

# Question Paper Preview

## Notations :

- Options shown in green color and with ✓ icon are correct.
- Options shown in red color and with ✗ icon are incorrect.

<b>Subject Name:</b>	Stream SA
<b>Creation Date:</b>	2016-11-09 16:30:18
<b>Duration:</b>	180
<b>Total Marks:</b>	100
<b>Display Marks:</b>	Yes
<b>Calculator:</b>	Scientific
<b>Magnifying Glass Required?:</b>	No
<b>Ruler Required?:</b>	No
<b>Eraser Required?:</b>	No
<b>Scratch Pad Required?:</b>	No
<b>Rough Sketch/Notepad Required?:</b>	No
<b>Protractor Required?:</b>	No

## Part I Mathematics

Display Number Panel:	Yes
Group All Questions:	No

Question Number : 1 Question Id : 4356472001 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Suppose the quadratic polynomial  $P(x) = ax^2 + bx + c$  has positive coefficients  $a, b, c$  in arithmetic progression in that order. If  $P(x) = 0$  has integer roots  $\alpha$  and  $\beta$ , then  $\alpha + \beta + \alpha\beta$  equals

- A. 3                      B. 5                      C. 7                      D. 14

## Options :

- ✗ A
- ✗ B
- ✓ C
- ✗ D

Question Number : 2 Question Id : 4356472002 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

The number of digits in the decimal expansion of  $16^{55}5^{16}$  is

- A. 16                      B. 17                      C. 18                      D. 19

Options :

1. ✘ A  
2. ✘ B  
3. ✔ C  
4. ✘ D

Question Number : 3 Question Id : 4356472003 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Let  $t$  be real number such that  $t^2 = at + b$  for some positive integers  $a$  and  $b$ . Then for any choice of positive integers  $a$  and  $b$ ,  $t^3$  is never equal to

- A.  $4t + 3$               B.  $8t + 5$               C.  $10t + 3$               D.  $6t + 5$

Options :

1. ✘ A  
2. ✔ B  
3. ✘ C  
4. ✘ D

Question Number : 4 Question Id : 4356472004 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Consider the equation  $(1 + a + b)^2 = 3(1 + a^2 + b^2)$ , where  $a, b$  are real numbers. Then

- A. there is no solution pair  $(a, b)$   
B. there are infinitely many solution pairs  $(a, b)$   
C. there are exactly two solution pairs  $(a, b)$   
D. there is exactly one solution pair  $(a, b)$

Options :

1. ✘ A  
2. ✘ B  
3. ✘ C  
4. ✔ D

Question Number : 5 Question Id : 4356472005 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Let  $a_1, a_2, \dots, a_{100}$  be non-zero real numbers such that

$$a_1 + a_2 + \dots + a_{100} = 0.$$

Then

- A.  $\sum_{i=1}^{100} a_i 2^{a_i} > 0$  and  $\sum_{i=1}^{100} a_i 2^{-a_i} < 0$
- B.  $\sum_{i=1}^{100} a_i 2^{a_i} \geq 0$  and  $\sum_{i=1}^{100} a_i 2^{-a_i} \geq 0$
- C.  $\sum_{i=1}^{100} a_i 2^{a_i} \leq 0$  and  $\sum_{i=1}^{100} a_i 2^{-a_i} \leq 0$
- D. the sign of  $\sum_{i=1}^{100} a_i 2^{a_i}$  or  $\sum_{i=1}^{100} a_i 2^{-a_i}$  depends on the choice of  $a_i$ 's

Options :

1.  A
2.  B
3.  C
4.  D

Question Number : 6 Question Id : 4356472006 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Let  $ABCD$  be a trapezium, in which  $AB$  is parallel to  $CD$ ,  $AB = 11$ ,  $BC = 4$ ,  $CD = 6$  and  $DA = 3$ . The distance between  $AB$  and  $CD$  is

- A. 2
- B. 2.4
- C. 2.8
- D. not determinable with the data

Options :

1.  A
2.  B
3.  C
4.  D

Question Number : 7 Question Id : 4356472007 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

The points  $A, B, C, D, E$  are marked on the circumference of a circle in clockwise direction such that  $\angle ABC = 130^\circ$  and  $\angle CDE = 110^\circ$ . The measure of  $\angle ACE$  in degrees is

- A.  $50^\circ$
- B.  $60^\circ$
- C.  $70^\circ$
- D.  $80^\circ$

Options :

1.  A
2.  B
3.  C
4.  D

Question Number : 8 Question Id : 4356472008 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Three circles of radii 1, 2 and 3 units respectively touch each other externally in the plane. The circumradius of the triangle formed by joining the centers of the circles is

- A. 1.5                      B. 2                      C. 2.5                      D. 3

Options :

1. ✘ A  
2. ✘ B  
3. ✔ C  
4. ✘ D

Question Number : 9 Question Id : 4356472009 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Let  $P$  be a point inside a triangle  $ABC$  with  $\angle ABC = 90^\circ$ . Let  $P_1$  and  $P_2$  be the images of  $P$  under reflection in  $AB$  and  $BC$  respectively. The distance between the circumcenters of triangles  $ABC$  and  $P_1PP_2$  is

- A.  $\frac{AB}{2}$                       B.  $\frac{AP+BP+CP}{3}$   
C.  $\frac{AC}{2}$                       D.  $\frac{AB+BC+AC}{2}$

Options :

1. ✘ A  
2. ✘ B  
3. ✔ C  
4. ✘ D

Question Number : 10 Question Id : 4356472010 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Let  $a$  and  $b$  be two positive real numbers such that  $a + 2b \leq 1$ . Let  $A_1$  and  $A_2$  be, respectively, the areas of circles with radii  $ab^3$  and  $b^2$ . Then the maximum possible value of  $\frac{A_1}{A_2}$  is

- A.  $\frac{1}{16}$                       B.  $\frac{1}{64}$                       C.  $\frac{1}{16\sqrt{2}}$                       D.  $\frac{1}{32}$

Options :

1. ✘ A  
2. ✔ B  
3. ✘ C  
4. ✘ D

Question Number : 11 Question Id : 4356472011 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

There are two candles of same length and same size. Both of them burn at uniform rate. The first one burns in 5 hours and the second one burns in 3 hours. Both the candles are lit together. After how many minutes the length of the first candle is 3 times that of the other?

