



RANKRIDGE IIT JEE/NEET JUNIOR COLLEGE (LONGTERM)

TELANGANA

STREAM: JR MPC
Time: 3:00 Hours

CUMULATIVE TEST-04

Date: 04-08-2025
Max Marks: 300

MATHEMATICS

(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONLY ONE option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases

1. n^{th} term of the series

$$4+14+30+52+\dots =$$

(A) $5n-1$ (B) $2n^2+2n$
 (C) $3n^2+n$ (D) $2n^2+2$

2. $2.4+4.7+6.10+\dots \text{ upto } (n-1)$

terms =

(A) $2n^3+2n^2$ (B) $\frac{1}{6}(n^3+3n^2+1)$
 (C) $2n^3+2n$ (D) $2n^3-2n^2$

3. $\forall n \in N, 7.5^{2n} + 12.6^n$ is divisible by

(A) 13 (B) 19
 (C) 247 (D) 26

4. A = sum of first 10 natural numbers, B = sum of squares of first 10 natural numbers, C = sum of cubes of first 10 natural numbers, D = sum of first 10 even natural numbers, then increasing order of A, B, C, D

(A) A, B, C, D (B) A, C, D, B
 (C) A, B, D, C (D) A, D, B, C

5. The remainder left out when

$8^{2n} - (62)^{2n+1}$ is divided by 9 is

(A) 2 (B) 7
 (C) 8 (D) 0

6. If the sum to 'n' terms of an A.P. is

$\frac{4n^2 - 3n}{4}$, then the n^{th} term of the A.P. is

(A) $\frac{5n-1}{4}$ (B) $\frac{8n-7}{4}$
 (C) $\frac{3n^2 - 2}{4}$ (D) $\frac{7n-8}{4}$

7. The sets S_1, S_2, S_3, \dots are given by

$$S_1 = \left\{ \frac{2}{1}, \frac{3}{1}, \frac{5}{2} \right\}, S_2 = \left\{ \frac{3}{2}, \frac{5}{2} \right\},$$

$$S_3 = \left\{ \frac{4}{3}, \frac{7}{3}, \frac{10}{3} \right\}, S_4 = \left\{ \frac{5}{4}, \frac{9}{4}, \frac{13}{4}, \frac{17}{4} \right\}, \dots$$

then the sum of the numbers in the set S_{25} is

(A) 322 (B) 324
 (C) 325 (D) 326

8. If $A = [a_{ij}]_{m \times n}$ is a matrix of rank r then

(A) $r = \min\{m, n\}$ (B) $r < \min\{m, n\}$
 (C) $r \leq \min\{m, n\}$ (D) $r = \max\{m, n\}$

9. A fruit shop has 5 dozen oranges, 3 dozen mangoes, 6 dozen bananas their selling prices are Rs.60, Rs.40, Rs.30 each respectively. Using matrix algebra the value of the fruits in the shop is

(A) 7200 (B) 7000
 (C) 2700 (D) 7500

10. If $3A + 4B^T = \begin{pmatrix} 7 & -10 & 17 \\ 0 & 6 & 31 \end{pmatrix}$ and

$$2B - 3A^T = \begin{pmatrix} -1 & 18 \\ 4 & -6 \\ -5 & -7 \end{pmatrix} \text{ then } B =$$

(A) $\begin{pmatrix} 1 & 3 \\ -1 & 0 \\ -2 & -4 \end{pmatrix}$ (B) $\begin{pmatrix} 1 & 3 \\ 1 & 0 \\ 2 & 4 \end{pmatrix}$

(C) $\begin{pmatrix} 1 & 3 \\ -1 & 0 \\ 2 & 4 \end{pmatrix}$ (D) $\begin{pmatrix} 1 & -3 \\ 1 & 0 \\ 2 & 4 \end{pmatrix}$

