



## CHEMISTRY

### BOOKS - VGS BRILLIANT CHEMISTRY (TELUGU ENGLISH)

#### STRUCTURE OF ATOM

##### Textual Lesson Part Conceptual Understanding

1. What information does the electronic configuration of an atom provide ?



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2. How many maximum number pf electrons can be accommodated in a principal energy shell?



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3. How many maximum number of electrons can be accommodated in a sub-shell ?

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4. How many maximum number of electrons can be accommodated in an orbitals ?

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5. How many sub-shells present in a 'M' principal energy shell?

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6. How many spin orientation are possible for an electron in an orbital ?

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7. In an atom the number of electrons in M - shell is equal to the number of electrons in the K and L - shell . Answer the question.

Explanation :

1) Number of electrons in K-shell ( $1s^2$ ) = 2

Number of electrons in L-shell ( $2s^2 2p^6$ ) = 8

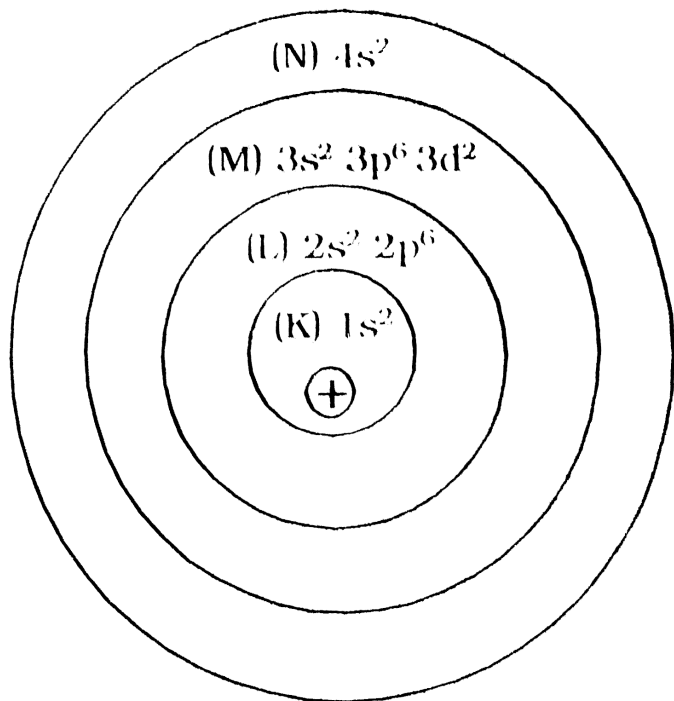
Total number of electrons in k & L shells = 10

2) Given that number of electrons in M-shell is equal to number of electrons in K& L- shells

3) Hence number of electrons in M-shell ( $3s^2 3p^6 3d^2$ ) = 10

4) But , we know that before filling of 3d orbital 4s should be filled ( $4s^2$ )

5) So , electronic configuration is  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$



Which is the outermost cell ?

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8. In an atom the number of electrons in M - shell is equal to the number of electrons in the K and L - shell . Answer the question.

Explanation :

1) Number of electrons in K-shell ( $1s^2$ ) = 2

Number of electrons in L-shell ( $2s^2 sp^6$ ) = 8



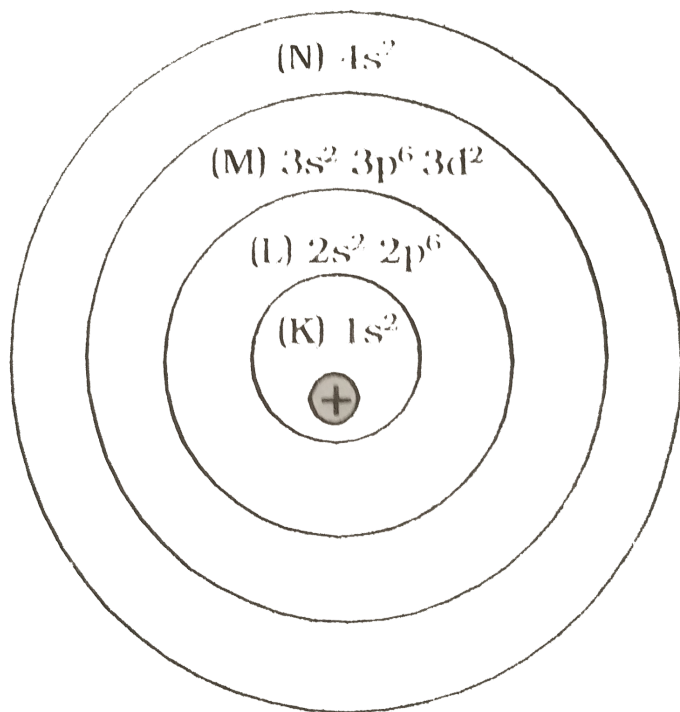
Total number of electrons in k & L shells = 10

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3) Hence number of electrons in M-shell ( $3s^2 3p^6 3d^2$ ) = 10

4) But, we know that before filling of 3d orbital 4s should be filled ( $4s^2$ )

5) So, electronic configuration is  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$



How many electrons are there in its outermost shell ?

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9. In an atom the number of electrons in M - shell is equal to the number of electrons in the K and L - shell . Answer the question.

Explanation :

1) Number of electrons in K-shell  $(1s^2) = 2$

Number of electrons in L-shell  $(2s^2 2p^6) = 8$

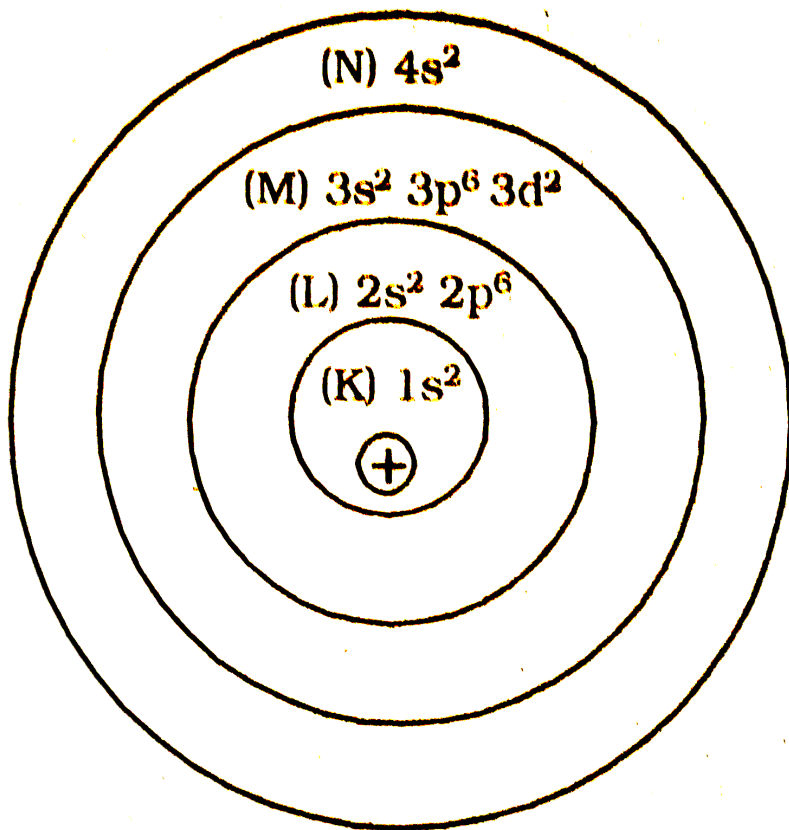
Total number of electrons in k & L shells = 10

2) Given that number of electrons in M-shell is equal to number of electrons in K& L- shells

3) Hence number of electrons in M-shell  $(3s^2 3p^6 3d^2) = 10$

4) But , we know that before filling of 3d orbital 4s should be filled  $(4s^2)$

5) So , electronic configuration is  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$



What is the atomic number of element ?

