

Atomic Energy Central School No. 4 Rawatbhata

Class 11 - Physics

Multiple Choice Questions Test (August-2019-20)

Maximum Marks: 120

Time Allowed: 180 minutes

Section A

1. An airplane's compass indicates that it is headed due north, and its airspeed indicator shows that it is moving through the air at 240 km/h. If there is a 100-km/h wind from west to east, what is the velocity of the airplane relative to the earth? 1
- a) 255 km/h 26° E of N b) 260 km/h 23° E of N
c) 270 km/h 24° E of N d) 250 km/h 25° E of N
2. A man stands on the roof of a 15.0 m tall building and throws a rock with a velocity of magnitude 30.0 m/s at an angle of 33.0° above the horizontal. You can ignore air resistance. Calculate the magnitude of the velocity of the rock just before it strikes the ground. 1
- a) 30.6 m/s b) 29.6 m/s
c) 32.6 m/s d) 34.6 m/s
3. The reason why cyclists bank when taking a sharp turn is 1
- a) to supply the acceleration required to move fast b) cyclists enjoy turning to one side and so bank
c) to decelerate at the turns as turns are dangerous d) to supply the sidewise (centripetal) acceleration required to make the direction change
4. If A_x , A_y and A_z are x, y and z components of a vector then its magnitude is 1
- a) $\sqrt{A_x^2 + 2A_y^2 + A_z^2}$ b) $\sqrt{A_x^2 + A_y^2 + A_z^2}$
c) $\sqrt{3A_x^2 + A_y^2 + A_z^2}$ d) $\sqrt{A_x^2 + A_y^2 + A_z^3}$
5. Two vectors are equal if 1
- a) the magnitude and direction are the same for both b) the direction is the same for both
c) the magnitude is the same for both d) the two vectors have opposite directions

displacement of the plane in m while it is stopping?

- a) 60.0
- b) 50
- c) 45
- d) 35

34. An object is said to be in uniform motion in a straight line if its displacement **1**

- a) is decreasing in equal intervals of time
- b) is equal in not equal intervals of time.
- c) is increasing in equal intervals of time
- d) is equal in equal intervals of time.

35. A drag racer starts her car from rest and accelerates at 10.0 m/s^2 for the entire distance of 400 m . What is the speed of the race car in m/s at the end of the run? **1**

- a) 89.4
- b) 87.2
- c) 86.0
- d) 90.3

36. for motion in a straight line **1**

- a) motion away from origin is positive
- b) position to the left of the origin is taken as positive and to the right as negative.
- c) motion towards origin is positive
- d) position to the right of the origin is taken as positive and to the left as negative.

37. A jet lands on an aircraft carrier at 63 m/s. What is the displacement of the plane in m while it stopped in 2 s. **1**

- a) 57
- b) 60
- c) 68
- d) 63.0

38. Two parallel rail tracks run north-south. Train A moves north with a speed of 54 km/ hr, and train B moves south with a speed of 90 km/ hr. What is the velocity of B with respect to A in m/sec? Choose the positive direction of x-axis to be from south to north. **1**

- a) -40.0
- b) -55.0
- c) -30.0
- d) -45.0

39. The position of an object moving in a straight line can be specified with reference to **1**

- a) an arbitrary star
- b) a conveniently chosen origin
- c) a triangle
- d) another straight line

Atomic Energy Central School No. 4 Rawatbhata

Class 11 - Chemistry

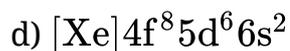
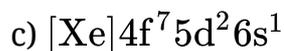
Multiple Choice Questions Test(August 2019)

General Instructions:

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Section A

41. Which one of the following species is smallest in its size 1
 Al^{3+} , Mg^{2+} , Na^+ , Ne ?
a) Ne b) Mg^{2+}
c) Na^+ d) Al^{3+}
42. Which one of the following is isoelectronic with Ne? 1
a) Mg^{2+} b) Al^{3+}
c) N^{3-} d) All of these
43. The correct increasing order of atomic radii for the same element is ____ ? 1
a) covalent radius < Metallic radius < van der Waal's radius b) covalent radius < crystal radius < Metallic radius
c) van der Waal's radius < Metallic radius < covalent radius d) Metallic radius < covalent radius < van der Waal's radius
44. An element with atomic number 21 is a 1
a) transition element b) representative element
c) alkali metal d) halogen
45. The electronic configuration of an element in Group 15 and period 3 of the periodic table is -----? 1
a) $1s^2 2s^2 2p^6 3s^2 3p^1$ b) $1s^2 2s^2 2p^6 3s^2 3p^4$
c) $1s^2 2s^2 2p^6 3s^2 3p^3$ d) $1s^2 2s^2 2p^6 3s^2 3p^2$
46. Choose one of the following in the increasing order of electron gain enthalpy 1
a) $F < Cl < Br < I$ b) $I < Br < F < Cl$
c) $Cl < I < Br < F$ d) $Br < F < Cl < I$
47. The electronic configuration of gadolinium (Atomic number 64) is 1
a) $[Xe]4f^7 5d^1 6s^2$ b) $[Xe]4f^3 5d^5 6s^2$



48. Among the following elements, which has the least electron affinity? 1

a) Phosphorus

b) Nitrogen

c) Sulphur

d) Oxygen

49. Which of the following will have the most negative electron gain enthalpy and which one the least negative? P, S, Cl, F.

a) P, Cl

b) P, Cl

c) Cl, P

d) P, S

50. Right order of increasing metallic character is: 1

a) $\text{Si} < \text{Mg} < \text{Na} < \text{P} < \text{Be}$ b) $\text{Be} < \text{Mg} < \text{Na} < \text{P} < \text{Si}$ c) $\text{P} < \text{Si} < \text{Be} < \text{Mg} < \text{Na}$.d) $\text{Si} < \text{Be} < \text{Mg} < \text{Na} < \text{P}$

51. $\text{Al}^{(3+)} < \text{Mg}^{(2+)} < \text{Na}^+ < \text{F}^- < \text{O}^{(2-)} < \text{N}^{(3-)}$ The above can be aptly described as 1

a) isoelectronic species

b) the same number of electrons (9 electrons).

c) the same number of electrons (7 electrons).

d) the same number of electrons (8 electrons).

52. The number of columns in the Modern periodic table in s, p, d and f-blocks are respectively ----, ----, ----, ----. ? 1

a)

b)

6, 2, 14, 10

6, 2, 10, 14

c)

2, 6, 10, 14

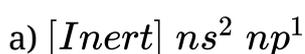
53. For the four successive transition elements (Cr, Mn, Fe and Co), the stability of +2 oxidation state will be there in which of the following order? (At. nos. Cr = 24, Mn = 25, Fe = 26, Co = 27) 1

a) $\text{Mn} > \text{Fe} > \text{Cr} > \text{Co}$ b) $\text{Cr} > \text{Mn} > \text{Co} > \text{Fe}$ c) $\text{Fe} > \text{Mn} > \text{Co} > \text{Cr}$ d) $\text{Co} > \text{Mn} > \text{Fe} > \text{Cr}$

54. Arrange following elements in the order of their chemical reactivity in terms of oxidising property: F, Cl, O and N 1

a) $\text{F} > \text{Cl} > \text{O} > \text{N}$ b) $\text{F} > \text{O} > \text{Cl} > \text{N}$ c) $\text{Cl} > \text{F} > \text{O} > \text{N}$ d) $\text{O} > \text{F} > \text{N} > \text{Cl}$

55. What is the general electronic configuration of the elements of group 14? 1



- a) [BF_4^- and NH_4^+] b) [NF_3 and BF_3]
 c) [BCl_3 and $BrCl_3$] d) [NH_3 and NO_3^-]

65. Considering X-axis as the internuclear axis which out of the following will not form a sigma bond and why? 1

- a) $2p_y$ and $2p_y$ b) $1s$ and $2s$
 c) $1s$ and $1s$ d) $1s$ and $2p_x$

66. A molecule or ion is stable if 1

- a) $N_b = N_a$ b) $N_a \times N_b = 1$
 c) $N_a < N_b$ d) $N_b < N_a$

67. When O_2 is converted into O_2^+ 1

- a) paramagnetic character increases b) both paramagnetic character and bond order increase
 c) paramagnetic character decreases and the bond order increases d) bond order decreases

68. The structure of PF_5 is 1

- a) Octahedral b) Square pyramid
 c) Trigonal bipyramid d) Pentagonal bipyramid

69. In acetylene molecule, between the carbon atoms there are 1

- a) one sigma and two pi bonds b) three sigma bonds
 c) two sigma and one pi bonds d) three pi bonds

