2. Structure Of Atom
Test Paper

1. An electron is moving with a kinetic energy of 4.55×10^{-25}J. Calculate de-Broglie wavelength for it.
a. $7.5 \times 10^{-6}m$
b. $14.5 \times 10^{-7}m$
c. $7.25 \times 10^{-7}m$
d. $3.125.2.5 \times 10^{-7}m$

2. Calculate the product of uncertainties of displacement of velocity of a moving electron of mass 9.1×10^{-28}g.
a. 5.77×10^{-4} m^2s
b. 5.77×10^{-5} m^2s^{-1}
c. $11.4 \times 10^{-5}m^2s^{-1}$
d. $11.4 \times 10^{-4}m^2s^{-1}$

3. Light of wavelength 400 nm strikes on cesium metal which has a photoelectric work function of 2.13 eV. Find out the maximum kinetic energy of the photoelectrons.
a. 1.7×10^{-19} J
b. 1.56×10^{-19} J
c. 1.56×10^{-18} J
d. 2×10^{-18} J

4. A 100 watt bulb is emitting monochromatic light having wavelength 6000 $\overset{o}{A}$. Calculate the number of photons emitted by bulb in five minute.
a. 6×10^{22} b. 9×10^{22}
c. 9×10^{23} d. 66×10^{23}

5. Calculate the uncertainty in position of an electron if the uncertainty in its velocity is $5.7 \times 10^6 ms^{-1}$.
a. 4×10^{-10}m b. 10^{-10}m
c. 2×10^{-10}m d. 10^{-9}m

6. Calculate the wavelength of radiation emitted by electron during transition from second orbit to 4th orbit in He^-.
a. 1.216×10^{-7}m b. 1.7×10^{-7}m
c. 1.216×10^{-6}m d. 1.216×10^{-9}m

7. Angular momentum of electrons in *4s* orbital is:
a. 00 b. $\frac{2h}{\pi}$
c. $\frac{3h}{2\pi}$ d. $\left(\frac{3}{2}\right)^{\frac{1}{2}}\frac{h}{\pi}$

8. The shape of an orbital is given by the quantum number:
a. n b. ℓ
c. m d. s

9. The energy corresponding to second line of Balmer series for hydrogen atom will be:
a. 12.1 eV b. 1.89 eV
c. 2.55 eV d. 13.6 eV

10. Which is not the characteristics property of Planck's quantum theory?
a. Energy is neither absorbed nor emitted in simple multiple of quanta.
b. Radiation is related to energy.
c. Energy is not radiated continuously but in small packets of energy called quantum.
d. The energy of a quanta is proportional to its frequency.

11. Which of the following pair is isodiapheres?
a. $^{14}_{6}C$ and $^{23}_{11}Na$ b. $^{24}_{12}Mg$ and $^{23}_{11}Na$
c. $^{4}_{2}He$ and $^{16}_{8}O$ d. $^{12}_{6}C$ and $^{16}_{7}N$

12. The ratio of velocity of the electron in the third and fifth orbit of Li^{2+} would be:
a. 3 : 5 b. 5 : 3
c. 25 : 9 d. 9 : 25

13. With increasing principle quantum number, the energy difference between adjacent energy levels in H-atom:
a. Decreases
b. Increases
c. Remains constant
d. Decreases for low value of Z and increases for higher value of Z

14. What is the energy (kJ/mol) associated with the de-excitation of an electron from n = 6 to n = 2 in He^+ ion?
a. 1.36×10^6 b. 1.36×10^3
c. 1.16×10^5 d. 1.78×10^3

15. The photoelectric emission from a surface starts only when the light incident upon the surface has certain minimum:
a. Intensity b. Wavelength
c. Frequency d. Velocity

16. Which of the following has the largest de Broglie wavelength (all have equal velocity):
a. CO_2 molecule b. NH_3 molecule
c. Electron d. Proton

17. Time taken for an electron to complete one revolution in Bohr orbit of hydrogen atom is:
a. $\frac{4\pi^2Mr^2}{nh}$ b. $\frac{nh}{4\pi^2mr}$
c. $\frac{2\pi mr}{n^2h^2}$ d. $\frac{h}{2\pi mr}$

