GAMBITOR

ATHENOX

Total Questions: 35

Maximum Marks: 140

Marking Scheme: +4,-1

Duration: 150mins

ATHENOX

Q1. **Ash Ketchum, a young man from New Bark Town, who aspires to become a Pokémon Master, finally comes of age. He is supposed to get his first Pokémon from Professor Oak. But since he woke up late, the only Pokémon left for him was a Cyndaquil. But Professor Oak, believing him to be insincere, gives him a question to solve as a penalty. He will only get his Pokémon if he answers the question correctly:-**

Suppose that we wish to know what minimum velocity is required to open a Pokéball. Velocities can only take integral values from 1 to 100. What strategy should be used to throw Pokéballs such that the total number of throws is minimized and we find the required velocity using only 2 Pokéballs.

The minimum throws required to successfully determine the velocity?

We may make a few assumptions:

1)A Pokéball that doesn't open can be used again.

2)An opened Pokéball must be discarded.

3)The effect of throwing is the same for all Pokéballs.

4)If a Pokéball opens on a velocity X then it would also open on velocities more than X

5)If a Pokéball doesn't open on a velocity X, it won't open on velocities less than X.

A)25

C)12

B)50

D)14

Q2. **After getting the question right, he receives his Pokémon but is shocked to see Cyndaquil act so rebellious towards him. He is told by Professor Oak that to gain Cyndaquil's respect, he needs to provide the correct output to the question that is written inside of the Pokéball containing Cyndaquil.**

The question is as follows:-

You are given a list of n numbers $a_1,a_2,.....,a_n$ from 0 to n. which are pairwise distinct.

You have to do k operations on the given list. One operations include:

Replacing ai from the least non-negative integer absent from the list for all i (from 1 to n).

All the elements are less than equals to n.

(note:don't forget that the list is updated after every replacement)

1 operation on the list : 2 3 0 5 1 (n=5) is 4 2 3 0 5

First , 4 is the least non negative number absent from list , hence 2 is replaced by 4 4 3 0 5 1

Then 2 is the least non negative number absent from list , hence 3 is replaced by 2 4 2 0 5 1

Then 3 is the least non negative number absent from list , hence 0 is replaced by 34 2 3 5 1

…

Final list after 1 operation will be 4 2 3 0 5. You are

given n , k ,and the n elements of the list

YOU have to tell the list after k operations.

Example test case:

4 3

2 0 1 4

ans→1 4 3 2

INPUT

10 100

5 3 0 4 2 1 6 9 10 8

The OUTPUT is:

A) 9 10 8 7 5 3 0 4 2 1

B) 2 1 6 9 10 8 7 5 3 0

C) 5 3 0 4 2 1 6 9 10

D) 7 5 3 0 4 2 1 6 9

Q3. **On his way to the first Pokémon gym in Violet City, he enters a region where his sense of time becomes unstable. After seeing the same landmarks over and over again, he deduces that he is stuck in a time loop somehow. He begins searching for clues that would lead him out of the loop. Ash figures out that the loop he's stuck in, will be unraveled by a set of codes and if he needs to get out, he has to figure out all the codes. Ash figures out 5 out of 6 codes. He observes that they follow a certain pattern. What would be the last code Ash needs to get out of the loop?**

L5, O28, R87, U200, X385, __?

A) B648

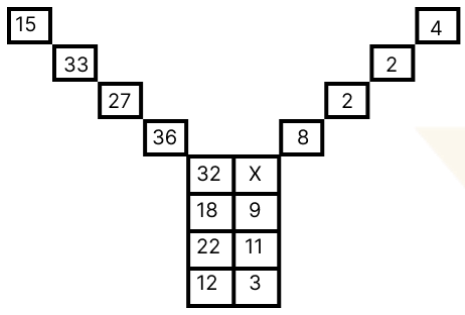
B) A660

C) B580

D) A630

Q4. **After figuring out the right code and getting out, Ash finds that the time loop was in fact an illusion set by the ghost-type Pokémon, Gengar, who once again bombards him with riddles. To defeat Gengar, Ash needs to figure out the answer. Help him defeat and capture Gengar.**

Give the answer as the value of : 4+ X * 3 ÷ 4 + 5



A)3

B)4

C)8

D)12

Q5. **After capturing Gengar and reaching Violet City, he goes to a shop that sells healing Poképotions. However, the shop accepts only those customers who can answer the shopkeeper's "Question of the Day". The question is:-**

There is a drum full of Poképotion. The Pokémon trainers come to buy Poképotion in the range of 1-120 litres. You can have only 5 cans to draw Poképotion out of the drum. What should be the measurement of these five cans so that you can measure any amount of Poképotion in the 1-120 liters range. What is the volume of the largest container used? (Note: the cans cannot be used more than once to refill from the drum.)