70. Which one of the following pairs of species has the same bond order? 1

- a) CN^- and NO^+ b) NO^+ and CN^+
 c) O_2^- and CN^- d) CN^- and CN^+

71. In PO_4^{3-} ion the formal charge on the oxygen atom of P-O bond is 1

- a) -0.75 b) -1
 c) $+1$ d) $+0.75$

72. Which of the following angle corresponds to sp^2 hybridisation? 1

- a) 109° b) 180°
 c) 90° d) 120°

73. Hydrogen bonds are formed in many compounds e.g., H_2O , HF, NH_3 . The boiling point of such compounds depends to a large extent on the strength of 1

hydrogen bond and the number of hydrogen bonds. The correct decreasing order of the boiling points of above compounds is :

- a) $\text{H}_2\text{O} > \text{HF} > \text{NH}_3$ b) $\text{HF} > \text{H}_2\text{O} > \text{NH}_3$
c) $\text{NH}_3 > \text{HF} > \text{H}_2\text{O}$ d) $\text{NH}_3 > \text{H}_2\text{O} > \text{HF}$

74. Which one of the following is paramagnetic? 1

- a) CO b) O_3
c) NO d) N_2

75. Which one is diamagnetic among NO, NO^+ and NO^- ? 1

- a) NO^+NO^+ b) NO^-
c) NO d) None of these

76. The hybridization of orbitals of N atom in NO_3^- , NO_2^+ and NH_4^+ are respectively 1

- a) sp, sp^3 , sp^2 b) sp, sp^2 , sp^3
c) sp^2 , sp^3 , sp d) sp^2 , sp, sp^3

77. The electronegativity difference (ΔEN) is large in one of the following. 1

- a) metal and a nonmetal b) Two nonmetals
c) Hydrogen and Helium d) Two metals

78. The number of types of bonds between two carbon atoms in calcium carbide is 1

- a) Two sigma, two pi b) One sigma, one pi
c) Two sigma, one pi d) One sigma, two pi

79. Rank the bonds in the set C=O, C-O, $\text{C}\equiv\text{O}$ in order of decreasing bond length 1

- a) C-O > C=O > $\text{C}\equiv\text{O}$ b) C=O > $\text{C}\equiv\text{O}$ > C-O
c) $\text{C}\equiv\text{O}$ < C-O < C=O d) C-O > $\text{C}\equiv\text{O}$ > C=O

80. N, CO and NO are isoelectronic molecules. Their respective bond order is : 1

- a) 3,3,3 b) 2,3,4
c) 1,1,3 d) 2,3,3

(ii) Parapodia	(b) Mollusca
(iii) Scales	(c) Porifera
(iv) Comb plates	(d) Reptilia
(v) Radula	(e) Annelida
(vi) Hairs	(f) Cyclostomata and Chondrichthyes
(vii) Choanocytes	(g) Mammalia
(viii) Gill slits	(h) Osteichthyes

- a) (i)-(b),(ii)-(a), (iii)-(c),(iv)-(e), (v)-(d),(vi)-(g), (vii)-(h),(viii)-(f)
b) (i)-(h), (ii)-(e), (iii)-(d), (iv)-(a), (v)-(b), (vi)-(g), (vii)-(c), (viii)-(f)
c) (i)-(a), (ii)-(b)-(iii)-(c),(iv)-(d), (iv)-(e), (v)-(f), (vi)-(g), (vii)-(h)
d) (i)-(f), (ii)-(g),(iii)-(h), (iv)-(d), (v)-(c), (vi)-(e), (vii)-(b), (viii)-(a)

87. Which two teeth are modified into tusk in elephants? 1

- a) Two upper molar
b) Two lower incisors
c) Two upper incisors
d) Two lower molar

88. Species going to extinct due to low reproductive rate is 1

- a) Island sps
b) Bald eagle
c) Giant panda
d) Lion

89. Salamander belongs to the class: 1

- a) Aves
b) Amphibian
c) Pisces
d) Reptiles

90. A fish that has electric organ is 1

- a) Pomfret
b) Torpedo
c) Katla
d) Common carp

91. Identify the animal in the figure given below and the phylum to which the animal belongs to? 1



- | | |
|---------------------------------|-------------------------------------|
| a) Octopus and phylum Mollusca | b) Ctenoplana and phylum Ctenophora |
| c) Gorgonia and phylum Cnidaria | d) Pennatula and phylum Cnidaria |

92. Which of the following is a unique characteristic of vertebrates? 1
- | | |
|---------------------------------|--------------------------------------|
| a) Presence of notochord | b) Presence of four-chambered heart. |
| c) Presence of vertebral column | d) Presence of jaw |
93. Which of the following is categorised as parasite in true sense? 1
- | | |
|--|--|
| a) Foetus developing inside the uterus and draws nourishment | b) The female anopheles bites and sucks blood from human |
| c) The cuckoo lays its eggs in crow's nest | d) Head louse living on the human scalp and laying egg in hair |
94. A cell membrane shows fluid behavior due to 1
- | | |
|---|---------------------------------|
| a) Mosaic of fat and glucose | b) Mosaic of lipid and proteins |
| c) Sandwich of protein between lipids layer | d) Presence of fluid protein |
95. The staining procedure is developed by 1
- | | |
|--------------------|--------------|
| a) Gram | b) Schwann |
| c) A.V.Leeuwenhoek | d) Schleiden |
96. Which of the following plastids stores proteins? 1
- | | |
|-----------------|-----------------|
| a) Aleuroplasts | b) Amyloplasts |
| c) Elaioplasts | d) Chloroplasts |
97. The inner membrane of mitochondria thrown into folds to form finger like structure is called 1
- | | |
|-------------------------|---------------|
| a) Inter membrane space | b) Amyloplast |
|-------------------------|---------------|

- c) Cristae
d) Matrix
98. A ribosome is 80S. In this statement what does the letter 'S' signify? **1**
 a) Both Size of ribosome and Density of ribosome
 b) Density of ribosome
 c) Radius of ribosome
 d) Size of ribosome
99. Longest cell in human body are **1**
 a) Mast cells
 b) Muscle cell
 c) Blood cells
 d) Nerve cells
100. Which of the following plastids stores oil and fat? **1**
 a) Aleuroplasts
 b) Chloroplasts
 c) Amyloplasts
 d) Elaioplasts
101. Which of the following scientists proposed the cell theory? **1**
 a) Leeuwenhoek
 b) Robert Hooke
 c) Robert Brown
 d) Schleiden, Schwann and Virchow
102. Which one is not a difference between Prokaryotic and Eukaryotic cell? **1**
 a) Presence of cell wall
 b) Presence of membrane bounded organelles
 c) Presence of nuclear membrane
 d) Number of chromosomes
103. The site for the light reactions is **1**
 a) Stroma
 b) Cisternae
 c) Grana
 d) Vacuoles
104. Which of the following is part of endomembrane system? **1**
 a) Vacuole
 b) Chloroplast
 c) Chromosome
 d) Mitochondria
105. Cytoskeleton is made of **1**
 a) Hemicellulose
 b) Phosphoglycerides
 c) Proteinaceous filaments
 d) Micro tubules
106. The fluid filled vacuoles or vesicles which are separated from cytoplasm by a selectively permeable membrane called **1**
 a) Tonoplast
 b) Hydroplast
 c) Aquaplast
 d) Symplast
107. How many essential amino acids are known? **1**

118. Fevicol is a synthetic sticky substance insoluble in water. It is a type of... **1**
- a) Steroids
 - b) Polysaccharides
 - c) Resins
 - d) Cellulose
119. In yeast, during fermentation the glycolysis pathway leads to **1**
- a) Production of ethanol
 - b) Production of glucose
 - c) Production of oxygen
 - d) Production of pyruvic acid
120. Monoterpene esters called pyrethroids found in flowers and leaves of chrysanthemum are used commercially for making **1**
- a) Perfumes
 - b) Insecticides
 - c) Drugs

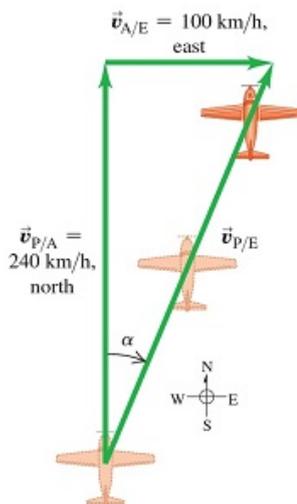
Solution
Class 11 - Physics
MCQ (2019-20)
Section A

1. (b)

260 km/h 23° E of N

Explanation:

