MOTION

Student's Solution Copy [CODE - 25447]

NEET PATTERN TEST Brahmastra Semi Major Test-01

12+13th NEET - Phase 12

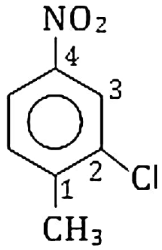
KOTA

Date: 05-Jan-2025 **Duration: 3 Hours 20 Mins** **Max Marks: 720**

Chemistry - Section A

1. **Answer:** 4

Sol:



2-chloro-1-methyl-4-nitrobenzene.

$As - NO_2$ is treated as substituent and not a functional group.

2. **Answer:** 4

Sol:

$= \frac{8.96}{22.4} \times N_A$

$= 2.408 \times 10^{23}$

$= 24.08 \times 10^{22}$

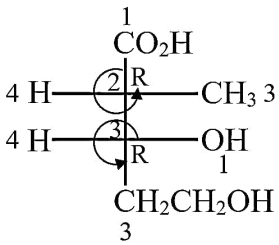
3. **Answer:** 2

Sol:

INA is X axis then P_y–P_y form π- bond.

4. **Answer:** 1

Sol:



5. **Answer:** 2

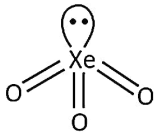
Sol:

The Ratio of hydrogen and oxygen remain same i.e. 1 : 8 so law of definite proportion.

6. **Answer:** 2

Sol:

(1) XeO_3→According to VSEPR theory for a steric number = 3bp + 1 l.p. = 4

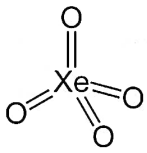


σ bond $= 3$

π bond $= 3$

XeO_3 has 3pп–dп bonds.

(2) XeO_4→ One s and three p orbitals undergo sp^3 hybridization. Since it has no lone pair of electrons, the shape of XeO_4 is tetrahedral with 4σ and п bonds each with a bond angle of 109°.



σ bond $= 4$

σ bond $= 4$

XeO_4 has 4pп–dп bonds

(3) SO_3→

The SO_3 molecule is sp^2 hybridized and has trigonal planar geometry.

The number of p pi -dpi bonds present in monomeric SO_3 is

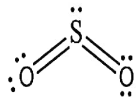
σ bond $= 3$

π bond $= 3$

SO_2 has 3pп–dп bonds

(4) SO_2→ In Sulphur dioxide, the S atom has 2 bond pairs and 1 lone pair, so it requires 3 hybrid orbitals. So the hybridization is sp^2.

The SO_2 molecule is slightly bent because the lone pair of electrons in it reduces the bond angle from 120° to 119°.



σ bond $= 2$

π bond $= 2$

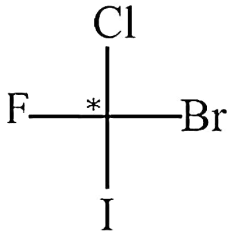
SO_2 has $2p\pi - d\pi$ bonds

The maximum number of dп-pп $d\pi - p\pi$ is equal to half of covalency. When covalency of Xe is 8, then, $4p\pi - d\pi$ bonds may be formed.

7. Answer: 4

8. Answer: 3

Sol:



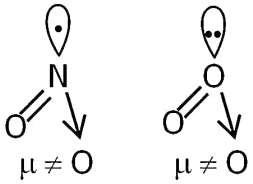
asymmetric carbon
or
chiral carbon

Sol:

% of water $= \frac{3\times18\times100}{56+3(12+14+32)+3\times18} = 19\%$

9. **Answer:** 3

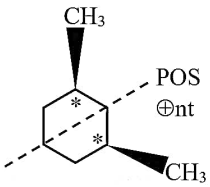
Sol:



10. **Answer:** 2

Sol:

It has 2 chiral carbon



11. **Answer:** 3

Sol:

given:- mol wt. of compound = 108

Element	weight	mole	simple ratio
C	9	$\frac{9}{12}=\frac{3}{4}$	3
H	1	$\frac{1}{1}=1$	4
N	3.5	$\frac{3.5}{14}=\frac{1}{4}$	1

So, empirical formula is C_3H_4N

empirical wt. = 54

$n = \frac{\text{mol. wt}}{\text{emp. wt}} = \frac{108}{54} = 2$

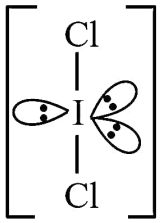
Empirical formula = n × emp. formula

$= C_6H_8N_2$

12. **Answer:** 4

Sol:

$ICl_2^- \Rightarrow 2\sigma + 3\,lp \Rightarrow sp^3d$

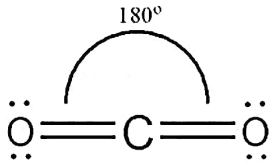


$\theta = 180^o$

(A) The molecular geometry of ICl_2^- is linear whereas electron geometry is trigonal bipyramidal.

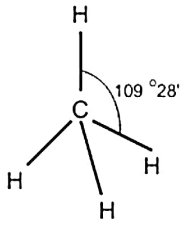
The bond angle in ICl_2^- molecule is 180°.