- A. 90                      B. 120                      C. 135                      D. 150

Options :

1. ✘ A  
2. ✘ B  
3. ✘ C  
4. ✔ D

Question Number : 12 Question Id : 4356472012 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

Consider a cuboid all of whose edges are integers and whose base is a square. Suppose the sum of all its edges is numerically equal to the sum of the areas of all its six faces. Then the sum of all its edges is

- A. 12                      B. 18                      C. 24                      D. 36

Options :

1. ✘ A  
2. ✘ B  
3. ✔ C  
4. ✘ D

Question Number : 13 Question Id : 4356472013 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

Let  $A_1, A_2, \dots, A_m$  be non-empty subsets of  $\{1, 2, 3, \dots, 100\}$  satisfying the following conditions:

- (1) the numbers  $|A_1|, |A_2|, \dots, |A_m|$  are distinct;  
(2)  $A_1, A_2, \dots, A_m$  are pairwise disjoint.

(Here  $|A|$  denotes the number of elements in the set  $A$ .)

Then the maximum possible value of  $m$  is

- A. 13                      B. 14                      C. 15                      D. 16

Options :

1. ✔ A  
2. ✘ B  
3. ✘ C  
4. ✘ D

Question Number : 14 Question Id : 4356472014 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical



Correct : 1

The number of all 2-digit numbers  $n$  such that  $n$  is equal to the sum of the square of digit in its tens place and the cube of the digit in units place is

- A. 0                      B. 1                      C. 2                      D. 4

Options :

1. ✘ A  
2. ✘ B  
3. ✔ C  
4. ✘ D

Question Number : 15 Question Id : 4356472015 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Let  $f$  be a function defined on the set of all positive integers such that  $f(xy) = f(x) + f(y)$  for all positive integers  $x, y$ . If  $f(12) = 24$  and  $f(8) = 15$ , the value of  $f(48)$  is

- A. 31                      B. 32                      C. 33                      D. 34

Options :

1. ✘ A  
2. ✘ B  
3. ✘ C  
4. ✔ D

Part I Physics

Display Number Panel:

Yes

Group All Questions:

No

Question Number : 16 Question Id : 4356472016 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

A person walks  $25.0^\circ$  north of east for 3.18 km. How far would she have to walk due north and then due east to arrive at the same location?

- A. towards north 2.88 km and towards east 1.34 km.  
B. towards north 2.11 km and towards east 2.11 km  
C. towards north 1.25 km and towards east 1.93 km  
D. towards north 1.34 km and towards east 2.88 km.

Options :

1. ✘ A

2. ✘ B

3. ✘ C

4. ✔ D

Question Number : 17 Question Id : 4356472017 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

The length and width of a rectangular room are measured to be  $3.95 \pm 0.05$  m and  $3.05 \pm 0.05$  m, respectively. The area of the floor is

A.  $12.05 \pm 0.01 \text{ m}^2$ .

B.  $12.05 \pm 0.005 \text{ m}^2$ .

C.  $12.05 \pm 0.34 \text{ m}^2$ .

D.  $12.05 \pm 0.40 \text{ m}^2$ .

Options :

1. ✘ A

2. ✘ B

3. ✔ C

4. ✘ D

Question Number : 18 Question Id : 4356472018 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

A car goes around uniform circular track of radius  $R$  at a uniform speed  $v$  once in every  $T$  seconds. The magnitude of the centripetal acceleration is  $a_c$ . If the car now goes uniformly around a larger circular track of radius  $2R$  and experiences a centripetal acceleration of magnitude  $8a_c$ , then its time period is

A.  $2T$

B.  $3T$

C.  $T/2$

D.  $3/2 T$

Options :

1. ✘ A

2. ✘ B

3. ✔ C

4. ✘ D

Question Number : 19 Question Id : 4356472019 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

The primary and the secondary coils of a transformer contain 10 and 100 turns, respectively. The primary coil is connected to a battery that supplies a constant voltage of 1.5 volts. The voltage across the secondary coil is

- A. 1.5 V
- B. 0.15 V
- C. 0.0 V
- D. 15 V

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✔ C
- 4. ✘ D

Question Number : 20 Question Id : 4356472020 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Water falls down a 500.0 m shaft to reach a turbine which generates electricity. How much water must fall per second in order to generate  $1.00 \times 10^9$  Watts of power? (Assume 50 % efficiency of conversion and  $g = 10 \text{ m/s}^2$ )

- A. 250 m<sup>3</sup>
- B. 400 m<sup>3</sup>
- C. 500 m<sup>3</sup>
- D. 200 m<sup>3</sup>

Options :

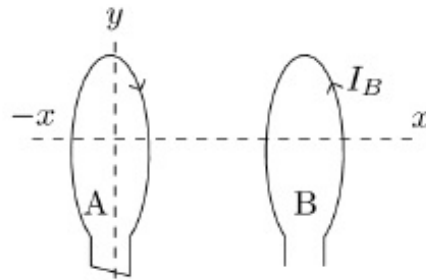
- 1. ✘ A
- 2. ✔ B
- 3. ✘ C
- 4. ✘ D

Question Number : 21 Question Id : 4356472021 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1



The diagram below shows two circular loops of wire (A and B) centred on and perpendicular to the  $x$ -axis, and oriented with their planes parallel to each other. The  $y$ -axis passes vertically through loop A (dashed line). There is a current  $I_B$  in loop B as shown. Possible actions which we might perform on loop A are:



- (i) Move A to the right along  $x$  axis closer to B
- (ii) Move A to the left along  $x$  axis away from B
- (iii) As viewed from above, rotate A clockwise about  $y$  axis
- (iv) As viewed from above, rotate A anticlockwise about  $y$  axis

Which of these actions will induce a current in A only in the direction shown.