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10. In an atom the number of electrons in M - shell is equal to the number of electrons in the K and L - shell . Answer the question.

Explanation :

1) Number of electrons in K-shell ( $1s^2$ ) = 2

Number of electrons in L-shell ( $2s^2 2p^6$ ) = 8

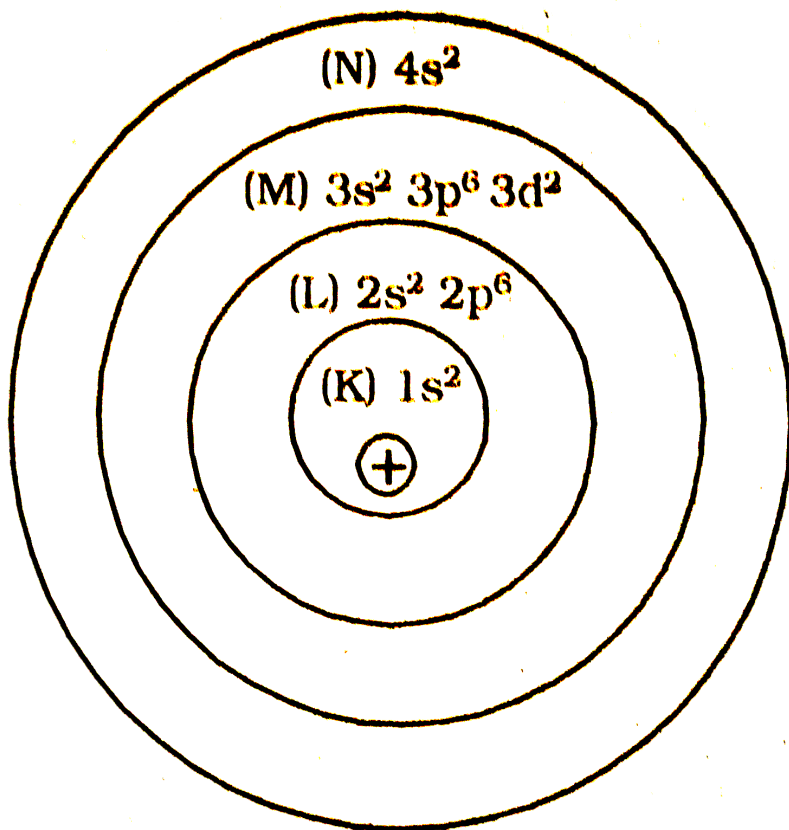
Total number of electrons in K & L shells = 10

2) Given that number of electrons in M-shell is equal to number of electrons in K & L shells

3) Hence number of electrons in M-shell ( $3s^2 3p^6 3d^2$ ) = 10

4) But, we know that before filling of 3d orbital 4s should be filled ( $4s^2$ )

5) So, electronic configuration is  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$



What is the atomic number of element ?

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11. Rainbow is an example for continuous spectrum - Explain

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12. How many elliptical orbits are added by Sommerfeld in third Bohr's orbit? What was the purpose of adding these elliptical orbits ?

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13. What is absorption spectrum?

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14. What is an orbital? How is it different from Bohr's orbit ?

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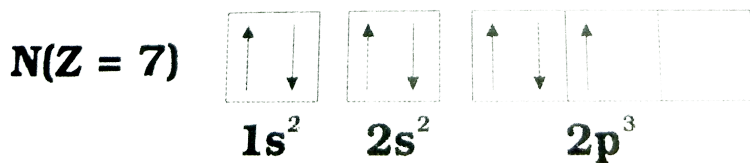
15. Explain the significance of three quantum numbers in predicting the positions of an electron in an orbit .

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16. What is  $nl^x$  method ? How is it useful ?

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17. Following orbital diagram shows the electronic configuration of nitrogen atom. Which rule does not support this ?



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18. Which rule is violated in the electronic configuration  $1s^0 2s^2 2p^4$  ?

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19. Write the four quantum numbers for the differentiating electron of sodium (Na) atom.

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20. Why there are exemptions in writing the electronic configurations of Chromium and Copper ?

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21. What is emission spectrum?

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1. An electron in an atom has the following set of four quantum numbers to which orbital it belong to :

<b>n</b>	<b>l</b>	<b>m<sub>l</sub></b>	<b>m<sub>s</sub></b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>+ 1/2</b>

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2. Which electron shell is at a higher energy level K or L ?

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1. Collect the information regarding wavelengths and corresponding frequencies of three primary colours red, blue and green.

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### Textual Lesson Part Application To Daily Life Concern To Biodiversity

1. The wavelength of a radiowave is 1 m. Find its frequency:

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### Textual Lesson Part Fill In The Blanks

1. If  $n = 1$ , then angular momentum quantum ( $l$ ) = .....

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2. If a sub-shell is denoted as 2p. then its magnetic quantum number values are .....

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3. Maximum number of electrons that an M-shell contains is / are .....

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4. For 'n', the minimum value is....., and the maximum value is .....

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5. For 'l', the minimum value is ....., and the maximum value is .....

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6. For  $m_l$  the minimum value is ..... , and the maximum value is .....



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7. The value of  $m_s$  for an electron spinning in clockwise direction is ....., and for anticlock wise direction is .....



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### Textual Lesson Part Multiple Choice Questions

1. An emission spectrum consists of bright spectral lines on a dark background. Which one of the following does not correspond to the bright spectral lines ?

- A. Frequency of emitted radiation
- B. Wavelength of emitted radiation

C. Energy of emitted radiations

D. Velocity of light

**Answer: D**

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2. The maximum number of electrons that can be accommodated in the L-shell of an atom is

A. 2

B. 4

C. 8

D. 16

**Answer: C**

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3. If  $l = 1$  for an atom, then the number of orbitals in its sub-shell is

A. 1

B. 2

C. 3

D. 0

**Answer: C**



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4. The quantum number which explains about size and energy of the orbit or shell is

A.  $n$

B.  $l$

C.  $m_l$

D.  $m_s$

**Answer: A**



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## Activities

1. Explain the wave nature of light.



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2. How is electromagnetic wave produced ? Draw a sketch of a plane e.m. wave propagating along X-axis depicting the directions of the oscillating electric and magnetic fields.