ANSWER - **81**

Q6. **After getting the Poképotions, he visits the nearest Pokémon Center. There, after giving his Pokémon to be healed by Nurse Joy, he sees a girl of his age trying and failing to figure out the answer to the question appearing on the television screen in the center. He wishes to help her alleviate her frustation. The question is:-**

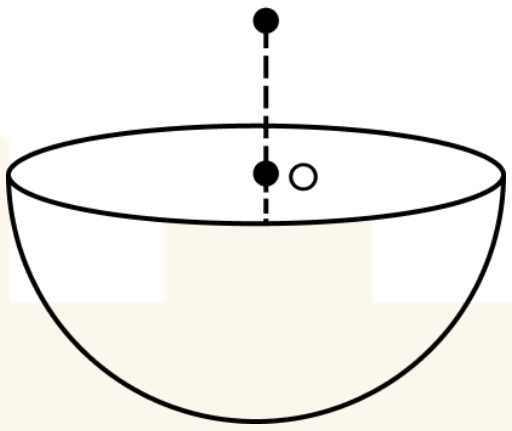
Kris wants to transport his 3000 Poképotion bottles to the deserted island. The distance between his initial position and the island is about 1000 kilometers. So he decided to take his Lapras to carry the Poképotion bottles. Lapras can carry a maximum of 1000 Poképotion bottles at a time, and it drinks one Poképotion bottle for every kilometer it travels.

How many maximum Poképotion bottles Kris can bring over to the desert?

ANSWER - **533**

Q7. **The girl, now named Samantha, thanks him for his help and wishes to repay Ash for his assistance. Ash however presents her with a question of his own which he needs her help with:-**

A spherical Pokéball is opened in half. The mass distribution of the ball is uniform. At a point on the symmetry axis, which is exactly at a distance of the radius measured from the center of the Pokéball O, a small bead is released. The speed of the bead is v0 when it reaches the centre. The speed of the bead when it reaches the shell is √x times v0. Find x (Neglect earth's gravity effect)

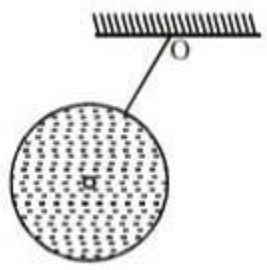


ANSWER - **2**

Q8.

After challenging the Violet City Gym Leader, Falkner and defeating him, he is presented with a suitcase in which lies the badge. However, a question is shown on the top of the case, only upon solving which he will get the badge. The question is as follows:-

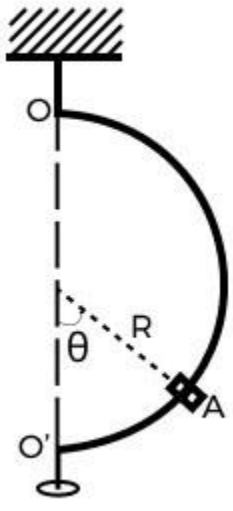
An Ultra Water Ball is constructed as a light thin-walled sphere of radius R filled up with water and suspended at the point O from a light rigid rod. The distance between the point O and the center of the sphere is equal to L. How many times will the frequency of small oscillations of the water ball change after the water freezes? The viscosity of water and the change of its volume on freezing are to be neglected. It can move translation wise, and the system behaves as a mathematical pendulum. let your answer be $\left(A+\frac{B}{C}\left(\frac{R}{l}\right)^2\right)^{0.5}$ **, what is the value of A+B+C**



ANSWER - **8**

Q9. **On his way out of Violet City, he is attacked by Team Rocket who wish to capture his Pokémon. However, he unleashes Gengar on them, who puts them in an illusion. The illusion they were put in is as follows:-**