11. $\begin{pmatrix} 2 & 3 & 5 \\ 4 & 1 & 2 \\ 1 & 2 & 1 \end{pmatrix} = P + Q$, where P is a symmetric and Q is a skew-symmetric then $Q =$
- (A) $\begin{pmatrix} 0 & -\frac{1}{2} & 2 \\ \frac{1}{2} & 0 & 0 \\ -2 & 0 & 0 \end{pmatrix}$ (B) $\begin{pmatrix} 0 & \frac{1}{2} & 1 \\ -\frac{1}{2} & 0 & 0 \\ -1 & 0 & 0 \end{pmatrix}$
 (C) $\begin{pmatrix} 0 & 1 & 0 \\ -1 & 0 & 1 \\ 0 & -1 & 0 \end{pmatrix}$ (D) $\begin{pmatrix} 0 & 2 & 3 \\ -2 & 0 & 4 \\ -3 & -4 & 0 \end{pmatrix}$
12. $\det \begin{bmatrix} 1990 & 1991 & 1992 \\ 1991 & 1992 & 1993 \\ 1992 & 1993 & 1994 \end{bmatrix} =$
- (A) 1992 (B) 1993
 (C) 1994 (D) 0
13. $\begin{vmatrix} (x-2)^2 & (x-1)^2 & x^2 \\ (x-1)^2 & x^2 & (x+1)^2 \\ x^2 & (x+1)^2 & (x+2)^2 \end{vmatrix} =$
- (A) 8 (B) 16
 (C) -8 (D) -16
14. If $x + y + z = 1$, $ax + by + cz = k$,
 $a^2x + b^2y + c^2z = k^2$ has unique solution
 then $x = \dots$
- (A) $\frac{(k-b)(c-k)}{(a-b)(c-a)}$ (B) $\frac{(k-c)(a-k)}{(b-c)(c-a)}$
 (C) $\frac{(k-a)(b-k)}{(b-c)(c-a)}$
 (D) $(k-a)(k-b)(k-c)$
15. If the system of equations
 $2x - 3y + 4z = 0$, $5x - 2y - z = 0$,
 $21x - 8y + az = 0$ has infinity solutions
 then $a =$
- (A) -5 (B) -4
 (C) 2 (D) 4

16. $a \neq p, b \neq q, c \neq r$ and $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$
 then the value of $\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c} =$
- (A) 1 (B) 2
 (C) 3 (D) c
17. The value of the determinant
 $\begin{vmatrix} \sin \alpha \cos \beta & \cos \alpha \cos \beta & -\sin \alpha \sin \beta \\ \sin \alpha \sin \beta & \cos \alpha \sin \beta & \sin \alpha \cos \beta \\ \cos \alpha & -\sin \alpha & 0 \end{vmatrix}$ is
- (A) independent of α (B) independent of β
 (C) independent of α and β
 (D) cannot be said
18. If $A = \begin{bmatrix} 2 & 1 \\ 4 & 1 \end{bmatrix}$; $B = \begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix}$ and
 $C = \begin{bmatrix} 3 & -4 \\ -2 & 3 \end{bmatrix}$ then
- $tr(A) + tr\left(\frac{ABC}{2}\right) + tr\left(\frac{A(BC)^2}{4}\right)$
 $+ tr\left(\frac{A(BC)^3}{8}\right) + \dots = \infty$
- (A) 6 (B) 9
 (C) 12 (D) 15
19. If $P = \begin{bmatrix} \frac{\sqrt{3}}{2} & 1 \\ 2 & \frac{\sqrt{3}}{2} \\ -1 & \frac{\sqrt{3}}{2} \\ \frac{1}{2} & 2 \end{bmatrix}$, $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and
 $Q = PAP^T$ and $X = P^T Q^{2015} P$, then X is
- (A) $\begin{bmatrix} 1 & 2015 \\ 0 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 0 \\ 2015 & 1 \end{bmatrix}$
 (C) $\begin{bmatrix} 2015 & 1 \\ 0 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 1 \\ 0 & 2015 \end{bmatrix}$
20. If a, b, c are non zero real numbers and if the equations $(a-1)x = y + z$,
 $(b-1)y = z + x$, $(c-1)z = x + y$ has a

non trivial solution then $ab + bc + ca$
equals
 (A) $a+b+c$ (B) abc
 (C) 1 (D) $a+b-c$

NUMERICAL VALUE TYPE

Section-II contains 5 Numerical Value Type questions.

Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases

21. If A is a square matrix of order 3 such that $|A| = 2$, then $\left(\text{adj } A^{-1} \right)^{-1}$ is 5.

22. If $f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x-1)x(x-1) \end{vmatrix}$

then $f(100)$ is equal to 20.