18. A body of mass 10 g is moving with a velocity of 100 ms^{-1}. The wavelength associated with it is:
a. 6.626×10^{-7}m b. 6.626×10^{-34}m
c. 6.626×10^{-4}m d. 6.626×10^{-35}m

19. According to Bohr's theory, the electronic energy of H-atom in Bohr's orbit is given by:
a. $E_n = \frac{2.18 \times 10^{-19} \times Z}{2n^2}$ J
b. $E_n = \frac{2.179 \times 10^{-18} \times Z^2}{n^2}$ J
c. $E_n = \frac{21.79 \times 10^{-18} \times Z}{2n^2}$ J
d. $E_n = \frac{21.8 \times 10^{-21} \times Z^2}{n^2}$ J

20. If Aufbau rule is not used, 19th electron in Sc (Z = 21) will have:
a. $n = 2, \ell = 0$ b. $n = 3, \ell = 1$
c. $n = 3, \ell = 2$ d. $n = 4, \ell = 0$

21. If radius of second stationary orbit (in Bohrs atom) is R. Then radius of third orbit will be:
a. R/3 b. 9R c. R/9 d. 2.25 R

stone is thrown from the top of a tower of height of 50 m ith a velocity of 30 m/s at angle of 30° above horizontal. nd the time during which the stone will be in air and the stance from the tower base to where the stone will hit the round:

3 sec, 50 m b. 4 sec, 60 m

5 sec, 130 m d. None of these

fighter plane flying horizontally at an altitude of 1.5 km ith speed 720 km h^{-1} passes directly overhead an anti-rcraft gun. At what angle from the vertical should the gun e fired for the shell with muzzle speed 600 m s^{-1} to hit the ane:

ake g = 10 m s^{-2})

$\sin^{-1}\left(\frac{1}{3}\right)$ b. $\sin^{-1}\left(\frac{2}{3}\right)$

$\cos^{-1}\left(\frac{1}{3}\right)$ d. $\cos^{-1}\left(\frac{2}{3}\right)$

ball rolls off the top of a stair case with a horizontal elocity of u m/s. If the steps are h m high and b m wide, e ball will hit the edge of the n^{th} step where n is:

$\frac{2hu}{gb^2}$ b. $\frac{2hu^2}{gb^2}$

$\frac{2hu^2}{gb}$ d. $\frac{hu^2}{gb^2}$

projectile is given an initial velocity of $\left(\hat{i}+2\hat{j}\right)$m/s . If = 10 m/$s^2$. Find the equation of Trajectory:

$Y = X - 5X^2$ b. $Y = 2X - 5X^2$

$4Y = 2X - 5X^2$ d. $4Y = 2X - 25X^2$

F_1 and F_2 are two vector of equal magnitude F such that $_1 . F_2| = |F_1 \times F_2|$ then $|F_1 + F_2|$ is equal to:

$\sqrt{(2+\sqrt{2})}F$ b. 2F

$F\sqrt{2}$ d. None of these

boy can throw a stone up to a max height of 10 m. The ax horizontal distance that the boy can throw the same up will be:

$20\sqrt{2}m$ b. 10 m

$10\sqrt{2}m$ d. 20 m

he angle between $A = \hat{i}+\hat{j}$ and $B = \hat{i}-\hat{j}$ is:

45° b. 90°

−45° d. 180°

24. Which one of the following statements is true?

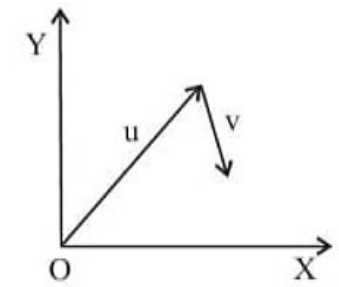
a. A scalar quantity is the one that is conserved in a

b. A scalar quantity is the one that can never take n values

c. A scalar quantity is the one that does not vary fr point to another in space

d. A scalar quantity has the same value for observe different orientation of the axes

25. Figure shows the orientation of two vectors u and xy-plane:



If $u = a\hat{i}+b\hat{j}$ and $v = p\hat{i}+q\hat{j}$

a. a and p are positive while b and q are negative

b. a, p and b are positive while q is negative

c. a, q and b are positive while p is negative

d. a, b, p and q are all positive

26. Assertion: When a body is dropped or thrown horiz from the same height. It would reach the ground same time.

Reason: Horizontal velocity has no effect on the direction.