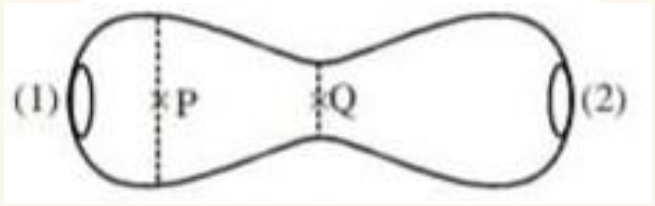
Team Rocket can slide freely along the trap which is a smooth rod bent in the shape of a half-circle of radius R=1.225m. The trap is set in rotation with a constant angular velocity ω=4/s about a vertical axis OO'. Find the angle in degrees corresponding to the steady position of Team Rocket. (Consider Team Rocket as a sleeve A) given that g=9.8 m/s2



ANSWER - **60**

Q10. **After leaving Team Rocket to deal with their illusion, he quickly gets away from them. While passing through the forest, he hears shouting and crying. Rushing towards the sound, he finds a trainer being abusive towards a Larvitar. When confronted, the trainer presents Ash with a question, which if he solves would get the trainer to free the Pokémon. Help Ash free the Larvitar:-**

A metallic conductor of irregular cross-section as shown in the figure. A constant potential difference is applied across the ends (1) and (2). Then:



Which of the following is/are correct ?

A)**The current at the cross-section P equals the current at the cross-section Q**

B)**The electric field intensity at P Is less than that at Q**

C)**The rate of heat generated per unit time at Q is greater than that at P**

D)**The number of electrons crossing per unit area of the cross-section at P is less than that at Q**

Q11. **After reaching Azalea Town and also gaining a new Pokémon, he visits the town's Pokémon center. There after giving his Pokémon to the nurse for healing, he is given a question to solve by the nurse in the meanwhile.**
The question is:-

A Pokéball is thrown in an upward direction with velocity . If there is air that is flowing in the horizontal direction with a constant velocity then which of the following is/are correct? (t= time, a= acceleration, H= height from ground, g= acceleration due to gravity)

A) $t_{ascent} < t_{descent}$

B) $a_{ascent} > g$

C) $a_{descent} > g$

D) $H_{max} < u^2/2g$

Q12. **On reaching the Azalea Town's Pokémon gym, Ash is welcomed by a swarm of bugs which rush at him immediately. Cyndaquil uses his fire to counter the bugs but is losing his energy rapidly. To stop the bugs, he needs to solve the following problem:-**

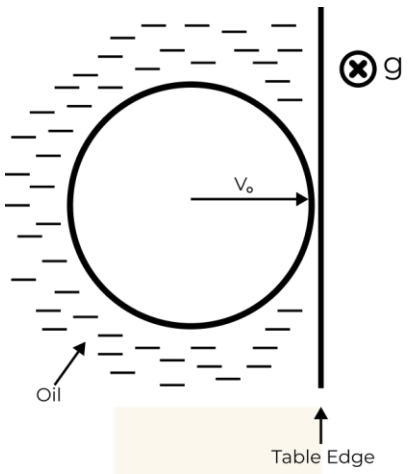
Kira enters an earth-like planet on his quest for new Pokémon. He decides to hover his spaceship exactly at 7.5 km above the planet to observe the conditions. What is the pressure (in kPa) he should power his spaceship with to hover in air?

(Assuming that the atmospheric temperature decreases with the increasing altitude at a uniform rate of 0.0065 K/m, and the temperature and pressure at the sea level are 15C and 101.5 kPa respectively and the value of for air is 1.4. Consider adiabatic conditions.)

A) 44.36
B) 53.03
C) 33.05
D) 34.50

Q13. **After the bugs stop swarming Ash, he challenges the Gym Leader, Bugsy, and defeats him. However, the leader puts a final challenge in front of him. To get the badge, he needs to provide the correct answer to the following question:-**

A uniform circular laminar disc is on the top of the horizontal table top; there is a thin layer of oil between the lamina & table. The lamina is being pulled by an external agent applying a horizontal force with a constant velocity v0 and at t=0, the table edge is tangent to the lamina and at t=T, the table edge coincides with the diameter of the lamina. During the period t=0 to t=T, mark the CORRECT statement.



A)Force exerted by the external agent increases

B)The distance between the center of mass of the lamina and the effective point of application of normal reaction on the disc from oil increases.

C)Viscous force exerted by oil on the lamina falls by 50%.