23. If the system of equations

$$x - 2y + 3z = 9, 2x + y + z = b,$$

$x - 7y + az = 24$, has infinity many solutions, then $a - b$ is equal to 3.

24. The least remainder when 17^{30} is divided by 5 is 3.

25. When 2^{301} is divided by 5, the least +ve remainder is 1.

PHYSICS

(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONLY ONE option can be correct.

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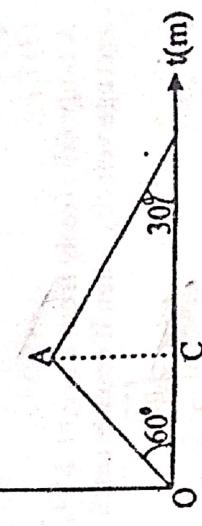
26. The relation $3t = \sqrt{3x} + 6$ describes the displacement of a particle in one direction where x is in meters and t in seconds. The displacement, when velocity is zero, is:-
 (1) 24 m (2) 12 m
 (3) 5 m (4) zero

27. An engine of a train moving with uniform acceleration passes an electric pole with velocity 6 m/s and the last compartment with velocity 8 m/s. The middle point of the train passes the same pole with a velocity of:-
 (1) $\sqrt{14}$ m/s (2) 5 m/s
 (3) 50 m/s (4) 7 m/s

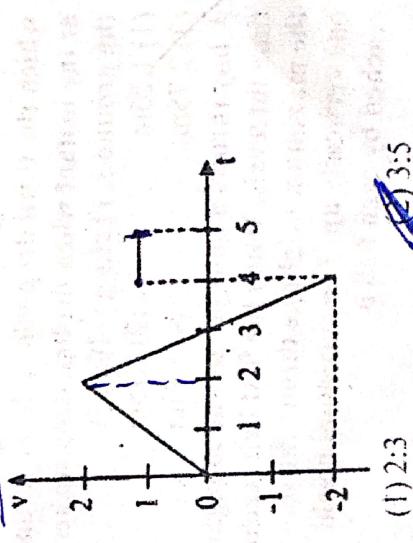
28. Two cars are travelling towards each other on a straight road at velocities 15 m/s and 16 m/s respectively. When they are 150m apart, both the drivers apply the brakes and the cars decelerate at 3m/s^2 until they stop. Separation and 4m/s^2 until they stop. Separation between the cars when they come to rest is
 (1) 86.5 m (2) 89.5 m
 (3) 85.5 m (4) 80.5 m

29. A bus starts from rest with a constant acceleration of 5 m/s^2 . At the same time a car travelling with a constant velocity 50 m/s over takes and passes the bus. How fast is the bus travelling when they are side by side?
 (1) 10 m/s (2) ~~50~~ 50 m/s
 (3) 100 m/s (4) 150 m/s
 (36) The displacement - time graph of a particle moving with respect to a reference point is a straight line
 (37) The reference point is stationary with zero velocity
 (2) the acceleration of the object is zero
 (3) body moves with uniform velocity
 (4) all the above

31. In displacement time graph, two straight lines make angles 60° and 30° with time axis. The ratio of magnitudes of the velocities represented by them is
 $x(\text{m})$



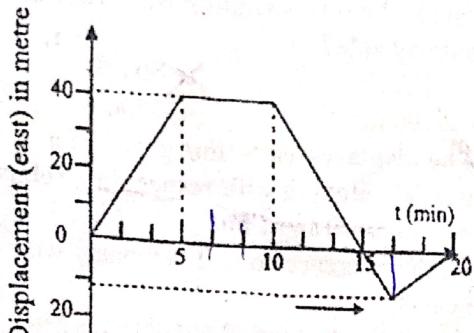
32. The velocity versus time graph of a body moving along a straight line is as shown in figure. The ratio of displacement and distance covered by body in 5 second is:-
 (1) 1:2 (2) 1:3
 (3) 2:1 (4) 3:1



- (3) 1:1 (4) 1.5:5

33. If the distance between the sun and the earth is 1.5×10^{11} m and velocity of light is 3×10^8 m/s, then the time taken by a light ray to reach the earth from the sun is
 (1) 500 s (2) 500 minute
 (3) 50 s (4) 5×10^3 s