27. Assertion: In circular motion the centripetal and cen force acting in opposite direction balance each othe

Reason: Centripetal and centrifugal forces don't ac same time.

28. Assertion: The handle of the watch-maker's screw is much thicker than the handle of a carpenter' driver.

Reason: Watchmaker requires more torque th carpenter.

29. Assertion: When a particle moves in a circular path uniform speed, its velocity and acceleration both ch

Reason: The centripetal acceleration in circular m dependent on angular velocity of the body.

30. Assertion: When range of a projectile is max, its a projection would be 45° or 135°.

Reason: Whether angle is 45° or 135°, value o remains the same, only the sign changes.

3. Motion in a Plane
Test Paper

1. There are N coplanar vectors each of magnitude V. Each vector is inclined to the preceding vector at angle $\frac{2\pi}{N}$. What is the magnitude of their resultant?

a. $\frac{V}{N}$ b. V c. Zero d. $\frac{N}{V}$

2. Rain is falling vertically with a speed of 35 ms^{-1}. Winds starts blowing after sometime with a speed of 12 ms^{-1} in east to west direction. At what angle with the critical should a boy waiting at a bus stop hold his umbrella to protect himself from rain?

a. $\sin^{-1}\left(\frac{12}{15}\right)$ b. $\cos^{-1}\frac{12}{35}$ c. $\tan^{-1}\frac{12}{35}$ d. $\cot^{-1}\frac{12}{35}$

3. A river is flowing from west to east with a speed 5 ms^{-1}. A swimmer can swim in still water at speed of 10 ms^{-1}. If he wants to start from point A on south bank and reach opposite point B on north bank, in what direction should he swim?

a. 30° east of north b. 60° east of north
c. 30° west of north d. 60° west of north

4. A unit vector in the direction of resultant vector of $\vec{A}=-2\hat{i}+3\hat{j}-\hat{k}$ and $\vec{B}=\hat{i}+2\hat{j}-4\hat{k}$ is:

a. $\frac{-2\hat{i}-\hat{j}+\hat{k}}{\sqrt{6}}$ b. $\frac{2\hat{i}+\hat{i}+\hat{k}}{\sqrt{6}}$

c. $\frac{-\hat{i}+5\hat{j}-5\hat{k}}{\sqrt{51}}$ d. $\frac{2\hat{i}-\hat{j}+\hat{k}}{\sqrt{6}}$

5. If R and H represent horizontal range and maximum height of the projectile, then the angle of projection with the horizontal is:

a. $\tan^{-1}\left(\frac{H}{R}\right)$ b. $\tan^{-1}\left(\frac{2H}{R}\right)$

c. $\tan^{-1}\left(\frac{4H}{R}\right)$ d. $\tan^{-1}\left(\frac{4R}{H}\right)$

6. Two constant Force, $F_1 = 2\hat{i}-3\hat{j}+3\hat{k}$ and $F_2=\hat{i}+\hat{j}-2\hat{k}$ acts on a body and displace it from the position $r_1=\hat{i}+2\hat{j}-2\hat{k}$ to $r_2=7\hat{i}+10\hat{j}+5\hat{k}$. Find the work done:

a. 9 J b. 4 J
c. –3 J d. 8 J

7. If the vectors $A=\hat{i}+2\hat{j}+4\hat{k}$ and $B=5\hat{i}$ represents the two sides of a triangle, then the third side of the triangle has length?

