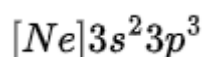


- Statement 3 is correct because cancer is uncontrolled cell division, and stem cells survive much longer than adult cells hence there is an increased risk that they accumulate sufficient mutations over time, resulting in unregulated self renewal and developing cancer.

2. D

- Z^{3-} ion has 3 “excess” electrons thus giving it a charge of 3-. Since the electronic configuration of Z^{3-} is 2,8,8, then atom Z must have the configuration 2,8,5.
- Imagine taking electrons out of an ion; it must be taken out from the outer shells first before moving onto the next innermost shell, as electrons have higher energies the higher the energy shell number they’re occupied in.
- Z must be a p block element as the 3rd shell has 5 electrons, and this can be rewritten as:

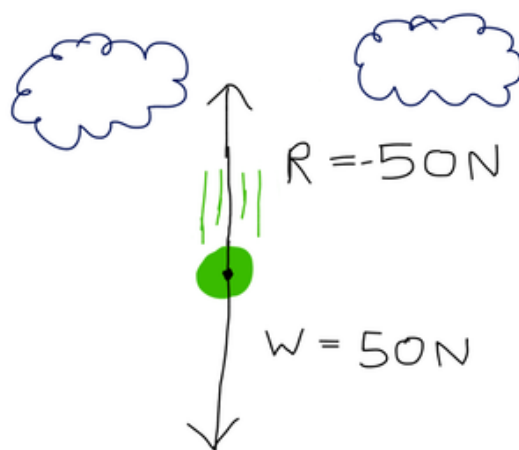


(where the squared bracket tells us the electron configuration of the noble gas element before addition of further electrons in the next highest shell).

- This is important as calculating group numbers depends on whether the element is a s, p or d block element.
 - S block: group number is either 1 or 2 (depending on number of outer shell electrons)
 - P block: group number is the number of outer shell electrons, plus 10.
 - D block: group number is the number of electrons in the highest level s and highest level d orbital
- Since Z is a p block element with configuration of 2,8,5, this means the group number is 15.

3. G

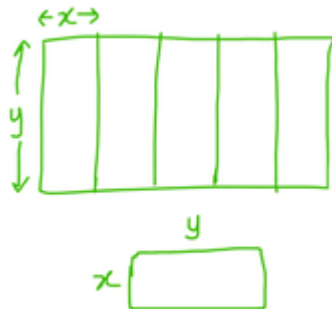
- Imagine the following scenario:



- Finally, we can calculate the $Pressure[kPa] = \frac{40[kg]}{(2/100)[m^2]} = 2000kPa$

12. A

- Since the larger rectangle and small rectangle are similar, then all corresponding sides will be in the same ratio.
- With regards to the small rectangle, let's label the short side as x , and the large side y . Also let's compare the large rectangle with another small rectangle, side by side, so that they're both orientated in the same way:



- Since the top and bottom rectangles are similar, their corresponding sides will have a common enlargement factor, which can be rewritten as follows:

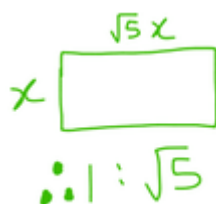
$\frac{5x}{y} = \frac{y}{x}$

- This then gives us:

$$5x^2 = y^2$$

$$\sqrt{5}x = y$$

- If we then substitute y in terms of x in the smaller rectangle we get the following, with the ratio of the smaller side to the larger side apparent:



- It therefore may be intuitive to think that the observer would be noticing an increase in frequency from f_0 , but actually in this case the train is decelerating and is approaching a state of being stationary. Hence the frequency would be decreasing towards f_0 , which is the actual frequency being generated by the horn. This goes back to the first point that a source of waves emits waves at constant frequency in all directions when it is stationary.
- As the train is approaching, the perceived amplitude of the sound by the observer will increase.

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