This problem involves velocities in two dimensions (northward and eastward), so it is a relative velocity problem using vectors. We are given the magnitude and direction of the velocity of the plane (P) relative to the air (A). We are also given the magnitude and direction of the wind velocity, which is the velocity of the air A with respect to the earth (E):



$$\vec{v}_{P/A} = 240 \text{ km/h due north}$$

$$\vec{v}_{A/E} = 100 \text{ km/h due east}$$

The magnitude and direction of velocity $\vec{v}_{P/E}$ of the plane relative to the earth.

$$\vec{v}_{P/E} = \vec{v}_{P/A} + \vec{v}_{A/E}$$

Image above shows that the three relative velocities constitute a right-triangle vector addition; the unknowns are the speed $v_{P/E}$ and the angle α .

$$v_{P/E} = \sqrt{(240)^2 + (100)^2} = 260 \text{ km/h}$$

$$\alpha = \tan^{-1}\left(\frac{100}{240}\right) = 23^\circ \text{ E of N}$$

2. (d)

34.6 m/s

Explanation:

Let downward be the y direction.

$$v_{ox} = v_o \times \cos\theta = 30.0 \times \cos 33.0^\circ \\ = 25.2 \text{ m/s}$$

$$v_{oy} = v_o \times \sin\theta = 30.0 \times \sin 33.0^\circ \\ = 16.3 \text{ m/s}$$

The velocity in the x direction is constant all the time,

At the ground, we have $h = -15.0 \text{ m}$,

We know,

$$(v_y)^2 = (v_{oy})^2 + 2a_y h \\ \Rightarrow v_y = \sqrt{(v_{oy})^2 + 2a_y h} \\ v_y = \sqrt{(16.3)^2 + 2(-9.8)(-15.0)} \\ \Rightarrow v_y = 23.7 \text{ m/s}$$

The magnitude of velocity of the rock just before it strikes the ground is

$$v = \sqrt{(v_x)^2 + (v_y)^2} \\ \Rightarrow v = \sqrt{(25.2)^2 + (23.7)^2} = 34.6 \text{ m/s}$$

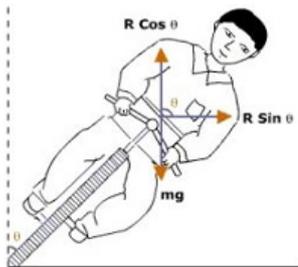
3. (d)

to supply the sidewise (centripetal) acceleration required to make the direction change

Explanation:

In order to take a safe turn, the cyclist has to bend a little from his vertical position. In this case, a component of the reaction provides the required centripetal force.

If θ is angle made by the cyclist with the vertical then



$$N \cos\theta = mg \dots (1)$$

$$N \sin\theta = \frac{mv^2}{r} \dots (2)$$

Dividing (2) by (1), we get

$$\tan \theta = \frac{v^2}{rg}$$

$$\Rightarrow \theta = \tan^{-1}\left(\frac{v^2}{rg}\right)$$

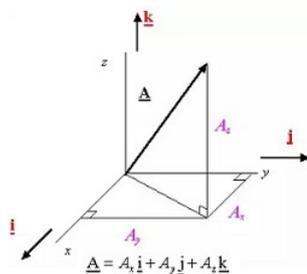
In actual practice, the value of q is slightly less because the force of friction also contributes towards the centripetal force.

4. (b)

$$\sqrt{A_x^2 + A_y^2 + A_z^2}$$

Explanation:

Rectangular component of a Vector: The projections of vector a along the x , y , and z directions are A_x , A_y , and A_z , respectively.



$$\text{Magnitude of vector} = \sqrt{A_x^2 + A_y^2 + A_z^2}$$

5. (a)

the magnitude and direction are the same for both

Explanation:

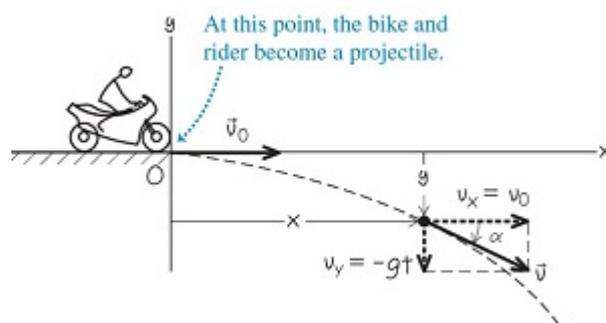
Equal vectors are vectors that have the same magnitude and the same direction. Equal vectors may start at different positions.

6. (a)

4.7 m

Explanation:

The motorcycle's x - and y -coordinates at $t=0.50$ s are



$$x = v_{0x} t = 9.0 \times 0.50 = 4.5 \text{ m}$$

$$y = -\frac{1}{2}gt^2 = -\frac{1}{2} \times 9.8 \times (0.50)^2 = -1.2\text{m}$$

The negative value of y shows that the motorcycle is below its starting point.

The motorcycle's distance from the origin at t = 0.50s is r =

$$\sqrt{x^2 + y^2} = \sqrt{(4.5)^2 + (-1.2)^2} = 4.7 \text{ m}$$

7. (d)

5.10 m, 1.02 s

Explanation:

Initial velocity u = 10m/s

As at the maximum height ball ll stop so final velocity v = 0 m/s

Only acceleration working on it is acceleration due to gravity g = -9.8m/s²

Let height = h

So we know

$$v^2 - u^2 = 2as$$

$$\Rightarrow (0)^2 - (10)^2 = 2 \times (-9.8)h$$

$$\Rightarrow h = \frac{-100}{-19.6} = 5.10 \text{ m}$$

Also let time taken to reach maximum height = t

Then

We know

$$v = u + at$$

$$\Rightarrow 0 = 10 + (-9.8)t$$

$$\Rightarrow t = \frac{-10}{-9.8} = 1.02\text{s}$$

8. (d)

3.1 s

Explanation:

Initial Velocity v₀ = 20 ms⁻¹

$$\theta = 50^\circ$$

$$\text{Time of flight} = \frac{2v_0 \sin \theta}{g}$$

$$= \frac{2 \times 20 \times \sin 50^\circ}{9.8}$$

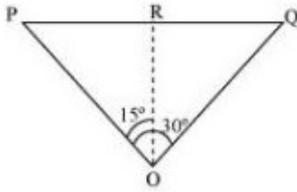
$$= 3.1 \text{ s}$$

9. (c)

182 m/s

Explanation:

The positions of the observer and the aircraft are shown in the given figure.



Height of the aircraft from ground, $OR = 3400 \text{ m}$

Angle subtended between the positions, $\angle POQ = 30^\circ$

Time = 10 s

In $\triangle PRO$:

$$\tan 15^\circ = \frac{PR}{OR}$$

$$PR = OR \tan 15^\circ$$

$$= 3400 \times \tan 15^\circ$$

$\triangle PRO$ is similar to $\triangle RQO$.

$$\therefore PR = RQ$$

$$PQ = PR + RQ$$

$$= 2PR = 2 \times 3400 \tan 15^\circ$$

$$= 6800 \times 0.268 = 1822.4 \text{ m}$$

$$\therefore \text{Speed of the aircraft} = \frac{1822.4}{10}$$

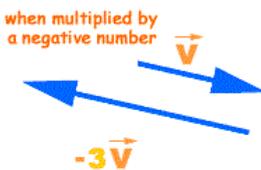
$$= 182.24 \text{ m/s} \approx 182 \text{ m/s}$$

10. (a)

gives a vector $\vec{v}' = \lambda \vec{v}$ in a direction opposite to \vec{v}

Explanation:

If a vector is multiplied by a negative number (for example -2, -3, -5, -60 unit etc.) or a scalar not only its magnitude is changed but its direction also reversed.