a. $\sqrt{56}$ b. $\sqrt{21}$
c. 5 d. 6

8. A ball is thrown at angle of 45° with horizontal with kinetic energy E. The kinetic energy at the highest point during the flight is:

a. Zero b. $E/2$
c. E d. $2^{1/2}E$

9. It is raining vertically downward with velocity of 3 km/hr. A man walks in the rain with a velocity of 4 km/hr. The rain drop will fall on the man with a relative velocity of:

a. 1 km/hr b. 3 km/hr
c. 4 km/hr d. 5 km/hr

10. An arrow is shot into air. Its range is 200 m and time of flight is 5 sec. Horizontal component of velocity of the arrow is:

a. 12.5 m/s b. 25.0 m/s
c. 31.25 m/s d. 40 m/s

11. A boat takes 2 hr to travel 8 km and back in still water. If velocity of water is 4 km/hr, the time taken for going upstream 8 km and coming back is:

a. 2 hr b. 2 hr 40 min
c. 1 hr 20 min d. None of the above

12. A ship 'A' moving towards west with a speed of 10 km/hr and ship 'B' 100 km south of 'A' is moving northward with a speed of 10 km/hr. The time after which the distance between them is shortest and the shortest distance between them are:

a. 0h, 100 km b. 5 hr, $50\sqrt{2}$ km
c. $50\sqrt{2}$ h, 50 km d. $10\sqrt{2}$ h, $50\sqrt{2}$ km

13. A particle is moving with a constant speed v in a circle. What is the magnitude of average velocity after half rotation?

a. 2v b. $2\frac{v}{\pi}$
c. $\frac{v}{2}$ d. $\frac{v}{2\pi}$

14. Two stones are projected with same velocity v at an angle 0 and $(90°-\theta)$. If H and H_1 are the greatest height in the two paths, what is the relation between R, H and H_1?

a. $R=4\sqrt{HH_1}$ b. $R=\sqrt{HH_1}$
c. $R=HH_1$ d. None of these

15. A car travels 6 km towards north at an angle of 45° to the east and then travels distance of 4 km towards north at an angle 135° to east. How far is the point from the starting point? What angle does the straight line joining its initial and final positions makes with the east?

a. $\sqrt{50}$ km and $\tan^{-1}10$

b. 10 km and $\tan^{-1}(\sqrt{5})$

c. $\sqrt{52}$ km and $\tan^{-1}(5)$

d. $\sqrt{52}$ km and $\tan^{-1}(\sqrt{5})$

16. A fighter plane is flying horizontally at an altitude of 1.5 km with speed 720 km/hr. At what angle of sight (w.r.t. horizontal) when the target is seen, should the pilot drop the bomb in order to attack the target? (Take g = 10 m s^{-2}, tan23° = 0.43)

a. 23° b. 32°
c. 12° d. 42°

4. Chemical Bonding and Molecular Structure
Test Paper

1. Which of the following statement is not true?
a. Ionic bonds are non-directional while covalent bonds are directional
b. Formation of π-bond shortens the distance between the two concerned atoms
c. Ionic bond is possible between similar and dissimilar atoms
d. Linear overlapping of atomic p-orbitals leads to a sigma bond

2. What are the exceptions of the octet rule?
a. The incomplete octet of central atom
b. An odd number of electrons on central atom
c. Expanded octet of the central atom
d. All of these

3. A pair of electrons present between two identical non-metals:
a. Is shifted to one of the atoms
b. Is shared equally between them
c. Undergoes addition reactions
d. Have same spin

4. Oxygen molecule is formed by:
a. One axial s-s overlap and one p-p axial overlap
b. Two p-p axial overlaps
c. Two p-p side wise overlaps
d. One s-s axial and one p-p side wise overlap

5. Which of the following statements is not true regarding molecular orbital theory?
a. The atomic orbitals of comparable energies combine to form molecular orbitals.
b. An atomic orbital is homocentric while a molecular orbital is polycentric
c. Bonding molecular orbital has higher energy than antibonding molecular orbital.
d. Molecular orbitals like atomic orbitals obey Aufbau principle for filling of electrons.