D)The flow of the oil underneath the lamina close to its center where its velocity gradient is also considered uniform is “Irrotational”

Q14. Ash exits Azalea Town after winning the badge but is immediately confronted by two teenagers, who tell him that they are willing to fight him, only if he is able to solve their question. Filled with confidence after winning two badges, he begins to solve the following problem:-

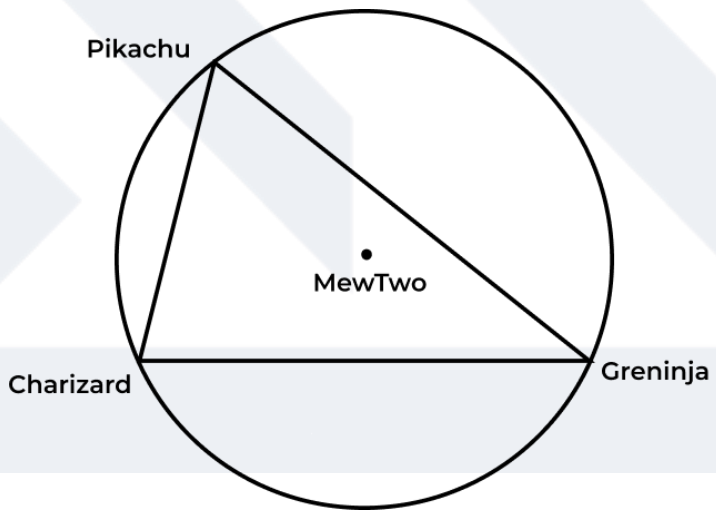
$$f = \left(\frac{a}{bd}\right)^{1.5} k^2 e^{\left(\frac{k^2 a}{2bd}\right)} ln\,(c)$$

k has dimensions LT^{-1} then find dimension of $\frac{df}{dv}$ where v is velocity.

A) L^0T^0
B) L^2T^{-2}
C) $L^{-2}T^2$
D) Cannot be determined

Q15. **After two victories and two badges, Ash arrives in Goldenrod City, where he overconfidently challenges the Gym Leader, Whitney. She swiftly defeats him, humbling him. Ash now seeks a rematch but faces a challenging problem to solve before he can challenge Whitney once more. The challenge is:-**

In a Pokémon battle, Gray stands in front of Mewtwo & Mewtwo is trapped at the center of the circular battlefield. Gray releases Pikachu, Charizard and Greninja who stand on the circumference of the battlefield forming a triangle. To defeat Mewtwo, the three Pokémons must contain Mewtwo in the triangle they form. Find the probability that Mewtwo remains trapped at the center of the circle. (Given figure is one of the cases possible).



A) 1/4

B)1/2

C) $\frac{\sqrt{3}}{4\pi}$

D) $\frac{3\sqrt{3}}{4\pi}$

Q16.**After defeating Whitney, he is present with the Plain Badge, which is bound in a box that can only be opened after solving the following question:-**

Let us define a function η which takes other functions as inputs and returns 0 if the period of the input function is irrational, 1 if rational and -1 if function is non periodic. $\eta(f) = 0$, $\eta(h) = 1$, $g : [R \to R]$ **, g is bijective.** $f,h : [R \to R]$. $\eta(f(g(h)))$ =?

A)-1

B)0

C)1

D)Intermediate

Q17. Once again, Ash faces Team Rocket and while their Pokémon battle, they try to defeat Ash psychologically by posing the following question to him:-

If $f, g : [R \to R]$**,** $g = f^{-1}$ **,** $f(a) = b$**,** $f'(a) = 2\sqrt{2}$ **and** $f''(a) = 2$ **then ,** $g''(b)$**= ?**

A) 4√2

B) $\frac{1}{2\sqrt{2}}$

C) 1/8√2

D) 2√2

Q18. **On his way to the next Pokémon gym, he meets Samantha, who challenges him to a friendly Pokémon battle. During the battle, they exchange questions with each other that they need to solve as their Pokémon battle. The question posed to Ash was:-**

Let f be a differentiable function on R and satisfying the integral equation:

$$\int_0^x f(t)dt + \int_0^x t \cdot f(x-t)dt = -1 + e^{-x}$$

, for all x ϵ R, then

A) $f(0) + f'(0) + f''(0) + f'''(0) \ldots. \; upto \; 30030 \; terms = 10010$

B) $f(0) + f'(0) + f''(0) + f'''(0) \ldots. \; upto \; 30030 \; terms = 6006$

C) $f(0) + f'(0) + f''(0) + f'''(0) \ldots. \; upto \; 30030 \; terms = 15015$

D) $f(0) + f'(0) + f''(0) + f'''(0) \ldots. \; upto \; 30030 \; terms = 4290$

Q19. **The question Ash posed to Samantha during their battle was as follows:-**

There is a bag containing two types of Pokéballs, normal and legendary. Balls are dimensionally identical. At random two Pokéballs are taken from the box simultaneously. Both the Pokéball come out to be normal and it is given that the probability of this event is 0.5. Find the minimum number of balls in the box for this to happen, given that the number of legendary balls are even.