11. (a)

60°

Explanation:

$$\text{Time taken to reach the maximum height} = \frac{u \sin \theta}{g}$$

$$\text{Maximum height} = \frac{u^2 \sin^2 \theta}{2g}$$

$$\text{Half the maximum height} = \frac{u^2 \sin^2 \theta}{4g}$$

$$\text{Horizontal velocity at half the maximum height} = u \cos \theta$$

$$\text{Vertical velocity at half the maximum height} = \frac{u \sin \theta}{\sqrt{2}}$$

$$\text{Velocity at half the maximum height} = \sqrt{u^2 \cos^2 \theta + \frac{u^2 \sin^2 \theta}{2}}$$

According to question,

$$u \cos \theta = \sqrt{\frac{2}{5}} \sqrt{u^2 \cos^2 \theta + \frac{u^2 \sin^2 \theta}{2}}$$

Squaring both sides,

$$u^2 \cos^2 \theta = \frac{2}{5} u^2 \left(\cos^2 \theta + \frac{\sin^2 \theta}{2} \right)$$

$$\Rightarrow 5 - 5 \sin^2 \theta = 2 \left(1 - \sin^2 \theta + \frac{\sin^2 \theta}{2} \right)$$

$$\Rightarrow 5 - 5 \sin^2 \theta = 2 - \sin^2 \theta$$

$$\Rightarrow 4 \sin^2 \theta = 3$$

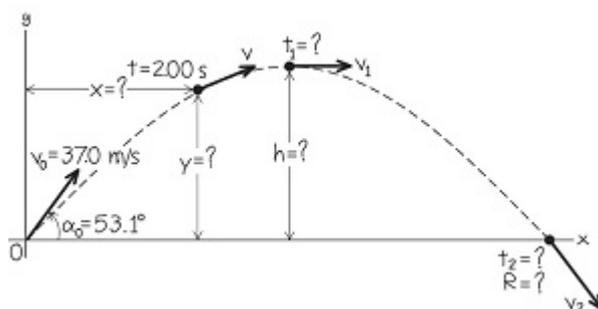
$$\Rightarrow \sin \theta = \frac{\sqrt{3}}{2}$$

$$\Rightarrow \theta = 60^\circ$$

12. (a)

3.02 s, 44.7 m

Explanation:



The initial velocity of the ball has components

$$v_{0x} = v_0 \cos \alpha_0 = 37.0 \times \cos 53.1^\circ$$

$$= 22.2 \text{ m/s}$$

$$v_{0y} = v_0 \sin \alpha_0 = 37.0 \times \sin 53.1^\circ$$

$$= 29.6 \text{ m/s}$$

At the highest point, the vertical velocity v_y is zero. Call the time when this

happens t_1 ; then

$$v_y = v_{oy} - gt_1 = 0$$

$$\Rightarrow t_1 = \frac{v_{oy}}{g} = \frac{29.6}{9.8} = 3.02 \text{ s}$$

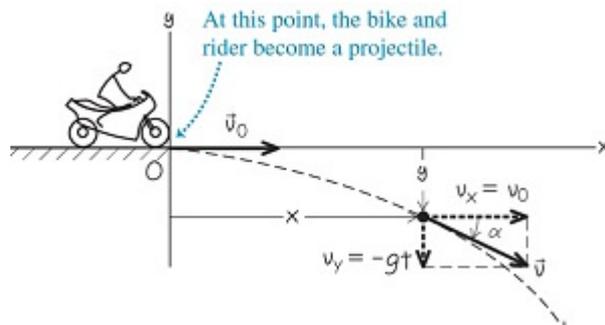
The height at the highest point is the value of y at time t_1 :

$$\begin{aligned} h &= v_{oy}t_1 - \frac{1}{2}gt_1^2 \\ &= 29.6 \times 3.02 - \frac{1}{2} \times 9.8 \times (3.02)^2 \\ &= 44.7 \text{ m} \end{aligned}$$

13. (c)

10.2 m/s

Explanation:



the velocity components at $t=0.50$ s are

$$v_x = v_{ox} = 9.0 \text{ m/s}$$

$$v_y = -gt = -9.8 \times 0.50 = -4.9 \text{ m/s}$$

The motorcycle has the same horizontal velocity v_x as when it left the cliff at $t = 0$, but in addition there is a downward (negative) vertical velocity v_y .

The velocity vector at $t = 0.50$ s is

$$\vec{v} = v_x \hat{i} + v_y \hat{j} = 9.0 \hat{i} + (-4.9) \hat{j}$$

at $t=0.50$ s the velocity has magnitude v given by

$$\begin{aligned} v &= \sqrt{(v_x)^2 + (v_y)^2} = \sqrt{(9.0)^2 + (-4.9)^2} \\ &= 10.2 \text{ m/s} \end{aligned}$$

14. (c)

parallelogram law of addition

Explanation:

Parallelogram law of vector addition is, If two vectors are considered to be the adjacent sides of a Parallelogram, then the resultant of two vectors is given by

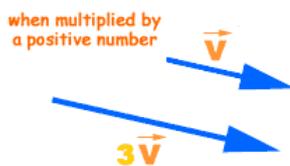
the vector which is a diagonal passing through the point of contact of two vectors.

15. (d)

gives a vector $\vec{v}' = \lambda \vec{v}$ in the same direction as \vec{v}

Explanation:

When a vector is multiplied by a positive number (for example 2, 3, 5, 60 unit etc.) or a scalar only its magnitude is changed but its direction remains the same as that of the original vector.



16. (a)

sum of two vectors A and B' such that B' is equal to B multiplied by -1

Explanation:

Vector subtraction is defined in the following way.

- The difference of two vectors, $A - B$, is a vector C that is, $C = A - B$
- The addition of two vector such that $C = A + (-B)$. B has been taken in opposite direction.

Thus vector subtraction can be represented as a vector addition.

17. (d)

122.5 m

Explanation:

We know that at the maximum height, the velocity of the ball is 0 m/s.

We also know that the ball takes the same time to reach its maximum height as it takes to travel from its maximum height to the initial position, due to time symmetry. The time taken is half the total time.

Therefore, we have the following information for the second (downward) part of the motion of the ball:

$t = 5$ second; half the total time

$$v_{top} = 0 \text{ m/s}$$

$$g = 9.8 \text{ m/s}^2 \text{ downward}$$

$s = ?$

As we know

$$s = ut + \frac{1}{2}gt^2$$

Put all the given value,

$$\Rightarrow s = 0 \times 5 + \frac{1}{2} \times 9.8 \times 25$$

$$\Rightarrow s = 122.5 \text{ m}$$

18. (d)

0.86 m s^{-2} , 54.5° with the direction of velocity

Explanation:

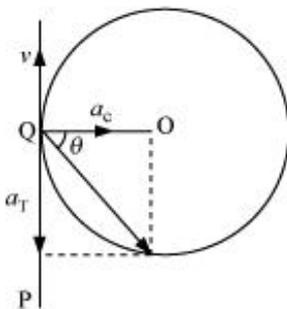
Speed of the cyclist, $v = 27 \text{ km/h} = 7.5 \text{ m/s}$

Radius of the circular turn, $r = 80 \text{ m}$

Centripetal acceleration is given as:

$$a_c = \frac{v^2}{r} = \frac{(7.5)^2}{80} = 0.7 \text{ ms}^{-2}$$

The situation is shown in the given figure:



Suppose the cyclist begins cycling from point P and moves toward point Q. At point Q, he applies the breaks and decelerates the speed of the bicycle by 0.5 m/s^2 .

This acceleration is along the tangent at Q and opposite to the direction of motion of the cyclist.

Since the angle between a_c and a_T is 90° , the resultant acceleration a is given by:

$$a = \sqrt{(a_c)^2 + (a_T)^2} = \sqrt{(0.7)^2 + (0.5)^2}$$
$$= \sqrt{0.74} = 0.86 \text{ ms}^{-2}$$

$$\tan \theta = \frac{a_c}{a_T}$$

where θ is the angle of the resultant with the direction of velocity.

$$\tan \theta = \frac{0.7}{0.5} = 1.4$$

$$\theta = \tan^{-1}(1.4) = 54.56^\circ \text{ with the direction of velocity.}$$

19. (c)
13.6 m

Explanation:

Let downward be the y direction.

$$v_{ox} = v_o \times \cos\theta = 30.0 \times \cos 33.0^\circ \\ = 25.2 \text{ m/s}$$

$$v_{oy} = v_o \times \sin\theta = 30.0 \times \sin 33.0^\circ \\ = 16.3 \text{ m/s}$$

At the maximum height, the velocity in the y direction v_y is zero:

$$\text{Using } (v_y)^2 = (v_{oy})^2 + 2a_y h \\ \Rightarrow 0 = (16.3)^2 + 2(-9.8)h \\ h = \frac{-(16.3 \times 16.3)}{-2 \times 9.8} = 13.6 \text{ m}$$

20. (d)
is either less or equal to the path length of the particle between two points

Explanation:

The maximum possible value for displacement is the distance travelled, so it cannot be of a greater value than distance (path length).

The magnitude of the displacement is always less than or equal to the distance traveled. If two displacements in the same direction are added, then the magnitude of their sum will be equal to the distance traveled.

21. (a)
vector addition

Explanation:

Vector addition is the operation of adding two or more vectors together into a vector sum. The so-called parallelogram law gives the rule for vector addition of two or more vectors. For two vectors, the vector sum is obtained by placing them head to tail and drawing the vector from the free tail to the free head.

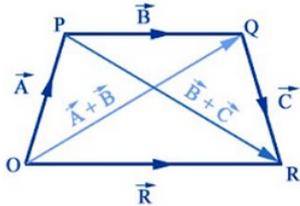
22. (a)
associative

Explanation:

Associative law of vector addition: The law states that the sum of vectors remains same irrespective of their order or grouping in which they are arranged.