6. Which of the following is the most stable state when two atoms come closer to each other to form a molecule?

I II III

a. (I), when the bond is formed, the energy is minimum.
b. (II), when the atoms touch each other, the energy is zero
c. (III), when the atoms are isolated, the energy is minimum
d. (II), when the attractive forces are more than repulsive forces

7. Which pair of elements can form multiple bond with itself and oxygen?
a. F, N b. N, Cl
c. N, P d. N, C

8. 0.01 mole of H_3PO_x is completely neutralized by 0.56 gram of KOH hence:
a. x = 3 and given acid is dibasic
b. x = 2 and given acid is monobasic
c. x = 3 and given acid is monobasic
d. x = 4 and given acid forms three series of salt

9. The correct order of increasing C—O bond strength of CO, CO_3^{2-}, CO_2 is:
a. $CO_3^{2-} < CO_2 < CO$ b. $CO_2 < CO_3^{2-} < CO$
c. $CO < CO_3^{2-} < CO_2$ d. $CO < CO_2 < CO_3^{2-}$

10. The state of hybridization of the central atom is not the same as in the others:
a. B in BF_3 b. O in H_3O^+
c. N in NH_3 d. P in PCl_3

11. Which of the following statements is incorrect for PCl_5?
a. Its three P—Cl bond lengths are equal
b. It involves sp^3d hybridization
c. It has a regular geometry
d. Its shape is trigonal bipyramidal

12. The number of sigma bonds in benzene are:
a. 3 b. 6
c. 12 d. None of these

13. The structure of the noble gas compound XeF_4 is:
a. Square planar
b. Distorted tetrahedral
c. Tetrahedral
d. Octahedral

14. What is the state of hybridisation of Xe in cationic part of solid XeF_6?
a. sp^3d^3 b. sp^3d^2
c. sp^3d d. sp^3

15. The geometry of ammonia molecule can be best described as:
a. Nitrogen at one vertex of a regular tetrahedron, the other three vertices being occupied by three hydrogens
b. Nitrogen at the centre of the tetrahedron, three of the vertices being occupied by three hydrogens
c. Nitrogen at the centre of an equilateral triangle, three corners being occupied by three hydrogens
d. Nitrogen at the junction of a T, three open ends being occupied by three hydrogens

16. Which molecular geometry is least likely to result from a trigonal bipyramidal electron geometry?
a. Trigonal planar b. See-saw
c. Linear d. T-shaped

17. Give the correct order of initials T or F for following statements. Use T if statement is true and F if it is false:

(I) The order of repulsion between different pair of electrons is lP – lP > lP – bP > bP – bP

(II) In general, as the number of lone pair of electrons on central atom increases, value of bond angle from normal bond angle also increases

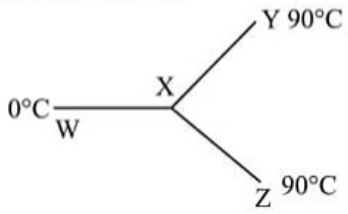
(III)The number of lone pair on O in H_2O is 2 while on N in NH_3 is 1

(IV)The structures of xenon fluorides and xenon oxyfluorides could not be explained on the basis of VSEPR theory

a. TTTF b. TFTF
c. TFTT d. TFFF

9. Thermal Properties of Matter
Test Paper

1. Three metal rods of the same material and identical in all respects are joined as shown in the figure. The temperatures at the ends are maintained as indicated. Assuming no loss of heat from the curved surfaces of the rods, the temperature at the junction X would be:



a. 45°C b. 60°C
c. 30° d. 20°C

2. When 1.5 kg of ice at 0°C is mixed with 2 kg of water at 70°C in a container, the resulting temperature is 5°C. The heat of fusion of ice is (Specific heat capacity of water = 4186 J $kg^{-1}K^{-1}$)
a. 1.42×10^5 J kg^{-1}
b. 2.42×10^5 J kg^{-1}
c. 3.42×10^5 J kg^{-1}
d. 4.42×10^5 J kg^{-1}

3. The triple point of carbon dioxide is 216.55 K. The corresponding temperature on the Celsius and Fahrenheit scale is:
a. 56.45°C, –69.61°C
b. –56.45°C, 69.61 °F
c. 56.45°C, 69.61 °F
d. –56.45°C, –69.61 °F

