15

4. * 16



Question Number : 198 Question Id : 47720321630 Display Question Number : Yes Is Question

Mandatory: No

Every mine manager of an underground mine shall be assisted by a safety officer to promote safety and safe practices in the mine when the output exceeds per month?

Options:

- 1000 tons
- 3000 tons
- 3. **8** 8000 tons
- 4. **✓** 5000 tons

Question Number : 199 Question Id : 47720321631 Display Question Number : Yes Is Question Mandatory : No

The renewal period for wage agreement in years for workers in coal mines presently is:

Options:

- 1. * 3
- 2. **
- 3. 🗸 🍮
- 4. * 6

Question Number: 200 Question Id: 47720321632 Display Question Number: Yes Is Question

Mandatory : No

How many years of practical experience Superintendent of Rescue Station should have in below ground mines?

Options:

1 year

2. ***** 3 years

4 years

4. ✓ 5 years