Consider three vectors \vec{A} , \vec{B} and \vec{C} Applying "head to tail rule" to obtain the resultant of $(\vec{A} + \vec{B})$ and $(\vec{B} + \vec{C})$.

Then finally again find the resultant of these three vectors :



In $\triangle OPR$

$$\vec{OR} = \vec{OP} + \vec{PR}$$

Or

$$\vec{R} = \vec{A} + (\vec{B} + \vec{C}) \dots(I)$$

In $\triangle OQR$

$$\vec{OR} = \vec{OQ} + \vec{QR}$$

Or

$$\vec{R} = (\vec{A} + \vec{B}) + \vec{C} \dots(ii)$$

Thus from (1) and (2)

$$\vec{A} + (\vec{B} + \vec{C}) = (\vec{A} + \vec{B}) + \vec{C}$$

This fact is known as the associative law of vector addition.

23. (d)

48.05 m

Explanation:

Let the initial velocity of the ball before the last 6m be =u

$$a = 10 \text{ m/s}^2, s = 6.0\text{m}, t = 0.2 \text{ sec}$$

$$\Rightarrow s = ut + \frac{1}{2}at^2$$

$$\Rightarrow 6 = 0.2u + \frac{1}{2} \times 10 \times 0.04$$

$$\Rightarrow u = 29 \text{ m/s}$$

Now consider the journey from rest to this height.

$$v = 29 \text{ m/s}, u = 0 \text{ m/s}, a = 10 \text{ m/s}^2$$

$$v^2 - u^2 = 2as$$

$$\Rightarrow 841 - 0 = 2 \times 10 \times s$$

$$\Rightarrow s = 42.05 \text{ m}$$

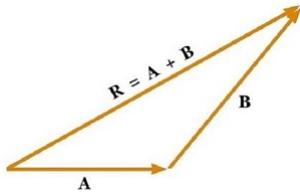
Therefore the total height = $42.05 + 6 = 48.05 \text{ m}$

24. (c)

so that its tail is at the head of the vector A

Explanation:

Triangle law of vector addition states that when two vectors are represented by two sides of a triangle in magnitude and direction taken in same order then third side of that triangle represents in magnitude and direction the resultant of the vectors.



Taken in same order mean tail of Vector B must coincide with head of vector A as shown in image.

25. (b)

25 m

Explanation:

Initial velocity $u = 54 \text{ km/h} = 15 \text{ m/s}$

Let Final velocity $v = 0$

Acceleration $a = -0.3 \text{ m/s}^2$

Time taken to stop = t

Using $v = u + at$

$$\Rightarrow 0 = 15 + (-0.3)t$$

$$\Rightarrow t = 50 \text{ sec}$$

It means it has been stopped before 1 minutes.

So distance covered in 1 minute

$$v^2 - u^2 = 2as$$

$$\Rightarrow 0 - 225 = 2 \times (-0.3)s$$

$$\Rightarrow s = 375 \text{ m}$$

Position of locomotive relative to the traffic lights = $400 - 375 = 25 \text{ m}$

26. (b)

direction

Explanation:

Scalar quantity gives you an idea about how much of an object there is, but vector quantity gives you an indication of how much of an object there is and that also in which direction. So, the main difference between these two quantities is associated with the direction, i.e. scalars do not have direction but vectors do.

27. (d)
8.54 m s⁻¹, 70° with x-axis

Explanation:

Position vector $\vec{r} = 3.0t\hat{i} + 2.0t^2\hat{j} + 4.0\hat{k}$

We know velocity is given by

$$\vec{v} = \frac{dr}{dt}$$

$$\text{So, } \vec{v} = 3.0\hat{i} + 4t\hat{j}$$

Velocity after 2 seconds

$$\vec{v}_2 = 3\hat{i} + 8\hat{j}$$

$$\text{Magnitude of velocity} = \sqrt{(3)^2 + (8)^2}$$

$$= \sqrt{73} = 8.54 \text{ ms}^{-1}$$

Direction is given by

$$\theta = \tan^{-1}\left(\frac{8}{3}\right) = 69.5 \approx 70^\circ \text{ with x-axis}$$

28. (c)
equal to zero

Explanation:

A null vector is a vector having magnitude equal to zero. It is represented by $\vec{0}$.

A null vector has no direction or it may have any direction.

Generally a null vector is either equal to resultant of two equal vectors acting in opposite directions or multiple vectors in different directions.

$$\vec{0} = \vec{A} + (-\vec{A})$$

29. (a)
having a magnitude of 1 and points in any chosen direction

Explanation:

A unit vector in a normed vector space is a vector (often a spatial vector) of length 1. A unit vector is often denoted by a lowercase letter with a circumflex, or "hat": \hat{i} (pronounced "i-hat"). The term direction vector is used to describe a unit vector being used to represent spatial direction.

\hat{i} = a unit vector directed along the positive x axis

\hat{j} = a unit vector directed along the positive y axis

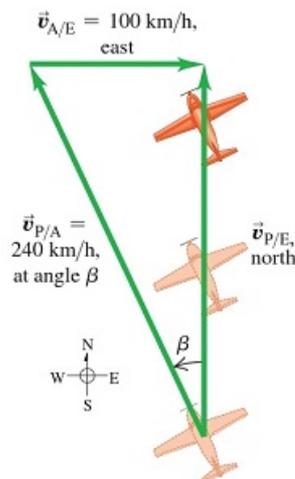
\hat{k} = a unit vector directed along the positive z axis

30. (c)

25° W of N, 218 km/h

Explanation:

This is a relative velocity problem with vectors. Image given is a scale drawing of the situation. Again the vectors form a right triangle:



$$\vec{v}_{P/E} = \vec{v}_{P/A} + \vec{v}_{A/E}$$

As shown in image, The pilot points the nose of the airplane at an angle β into the wind to compensate for the crosswind. This angle, which tells us the direction of the vector $\vec{v}_{P/A}$ (the velocity of the airplane relative to the air), is one of our target variables. The other target variable is the speed of the airplane over the ground, which is the magnitude of the vector $\vec{v}_{P/E}$ (the velocity of the airplane relative to the earth). The known and unknown quantities are: $\vec{v}_{P/E}$ = magnitude unknown due North

$$\vec{v}_{P/A} = 240 \text{ km/h due north}$$

$$\vec{v}_{A/E} = 100 \text{ km/h due east}$$

We'll solve for the target variables by using image and trigonometry.

$$v_{P/E} = \sqrt{(240)^2 - (100)^2} = 218 \text{ km/h}$$

$$\beta = \sin^{-1}\left(\frac{100}{240}\right) = 25^\circ$$

The pilot should point the airplane 25° west of north, and her ground speed is then 218 km/h.

31. (c)
-16.0

Explanation:

Distance covered $s = \text{Final position} - \text{initial position} = -5 - 3 = -8 \text{ cm}$

Initial velocity $u = 12.0 \text{ cm/s}$

Time taken $t = 2.0 \text{ s}$

We know

$$s = ut + \frac{1}{2}at^2$$

$$\Rightarrow -8 = 2 \times 12.0 + \frac{1}{2}a \times 4$$

$$\Rightarrow -8 = 24 + 2a$$

$$\Rightarrow a = \frac{-8-24}{2} = -16.0 \text{ cm/s}^2$$

32. (c)
-20

Explanation:

Velocity of A $v_A = +27 \text{ kmh}^{-1} = +7.5 \text{ ms}^{-1}$

Velocity of B $v_B = -45 \text{ kmh}^{-1} = -12.5 \text{ ms}^{-1}$

Relative velocity of B with respect to A $v_{BA} = v_B - v_A$

$$-7.5 - 12.5 = -20 \text{ ms}^{-1}$$

i.e. the train B appears to A to move with a speed of 20 ms^{-1} from north to south.

33. (a)
60.0

Explanation:

Initial velocity $u = 60 \text{ m/s}$

As it stops so final velocity $v = 0 \text{ m/s}$

Time taken $t = 2 \text{ seconds}$

We know

$$v - u = at$$

$$\Rightarrow a = \frac{v-u}{t} \dots\dots (1)$$

Also

$$s = ut + \frac{1}{2}at^2$$

From (1), we have

$$s = ut + \frac{1}{2}\left(\frac{v-u}{t}\right)t^2$$

$$\Rightarrow s = ut + \frac{1}{2}(v - u)t$$

After putting given values, we have

$$\Rightarrow s = (60 \times 2) + \frac{1}{2}(0 - 60) \times 2$$

$$\Rightarrow s = 120 - 60 = 60 \text{ m}$$

34. (d)

is equal in equal intervals of time.

Explanation:

Uniform motion is the kind of motion in which a body covers equal displacement in equal intervals of time. It does not matter how small the time intervals are, as long as the displacements covered are equal.