ANSWER- ***21***

Q20. **After parting ways with Samantha, Ash goes to Ecruteak City, where he goes on to challenge the Gym Leader, Morty. Morty uses Ghost-type Pokémon which put Gengar in an illusion. To break the illusion, he needs to aid Gengar to solve the problem to get him out of the illusion:If $a_1 = 1$ for n > 1, $a_n = a_{n-1} + 1/a_{n-1}$, then a_{75} lies between:**

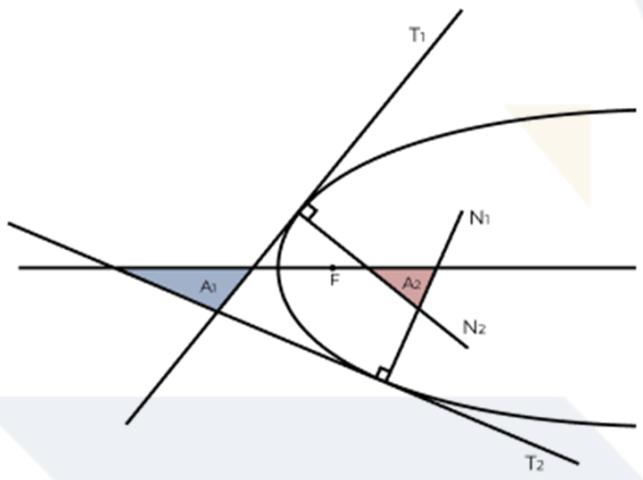
A) (12,15)

B) (11,12)

C) (15,18)

D) None of these

Q21. **After defeating Morty and getting the Fog Badge, he is congratulated by Morty and is posed a final illusion that he needs to break out of, achieving which he will receive the Fire Stone, which Ash can use to evolve Cyndaquil. The illusion poses him the following question:-**



2 triangles are formed: one by the axis and the tangents T1: [2y - x = 8] & T2: [x + y = 10] (triangle 1) and one by axis and the normals(triangle 2), Ratio of area of the 2 triangles is 1/A. Find the value of A if focus of the parabola lies at (4,3).

ANSWER- **2**

Q22. **While going through the forest in order to reach the next city, he finds a man trying to fend off against a pair of Nidoran which have poisoned his Pokémon. Ash evolves Cyndaquil into Quilava, which provides him with the power to defeat the Nidoran. The man thanks Ash and promises to gift him with a rare material if he answers his riddle:-**

Let PQ be a focal chord of a parabola. A circle with diameter PQ always touches the line x + 5 = 0 for all positions of P and Q. Length of latus rectum of parabola is 8. If equation of line PQ is x + y = 1, then

A) Parabola is $(y - 2)^2 = 8 (x + 3)$

B) Parabola is $(y - 10)^2 = -8(x + 7)$

C) From point (2, 3) two ⊥ normal can be drawn to one of the possible parabola

D) From point (-17, 12) two ⊥ normal can be drawn to one of the possible parabola

Q23. The man, satisfied with Ash's response, grants him a stone, saying it would help him in his time of greatest need. Ash, believing the man to be out of his mind, does not pay attention to his words, nevertheless keeps the stone as a token of gratitude from a stranger. Moving forward, he is accosted by Team Rocket again, who once again try to steal his Pokémon. They also pose another challenge to him:-

Start with the numbers 1, 2, 3, 4, 5, 6. Replace two of these numbers say x and y by $\frac{xy}{x+y}$. Repeat this until there is only one number left, say p. Find the number of different values of p.