- A. Only (i)
- B. Only (ii)
- C. Only (i) and (iv)
- D. Only (ii) and (iii)

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

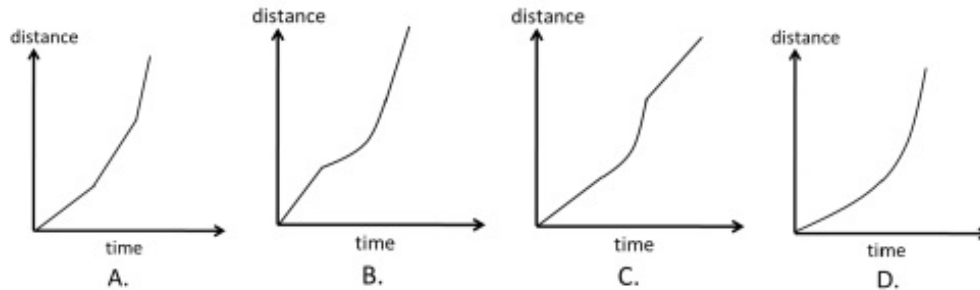
Question Number : 22 Question Id : 4356472022 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

A rigid ball rolls without slipping on a surface shown below.



Which one of the following is the most likely representation of the distance travelled by the ball vs time graph?



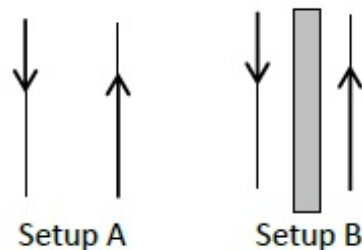
Options :

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

Question Number : 23 Question Id : 4356472023 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

In an experiment, setup A consists of two parallel wires which carry currents in opposite directions as shown in the figure. A second setup B is identical to setup A, except that there is a metal plate between the wires.



Let  $F_A$  and  $F_B$  be the magnitude of the force between the two wires in setup A and setup B, respectively.

- A.  $F_A > F_B \neq 0$
- B.  $F_A < F_B$
- C.  $F_A = F_B \neq 0$
- D.  $F_A > F_B = 0$

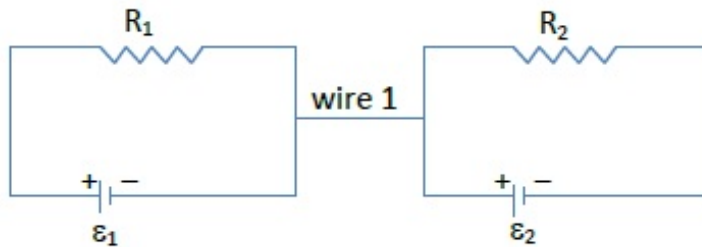
Options :

1. ✘ A
2. ✘ B
3. ✔ C
4. ✘ D

Question Number : 24 Question Id : 4356472024 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

In the circuit, wire 1 is of negligible resistance. Then



- A. Current will flow through wire 1 if  $\epsilon_1 \neq \epsilon_2$
- B. Current will flow through wire 1 if  $\epsilon_1/R_1 \neq \epsilon_2/R_2$
- C. Current will flow through wire 1 if  $(\epsilon_1 + \epsilon_2)/(R_1 + R_2) \neq (\epsilon_1 - \epsilon_2)/(R_1 - R_2)$
- D. No current will flow through wire 1.

Options :

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

Question Number : 25 Question Id : 4356472025 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

The radius of a nucleus is given by  $r_0 A^{1/3}$  where  $r_0 = 1.3 \times 10^{-15}$  m and  $A$  is the mass number of the nucleus. The Lead nucleus has  $A = 206$ . The electrostatic force between two protons in this nucleus is approximately

- A.  $10^2$  N
- B.  $10^7$  N
- C.  $10^{12}$  N
- D.  $10^{17}$  N

Options :

1. ✔ A
2. ✘ B
3. ✘ C

4. ✘ D

Question Number : 26 Question Id : 4356472026 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

A hollow lens is made of thin glass and in the shape of a double concave lens. It can be filled with air, water of refractive index 1.33 or  $\text{CS}_2$  of refractive index 1.6. It will act as a diverging lens if it is

- A. filled with air and immersed in water.
- B. filled with water and immersed in  $\text{CS}_2$ .
- C. filled with air and immersed in  $\text{CS}_2$ .
- D. filled with  $\text{CS}_2$  and immersed in water.

Options :

1. ✘ A

2. ✘ B

3. ✘ C

4. ✔ D

Question Number : 27 Question Id : 4356472027 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

A stone thrown down with a speed  $u$  takes a time  $t_1$  to reach the ground, while another stone, thrown upwards from the same point with the same speed, takes time  $t_2$ . The maximum height the second stone reaches from the ground is

- A.  $\frac{1}{2} g t_1 t_2$
- B.  $g/8 (t_1 + t_2)^2$
- C.  $g/8 (t_1 - t_2)^2$
- D.  $\frac{1}{2} g t_2^2$

Options :

1. ✘ A

2. ✘ B

3. ✔ C

4. ✘ D

Question Number : 28 Question Id : 4356472028 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

An electric field due to a positively charged long straight wire at a distance  $r$  from it is proportional to  $r^{-1}$  in magnitude. Two electrons are orbiting such a long straight wire in circular orbits of radii  $1 \text{ \AA}$  and  $2 \text{ \AA}$ . The ratio of their respective time periods is