If a body is involved in rectilinear motion and the motion is uniform, then the acceleration of the body must be zero.

35. (a)

89.4

Explanation:

Initial velocity $u = 0$

Acceleration $a = 10.0 \text{ m/s}^2$

Distance covered $s = 400 \text{ m}$

Final velocity $v = ?$

We know

$$v^2 - u^2 = 2as$$

$$\Rightarrow v^2 - 0 = 2 \times 10 \times 400$$

$$\Rightarrow 8000 = v^2$$

$$\Rightarrow v = \sqrt{8000} = 89.4 \text{ m/s}$$

36. (d)

position to the right of the origin is taken as positive and to the left as negative.

Explanation:

To describe motion along a straight line, we can choose an axis, say X-axis, so that it coincides with the path of the object. We then measure the position of the object with reference to a conveniently chosen origin, say O, Positions to the right of O are taken as positive and to the left of O, as negative.

37. (d)
63.0

Explanation:

Initial velocity $u = 63 \text{ m/s}$

At it stops final velocity $v = 0 \text{ m/s}$

Time taken $t = 2 \text{ s}$

We know,

$$s = \frac{1}{2}(u + v)t$$

$$\Rightarrow s = \frac{1}{2}(0 + 63) \times 2$$

$$\Rightarrow s = 63 \text{ m}$$

38. (a)
-40.0

Explanation:

Velocity of A $v_A = +54 \text{ kmh}^{-1} = +15 \text{ ms}^{-1}$

Velocity of B $v_B = -90 \text{ kmh}^{-1} = -25 \text{ ms}^{-1}$

Relative velocity of B with respect to A $v_{BA} = v_B - v_A$

$$-25 - 15 = -40 \text{ ms}^{-1}$$

i.e. the train B appears to A to move with a speed of 40 ms^{-1} from north to south.

39. (b)
a conveniently chosen origin

Explanation:

To describe motion along a straight line, we can choose an axis, say X-axis, so that it coincides with the path of the object. We then measure the position of the object with reference to a conveniently chosen origin, say O, Positions to the right of O are taken as positive and to the left of O, as negative.

40. (d)

31.0 s

Explanation:

Initial speed of the car $u = 45 \text{ m/s}$

Let $t = 0 \text{ s}$ when the car passes the trooper.

The trooper starts from rest 1 s after the car passes the billboard.

In this 1 s the car would have covered a distance of 45 m.

Let y be the time at which the trooper overtakes the car.

Distance covered by car at time y

$$S = 45 + uy = 45 + 45y. \dots (1)$$

(The distance is measured from the billboard)

The same distance is covered by the trooper also.

$$S = 0 + \frac{1}{2} \times 3 \times (y)^2. \dots (2)$$

(Initial speed of trooper = 0).

Equating (1) and (2)

$$45 + 45y = \frac{3}{2}(y)^2$$

$$\Rightarrow 3y^2 - 90y - 90 = 0$$

$$\Rightarrow y^2 - 30y - 30 = 0$$

Using quadratic formula

$$y = \frac{30 \pm \sqrt{900 + 120}}{2} = \frac{30 \pm 31.93}{2} = 30.97 \text{ s} \approx 31 \text{ s}$$

Neglected negative value of y

Solution
Class 11 - Chemistry
Multiple Choice Questions Test(August 2019)
Section A

41. (d)

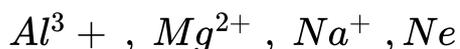


Explanation:

- The given species are all isoelectronic species .
- *Ne* though, isoelectronic with other species is a neutral and inert element, so in the absence of any charge over its atom would have largest size.
- In case of other cationic species ;

Greater the number of positive charge over a cation more is the effective nuclear attraction resulting into greater reduction in size of the cation.

Therefore , out of



Al^{3+} is smallest in size.

42. (d)

All of these

Explanation:

Isoelectronic species have same number of electrons.

Ne (Z=10) has 10 electrons.

N (Z=7) has 7 electrons and with addition of 3 more electrons it becomes N^{3-} anion which has 10 electrons.

Mg (Z=12) has 12 electron and with removal of 2 electrons it becomes Mg^{2+} cation which has 10 electrons.

Al (Z=13) has 13 electrons and with removal of 3 electrons it becomes Al^{3+} cation which has 10 electrons.

Since all the species have same number of electrons that is 10 , so they are isoelectronic.

43. (a)

covalent radius < Metallic radius < van der Waal's radius

Explanation:

For the same element ,

- Metallic radius of atoms are always greater than corresponding covalent radius.
- Metallic radius is always lesser than van der Waal's radius

Hence , the correct increasing order of atomic radii of an element is covalent < Metallic < van der Waal's radius.

44. (a)

transition element

Explanation:

The element is,

Scandium, (Sc)with atomic number (Z) = 21

The electronic configuration of

${}_{21}\text{Sc}$ is $[\text{Ar}] 3d^1, 4s^2$; hence, it is a transition element.

45. (c)

$1s^2 2s^2 2p^6 3s^2 3p^3$

Explanation:

Since , according to classification of elements in Modern periodic table, Period number gives an idea of Valence shell number (n) while group number gives an idea of Valence electrons i.e. no. Of electrons short to nearest octet or duplet.

Here, period no. = n = 3 and to complete the octet i.e. 8 electrons in Valence shell 15th group is 3 electrons short so, it must be having 5 electrons in the Valence shell.

\therefore the electronic configuration of element in 3^{rd} period and 15^{th} Group is $(1s^2, 2s^2 2p^6, 3s^2 3p^3)$.

46. (b)

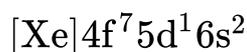
$\text{I} < \text{Br} < \text{F} < \text{Cl}$

Explanation:

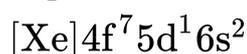
In general as the we move down the group electron gain enthalpy decreases; so the expected trend should be $\text{I} < \text{Br} < \text{Cl} < \text{F}$ but in actual the order is $\text{I} < \text{Br} <$

F < Cl . This is due to small size of F atom. The valence electrons of F atom provide strong repulsion to incoming electron, hence F has unexpectedly low electron affinity.

47. (a)



Explanation:



48. (b)

Nitrogen

Explanation:

Nitrogen has electronic configuration of $1s^2 2s^2 2p^3$. It has half filled p orbitals in this outermost shell which is a stable configuration. It is difficult to add electron in such orbitals and lesser energy is released on addition of electrons hence the electron affinity value will decrease.

49. (c)

Cl, P

Explanation:

Chlorine has the electronic configuration of $1s^2 2s^2 2p^6 3s^2 3p^5$, it need one more electrons to get fully filled electronic configuration. It will accept an electron easily to acquire stability, hence it has most negative electron gain enthalpy. Whereas phosphorus has $1s^2 2s^2 2p^6 3s^2 3p^3$; here p-orbitals are half filled. This half filled configuration gives extra stability to phosphorus, hence it will be resistant to accept an electron. It has a positive electron affinity or in simple words energy is added to make P accept an electron.

50. (c)

P < Si < Be < Mg < Na.

Explanation:

Elements of s block are more metallic than p block elements

51. (a)

isoelectronic species

Explanation:

Isoelectronic species are elements or ions that have the same, or equal number of electrons. Although isoelectronic species have the same number of electrons, they are different in their physical and chemical properties.

52. (c)
2, 6, 10, 14

Explanation:

The number of columns in different blocks of elements in the periodic table is in accordance of Aufbau principle which also gives the linear order of blocks (as atomic number increases) in the periodic table.

Therefore , the number of columns for

(i) s -block elements =

2

(ii) p - block elements =

6

(iii) d- block elements =

10

(iv) f - block elements =

14

53. (a)
 $Mn > Fe > Cr > Co$

Explanation:

This is attributed to the extra stability of half filled orbitals that is seen only in Mn^{2+} (i.e. d^5). The other members have Fe (d^6); Cr (d^4) and Co (d^7) respectively.

54. (b)
 $F > O > Cl > N$

Explanation:

Within a period, the oxidising character increases from left to right. Therefore, among F, O and N, oxidizing power decreases in the order: $F > O > N$. However, within a group, oxidizing power decreases from top to bottom. Thus, F is a

stronger oxidising agent than Cl. Further because O is more electronegative than Cl, therefore, O is a stronger oxidising agent than Cl. Thus, overall decreasing order of oxidizing power is: $F > O > Cl > N$.