ANSWER- 1

Q24. **After reaching Cianwood City, he goes to the Pokémon Gym, where he meets Chuck, the Gym Leader. After battling and defeating Chuck, he is sent to a room with a huge screen where his final challenge in Cianwood City is presented to him, after which he'll receive his next badge, the Storm Badge. The challenge is as follows:-**

K = $\lim_{n\to\infty} \frac{2}{\sqrt{2}} \frac{2}{\sqrt{2+\sqrt{2}}} \ldots\ldots \sqrt{2+\sqrt{2+\sqrt{2\ldots.\sqrt{2+\sqrt{2}}}}}$ **=? ,where n is number of terms in multiplication.**

find the value of K?

A) π/2

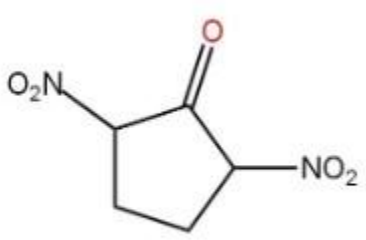
B)π

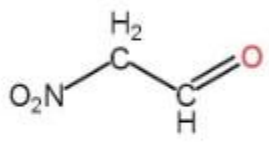
C)2π/3

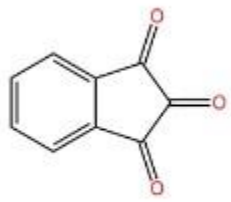
D) π/3

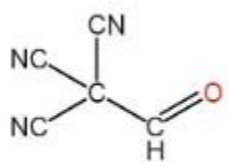
Q25. **Ash, happy with his progress so far, takes a day off to take a break. However, while roaming the forest, he hears pained cries echoing throughout the forest. Moving towards the source of the cries, he finds an Ampharos bleeding on the ground from a gash on the ground. He needs a chemical which form stablehydrates with H2O to heal the Ampharos. Help him figure out the chemical required.**

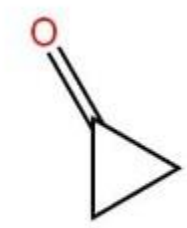
How many of the following will form stable hydrates with H2O?

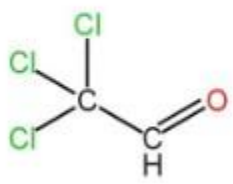


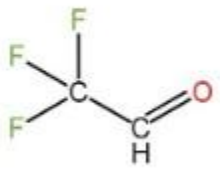










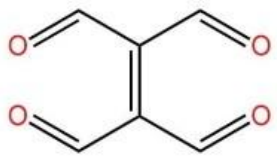


ANSWER- 7

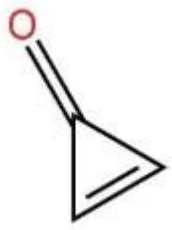
Q26. **After healing the Ampharos, Ash successfully catches the Ampharos and become ecstatic.While going forward to the Olivine City, he is reminded of another compounds that had helped him in a similar scenario and that can be obtained by intermediates of the given reaction. Help him to remember those compounds.**

Predict the intermediate of the following reaction :

▼*A*

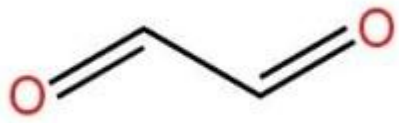


▼C



▼*B*

▼*D*



ANSWER- ***ABD***

Q27. **Arriving in Olivine City, Ash heads to the Pokémon Center and later challenges Jasmine at the Gym. With Jasmine's stronger Pokémon, Ash's only remaining fighter is Ampharos. During the battle, both Ampharos and a mysterious stone Ash received emit a similar ethereal light. Ash realizes there's a problem with their merging and starts to find it out. Help him find it quickly.**

The number of p-molecular orbitals completely filled in the ground state of benzene is:

A)1

B)3

C)6

D)NONE

Q28. **Reaching the Mahogany Gym, he challenges the Gym Leader, Pryce and gets the Glacier Badge after defeating Pryce and solving the following question:-**

For an upcoming quest, Dean is tasked to create some of the chemicals from the lab. Which among these can Dean actually create?

A) SH_5F
B) **SH_4F_2**
C) SH_6
D) None of the above

Q29. **He figures with the use of a chemical that what happened with Ampharos was Mega Evolution. The chemical was one that had been taught to him by Professor Oak as a challenge when he was younger. The challenge was:-**

Pikachu accidently swallows a dilute when Zeke was training him. Which of the following should Zeke use to prevent the absorption of soluble barium poisoning?

