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Hack the North Test Test [22]

Answer the following questions **in the box provided**. Complete solutions and sentences must be shown for full marks.

1. When $2x^4 + 3x^3 + ax^2 + bx + 7$ is divided by $x - 1$ the remainder is 15. When it is divided by $x + 2$ the remainder is -3. Determine the values of a and b. [5]

$f(1) = 2(1)^4 + 3(1)^3 + a(1)^2 + b(1) + 7$

$15 = 12 + a + b$

$3 = a + b$

$f(2) = 2(2)^4 + 3(2)^3 + a(2)^4 + b(2) + 7$

$-3 = 15 + 4a - 2b$

$-18 = 4a - 2b$

$3 = a + b$

$-9 = 2a - b$

$-6 = 3a$

$-2 = a$

$-9 = 2(-2) - b$

$-5 = -b$

$5 = b$

2. Calculate the number of moles of 2.35g of calcium nitrate. [3]

$m = 2.35g$

$M = 100.10\ g/mol$

$n = ?$

$n = \frac{m}{M}$

$= \frac{2.35g}{100.10\ g/mol}$

$n = 0.0235\ mol$

3. Explain, in terms of the energy of its molecules, why the temperature of a pure substance does not change during melting. [3]

Temp and ~~kinetic~~ KE are directly related

When melting, PE changes but KE doesn't.

PE increases because energy is inputted and absorbed.

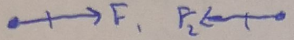
Since KE doesn't change, temp ~~does~~ does not change.

4. State Newton's Third Law of Motion and provide an example of an application of the third law. [2]

Every force has an equal and opposite reaction force.

Pushing on wall while sitting in rolling chair.

FBD person FBD wall



5. Give the full electron configuration of the selenium atom ($_{34}$Se). [1]

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^4$

6. Give the full electron configuration of this ion and explain why this electron arrangement is stable. [2]

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6$

Same electron config of noble gas Kr, since noble gas stable,

∴ this ion is also stable.

7. Identify one other major variable that must be controlled in order to study the relationship between temperature and volume. [1]

# of moles

8. Write the equation of the transformed function of y = |x| if it has been horizontally dilated by a factor of 6, vertically dilated by a factor of 5, reflected in the x-axis, horizontally translated 3 units to the left and vertically translated 7 units down. [5]

$$y = 5\left|-\tfrac{1}{6}(x+3)\right| - 7$$