4. Two rods of equal length and diameter have thermal conductivities 3 and 4 units respectively. If they are joined in series, the thermal conductivity of the combination in the given units would be:
a. 3.43 b. 4.43
c. 5.43 d. 2.43

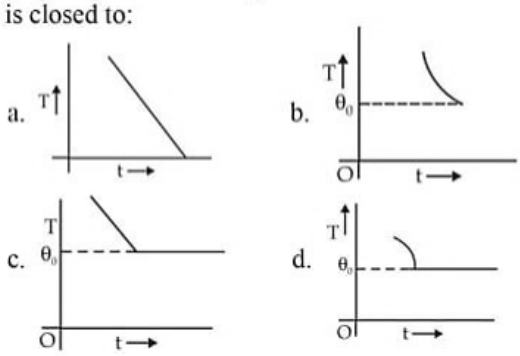
5. A wall is made of equally thick layers A and B of different materials. Thermal conductivity of A is twice to that of B. In the steady state, the temperature difference across the wall is 36°C. The temperature difference across the layer A is:
a. 12°C b. 18°C
c. 6° d. 24°C

6. The rate of cooling at 600 K, if surrounding temperature is 300 K is H. The rate of cooling at 900 K is:

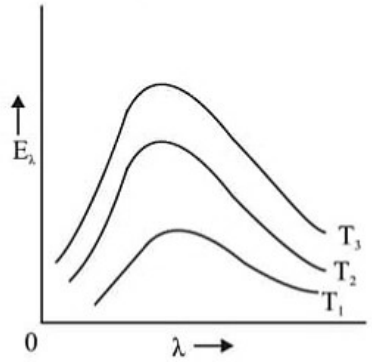
a. $\frac{16}{3}$H b. 2H
c. 3H d. $\frac{2}{3}$H

7. Experimental investigations show that the intensity of solar radiation is maximum for a wavelength 480 nm in the visible region. Estimate the surface temperature of sun (Given Wein's constant b = 2.88×10^{-3} m K).
a. 4000 K b. 6000 K
c. 8000 K d. 10^6 K

8. If a piece of metal is heated to temperature θ and then allowed to cool in a room which is at temperature θ_0. The graph between the temperature T of the metal and time (t) is closed to:



9. Variation of radiant energy emitted by sun, filament of tungsten lamp and welding arc as a function of its wavelength is shown in figure. Which of the following options is the correct match?



a. Sun $-T_3$, tungsten filament $-T_1$, welding arc $-T_2$
b. Sun $-T_2$, tungsten filament $-T_1$, welding arc $-T_3$
c. Sun $-T_3$, tungsten filament $-T_2$, welding arc $-T_1$
d. Sun $-T_1$, tungsten filament $-T_2$, welding arc $-T_3$

10. A radiation of energy E falls normally on a perfectly reflecting surface. The momentum transferred to the surface is:
a. $\frac{E}{c}$ b. $\frac{2E}{c}$ c. Ec d. $\frac{E}{c^2}$

11. A black body at a high temperature T K radiates energy at the rate of E Wm^{-1}. When the temperature falls to T/2 K, the radiated energy will be:
a. $E/4$ b. $E/2$ c. $2E$ d. $E/16$

12. Temperature of two stars are in the ratio 2 : 3. If wavelength for the maximum intensity of the first body is 4000Å, what is the corresponding wavelength of the second body?
a. 9000Å b. 6000Å
c. 2000Å d. 8000Å

13. The energy spectrum of a black body exhibits a maximum around wavelength λ_0. The temperature of the black body is now changed such that the energy is maximum around a wavelength $\frac{3\lambda_0}{4}$. The power radiated by the black body will now increase by a factor of:
a. 64/27 b. 256/81
c. 4/3 d. 16/9

SEQUENCE & PROGRESSION

1. If sum of the first 21 terms of the series $\log_{9^{1/2}} x + \log_{9^{1/3}} x + \log_{9^{1/4}} x + \ldots\ldots$, where $x > 0$ is 504, then x is equal to

(1) 243 (2) 9 (3) 7 (4) 81

2. Let $\{a_n\}_{n=1}^{\infty}$ be a sequence such that $a_1 = 1$, $a_2 = 1$ and $a_{n+2} = 2a_{n+1} + a_n$ for all $n \geq 1$. Then the value of $47\sum_{n=1}^{\infty} \frac{a_n}{2^{3n}}$ is equal to _____.