55. (c)



Explanation:

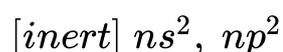
The general electronic configuration of different elements is given with reference to complete configuration of an inert element preceding it. It is usually denoted as $[Inert]$ and thereafter the number of electrons in the last orbit of the element is written following nl^x notation, where

$n = \text{principal quantum number}$

$l = \text{secondary or Azimuthal quantum number}$

$x = \text{number of electrons}$

So, the general electronic configuration of group 14 elements (ie. a p-block element) is



56. (c)

Lanthanoids

Explanation:

The two rows of elements at the bottom of the Periodic Table, called the Lanthanoids, Ce(Z = 58) – Lu(Z = 71) and Actinoids, Th(Z = 90) – Lr (Z = 103) are characterised by the outer electronic configuration $(n-2)f^{1-14} (n-1)d^{0-1}ns^2$. The last electron added to each element is filled in f- orbital. These two series of elements are hence called the Inner-Transition Elements (f-Block Elements).

57. (d)

N

Explanation:

Generally atomic size along the period decreases while down the group it increases.

58. (c)

Be and Al

Explanation:

Elements of second period Li, Be and B resemble closely the elements Mg, Al and Si of the third period in the next higher group. Diagonal relationship is due to similar size of ions and almost similar electron negativities of the elements.

59. (c)
increasing order of their atomic weights

Explanation:

When they arranged elements in the increasing order of their atomic weights, both of them observed that the chemical and physical properties of the elements repeated after a regular interval.

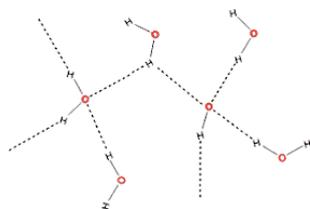
60. (d)
 $F < Cl < Br < I$

Explanation:

In a group moving from top to bottom the number of shells increases. So the atomic size increases. Although the effective nuclear charge increases but its effect is negligible in comparison to the effect of increasing number of shells.

61. (d)
4

Explanation:



The two hydrogens of the water molecule can form hydrogen bonds with other oxygens in water, and the two lone pair of electrons on oxygen of the water molecule can attract other hydrogens in water. Hence, 4 possible hydrogen bonds.

62. (b)
 O_2^{2+}

Explanation:

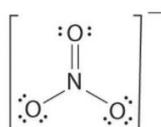
Bond length is inversely proportional to bond order. O_2^{2+} has highest bond order as electrons are removed from antibonding MO.

63. (d)

4, 0

Explanation:

The nitrate ion is formed by the loss of the hydrogen ion, and so its structure is:



Around the central nitrogen there are 4 pairs of shared electrons, and no remaining lone pair. The original lone pair has now become a bonding pair. Two of those pairs make up a double bond.

64. (a)



Explanation:

BF_4^- and NH_4^+ both have sp^3 hybridisation.

65. (a)

$2p_x$ and $2p_y$

Explanation:

For p-orbitals ($l = 1$), there are three possible orientations corresponding to $m = -1, 0, +1$ values. This means that there are three p-orbitals in each p-subshell. These are designated as p_x , p_y and p_z ;

These three orbitals are equal in energy but differ in their orientations. Each orbital consists of two lobes symmetrical about a particular axis. Depending upon the orientation of the lobes, these are designated as $2p_x$, $2p_y$ and $2p_z$, as they are symmetrical about x, y and z-axes respectively. That is, $2p_x$ orbital has two lobes symmetrical around x-axis and the lobes of $2p_z$ orbital are

symmetrical around z-axis while $2p_y$ orbital has two lobes symmetrical around y-axis so it doesn't form sigma bond.

66. (c)

$$N_a < N_b$$

Explanation:

Stability of molecule : It is determined by bond order. Higher is the bond order greater is the stability of molecule.

Bond order is defined as the number of covalent bonds between the two combining atoms of a molecule.

$$\text{Bond order} = 0.5 (N_b - N_a)$$

If $N_b > N_a$, then molecule will be stable. Where

N_b = number of bonding electrons or number of electrons in bonding M.O's

N_a = number of antibonding electrons

67. (c)

paramagnetic character decreases and the bond order increases

Explanation:

**For O_2 : $\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2pz^2,$
 $(\pi 2py^2 = \pi 2px^2), (\pi^* 2py^1 = \pi^* 2px^1) \sigma^* 2pz$**

**For O_2^+ : $\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2pz^2,$
 $(\pi 2py^2 = \pi 2px^2), (\pi^* 2py^1 = \pi^* 2px^0) \sigma^* 2pz$**

$$\text{Bond order} = \frac{N_b - N_a}{2}$$

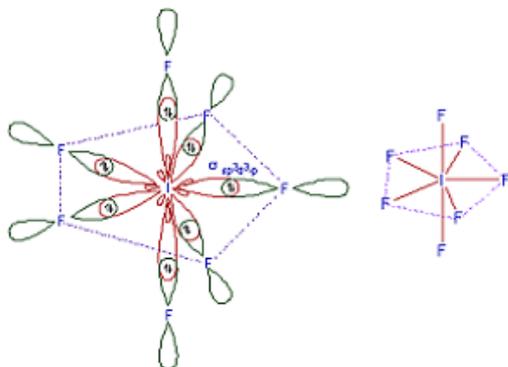
$$\text{For } O_2 = \frac{10 - 6}{2} = 2$$

$$\text{For } O_2^+ = \frac{10 - 5}{2} = 2.5$$

68. (d)

Pentagonal bipyramid

Explanation:



Pentagonal bipyramidal structure of IF_7

In IF_7 out of 7 Fluorine atoms 5 of them are placed on a plane in Pentagonal shape. In remaining 2 fluorines one is placed above the plane and other below the plane each at 90 degrees

69. (a)
one sigma and two pi bonds

Explanation:

acetylene is C_2H_2 .

C atoms are bound with triple bond i.e. 1 sigma and 2 pie bonds.

70. (a)
 CN^- and NO^+

Explanation:

$$\text{Bond order} = \frac{n_b - n_a}{2}$$

There are 8 bonding electrons and 2 antibonding electrons, therefore B.O. = $\frac{8-2}{2} = 3$

NO^+ has 10 electrons, a triple bond between N and O and two pairs, one on each atom. This means that both N and O follow the octet rule. Bond order is 3.

71. (b)
- 1

Explanation:

Formal charge on the oxygen atom of P-O bond is - 1.

Formal charge = (no. Of Valence electrons) - (no. Of non bonded electrons + no. Of bonds).

72. (d)
 120°

Explanation:

sp^2 hybridisation have triangular planar structure so bond angle is 120°

73. (a)



Explanation:

Boiling point order depend on hydrogen bonding strength which depends on the no. of hydrogen bonds formed and electronegative difference. H_2O and NH_3 forms 4 hydrogen bonds while HF forms only 2. But F is more electronegative than N.

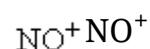
74. (c)

NO

Explanation:

The number of electrons in Nitrogen are 7 and in oxygen are 8. Hence the number of electrons that would be present in the molecular orbitals in NO are $7 + 8 = 15$. As the number of electrons are odd, all the electrons in NO molecule cannot be paired. Hence, a single electron would be present in a π^*2p orbital. Therefore NO is an odd electron species and the gas is hence paramagnetic due to the presence of unpaired electron.

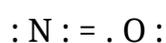
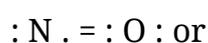
75. (a)



Explanation:

Molecules having all their subshells completely filled are diamagnetic, i.e., they are not influenced greatly by a magnetic field. Paramagnetic is the opposite and it is the nature of elements possessing incompletely filled subshell(s).

The Lewis structure of NO molecule can be represented as



It is observed that the total no. of unbonded electrons is odd. Therefore, there must be an incompletely filled subshell. Therefore, it is paramagnetic. In NO^+ ,

due to loss of 1 electron, the no. of unbonded electrons becomes even.
Therefore, all subshells must be completely filled. Therefore, it is diamagnetic.

76. (d)
 sp^2 , sp , sp^3

Explanation:

Hybridization of orbitals of N atom in NO_3^- , NO_2^+ and NH_4^+ are sp^2 , sp , sp^3 which can be explained by their Lewis structures.

The empty p-orbitals of N take part in hybridisation.

77. (a)
metal and a nonmetal

Explanation:

Metals are electropositive in nature as they easily lose electrons, so they are reducing agents. On the contrary, Non-metals are electronegative because they gain electrons and thus they are oxidising agents.

78. (d)
One sigma, two pi

Explanation:



CaC_2 has a combination of bonds. It is an ionic lattice that has Ca^{2+} cations and acetylide C_2^{2-} anions. Within each C_2^{2-} there is a triple bond between the 2C atoms, consisting of 1 sigma and 2 pi bonds.

79. (a)
 $\text{C-O} > \text{C=O} > \text{C}\equiv\text{O}$

Explanation:

The length of the bond is determined by the number of bonded electrons (the bond order). The higher the bond order, the stronger the pull between the two atoms and the shorter the bond length. Generally, the length of the bond between two atoms is approximately the sum of the covalent radii of the two atoms. CO has triple bond so has minimum bond length.