A) NaCl
B) Na_2SO_4
C) Na_2CO_3
D) NH_4Cl

Q30)**After reaching Blackthorn City, he finds that Pokémon trainers are being tested on their knowledge of elements and molecules. He participates in that competition and is given the following problem to solve:-**

How many of the following are correct?

1. Si-I > C-I (Bond Length)

2. Te > O (Magnitude of Δ_{eg} H)

3. N_2 > C_2 (Number of electrons in Molecular orbitals)

4. He^+ > H (Size)

5. O_2 Molecule > O atom (Ionisation energy)

6. C_2 > O_2 (Bond distance)

A)2
B)3
C)4
D)5

Q31. Upon challenging and defeating Clair, the Blackthorn City Gym Leader, and getting the Rising Badge, he moves towards the Johto Champion League. He moves to the nearest town to register for the Champion's League, where he is asked the following question as a method of verification:-

$Pb(IO_3)_2$ is sparingly soluble salt (K_{sp} = 2.7 x 10^{-13}). To 35 ml 0.15 M $Pb(NO_3)_2$ solution, 15 ml of 0.8 M KIO_3 solution is added and a precipitate of $Pb(IO_3)_2$ is formed.

A) $Pb(IO_3)_2$
B) KIO_3
C) **$Pb(NO_3)_2$**
D) Both B & C

Q32 Upon challenging and defeating Clair, the Blackthorn City Gym Leader, and getting the Rising Badge, he moves towards the Johto Champion League. He moves to the nearest town to register for the Champion's League, where he is asked the following question as a method of verification:-

$Pb(IO_3)_2$ is sparingly soluble salt (K_{sp} = 2.7 x 10^{-13}). To 35 ml 0.15 M $Pb(NO_3)_2$ solution, 15 ml of 0.8 M KIO_3 solution is added and a precipitate of $Pb(IO_3)_2$ is formed.

A)0.152
B)0.081
C)0.41
D)0.03

Q33. Ash challenges Lance, the reigning Johto Champion. After a strenuous battle, Ash comes out victorious and gains the title of Johto Champion. However, a final hurdle remains in his path to truly become a Pokémon Master. The final challenge is:-

where $\sigma = \frac{2Zr}{a_0}$

In Search of more evolved Legendary Pokémon, scientists started studying outer-space in their labs and found out that the probability of finding a Pokémon depends on the distance of the point in space from their planet. Let this distance be "r". and probability follows the above mentioned function. Find the finite distance from the planet where probability of finding a Legendary Pokémon is the highest (in terms of $\frac{a_0}{2Z}$).

A)**1.472**

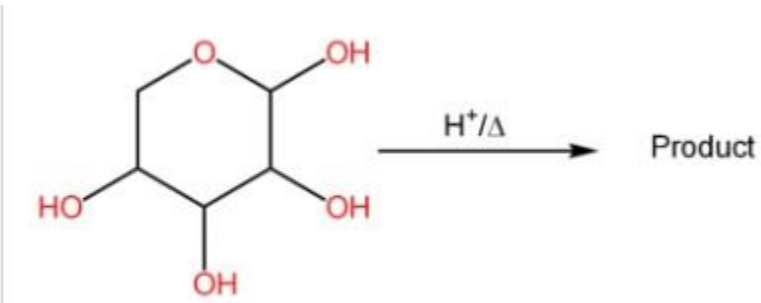
B)1.414

C)1.732

D)2

Q34.**After becoming a Pokémon Master and returning home to New Bark Town, he wishes to follow in the footsteps of Professor Oak. He approaches Oak with the desire to become his apprentice and research about Pokémon and their evolutions to better understand them. Oak agrees but gives Ash a final riddle, only upon solving which can he study under Oak:-**

Which of the following statements is/are correct about the product formed?



A) Product is non aromatic

B) **Product contain 2 oxygen atoms**

C) Product contains ketone as major functional group

D) **Product has 8 pi electrons**

Q35. **After finally becoming worthy of Cyndaquil, he sets out on his journey to become the greatest Pokémon Master to ever exist. As he goes to register himself as a Pokémon Trainer, he is given a riddle to solve by the receptionist. The riddle goes like this:-**

If every even letter beginning from "B" in the alphabetical order is replaced by an odd number starting with 3, which letter/number will be third to the right of the tenth number/ letter counting from your right? All the alphabets are present in a horizontal straight line initially.

ANSWER- ***21***