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3. Write an activity which shows metal produces colour in flame.



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4. Complete the electronic configuration of the following elements .

Element	Atomic number (Z)	Electronic configuration of elements	Element	Atomic number (Z)	Electronic configuration of elements
C	6		Si	14	
N	7		P	15	
O	8		S	16	
F	9		Cl	17	
Ne	10		Ar	18	
Na	11		K	19	
Mg	12		Ca	20	
Al	13				

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### Questions Given In The Lessons 1 Marks Questions

1. How many colours are there in a rainbow ? What are they ?

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2. What are the characteristics of electromagnetic waves ?



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3. Can we apply this equation  $c = v\lambda$ , to a sound wave '?

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4. Do you observe any other colour at the same time when one colour is emitted ?

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5. Do you observe yellow light in street lamps? Which will produce yellow light?

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6. What happens when an electron gains energy ?

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7. Does the electron retain the energy forever ?

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8. Did Bohr's model account for the splitting of line spectra of a hydrogen atom into finer lines ?

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9. Why is the electron in an atom restricted to revolve around the nucleus at certain fixed distances ?

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10. Do the electrons follow defined paths around the nucleus

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11. What is the velocity of the electron ?



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12. Do atoms have a definite boundary, as suggested by Bohr's model'?



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13. What do we call the region of space where the electron might be, at a given time ?



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14. What information do the quantum numbers provide ?



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15. What does each quantum number signify ?

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16. What is the maximum value of  $l$  for  $n = 4$  ?

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17. How many values can  $l$  have for  $n = 4$  ?

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18. Do all the p-orbitals have the same energy ?

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19. How are two electrons in the Helium atom arranged ?



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20. What are the spins of two electrons in an orbital ?



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21. How many electrons are occupied by an orbital ?



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## Questions Given In The Lessons 2 Marks Questions

1. Which colours do you observe when an iron rod is gradually heated ?



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2. Do you enjoy Deepavali fire works ? Variety of colours is seen from fire works. How do these colours come from fire works ?

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3. Is it possible to find exact position of electron ? How do you find the position and velocity of an electron ?

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### Questions Given In The Lessons 4 Marks Questions

1. Why do different elements emit different flame colours when heated by the same non - luminous flame ?

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1. Write about sub atomic particles.

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2. What is the speed of visible light ?

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3. What is the distance between two continuous wave peaks in a wave ?

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4. What is the number of wave peaks that pass by a given point per unit time?

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5. What are the units for frequency ?



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6. Which is expressed by  $\frac{c}{\lambda}$  ?



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7. Write a relation between wavelength ( $\lambda$ ) , frequency (upsilon) and speed of wave (c).



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8. How is wavelength of a wave changes as its frequency increases ?



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9. How do you call the entire range of electromagnetic wave frequencies .

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10. Write one example to visible natural spectrum.

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11. Arrange the following type of radiation in increasing order of frequency :

(a) X- rays (b) visible radiation (c) microwave radiation and (d) radiation from radio waves .

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12. What is the range of wavelength of visible light rays?

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13. Which of the following has shortest wavelength ?

A) Cosmic rays B)  $\gamma$  rays C) Microwave rays



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14. Select the correct answer.

'Electromagnetic energy can be gained or lost in the manner of ....' .

a) continuous b) discrete



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15. What is the value of Planck's constant



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16. How much energy ( $E$ ) can be released or absorbed by an electromagnetic wave with the frequency ' $\nu$ ' ?

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17. How does energy of a wave change as its wavelength decreases or frequency increases?

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18. Which colour do you observe, when cupric chloride burns in a non-luminous flame?

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19. Which colour do you observe, when strontium chloride burns in a non-luminous flame?



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20. Do you observe yellow light in street lamps? Which will produce yellow light?

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21. What is the use of a line spectra?

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22. Which is used to identify unknown atoms ?

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23. Does the electron retain the energy at excited state forever ?

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24. Match it .

- |  |                |
|--|----------------|
| a) Electron jumps from ground state to excited       | (i) absorption |
| b) Electron jumps from excited state to ground state | (ii) emission  |

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25. It is a successful model as far as line spectra of hydrogen atom. But it is failed to account for splitting of line spectra. Which model it is ?

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26. Who introduced elliptical orbits ?

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27. How many elliptical orbits are added to Bohr's first circular orbit by Sommerfeld ?

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28. Which model successfully explained fine line structure of hydrogen atomic spectra?

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29. Which of the following atomic model did not explained the fine line spectra of atoms of more than one electron ?

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30. Who developed quantum mechanical model of atom ?

A. Erwin Schrodinger

B. Neil Bohr

C. Planck

D. Thomson

**Answer: A**



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**31.** What do we call the region of space where the electron might be, at a given time ?



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**32.** Where do you find electron in an atom ?



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**33.** Which numbers indicate the probability of finding the electron in the space around the nucleus?



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34. The quantum number which explains about size and energy of the orbit or shell is

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35. What are the values of principle quantum number 'n' ?

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<b>Shell</b>	<b>K</b>	<b>L</b>	<b>M</b>	<b>N</b>
<b>n</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>

36.

If 'n' increases the shells become larger, from the above data answer the following.

Which shell very closure to the nucleus ?

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<b>Shell</b>	<b>K</b>	<b>L</b>	<b>M</b>	<b>N</b>
<b>n</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>

37.

If 'n' increases the shells become larger, from the above data answer the following.

What is the principle quantum number of shell N ?

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38. Write the range of 'l' values for each value of 'n'

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39. Which quantum number represents sub-shell ?

A. Principle quantum no.

B. Azimuthal quantum no.



C. magnetic quantum no.

D. spin quantum no.

**Answer: B**

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**40.** Which quantum number represents sub-shell ?

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**41.** Name the sub-shell if  $l = 2$ .

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**42.** Name the sub-shell if  $l = 0$ .

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43. Name the orbital for  $n = 1$  and  $l = 0$ .

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44. How many sub-shells can exist in the main shell  $n = 2$  ?

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45. What is the value of angular momentum quantum number for 'f' ?

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46. What is the maximum value of  $l$  for  $n = 4$  ?

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47. How many values can  $l$  have for  $n = 4$  ?



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48. What is the maximum value of 'l' for 'n' ?



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49. How many integer values exists for a certain value of 'l' ?



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50. Which quantum number describes the orientation of the orbital in space ?



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51. How many orientations can 's-orbital' exhibit ?



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52. What is the  $m_l$  value for s-orbital ?



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53. Name the  $m_l$  values for  $l = 1$ .



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54. Name the degenerated orbitals for  $l = 1$ .



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55. Which quantum shows degenerated orbitals for certain  $l$  values ?



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56. What is the relation between  $l$  and  $m_l$ ?

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57. What is the shape of s-orbital ?