34. A boy begins to walk eastward along a straight street in front of his house and the graph of his displacement from home is shown in the following figure. His average speed for the whole time interval is equal to



- (1) 8 m min^{-1} (2) 5 m min^{-1}
 (3) $\frac{8}{3} \text{ m min}^{-1}$ (4) 2 m min^{-1}

35. A freely falling body travelled x m in n th second, then distance travelled in $n-1$ th second is

- (1) x (2) $x + g$
 (3) $x - g$ (4) $2x + 3g$

36. A body falls freely from a height 'h' its average velocity when it reaches earth is

- (1) \sqrt{gh} (2) $\sqrt{\frac{gh}{2}}$
 (3) $\sqrt{2gh}$ (4) $g\sqrt{h}$

37. Water drops fall from a tap on to the floor 5.0m below at regular intervals of time. The first drop strikes the floor when the fifth drop begins to fall. The height at which the third drop will be from ground, at the instant when the first drop strikes the ground is (Take $g = 10 \text{ ms}^{-2}$)
 (1) 1.25m (2) 2.15m
 (3) 2.75m (4) 3.75m

38. A boy throws n balls per second at regular time intervals. When the first ball reaches the maximum height he throws the second one vertically up. The maximum height reached by each ball is

(1) $\frac{g}{2(n-1)^2}$ (2) $\frac{g}{2n^2}$

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

39. A ball is dropped on the floor from a height of 10m. It rebounds to a height of 2.5m. If the ball is in contact with the floor for 0.01 s, then the average acceleration during contact is nearly

- (1) $500\sqrt{2} \text{ m/s}^2$ upwards
 (2) $1800\sqrt{2} \text{ m/s}^2$ downwards
 (3) $1500\sqrt{2} \text{ m/s}^2$ upwards
 (4) $1500\sqrt{2} \text{ m/s}^2$ downwards

40. A ball is thrown straight upward with a speed v from a point h meter above the ground. The time taken for the ball to strike the ground is

(1) $\frac{v}{g} \left[1 + \sqrt{1 + \frac{2hg}{v^2}} \right]$ (2) $\frac{v}{g} \left[1 - \sqrt{1 - \frac{2hg}{v^2}} \right]$
 (3) $\frac{v}{g} \left[1 - \sqrt{1 + \frac{2hg}{v^2}} \right]$ (4) $\frac{v}{g} \left[2 + \frac{2hg}{v^2} \right]$

41. Two bodies begin to fall freely from the same height. The second one begins to fall τ after the first. The time after which the 1st body begins to fall, the distance between the bodies equals to l is

(1) $\frac{l}{g\tau} + \frac{\tau}{2}$ (2) $\frac{g\tau}{l} + \tau$
 (3) $\frac{\tau}{lg} + \frac{2}{\tau}$ (4) $\frac{g}{l\tau} + \frac{\tau}{2}$

42. A stone projected upwards with a velocity 'u' reaches two points 'P' and 'Q' separated by a distance 'h' with velocities $u/2$ and $u/3$. The maximum height reached by it is

(1) $\frac{9h}{5}$ (2) $\frac{18h}{5}$
 (3) $\frac{36h}{5}$ (4) $\frac{72h}{5}$

43. The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in meters and t in seconds. The acceleration of the particle at $t = 2$ s is

- (1) 0 (2) 5 m/s^2

- (3) -4 m/s^2 (4) -8 m/s^2
44. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1 . On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2 . The time taken by her to walk up on the moving escalator will be
- (1) $\frac{t_1 t_2}{t_2 - t_1}$ (2) $\frac{t_1 t_2}{t_2 + t_1}$
 (3) $t_1 + t_2$ (4) $\frac{t_1 + t_2}{2}$

45. Rain, pouring down at an angle α with the vertical has a speed of 10 ms^{-1} . A girl runs against the rain with a speed of 8 ms^{-1} and sees that the rain makes an angle β with the vertical, then relation between α and β is
- (1) $\tan \alpha = \frac{8 + 10 \sin \beta}{10 \cos \beta}$
 (2) $\tan \beta = \frac{8 + 10 \sin \alpha}{10 \cos \alpha}$
 (3) $\tan \alpha = \tan \beta$
 (4) $\tan \alpha = \cot \beta$