- A. 1:1                      B. 1:2                      C. 2:1                      D. 4:1

Options :

1. ✘ A  
2. ✔ B  
3. ✘ C  
4. ✘ D

Question Number : 29 Question Id : 4356472029 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Two particles of identical mass are moving in circular orbits under a potential given by  $V(r) = Kr^{-n}$ , where  $K$  is a constant. If the radii of their orbits are  $r_1, r_2$  and their speeds are  $v_1; v_2$ , respectively, then

- A.  $v_1^2 r_1^n = v_2^2 r_2^n$   
B.  $v_1^2 r_1^{-n} = v_2^2 r_2^{-n}$   
C.  $v_1^2 r_1 = v_2^2 r_2$   
D.  $v_1^2 r_1^{2-n} = v_2^2 r_2^{2-n}$

Options :

1. ✔ A  
2. ✘ B  
3. ✘ C  
4. ✘ D

Question Number : 30 Question Id : 4356472030 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Mercury is often used in clinical thermometers. Which one of the following properties of mercury is not a reason for this?

- A. The coefficient of the thermal expansion is large.  
B. It is shiny.  
C. It is a liquid at room temperature.  
D. It has high density.

Options :



- ✘ A
- ✘ B
- ✘ C
- ✔ D

Part I Chemistry

Display Number Panel:

Yes

Group All Questions:

No

Question Number : 31 Question Id : 4356472031 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

One mole of one of the sodium salts listed below, having carbon content close to 14.3%, produces 1 mole of carbon dioxide upon heating (atomic mass Na = 23, H = 1, C = 12, O = 16). The salt is

- $C_2H_5COONa$
- $NaHCO_3$
- $HCOONa$
- $CH_3COONa$

Options :

- ✘ A
- ✔ B
- ✘ C
- ✘ D

Question Number : 32 Question Id : 4356472032 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Among formic acid, acetic acid, propanoic acid and phenol, the strongest acid in water is

- formic acid
- acetic acid
- propanoic acid
- phenol

Options :

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Question Number : 33 Question Id : 4356472033 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical  
Correct : 1

According to Graham's Law, the rate of diffusion of CO, O<sub>2</sub>, N<sub>2</sub> and CO<sub>2</sub> follows the order:

- A. CO = N<sub>2</sub> > O<sub>2</sub> > CO<sub>2</sub>
- B. CO = N<sub>2</sub> > CO<sub>2</sub> > O<sub>2</sub>
- C. O<sub>2</sub> > CO = N<sub>2</sub> > CO<sub>2</sub>
- D. CO<sub>2</sub> > O<sub>2</sub> > CO = N<sub>2</sub>

Options :

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Question Number : 34 Question Id : 4356472034 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical  
Correct : 1

The major product formed when 2-butene is reacted with O<sub>3</sub> followed by treatment with Zn/H<sub>2</sub>O is

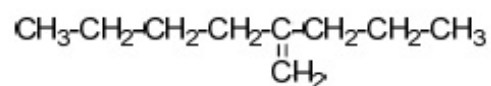
- A. CH<sub>3</sub>COOH
- B. CH<sub>3</sub>CHO
- C. CH<sub>3</sub>CH<sub>2</sub>OH
- D. CH<sub>2</sub>=CH<sub>2</sub>

Options :

1. ✗ A
2. ✓ B
3. ✗ C
4. ✗ D

Question Number : 35 Question Id : 4356472035 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical  
Correct : 1

The IUPAC name for the following compound is



- A. 2-propylhex-1-ene
- B. 2-butylpent-1-ene
- C. 2-propyl-2-butylethene
- D. propyl-1-butylethene

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 36 Question Id : 4356472036 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

The major products obtained in the reaction of oxalic acid with conc.  $\text{H}_2\text{SO}_4$  upon heating are

- A.  $\text{CO}$ ,  $\text{CO}_2$ ,  $\text{H}_2\text{O}$
- B.  $\text{CO}$ ,  $\text{SO}_2$ ,  $\text{H}_2\text{O}$
- C.  $\text{H}_2\text{S}$ ,  $\text{CO}$ ,  $\text{H}_2\text{O}$
- D.  $\text{HCOOH}$ ,  $\text{H}_2\text{S}$ ,  $\text{CO}$

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 37 Question Id : 4356472037 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

LiOH reacts with  $\text{CO}_2$  to form  $\text{Li}_2\text{CO}_3$  (atomic mass of Li = 7). The amount of  $\text{CO}_2$  (in g) consumed by 1 g of LiOH is closest to

- A. 0.916
- B. 1.832
- C. 0.544
- D. 1.088

Options :

- 1.  A
- 2.  B
- 3.  C
- 4.  D

Question Number : 38 Question Id : 4356472038 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

The oxidation number of sulphur is +4 in

- A.  $\text{H}_2\text{S}$
- B.  $\text{CS}_2$
- C.  $\text{Na}_2\text{SO}_4$
- D.  $\text{Na}_2\text{SO}_3$

Options :

- 1.  A
- 2.  B
- 3.  C
- 4.  D

Question Number : 39 Question Id : 4356472039 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

$\text{Al}_2\text{O}_3$  reacts with

- A. only water
- B. only acids
- C. only alkalis
- D. both acids and alkalis

Options :

- ✘ A
- ✘ B
- ✘ C
- ✔ D

Question Number : 40 Question Id : 4356472040 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

The major product formed in the oxidation of acetylene by alkaline  $\text{KMnO}_4$  is

- ethanol
- acetic acid
- formic acid
- oxalic acid

Options :

- ✘ A
- ✘ B
- ✘ C
- ✔ D

Question Number : 41 Question Id : 4356472041 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

In a closed vessel, an ideal gas at 1 atm is heated from  $27^\circ\text{C}$  to  $327^\circ\text{C}$ . The final pressure of the gas will approximately be