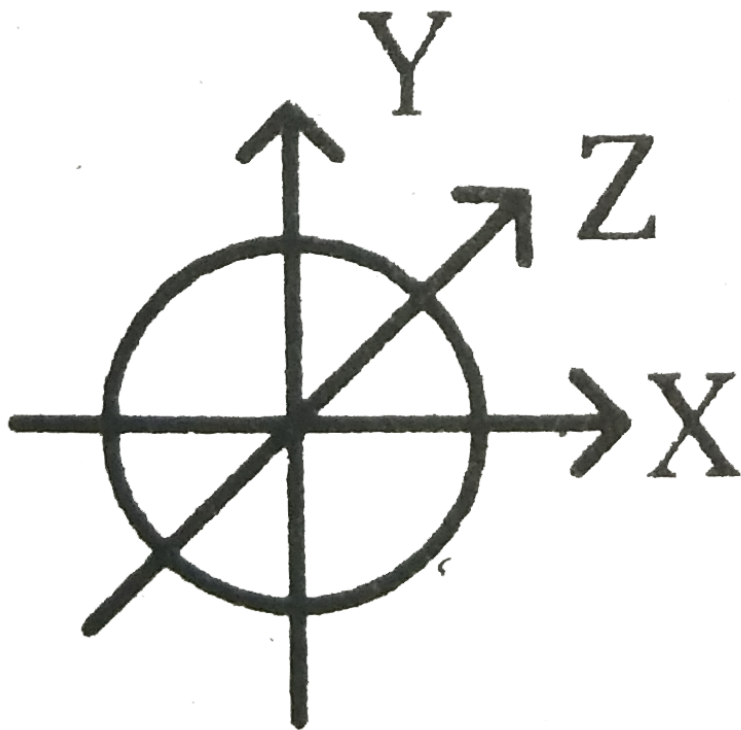
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58. What is the shape of p-orbital ?

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59. What is the shape of d-orbital ?

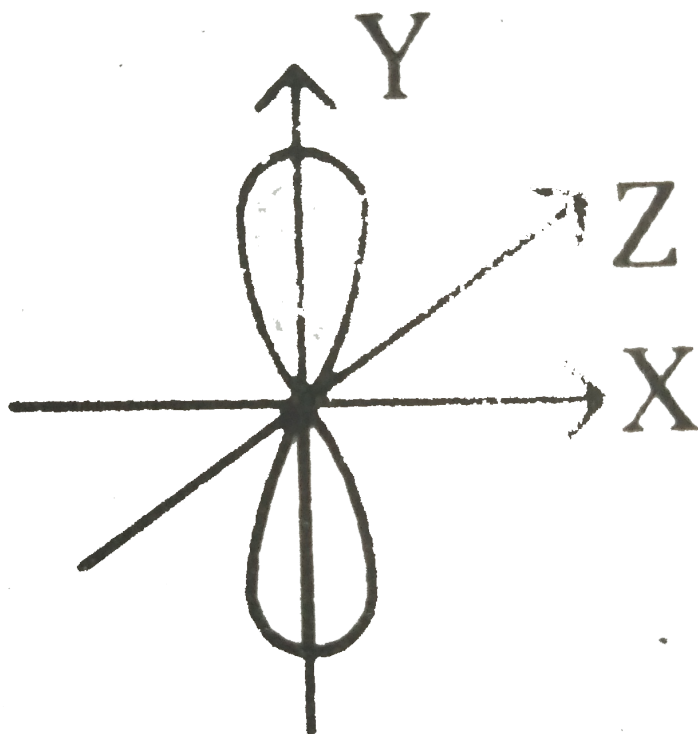
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60.

Name the given orbital .

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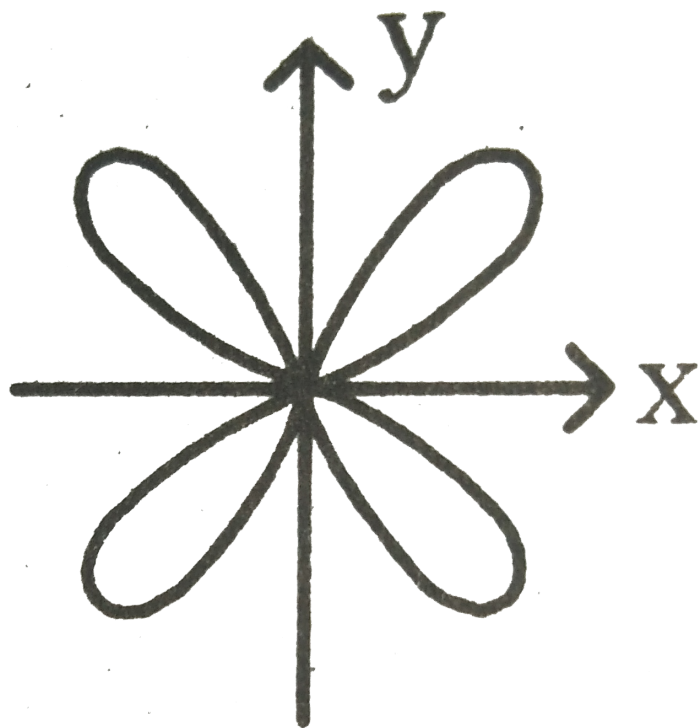


61.

Name the given orbital .



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62.

Name the given orbital .

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63. Name the different orientations of d-orbitals

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64. Which subshell has '5' degenerated orbitals?

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65. What is relation between subshell ( $l$ ) and maximum number of electrons ?

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66. How many maximum number of electrons can be accommodated in an orbitals ?

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67. Match it.

- |                |           |
|----------------|-----------|
| a) size        | i) $l$    |
| b) shape       | ii) $m_l$ |
| c) orientation | iii) $n$  |

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68. What are values of  $m_s$  ?

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69. What are the values of a parallel spin ?

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70. Write the short notation of electronic configuration.

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71. In  $nl^x$  method, how many quantum numbers are there ?

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72. In  $nl^x$  method , what is x ?

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73.  $\uparrow$  What is the spin value of the given electron ?

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74. Write four quantum numbers for  $1s^1$  electron.

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75. Which quantum number of the electron values differs In the Helium atom ?

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76. a) An orbital can hold only two electrons

b) An orbital must have electrons with opposite spins. Which is correct ?

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77. "No two electrons of the same atom can have all four quantum numbers the same". Name the above principle.

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78. What is the maximum number of electrons in any shell, if 'n' is the principal quantum number?

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79. What is the maximum number of electrons in a sub-shell (s, p, d, f) ?

Where  $Z = 0, 1, 2, 3, \dots$ ?

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80. What is the meaning of word 'Aufbau'?

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81. Which formula can be used to calculate energy of an orbital ?

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82. In 4s, 4p, 4d, 3d orbitals, which one has least energy ?

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83. 'Moeller chart' deals with

a) Pauli's principle b) Aufbau principle c) Hund's Rule

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84. Which principle is stated that the orbitals are filled in the order of increasing energy ?