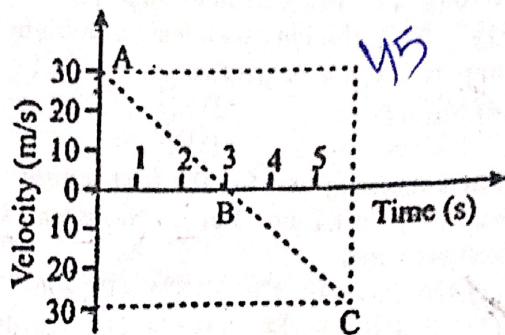
NUMERICAL VALUE TYPE

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46. A bullet travelling horizontally loses $1/20^{\text{th}}$ of its velocity while piercing a wooden plank. Then the number of such planks required to stop the bullet is _____.
 47. The velocity-time graph of a stone thrown vertically upward with an initial velocity of 30 ms^{-1} is shown in the figure. The velocity in the upward direction is taken as positive and that in the downward direction as negative. What is the

maximum height to which the stone rises?



48. the height y and horizontal distance x covered by a projectile in a time t seconds are given by the equations $y = 8t - 5t^2$ and $x = 6t$. If x and y are measured in metres, the velocity of projection is ms⁻¹.
49. A bomb at rest is exploded and the pieces are scattered in all directions with a maximum velocity of 20 ms^{-1} . Dangerous distance from that spot is ($g = 10 \text{ m/s}^2$) 40 m.
50. Two cliff of heights 120 m and 100.4 m are separated by a horizontal distance of 16 m if a car has to reach from the first cliff to the second the horizontal velocity of car should be 9 m/s.

CHEMISTRY

(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONLY ONE option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases

51. What will be the IUPAC symbol and name for the element with atomic number 123?
 (1) Un and unniltrium
 (2) Ubq and unbiquadium
 (3) Ubt and unbitrium
 (4) Unb and unnilbium Unbitrium
52. Arrange the following ions in the correct order with respect to their ionic radii.
 (1) $\text{Br}^- > \text{Cl}^- > \text{Na}^+ > \text{Be}^{2+}$
 (2) $\text{Be}^{2+} > \text{Na}^+ > \text{Cl}^- > \text{Br}^-$
 (3) $\text{Cl}^- > \text{Br}^- > \text{Na}^+ > \text{Be}^{2+}$
 (4) $\text{Na}^+ > \text{Be}^{2+} > \text{Br}^- > \text{Cl}^-$
53. In which group of the periodic table the element with $Z = 120$ be placed?
 (1) 2 (2) 1
 (3) 14 (4) 15

54. Among the isoelectronic ions (O^{2-} , N^{3-} , Mg^{2+} , Na^+), the ions with least and highest ionic radius are respectively
 (1) Mg^{2+} , N^{3-} (2) Mg^{2+} , O^{2-}
 (3) Na^+ , N^{3-} (4) Na^+ , O^{2-}
55. The correct option for the first ionisation enthalpy (in kJ mol^{-1}) of Li, Na, K and Cs respectively is
 (1) 496, 520, 419, 374 (2) 374, 419, 496, 520
 (3) 520, 496, 419, 374 (4) 374, 419, 520, 496
56. The correct increasing order of ionisation enthalpy of He, Li⁺, Be²⁺ is
 (1) $He < Li^+ < Be^{2+}$ (2) $Be^{2+} < Li^+ < He$
 (3) $Li^+ > Be^{2+} > He$ (4) $Be^{2+} < He < Li^+$
57. Which of the following statement is wrong for the d-block elements?
 (1) General electronic configuration for them is $d^{1-10} ns^{0-2}$.
 (2) They generally exhibit variable valency.
 (3) Last electron enters in $(n-1)d$ subshell in them.
 (4) They are placed from third period to sixth period in modern periodic table.
58. The group in the modern periodic table, in which all the elements do not have same number of electrons in their valence shell is:
 (1) 13th (2) 11th
 (3) 9th (4) zero
59. The elements with atomic numbers 9, 17, 35, 53, 85 are all
 (1) Noble gases (2) Halogens
 (3) Heavy metals (4) Light metals
60. An element has electronic configuration $1s^2, 2s^2, 2p^6, 3s^2 3p^3$. Predict their period, group and block
 (1) Period = 3rd, block = p, group = 15
 (2) Period = 5th, block = s, group = 1
 (3) Period = 3rd, block = p, group = 10
 (4) Period = 4th, block = d, group = 12
61. In Mendeleev's periodic table some pairs of elements do not follow increasing order of atomic weight known as anomalous pair. The correct example of anomalous pair is
 (1) Cl, Ar (2) Th, Pa
 (3) Te, In (4) Co, Nb
62. Dobereiner triads is
 (1) Na, K, Rb (2) Mg, S, As
 (3) P, S, As (4) Cl, Br, I
63. The correct order of ionisation energy for comparing carbon, nitrogen and oxygen atoms is
 (1) C > N > O (2) C > N < O