3. Let S_n denote the sum of first n-terms of an arithmetic progression. If $S_{10} = 530$, $S_5 = 140$, then $S_{20} - S_6$ is equal to :

(1) 1862 (2) 1842 (3) 1852 (4) 1872

4. The sum of all the elements in the set $\{n \in \{1, 2, ..., 100\} \mid \text{H.C.F. of n and 2040 is 1}\}$ is equal to _____.

5. Let S_n be the sum of the first n terms of an arithmetic progression. If $S_{3n} = 3S_{2n}$, then the value of $\frac{S_{4n}}{S_{2n}}$ is :

(1) 6 (2) 4 (3) 2 (4) 8

6. If the value of $\left(1 + \frac{2}{3} + \frac{6}{3^2} + \frac{10}{3^3} + \ldots\ldots\text{upto } \infty\right)^{\log_{(0.25)}\left(\frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} + \ldots\ldots\text{upto } \infty\right)}$ is l, then l^2 is equal to _____.

7. If $\log_3 2, \log_3(2^x - 5), \log_3\left(2^x - \frac{7}{2}\right)$ are in an arithmetic progression, then the value of x is equal to _____.

8. Let $A = \{n \in \mathbf{N} \mid n^2 \leq n + 10{,}000\}$, $B = \{3k + 1 \mid k \in \mathbf{N}\}$ and $C = \{2k \mid k \in \mathbf{N}\}$, then the sum of all the elements of the set $A \cap (B - C)$ is equal to _____ .

9. The sum of the series

$$\frac{1}{x+1} + \frac{2}{x^2+1} + \frac{2^2}{x^4+1} + \ldots\ldots + \frac{2^{100}}{x^{2^{100}}+1}$$ when $x = 2$

is:

(1) $1 + \frac{2^{101}}{4^{101}-1}$ (2) $1 + \frac{2^{100}}{4^{101}-1}$

(3) $1 - \frac{2^{100}}{4^{100}-1}$ (4) $1 - \frac{2^{101}}{4^{101}-1}$

10. If the sum of an infinite GP a, ar, ar^2, ar^3,... is 15 and the sum of the squares of its each term is 150, then the sum of ar^2, ar^4, ar^6, ... is :

(1) $\frac{5}{2}$ (2) $\frac{1}{2}$ (3) $\frac{25}{2}$ (4) $\frac{9}{2}$

11. Let $a_1, a_2, \ldots, a_{10}$ be an AP with common difference –3 and $b_1, b_2, \ldots, b_{10}$ be a GP with common ratio 2. Let $c_k = a_k + b_k$, $k = 1, 2, \ldots, 10$. If $c_2 = 12$ and $c_3 = 13$, then $\sum_{k=1}^{10} c_k$ is equal to _____.

12. If for $x, y \in \mathbf{R}$, $x > 0$,

$y = \log_{10} x + \log_{10} x^{1/3} + \log_{10} x^{1/9} + \ldots\ldots$ upto ∞ terms and $\frac{2+4+6+\ldots+2y}{3+6+9+\ldots+3y} = \frac{4}{\log_{10} x}$, then the ordered pair (x, y) is equal to :

(1) $(10^6, 6)$ (2) $(10^4, 6)$

(3) $(10^2, 3)$ (4) $(10^6, 9)$

13. The sum of 10 terms of the series $\frac{3}{1^2 \times 2^2} + \frac{5}{2^2 \times 3^2} + \frac{7}{3^2 \times 4^2} + \ldots\ldots$ is :