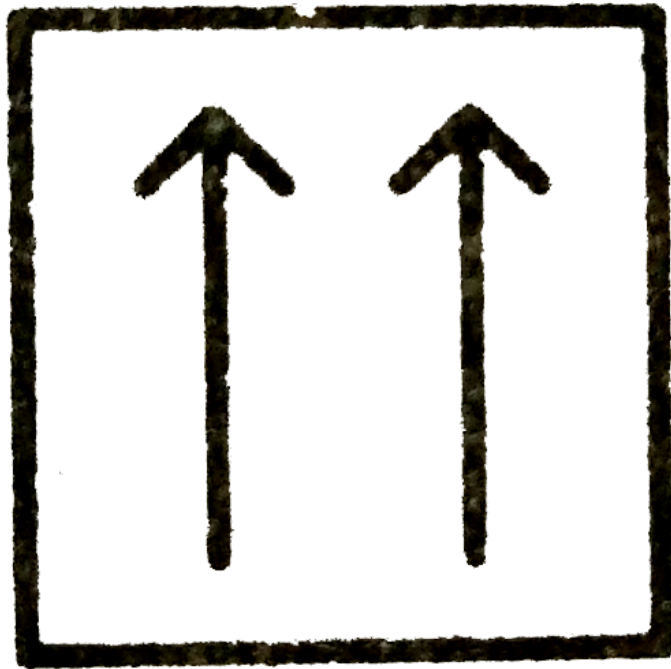
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85.  $1s^2, 2s^2, 2p_x^2$ . Which rule is violated



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86. He :



Which rule is violated ?

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87.  $1s^2, 2s^2 2p^6 3s^2 3p^6 3d^{10}$ . Which rule is violated ?

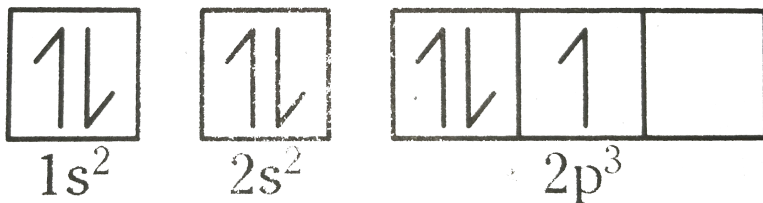
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88. Write the electronic configuration of chromium (Cr) and copper (Cu).

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89. Write the electronic configuration of chromium (Cr) and copper (Cu).

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Which rule does not support this ?

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91. Which rule is violated in the electronic configuration  $1s^0 2s^2 2p^4$  ?

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92. Write the four quantum numbers for the differentiating electron of sodium (Na) atom.

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93. Which electron shell is at a higher energy level K or L ?

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94. Maximum number of electrons that an M-shell contains is / are .....

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95. The wavelength of a radiowave is 1 m. Find its frequency:

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96. Prepare a question on  $n\ell^x$  method.

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### Creative Questions For New Model Examination Section II 1 Mark

1. Write the electronic configuration of chromium (Cr) and copper (Cu).

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2. Out of 3d and 4s, which has more  $(n + l)$  value ? Explain.

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3. Which colours do you observe when an iron rod is gradually heated ?

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4. Which principle is not followed in writing the electronic configuration of  $1s^2 2s^1 2p^4$  ? Give reasons.

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5. The four quantum number values of the 21st electrons of scandium (Sc) are given in the following table.



Write the values of the four quantum numbers for the 20th electron of scandium (Sc) in the form of the table.

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6. Write the symbol of the outermost shell of magnesium ( $Z = 12$ ) atom.

How many electrons are present in the outermost shell of magnesium?

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7. If  $n = 3$ , mention the orbitals present in the shell and write maximum number of electrons in the shell.

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8. If  $n = 3$ , mention the orbitals present in the shell and write maximum number of electrons in the shell.

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9. What is the speed of visible light ?

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10. Define wavelength ( $\lambda$ ).



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11. Define frequency ( $\nu$ )



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12. What is electromagnetic spectrum ?



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13. What is visible spectrum ? What is its wavelength range ?



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14. What is the significance of Planck's proposal ?



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15. What do you mean by ground state ?



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16. What are the failures of Bohr's model of atom ?



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17. What is an orbital ?



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18. What are quantum numbers ?



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19. What is an electronic configuration ?



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20. Explain Pauli's exclusion principle .



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21. State Hund's rule and Aufbau principle.



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22. State Hund's rule and Aufbau principle.



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23. When does electromagnetic waves produce ?

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24. Rainbow is an example for continuous spectrum - Explain

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25. Which is example for line spectrum ?

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26. Which model explain fine spectrum of atom ?

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27. How wavelength and velocity of light related?





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28. What is the meaning of word 'Aufbau'?



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29. Why are zero group elements called noble gases or inert gases?



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30. Why does spin quantum number introduced ?



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31. Write the set of quantum numbers for the electrons in a  $3p_z$  orbital.



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32. What is the difference between an orbit and orbital ?

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33. Write the set of quantum numbers for the lastly entered electron of oxygen atom.

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34. What are the factors which influence electromagnetic energy ?

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35. Do all the p-orbitals have the same energy ?

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**36.** What is the value of Planck's constant



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**37.** What is maximum value of 'l' for  $n = 3$  ?



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**38.** How many values can l have for  $n = 4$  ?



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**39.** Write the four quantum numbers for the differentiating electrons of lithium (Li) atom .



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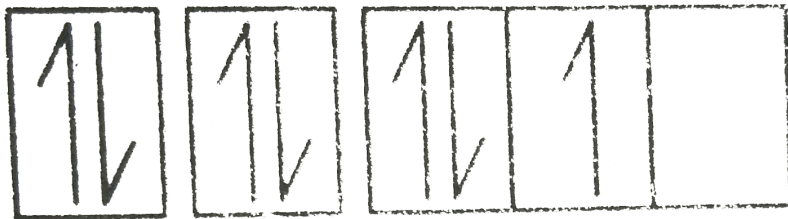
40. Write four quantum numbers for  $2p^1$  electron .

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41. How many electrons are occupied by an orbital ?

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42. Which rule is violated in the following electronic configuration?



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43. How many maximum number of  $pf$  electrons can be accommodated in a principal energy shell?



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44. The maximum number of electrons that can be accommodated in the L-shell of an atom is



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45. How many maximum number of electrons can be accommodated in d sub-shell?

A. 10

B. 5

C. 4

D. 8

**Answer:**



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**46.** How many sub-shells present in a 'M' principal energy shell?

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**47.** How many orientations can 's-orbital' exhibit ?

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**48.** What happens when an electron gains energy ?

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**49.** What happens when an object is suitably excited by heating ?

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**50.** Why do different elements emit different flame colours when heated by the same non - luminous flame ?

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**51.** Predict what happens when an electric charge vibrates ?

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**52.** Which colours do you observe when an iron rod is gradually heated ?

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**53.** Manoj observed a street light which is producing yellow light. Then he got many doubts in his mind. What could be those doubts ?

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54. What happens, when an electron. is in excited state ?

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55. Write two sentences about the electron in the  $3p^1$  orbital.

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56. How many orbitals there in the orbit  $n = 3$  ? What are they ?

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57. Fill the sub-shells in the given table.

<i>l</i>	0	1	2	3
Sub – shell				

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58.  $l = 1$  is given . What is the shape of the orbital ? Why ?