- 3 atm
- 0.5 atm
- 2 atm
- 12 atm

Options :

- ✘ A
- ✘ B
- ✔ C
- ✘ D

Question Number : 42 Question Id : 4356472042 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1



Among the elements Li, N, C and Be, one with the largest atomic radius is

- A. Li
- B. N
- C. C
- D. Be

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 43 Question Id : 4356472043 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

A redox reaction among the following is

- (i)  $\text{CdCl}_2 + 2 \text{KOH} \rightarrow \text{Cd(OH)}_2 + 2 \text{KCl}$
- (ii)  $\text{BaCl}_2 + \text{K}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2 \text{KCl}$
- (iii)  $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- (iv)  $2 \text{Ca} + \text{O}_2 \rightarrow 2 \text{CaO}$

- A. (i)
- B. (ii)
- C. (iii)
- D. (iv)

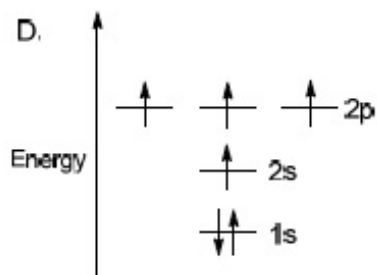
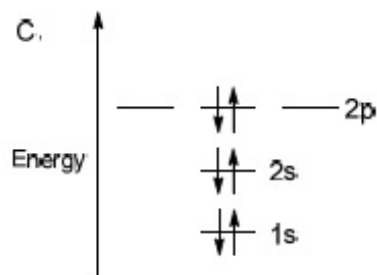
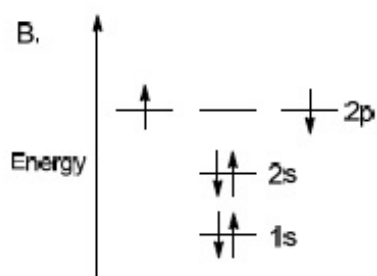
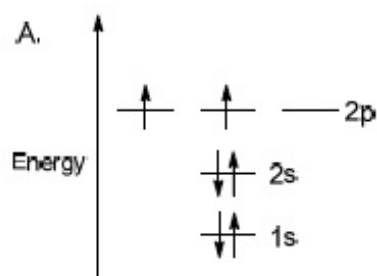
Options :

- 1. ✗ A
- 2. ✗ B
- 3. ✗ C
- 4. ✓ D

Question Number : 44 Question Id : 4356472044 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

The electronic configuration which obeys Hund's rule for the ground state of carbon atom is



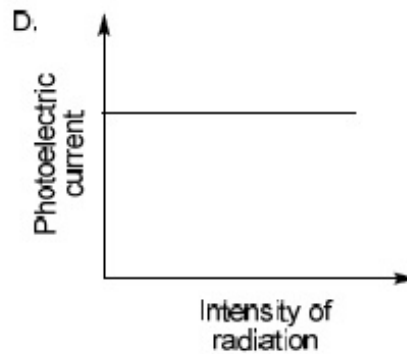
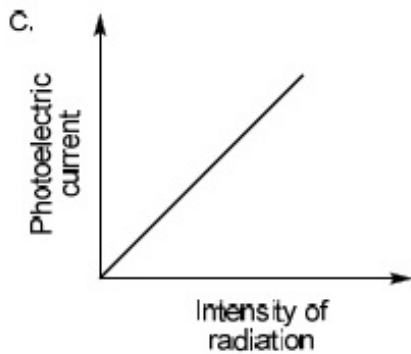
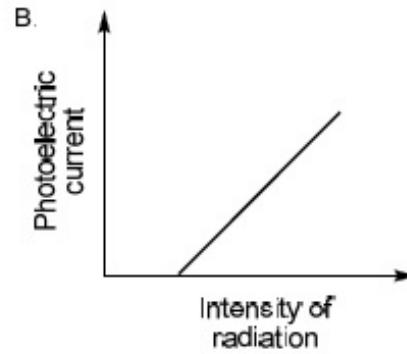
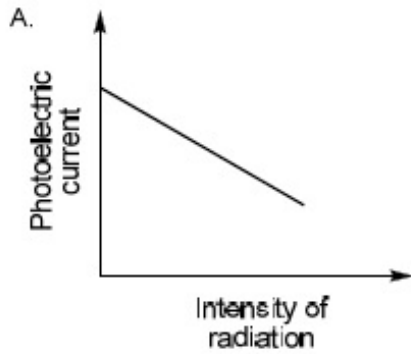
Options :

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Question Number : 45 Question Id : 4356472045 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

The graph that depicts Einstein's photoelectric effect for a monochromatic source of frequency above the threshold frequency is



Options :

1. ✘ A
2. ✘ B
3. ✔ C
4. ✘ D

Part I Biology

Display Number Panel:

Yes

Group All Questions:

No

Question Number : 46 Question Id : 4356472046 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

What is the length of human DNA containing  $6.6 \times 10^9$  bp?

- A. 22 nm
- B. 0.22 mm
- C. 2.2 m
- D. 22 m

Options :

1. ✘ A
2. ✘ B
3. ✔ C
4. ✘ D

Question Number : 47 Question Id : 4356472047 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

The *Diphtheria, Pertussis, Tetanus* (DPT) vaccine consists of

- A. live attenuated strains of *Diphtheria, Pertussis, Tetanus*
- B. toxoid of *Diphtheria, Tetanus*, and heat killed whole cells of *Pertussis*
- C. whole cell lysate of *Diphtheria, Pertussis, Tetanus*
- D. heat killed strains of *Diphtheria, Pertussis, Tetanus*

Options :

1. ✘ A
2. ✔ B
3. ✘ C
4. ✘ D

Question Number : 48 Question Id : 4356472048 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

Which of the following is NOT an enzyme?