80. (a)
3,3,3

Explanation:

Total number of electrons in N_2 molecule is $7+7=14$.

As per the formula Bonded pair of electrons N_b : $\sigma 1s^2 \sigma 2s^2 \pi 2p_y^2 \pi 2p_z^2 \sigma 2p_x^2$

Total 10 electrons.

Anti bond pairs of electrons N_a : $\sigma 1s^*^2 \sigma 2s^*^2$ Total 4 electrons.

$$\text{Bond Order (B.O.)} = \frac{N_b - N_a}{2} = \frac{10 - 4}{2} = 3$$

Similarly bond order of CO And NO^+ is 3

Solution
Class 11 - Biology
MCQ(2019-20)
Section A

81. (a)
1973

Explanation:

Project tiger is a tiger conservation programme launched in 1973 by the Government of India to maintain the rapidly decreasing number of tigers in India.

82. (d)
Euspongia and phylum Porifera

Explanation:

The animal is identified as Euspongia which belong to phylum Porifera.

83. (a)
Have gill slit at some stage of life.

Explanation:

Crocodile and penguin are similar to whale and dog fish in having gill slits at some stage of their life cycle which is used as respiratory organs.

84. (b)
Ornithorhynchus

Explanation:

Ornithorhynchus is a mammal but lays egg.

85. (b)
Liver fluke

Explanation:

Most of the animals are not able to fertilize its own egg by sperms but in liver fluke, self-fertilization takes place. Earthworm also possess both male and

female reproductive organ in same individual but not able to fertilize its own egg.

86. (b)

(i)-(h), (ii)-(e), (iii)-(d), (iv)-(a), (v)-(b), (vi)-(g), (vii)-(c), (viii)-(f)

Explanation:

(i)-(h), (ii)-(e), (iii)-(d), (iv)-(a), (v)-(b), (vi)-(g), (vii)-(c), (viii)-(f)

87. (c)

Two upper incisors

Explanation:

In elephants two upper front teeth are modified into tusk of elephants. Continuous growth of tusk is enabled by formative tissues in the apical opening of the root of the teeth.

88. (c)

Giant panda

Explanation:

Giant panda is going to extinct due to low reproductively rate. They live in mountain ranges in central china. There reproductively rate is vary less due to climatic conditions.

89. (b) Amphibian

Explanation:

Salamanders are a group of amphibians typically characterized by a lizard-like appearance, with slender bodies, blunt snouts, short limbs projecting at right angles to the body, and the presence of a tail in both larvae and adults.

90. (b)

Torpedo

Explanation:

Torpedo fish has electric organ. They are known for being capable of producing an electric discharge ranging from 8 to 220 volts depending on species.

91. (a)

Octopus and phylum Mollusca

Explanation:

The animal is identified as octopus which belongs to phylum Mollusca.

92. (a)

Presence of notochord

Explanation:

Presence of notochord is main characteristic of vertebrates. Notochord is the defining structure of the chordates, and has essential roles in vertebrate development. It serves as a source of midline signals that pattern surrounding tissues and as a major skeletal element of the developing embryo.

93. (d)

Head louse living on the human scalp and laying egg in hair

Explanation:

The parasites lives and obtain nutrients from host. Head louse living on the human scalp and laying egg in hair are parasite in true sense.

94. (b)

Mosaic of lipid and proteins

Explanation:

A cell membrane shows fluid behavior due to mosaic of lipid and proteins. Fluid mosaic model of plasma membrane is most accepted and recent model.

95. (a)

Gram

Explanation:

The staining procedure developed by Gram viz., those that take up the gram stain are gram positive and the others that do not are called gram negative bacteria.

96. (a)

Aleuroplasts

Explanation:

Aleuroplasts also known as Proteoplasts or proteinoplasts. They store proteins and found in seeds (maize)

97. (c)

Cristae

Explanation:

Mitochondria are double membranous structure. The inner membrane of mitochondria thrown into folds to form finger-like structure is called cristae.

98. (a)

Both Size of ribosome and Density of ribosome

Explanation:

S is Svedberg unit. One Svedberg unit is equal to 10^{-13} s, so comparing the number of Svedberg units for different macromolecules will tell about their relative masses, shapes, and densities. The higher the value of S, the faster a molecule will sediment.

99. (d)

Nerve cells

Explanation:

Nerve cell or neuron is the longest cell in human body. They are responsible for transfer of information from one part of the body to the other in form of nerve impulses.

100. (d)

Elaioplasts

Explanation:

Elaioplasts are a type of leucoplast that is specialized for the storage of lipids in plants. Elaioplasts house oil body deposits as rounded plastoglobuli, which are essentially fat droplets.

101. (d)

Schleiden, Schwann and Virchow

Explanation:

Credit for developing cell theory is usually given to two scientists: Theodor Schwann and Matthias Jakob Schleiden. While Rudolf Virchow contributed to the theory, he is not as credited for his attributions toward it.

102. (a)

Presence of cell wall

Explanation:

Most prokaryotic cells, particularly the bacterial cells, have a chemically complex cell envelope. All eukaryotic cells are not identical. Plant and animal cells are different as the former possess cell walls.

103. (c)

Grana

Explanation:

In plant cells, the chloroplasts are responsible for trapping light energy essential for photosynthesis. The grana, in the plastid, is the site of light reactions.

104. (a)

Vacuole

Explanation:

The endomembrane system include endoplasmic reticulum (ER), golgi complex, lysosomes and vacuoles.

105. (c)

Proteinaceous filaments

Explanation:

An elaborate network of filamentous proteinaceous structures present in the cytoplasm is collectively referred to as the cytoskeleton.

106. (a)

Tonoplast

Explanation:

Tonoplasts are the fluid filled vacuoles or vesicles which are separated from cytoplasm by a selectively permeable membrane. It help in maintaining turgidity of the cell.

107. (d)

9

Explanation:

The 9 essential amino acids are: histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine.

108. (b)

Tryptophan

Explanation:

Tryptophan is an amino acid needed for normal growth in infants and for nitrogen balance in adults. Nicotinamide can be synthesized in human body from tryptophan.

109. (c)

Dehydration

Explanation:

In a polypeptide or a protein, amino acids are linked by a peptide bond which is formed when the carboxyl (-COOH) group of one amino acid reacts with the amino (-NH₂) group of the next amino acid with the elimination of a water moiety (the process is called dehydration). In polysaccharide the individual monosaccharides are linked by a glycosidic bond. This bond is also formed by dehydration.

110. (b)

Collagen

Explanation:

Collagen is a fibrous protein. It is the main structural protein in the extracellular space in the various connective tissues. It is the most abundant protein in mammals.

111. (b)

4

Explanation:

Proteins human haemoglobin consists of 4 subunits. Two of these are identical to each other. Hence, two subunits of α type and two subunits of β type together constitute the human haemoglobin (Hb).

112. (a)

AUG

Explanation:

AUG codon is an initiation codon for protein synthesis. This codon codes for amino acid methionine.

113. (d)

RUBISCO

Explanation:

Ribulosebiphosphate Carboxylase-Oxygenase (RUBISCO) is the most abundant protein in the whole of the biosphere.

114. (a)

Tertiary structure

Explanation:

Tertiary structure: Long protein chain is folded upon itself like a hollow woolen ball. Gives a 3-dimensional view of protein, e.g., myosin.

115. (a)

Ten base pairs

Explanation:

One full turn of the helical strand would involve ten steps or ten base pairs. The pitch would be 34Å.

116. (a)

Substrate analogue

Explanation:

The inhibition of enzyme activity by presence of a chemical that competes with the substrate for binding to the active site of the enzyme is called substrate analogue.

117. (a)

78.2 Å°

Explanation:

The distance between two base pairs in DNA is 3.4 Å° . The length of DNA with 23 base pairs is $23 \times 3.4 = 78.2 \text{ Å}^{\circ}$.

118. (c)

Resins

Explanation:

Fevicol is a synthetic sticky substance insoluble in water and used for joining wood and paper is a type of resins.

119. (a)

Production of ethanol

Explanation:

Yeast cells obtain energy under anaerobic conditions using a very similar process called alcoholic fermentation.

Glycolysis is the chemical breakdown of glucose to lactic acid. Alcoholic fermentation is identical to glycolysis except for the final step.

In alcoholic fermentation, pyruvic acid is broken down into ethanol and carbon dioxide.

120. (b)

Insecticides

Explanation:

Monoterpene eaters called pyrethroids found in flowers and leaves of chrysanthemum are used commercially for making insecticides.