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59. Name the  $m_l$  values for  $l = 1$ .

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<b>Sub - shell</b>	<b>Maximum number of electrons</b>
s	2
p	6
d	10
f	14

60.

How many orbitals are there in p-shell ?

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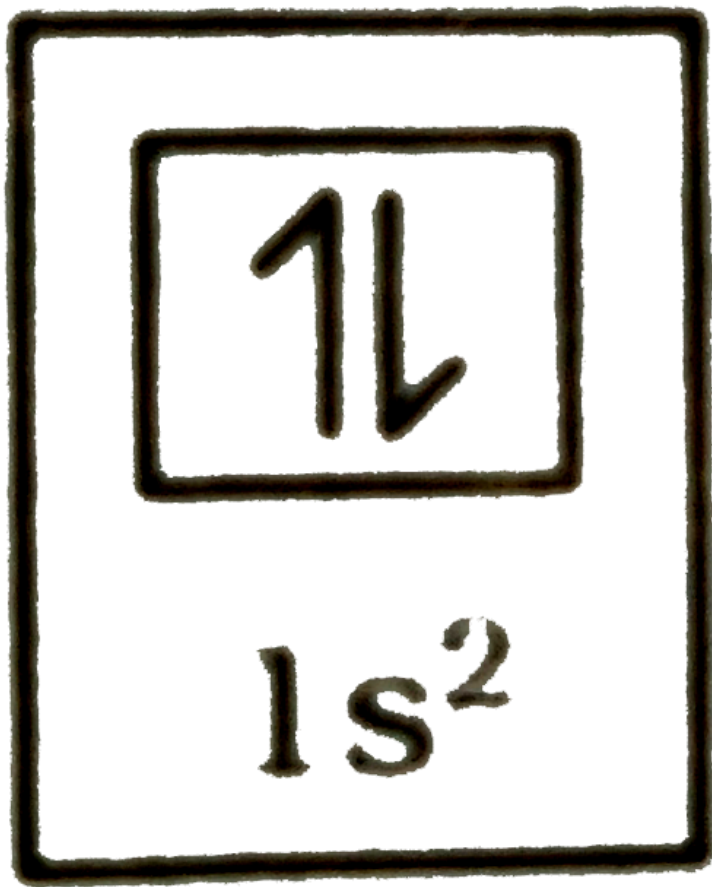
<b>Sub - shell</b>	<b>Maximum number of electrons</b>
s	2
p	6
d	10
f	14

61.

What is the relation between sub-shells and no. of electrons in it ?



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62.

What information can you write from the given data ?

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63. Draw the Bohr- Sommerfeld model for  $n=2$

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64. What is the shape of s-orbital ?

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65. Draw  $p_x$  - orbital.

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66. Draw the shape of  $d_{z^2}$  orbital .

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67. What is Sommerfeld's contribution for the structure of atom ?

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68. How do you appreciate the quantum numbers ?

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69. What is the use of a line spectra?

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70. What is the use of atomic spectra ?

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71. Explain the principle which describes the arrangements of electrons in degenerate orbitals .

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1. Explain Hund's rule with an example .

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2. The electronic configuration of Sodium is  $1s^2 2s^2 2p^6 3s^1$  .

What information that it gives ?

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3. Name the principle , which says an orbital can hold only 2 electrons and explain .

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4. For a better understanding about the electrode configuration in an atom , the teacher wrote shorthand notation  $nl^x$  on the blackboard .

Looking at this notation , what could be the probable questions that generate in the student's mind ? Write any two of them.

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5. Write the electronic configuration of the atom of an element having atomic number 11 . Write the names of the rules and the laws followed by you in writing this electronic configuration .

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6. Write the 'Octet Rule' . How does Mg (12) get stability while reacting with chlorine as per this rule ?

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7. The electron enters into 4 s orbital after filling 3 p orbital but not into 3d . Explain the reason .

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8. Write the electronic configuration of  $Na^+$  and  $Cl^-$

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9. Observe the given table and answer the question

Sl.No.	Electron Configuration
1.	$1s^2 2s^2 2p^6 3s^2 3p^3$
2.	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
3.	$1s^2 2s^2 2p^6 3s^2 3p^6$

Mention the divalent element name .

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10. Observe the given table and answer the question

Sl.No.	Electron Configuration
1.	$1s^2 2s^2 2p^6 3s^2 3p^3$
2.	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
3.	$1s^2 2s^2 2p^6 3s^2 3p^6$

Name the element belongs to 3<sup>rd</sup> period and VA Group

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11. Your friend is unable to understand  $nl^x$ . What questions will you ask him to understand  $nl^x$  method ?

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12. Why do valency electrons involve in bond formation, than electrons of inner shells ?

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13. What are characteristics of electromagnetic waves ?

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14. Write Planck's equation .

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15. Give the equation which give electromagnetic energy (light) that can have only certain discrete energy values .

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16. Explain Pauli's Exclusion principle with an example.

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17. Explain Aufbau principle with an example .



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18. There is an electron in one atom with  $n = 1, l = 0, m_l = 0$ .

a) Predict the name of the orbit in which it lies ?

b) Predict the name of the orbital in which it lies?



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19. Guess the orbital.

If 1) It's energy lies in between the energies of 4s and 4d.

2) It can hold only 2 electrons.



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20. The electronic configuration of an atom is as follows  $1s^2 2s^2 2p^2$

a) Which element's atom is it ?

b) What is the valence shell ?

c) When excited what could be the number of lone / single electrons in this atom ?

d) What is the value of principal quantum numbers of two electrons in the first box ?

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21. Fill the following table and write the rule which you use in filling the table .

$l$	0	1	2	3
Sub-shell	s	p	d	f
Number of orbitals				

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22. An electron in an atom has the following set of four quantum numbers to which orbitals it belongs to ?

$n$	$l$	$m_l$	$m_s$
3	0	0	$+\frac{1}{2}$

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23. You know that the distribution of electrons in shells, sub-shells and orbitals in an atom is known as electronic configuration.

Now answer the question by using the electronic configuration  $1s^2 2s^2 2p^1$

How many shells are there? What are they?

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24. You know that the distribution of electrons in shells, sub-shells and orbitals in an atom is known as electronic configuration.

Now answer the question by using the electronic configuration  $1s^2 2s^2 2p^1$

How many sub-shells are there? What are they?

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25. The differentiating electron in one atom is  $4p^1$ .

Write the set of 3 quantum numbers for it.

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26. The differentiating electron in one atom is  $4p^1$ .

Write the full electronic configuration of the atom.

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27. For  $n = 3$ .

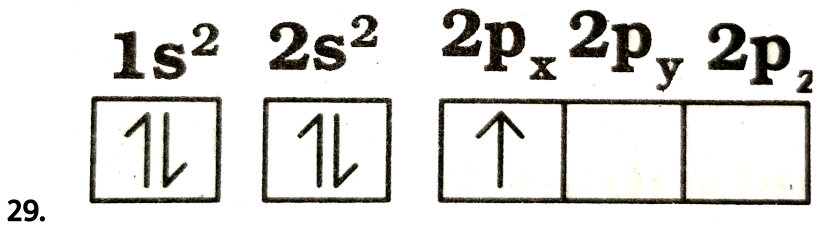
Write all the  $m_l$  values.