- A. Lipase
- B. Amylase
- C. Trypsin
- D. Bilirubin

Options :

1. ✘ A
2. ✘ B
3. ✘ C
4. ✔ D

Question Number : 49 Question Id : 4356472049 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

The pH of the avian blood is maintained by

- A.  $\text{HCO}_3^-$
- B.  $\text{H}_2\text{PO}_4^-$
- C.  $\text{CH}_3\text{COO}^-$
- D.  $\text{Cl}^-$

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 50 Question Id : 4356472050 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

Podocyte layer that provides outer lining to the surface of glomerular capillaries are found in

- A. bowman's capsule
- B. loop of Henle
- C. renal artery
- D. ureter

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 51 Question Id : 4356472051 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 1

If a dsDNA has 20% adenine, what would be its cytosine content?

- A. 20%
- B. 30%
- C. 40%
- D. 80%

Options :

- 1. ✗ A



2. ✓ B

3. ✗ C

4. ✗ D

Question Number : 52 Question Id : 4356472052 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

Which one of the following is incapable of curing Pellagra?

A. Niacine

B. Nicotine

C. Nicotinamide

D. Tryptophan

Options :

1. ✗ A

2. ✓ B

3. ✗ C

4. ✗ D

Question Number : 53 Question Id : 4356472053 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

In *Escherichia coli*, how many codons code for the standard amino-acids?

A. 64

B. 60

C. 61

D. 20

Options :

1. ✗ A

2. ✗ B

3. ✓ C

4. ✗ D

Question Number : 54 Question Id : 4356472054 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

*Bombyx mori* (silk worm) belongs to the order

- A. Lepidoptera
- B. Diptera
- C. Hymenoptera
- D. Coleoptera

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 55 Question Id : 4356472055 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

The source of mammalian hormone “Relaxin” is

- A. ovary
- B. stomach
- C. intestine
- D. pancreas

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 56 Question Id : 4356472056 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

Which one of the following animals is a connecting link between reptiles and mammals?

- A. Platypus
- B. Bat
- C. Armadillo
- D. Frog

Options :

- 1. ✓ A
- 2. ✗ B

3. ✘ C

4. ✘ D

Question Number : 57 Question Id : 4356472057 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

What is the number of chromosomes in an individual with Turner's syndrome?

A. 44

B. 45

C. 46

D. 47

Options :

1. ✘ A

2. ✔ B

3. ✘ C

4. ✘ D

Question Number : 58 Question Id : 4356472058 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

Chipko movement in the year 1974 in Garhwal Himalayas involved

A. protecting tigers

B. preventing soil erosion by planting trees

C. preventing pollution by closing down industries

D. hugging trees to prevent the contractors from felling them

Options :

1. ✘ A

2. ✘ B

3. ✘ C

4. ✔ D

Question Number : 59 Question Id : 4356472059 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

Which of the following amino acids is NOT involved in gluconeogenesis?

- A. Alanine
- B. Lysine
- C. Glutamate
- D. Arginine

Options :

- 1. ✘ A
- 2. ✔ B
- 3. ✘ C
- 4. ✘ D

Question Number : 60 Question Id : 4356472060 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 1

Which of the following entities causes syphilis?

- A. *Treponema pallidum*
- B. *Neisseria gonorrhoea*
- C. HIV
- D. Hepatitis B

Options :

- 1. ✔ A
- 2. ✘ B
- 3. ✘ C
- 4. ✘ D

Part II Mathematics

Display Number Panel:

Yes

Group All Questions:

No

Question Number : 61 Question Id : 4356472061 Question Type : MCQ Display Question Number : Yes Single Line Question  
Option : No Option Orientation : Vertical

Correct : 2



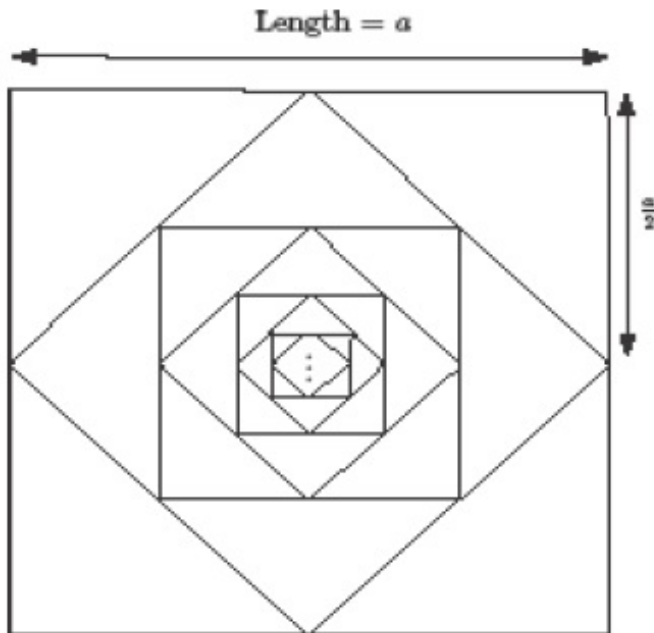


Question Number : 64 Question Id : 4356472064 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

Let  $S_1$  be the sum of areas of the squares whose sides are parallel to coordinate axes.  
Let  $S_2$  be the sum of areas of the slanted squares as shown in the figure. Then  $S_1/S_2$  is

- A. 2                      B.  $\sqrt{2}$                       C. 1                      D.  $\frac{1}{\sqrt{2}}$



Options :

1. ✓ A  
2. ✗ B  
3. ✗ C  
4. ✗ D

Question Number : 65 Question Id : 4356472065 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

If a 3-digit number is randomly chosen, what is the probability that either the number itself or some permutation of the number (which is a 3-digit number) is divisible by 4 and 5?