64. $C < N > O$ (4) C < N < O
 A sudden jump between the values of second and third ionisation energies of an atom would be associated with the electronic configuration
 (1) $1s^2, 2s^2, 2p^6$ (2) $1s^2, 2s^2, 2p^6, 3s^2, 3p^1$
 (3) $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$ (4) $1s^2, 2s^2, 2p^6, 3s^2$
65. A neutral atom will have the lowest ionisation potential when its electronic configuration is
 (1) $1s^1$ (2) $1s^2, 2s^2, 2p^6$
 (3) $1s^2, 2s^2, 2p^2$ (4) $1s^2, 2s^2, 2p^6, 3s^1$
66. Match List-I with List-II and select the correct answer:
- | | List-I | List-II |
|----|---------------------------------------------------|-------------|
| A. | Most electronegative element | 1. Helium |
| B. | The element having highest electron gain enthalpy | 2. Fluorine |
| C. | Most electropositive element | 3. Chlorine |
| D. | The element having highest ionisation energy | 4. Caesium |
- (A) (B) (C) (D)
 (1) 1 2 3 4
 (2) 4 3 2 1
 (3) 2 3 4 1
 (4) 4 1 2 3
67. A metal forms a chloride with the formula MCl_2 . Formula of Phosphoric acid is H_3PO_4 . Formula of the Phosphate of the metal is
 (1) M_2PO_4 (2) MPO_4
 (3) $M_3(PO_4)_2$ (4) M_2PO_4
68. An oxide of an element is a gas and dissolves in water to give an acidic solution. The element belongs to
 (1) II group (2) IV group
 (3) VIII group (4) Zero group
69. The electron affinity values (in kJ mol^{-1}) of three halogens X, Y and Z are respectively -349, -333 and -325. Then X, Y and Z respectively are
 (1) F_2, Cl_2 and Br_2 (2) Cl_2, F_2 and Br_2
 (3) Cl_2, Br_2 and F_2 (4) Br_2, Cl_2 and F_2
70. The atomic numbers of elements A, B, C and D are $z-1$, z , $z+1$ and $z+2$ respectively. If '⁺ prime B' is a noble gas,

choose the correct answers from the following statements:

- (a) 'A' has higher electron affinity.
(~~b~~) 'C' exists in +2 oxidation state.
(c) 'D' is an Alkaline Earth metal.
(1) (a) and (b) (2) (b) and (c)
(~~3~~) (a) and (c) (4) (a), (b) and (c)

NUMERICAL VALUE TYPE

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71. The ionisation energy of Li is 500 kJ/mole. The amount of energy required to convert

70mg of Li atoms in gaseous state into Li^+ ions (in kJ) is ____.

72. The percentage ionic character in H-Br bond in HBr molecule is 67, given the electro negativity of H and Br are 2.1 and 2.8 respectively. (Nearest Integer)

73. The bond energies of H-H, X-X and H-X are 104 K.Cal, 38 K.Cal and 138 K.Cal respectively the electronegativity of 'X' is $[\sqrt{67} = 8.18]$ (Nearest Integer) 1.7

74. The first four successive ionisation energies for an element are 6.113, 11.871, 50.908, 67.01 (in eV) respectively. The number of valency shell electrons is 2.
75. The atomic number of element Unq is: 104

BEST OF LUCK

$$X_a - X_b = \boxed{0.7}$$

$$\frac{0.7}{2 \times 3} \times 100 = 0.66 \times 100 \\ 66\% \text{ f-}$$