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28. For  $n = 3$ .

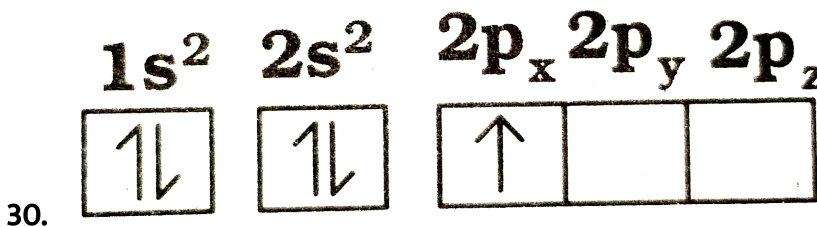
Write all the sub-shells

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Write the name of the atom and electronic configuration for the given block diagram.

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Where does the 6<sup>th</sup> electron go?



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31. Among 3d, 4s, 4p orbitals,  
which one has least orbital energy ? Why ?



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32. Among 3d, 4s, 4p orbitals,  
which one fills last by an electron? And why?



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33. Show all the p-orbitals in one diagram.



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34. Draw  $d_{x^2 - y^2}$  orbital and  $P_z$  orbital.



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**35.** Draw the diagram of electromagnetic wave

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**36.** How do you appreciate the Planck?

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**37.** What are the minimum and maximum frequency of a visible light ?

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**38.** Complete the following table based on quantum numbers related to atomic orbitals and electron of an atom .

Quantum number	Denoted by	Related to	Range of values
Principal quantum number		Size and energy of atomic orbital	
	$l$		0 to $n - 1$
Magnetic quantum number			-1 to 1
	$m_s$	behaviour of electron	

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### Creative Questions For New Model Examination Section Iv 4 Marks

1. What are the postulates of Bohr's model of hydrogen atom?

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2. What are the limitations of Bohr's theory of hydrogen atom?

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3. Draw Moeller chart of Ctlling order of atomic orbitals.



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4. Draw a diagram showing the increasing value of  $(n + l)$  of orbitals.



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5. Based on the information given in the table , answer the question given below

Sl.No.	Shell	K	L	M	N
1	n	1	2	3	4
2	l	0	0, 1	0, 1, 2	0, 1, 2, 3
3	$m_l$	0	0, 1	0, 1, 2	0, 1, 2, 3

For the 4th main shell, how many values are there for  $m_l$  ? What are they ?



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6. Based on the information given in the table , answer the question given below

Sl.No.	Shell	K	L	M	N
1	n	1	2	3	4
2	l	0	0, 1	0, 1, 2	0, 1, 2, 3
3	$m_l$	0	0	0	0
		0	-1, 0, 1	-1, 0, 1	-1, 0, 1
				-2, -1, 0, 1, 2	-2, -1, 0, 1, 2
					-3, -2, -1, 0, 1, 2, 3

For sub-shell with  $n = 3, l = 1$ , write the  $m_l$  values.

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7. Based on the information given in the table , answer the question given below

Sl.No.	Shell	K	L	M	N
1	n	1	2	3	4
2	l	0	0, 1	0, 1, 2	0, 1, 2, 3
3	$m_l$	0	0	0	0
		0	-1, 0, 1	-1, 0, 1	-1, 0, 1
				-2, -1, 0, 1, 2	-2, -1, 0, 1, 2
					-3, -2, -1, 0, 1, 2, 3

Write the principal quantum number value for 'N' shell. How many sub-shells are there in the main shell ?

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8. Based on the information given in the table , answer the question given below

Sl.No.	Shell	K	L	M	N
1	n	1	2	3	4
2	l	0	0, 1	0, 1, 2	0, 1, 2, 3
3	$m_l$	0	0 -1, 0, 1	0 -1, 0, 1 -2, -1, 0, 1, 2	0 -1, 0, 1 -2, -1, 0, 1, 2 -3, -2, -1, 0, 1, 2, 3

In the above table  $m_l$  and  $l$  values are given. Write a formula that gives the relationship between  $m_l$  and  $l$  based on those values.

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9. Observe the information provided in the table about quantum numbers. Then answer the question given below it.

<b>n</b>	<b>l</b>	<b>m<sub>l</sub></b>
<b>1</b>	<b>0</b>	<b>0</b>
<b>2</b>	<b>0</b>	<b>0</b>
	<b>1</b>	<b>-1, 0, +1</b>
<b>3</b>	<b>0</b>	<b>0</b>
	<b>1</b>	<b>-1, 0, +1</b>
	<b>2</b>	<b>-2, -1, 0, +1, +2</b>

Write the 'l' value and symbol of the spherical shaped sub-shell.

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10. Observe the information provided in the table about quantum numbers. Then answer the question given below it.

<b>n</b>	<b>l</b>	<b>m<sub>l</sub></b>
<b>1</b>	<b>0</b>	<b>0</b>
<b>2</b>	<b>0</b>	<b>0</b>
	<b>1</b>	<b>-1, 0, +1</b>
<b>3</b>	<b>0</b>	<b>0</b>
	<b>1</b>	<b>-1, 0, +1</b>
	<b>2</b>	<b>-2, -1, 0, +1, +2</b>

How many values that  $m_l$  takes for  $l = 2$ ? What are they?

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11. Observe the information provided in the table about quantum numbers. Then answer the question given below it.

<b>n</b>	<b>l</b>	<b>m<sub>l</sub></b>
<b>1</b>	<b>0</b>	<b>0</b>
<b>2</b>	<b>0</b>	<b>0</b>
	<b>1</b>	<b>-1, 0, +1</b>
<b>3</b>	<b>0</b>	<b>0</b>
	<b>1</b>	<b>-1, 0, +1</b>
	<b>2</b>	<b>-2, -1, 0, +1, +2</b>

Write the symbols of the orbitals for  $l = 1$  sub-shell.



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12. Observe the information provided in the table about quantum numbers. Then answer the question given below it.

<b>n</b>	<b>l</b>	<b>m<sub>l</sub></b>
<b>1</b>	<b>0</b>	<b>0</b>
<b>2</b>	<b>0</b>	<b>0</b>
	<b>1</b>	<b>-1, 0, +1</b>
<b>3</b>	<b>0</b>	<b>0</b>
	<b>1</b>	<b>-1, 0, +1</b>
	<b>2</b>	<b>-2, -1, 0, +1, +2</b>

What is the shape of the sub-shell for  $l = 2$  ? What is the shape of the sub-shell for  $l = 2$  ? What is the maximum number of electrons that can occupy this sub-shell ?

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13. Explain Bohr's model of hydrogen atom and its limitations.

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14. Explain Bohr- Sommerfeld model of an atom. What is the merit of this model? What are its limitations?

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15. Do the electrons follow defined paths around the nucleus



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16. What are the main features of quantum mechanical model of an atom?