- A.  $\frac{1}{45}$                       B.  $\frac{29}{180}$   
C.  $\frac{11}{60}$                       D.  $\frac{1}{4}$

Options :

1. ✗ A  
2. ✓ B  
3. ✗ C  
4. ✗ D

Part II Physics

Display Number Panel:

Yes

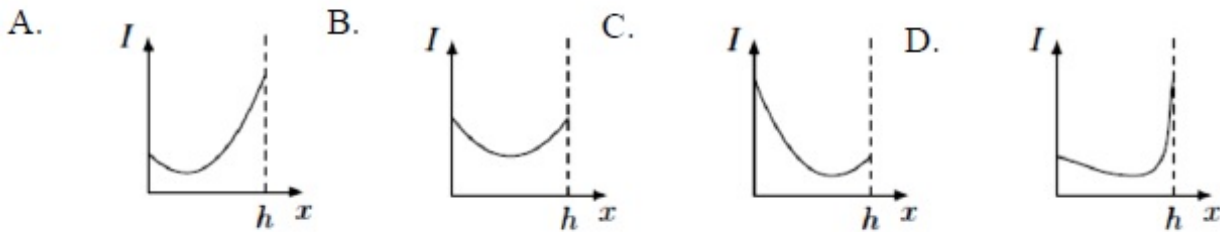
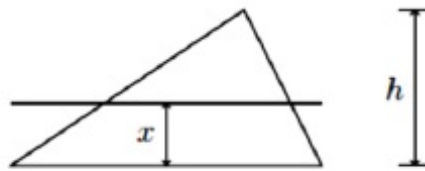
Group All Questions:

No

Question Number : 66 Question Id : 4356472066 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

Which one of the following four graphs best depict the variation with  $x$  of the moment of inertia  $I$  of a uniform triangular lamina about an axis parallel to its base at a distance  $x$  from it:



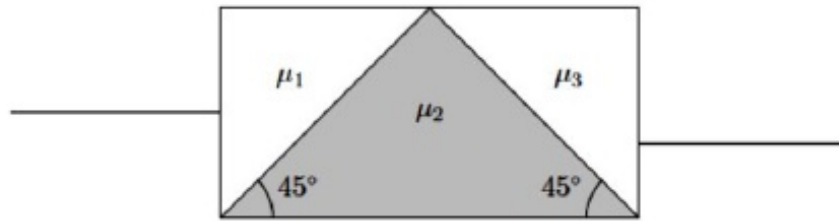
Options :

1. ✓ A
2. ✗ B
3. ✗ C
4. ✗ D

Question Number : 67 Question Id : 4356472067 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

A rectangular block is composed of three different glass prisms (with refractive indices  $\mu_1$ ,  $\mu_2$  and  $\mu_3$ ) as shown in the figure below. A ray of light incident normal to the left face emerges normal to the right face. Then the refractive indices are related by



- A.  $\mu_1^2 + \mu_2^2 = 2\mu_3^2$   
 B.  $\mu_1^2 + \mu_2^2 = \mu_3^2$   
 C.  $\mu_1^2 + \mu_3^2 = 2\mu_2^2$   
 D.  $\mu_2^2 + \mu_3^2 = 2\mu_1^2$

Options :

1. ✓ A  
 2. ✗ B  
 3. ✗ C  
 4. ✗ D

Question Number : 68 Question Id : 4356472068 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

A uniform metal plate shaped like a triangle ABC has a mass of 540 gm. The length of the sides AB, BC, and CA are 3 cm, 5 cm and 4 cm, respectively. The plate is pivoted freely about the point A. What mass must be added to a vertex, so that the plate can hang with the long edge horizontal?

- A. 140 gm at C  
 B. 540 gm at C  
 C. 140 gm at B  
 D. 540 gm at B

Options :

1. ✓ A  
 2. ✗ B  
 3. ✗ C  
 4. ✗ D

Question Number : 69 Question Id : 4356472069 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

A 20 gm bullet whose specific heat is  $5000 \text{ J}/(\text{kg}\cdot^\circ\text{C})$  and moving at 2000 m/s plunges into a 1.0 kg block of wax whose specific heat is  $3000 \text{ J}/(\text{kg}\cdot^\circ\text{C})$ . Both bullet and wax are at  $25^\circ\text{C}$  and assume that (i) the bullet comes to rest in the wax and (ii) all its kinetic energy goes into heating the wax. Thermal temperature of the wax in  $^\circ\text{C}$  is close to

- A. 28.1
- B. 31.5
- C. 37.9
- D. 42.1

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✔ C
- 4. ✘ D

Question Number : 70 Question Id : 4356472070 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

A "V" shaped rigid body has two identical uniform arms. What must be the angle between the two arms so that when the body is hung from one end, the other arm is horizontal?

- A.  $\cos^{-1}(1/3)$
- B.  $\cos^{-1}(1/2)$
- C.  $\cos^{-1}(1/4)$
- D.  $\cos^{-1}(1/6)$

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✔ C
- 4. ✘ D

Part II Chemistry

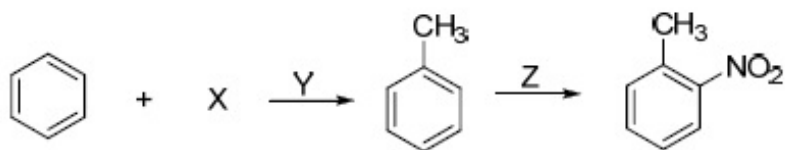
Display Number Panel:  
Group All Questions:

Yes  
No

Question Number : 71 Question Id : 4356472071 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