(1) 1 (2) $\frac{120}{121}$ (3) $\frac{99}{100}$ (4) $\frac{143}{144}$

18. Which of the following is an example of super octet molecule?

a. ClF_3 b. PCl_5

c. IF_7 d. All the three

19. Low melting point is expected for a solid:

a. Ionic solid

b. Metallic solid

c. Molecular solid

d. Covalent solid

20. Iodine molecules are held in the solid lattice by:

a. London forces

b. Dipole-dipole interactions

c. Covalent bonds

d. Coulombic force

21. Carbon dioxide is gas, while SiO_2 is solid because:

a. CO_2 is a linear molecule, while SiO_2 is angular

b. Van der Waals' forces are very strong in SiO_2

c. CO_2 is covalent, while SiO_2 is ionic

d. Si cannot form stable bonds with O, hence Si has to form a 3D lattice

22. According to molecular orbital theory, which of the following will not exist?

a. H_2^+ b. Be_2

c. B_2 d. C_2

23. In a diatomic molecule the bond distance is 1×10^{-8} cm. Its dipole moment is 1.2 D. What is the fractional electronic charge on each atom?

a. 0.50 b. 1.2×10^{-10}

c. 0.25 d. 1.2

24. Four diatomic species are listed below. Identify the correct order in which the bond order is increasing in them:

a. $NO < O_2^- < C_2^{2-} < He_2^+$

b. $O_2^- < NO < C_2^{2-} < He_2^+$

c. $C_2^{2-} < He_2^+ < O_2^- < NO$

d. $He_2^+ < O_2^- < NO < C_2^{2-}$

25. In which of the following species maximum atom can lie in same plane:

a. XeF_2O_2 b. PCl_5

c. AsH_4^+ d. XeF_4

26. **Assertion**: B_2H_6, Si_2H_6 are said to have similar structure.

Reason: They have same number of σ and π bonds.

27. **Assertion:** Molecular nitrogen is less reactive than molecular oxygen.

Reason: The bond length of N_2 is shorter than that of oxygen.

28. **Assertion:** 2nd period elements do not involve in excitation of electron.

Reason: 2nd period elements do not have vacant 2d-orbitals.

29. **Assertion:** Xe-atom in XeF_2 assumes *sp* hybrid state.

Reason: XeF_2 molecule follow octet rule.

30. **Assertion:** The atoms in a covalent molecule are said to share electrons, yet some covalent molecules are polar.

Reason: In polar covalent molecule, the shared electrons spend more time on the average near one of the atoms.

22. Total number of electrons present in one mole of CO_2 will be:

a. 1.8×10^{23}

b. 9.6×10^{24}

c. 1.33×10^{23}

d. 9.1×10^{31}

23. Which of the sequences given below shows the correct increasing order of energy?

a. *3s, 3p, 4s, 4p, 3d, 5s, 5p, 4d*

b. *3s, 3p, 3d, 4s, 4p, 4d, 5s, 5p*

c. *3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p*

d. *3s, 3p, 4s, 4p, 5s, 3d, 4d, 5p*

24. The atom/ion that has the highest number of unpaired electrons is

a. Mg^{2+} b. F

c. N d. S^{2-}

25. Rutherford's experiment on scattering of alpha particles showed for the first time that atom has:

a. Electrons b. Protons

c. Nucleus d. Neutrons

26. **Assertion:** In a hydrogen atom, a spectral line will be seen for the $2p_x$ to $2p_y$.

Reason: There is energy released in this transition

27. **Assertion**: Always, on increasing the intensity, the emitted photoelectric current increases.

Reason: More intensity means more energetic photons.

28. **Assertion**: Rutherford's model explained a stable nucleus-electron system.

Reason: Rutherford's model was rejected because it predicted a large sized nucleus.

29. **Assertion:** The angular momentum of d-orbitals is $6\ h/2\pi$.

Reason: Angular momentum of electron in orbit is $mv = \frac{nhr}{2\pi}$.

30. **Assertion:** The kinetic energy of photo-electrons increases with increase in frequency of incident light where $v > v_0$.

Reason: Whenever intensity of light is increased the number of photo-electron ejected always increases.