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17. Prepare some questions to ask and make your friend understand the concepts orbital and orbit.



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18. Anitha argued that the 3d orbital is filled first, but not 4s orbital, with electrons.

By asking some questions Saritha corrected Anitha's argument.

What would be those questions ?

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**19.** In an atom the number of electrons in N - Shell is equal to the number of electrons in K, L and M shells. Answer the question.

Which is the outermost shell ?

Explanation :

$$K = 1s^2(2) \text{ electrons}$$

$$L = 2s^22p^6(8) \text{ electrons}$$

$$M = 3s^23p^63d^{10} (18) \text{ electrons}$$

Total (28) electrons

$$N = 4s^24p^64d^{10}4f^{10} (28) \text{ electrons}$$

To fill  $4f^{10}, 1s^2, 2s^22p^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^66s^2$  should be filled. Hence, the electronic configuration is

$$1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^66s^24f^{10}.$$

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20. In an atom the number of electrons in N - Shell is equal to the number of electrons in K, L and M shells. Answer the question.

How many electrons are there in its outermost shell ?

Explanation :

$$K = 1s^2(2) \text{ electrons}$$

$$L = 2s^22p^6(8) \text{ electrons}$$

$$M = 3s^23p^63d^{10} (18) \text{ electrons}$$

Total (28) electrons

$$N = 4s^24p^64d^{10}4f^{10} (28) \text{ electrons}$$

To fill  $4f^{10}$ ,  $1s^2$ ,  $2s^22p^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^66s^2$  should be filled. Hence, the electronic configuration is  $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^66s^24f^{10}$ .



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21. In an atom the number of electrons in N - Shell is equal to the number of electrons in K, L and M shells. Answer the question.

What is the atomic number ?

Explanation :

$$K = 1s^2(2) \text{ electrons}$$

$$L = 2s^22p^6(8) \text{ electrons}$$

$$M = 3s^23p^63d^{10} (18) \text{ electrons}$$

Total (28) electrons

$$N = 4s^24p^64d^{10}4f^{10} (28) \text{ electrons}$$

To fill  $4f^{10}$ ,  $1s^2$ ,  $2s^22p^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^66s^2$  should be filled. Hence, the electronic configuration is  $1s^22s^22p^63s^23p^64s^23^{10}4p^65s^24d^{10}5p^66s^24f^{10}$ .



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**22.** In an atom the number of electrons in N - Shell is equal to the number of electrons in K, L and M shells. Answer the question.

Write the electronic configuration of the elements.

Explanation :

$$K = 1s^2(2) \text{ electrons}$$

$$L = 2s^22p^6(8) \text{ electrons}$$

$$M = 3s^23p^63d^{10} (18) \text{ electrons}$$

Total (28) electrons

$$N = 4s^2 4p^6 4d^{10} 4f^{10} \text{ (28) electrons}$$

To fill  $4f^{10}$ ,  $1s^2$ ,  $2s^2 2p^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$  should be filled. Hence, the electronic configuration is  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{10}$ .

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$l$	Number of orbitals	Maximum number of electrons
0	1	2
1	3	6
2	5	10
3	7	14

23.

- 1) How many orbitals are there in p-subshell ?
- 2) How many electrons are there in d-subshell ?
- 3) Write the corresponding orbitals for  $l = 0, 1, 2, 3$ .
- 4) What is the relation between  $l$  and number of orbitals and  $l$  and number of electrons?

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24. a)  $1s^2 2s^2 2p^3 \Rightarrow$



(b)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 \Rightarrow Z = 20$

c) Electronic configuration of He is  $1s^2 \Rightarrow$



Which one contradicts the Aufbau rule ?



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25. a)  $1s^2 2s^2 2p^3 \Rightarrow$



(b)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 \Rightarrow Z = 20$

c) Electronic configuration of He is  $1s^2 \Rightarrow$



Which one contradicts the Aufbau rule ?



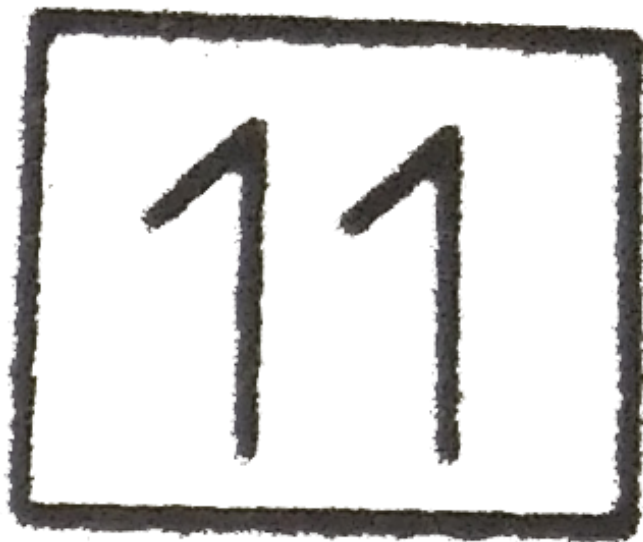
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26. a)  $1s^2 2s^2 2p^3 \Rightarrow$



(b)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 \Rightarrow Z = 20$

c) Electronic configuration of He is  $1s^2 \Rightarrow$



Which one contradicts the Hund's rule ?

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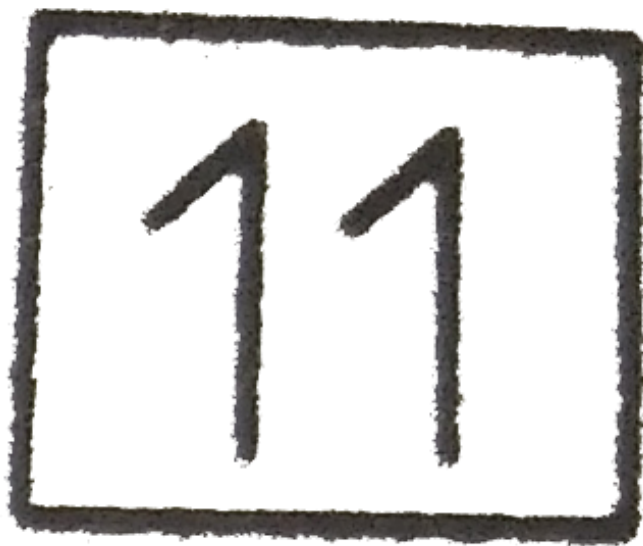


27. a)  $1s^2 2s^2 2p^3 \Rightarrow$



(b)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 \Rightarrow Z = 20$

c) Electronic configuration of He is  $1s^2 \Rightarrow$



Which one contradicts the Hund's rule ?

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28. Explain electromagnetic spectrum. Draw its diagram.

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29. Draw the electronic orbits for the main quantum number  $n = 4$  by Bohr-Sommerfeld model.

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30. Draw the shapes of s, p and d orbitals.

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31. How do you appreciate Niels Bohr for his contributions to understanding atomic structure?

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**32.** How do you appreciate the scientists Aufbau and Hund?



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