In the following reactions, X, Y and Z are



- A. X = CH<sub>3</sub>Cl; Y = anhydrous AlCl<sub>3</sub>; Z = HNO<sub>3</sub> + H<sub>2</sub>SO<sub>4</sub>
- B. X = CH<sub>3</sub>COCl; Y = anhydrous AlCl<sub>3</sub>; Z = HNO<sub>3</sub> + H<sub>2</sub>SO<sub>4</sub>
- C. X = CH<sub>3</sub>Cl; Y = conc. H<sub>2</sub>SO<sub>4</sub>; Z = HNO<sub>3</sub> + H<sub>2</sub>SO<sub>4</sub>
- D. X = CH<sub>3</sub>Cl; Y = dil. H<sub>2</sub>SO<sub>4</sub>; Z = HNO<sub>3</sub>

Options :

- 1. ✓ A
- 2. ✗ B
- 3. ✗ C
- 4. ✗ D

Question Number : 72 Question Id : 4356472072 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

2,3-Dibromobutane can be converted to 2-butyne in a two-step reaction using

- A. (i) HCl and (ii) NaH
- B. (i) alcoholic KOH and (ii) NaNH<sub>2</sub>
- C. (i) Na and (ii) NaOH
- D. (i) Br<sub>2</sub> and (ii) NaH

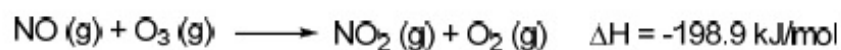
Options :

- 1. ✗ A
- 2. ✓ B
- 3. ✗ C
- 4. ✗ D

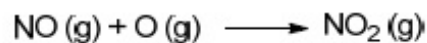
Question Number : 73 Question Id : 4356472073 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

Given



The enthalpy change ( $\Delta H$ ) for the following reaction is



- A. -304.1 kJ/mol                      B. +304.1 kJ/mol  
C. -403.1 kJ/mol                      D. +403.1 kJ/mol

Options :

1.  A  
2.  B  
3.  C  
4.  D

Question Number : 74 Question Id : 4356472074 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

A 1.85 g sample of an arsenic-containing pesticide was chemically converted to  $\text{AsO}_4^{3-}$  (atomic mass of As = 74.9) and titrated with  $\text{Pb}^{2+}$  to form  $\text{Pb}_3(\text{AsO}_4)_2$ . If 20 mL of 0.1 M  $\text{Pb}^{2+}$  is required to reach the equivalence point, the mass percentage of arsenic in the pesticide sample is closest to

- A. 8.1                                      B. 2.3  
C. 5.4                                      D. 3.6

Options :

1.  A  
2.  B  
3.  C  
4.  D

Question Number : 75 Question Id : 4356472075 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2







A breeder crossed a pure bred tall plant having white flowers to a pure bred short plant having blue flowers. He obtained 202 F<sub>1</sub> progeny and found that they are all tall having white flowers. Upon selfing these F<sub>1</sub> plants, he obtained a progeny of 2160 plants. Approximately, how many of these are likely to be short and having blue flowers?

- A. 1215
- B. 405
- C. 540
- D. 135

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✘ C
- 4. ✔ D

Question Number : 78 Question Id : 4356472078 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

Match the different types of heart given in column A with organisms given in the column B. Choose the correct combination.

**Column A**

- P. Neurogenic heart
- Q. Bronchial heart
- R. Pulmonary heart

**Column B**

- i. Human
- ii. King crab
- iii. Shark

- A. P-ii, Q-iii, R-i
- B. P-iii, Q-ii, R-i
- C. P-i, Q-iii, R-ii
- D. P-ii, Q-i, R-iii

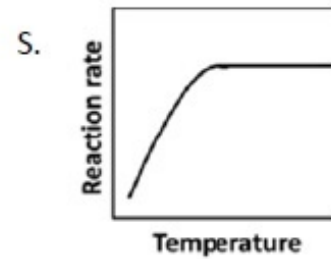
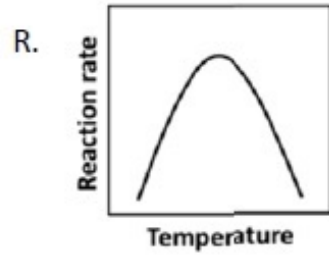
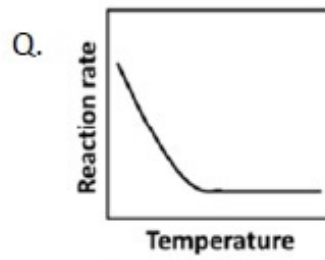
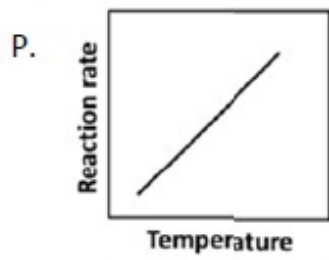
Options :

- 1. ✔ A
- 2. ✘ B
- 3. ✘ C
- 4. ✘ D

Question Number : 79 Question Id : 4356472079 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

Given below are the four schematics that describe the dependence of the rate of an enzymatic reaction on temperature. Which of the following combinations is true for thermophilic and psychrophilic organisms?



- A. P and P
- B. P and S
- C. P and R
- D. R and R

Options :

- 1. ✘ A
- 2. ✘ B
- 3. ✘ C
- 4. ✔ D

Question Number : 80 Question Id : 4356472080 Question Type : MCQ Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct : 2

Match the enzymes in Group I with the reactions in Group II. Select the correct combination.

**Group I**

- P. Hydrolase
- Q. Lyase
- R. Isomerase
- S. Ligase

**Group II**

- i. Inter- conversion of optical isomers
- ii. Oxidation and reduction of two substrates
- iii. Joining of two compounds
- iv. Removal of a chemical group from a substrate
- v. Transfer of a chemical group from one substrate to another

- A. P-iv, Q-ii, R-iii, S-i
- B. P-v, Q-iv, R-i, S-iii
- C. P-iv, Q-i, R-iii, S-v
- D. P-i, Q-iv, R-v, S-ii

Options :

- 1. ✘ A
- 2. ✔ B
- 3. ✘ C
- 4. ✘ D