(B)



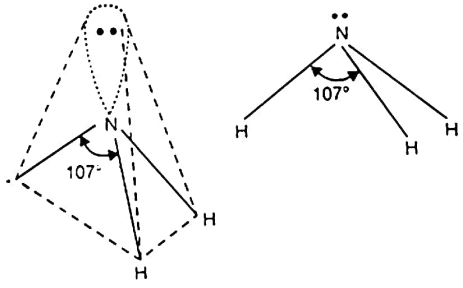
The carbon dioxide bond angle is 180°.

(C)



CH_4 has a tetrahedral shape. The sp^3 hybrid orbitals have a bond angle of 109.5°.

(D)



Distorted tetrahedral

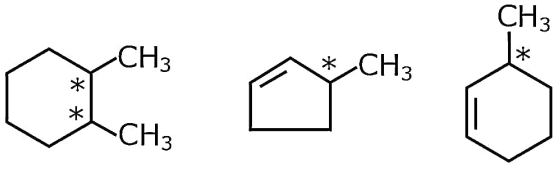
The bond angle in ammonia is less than the standard 109.5°. The bond angle is 107°.

13. Answer: 1

14. Answer: 3

Sol:

A carbon atom that is attached to four different atoms or groups is said to be asymmetric carbon atoms.



1,2-dimethyl cyclohexane = 2
3-methyl cyclopentene = 1
3-methyl cyclohexene = 1
Two, one, one asymmetric carbon atoms are present in the following groups.

15. Answer: 4

Sol:

(A) CH_4 $\rightarrow$ One carbon atom forms four covalent bonds with four hydrogen atoms by sharing a pair of electrons between itself and each hydrogen (H) atom

(B) NaCl $\rightarrow$ In NaCl molecule, an ionic bond is formed between Na^+ and Cl^- ions.

(C) NH_4Cl $\rightarrow$ In NH_4Cl molecule, an ionic bond is formed between NH_4^+ and Cl^- ions, 3 covalent bonds are formed between N and three H atoms, and one coordinate bond is formed between N and one H atom.

16. Answer: 3

Sol:

For both compound

Configuration is same [2R, 3R]

17. Answer: 4

Sol:

$MgCO_3$ decomposes as below:

$MgCO_3 \rightarrow MgO + CO_2$

mole ratio $= 1 : 1 : 1$

Thus 0.1 mole of CO_2 will be produced by 0.1 mole of $MgCO_3$

Mass of $MgCO_3$ in $10\ g$ sample
$= 0.1 \times 84 = 8.4\ g$

% purity $= \frac{8.4}{10} \times 100$

= 84%

18. Answer: 3

Sol:

Ionic radius of Li^+ is smallest in the periodic table

19. Answer: 3

Sol:

The ratio of the volume of gaseous reactants and products is in agreement with their molar ratio. For example;

$H_2+Cl_2 \rightarrow 2HCl$

The ratio of H_2:Cl_2:HCl by volume is 1:1:2 which is the same as their molar ratio

20. Answer: 3

Sol:

Bond order N_2^+ is 2.5 while Bond order of N_2 is 3.0. So, bond length of N_2^+ is greater than N_2.

Sol:

$$\begin{array}{lccc} & N_{2(g)} + & 3H_{2(g)} & \rightleftharpoons\ 2NH_{3(g)} \\ W_2 = & 20\,g & 5\,g & \\ n = & \frac{20}{28} & \frac{5}{2} & \end{array}$$

Stoichiometric Amount.

$N_2 \rightarrow \frac{20/28}{1} = \frac{20}{28}$

$H_2 \rightarrow \frac{5/2}{3} = \frac{5}{6}$

$\therefore N_2$ is the limiting reagent.

$\therefore n(NH_3) = 2 \times n(N_2) = 2 \times \frac{20}{28}$
$= 1.42$

21. Answer: 1

Sol:

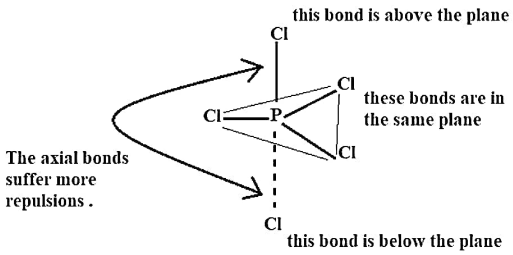
Radiation energy is not emitted or absorbed continuosly but in the from of small packets called quanta. This magnitude of energy asssociated with a quantum is proportional ot the frequency and inversely proportional to wavelength.

E= hv $=\frac{hc}{\lambda}$

22. Answer: 1

Sol:

Both Assertion and Reason are correct and Reason is correct for the Assertion.



23. Answer: 1

Sol:

Accuracy in velocity $= 0.001\% = \frac{0.001}{100}$

Actual velocity of the electron

$(\Delta v) = 3 \times 10^4 \times \frac{0.001}{100} = 0.3 \text{ cm/s}$

Planck's constant (h)=6.626×10^{-27} erg-sec.

$(\Delta x) = \frac{h}{4\pi m \Delta v} = \frac{6.626\times10^{-27}\times7}{4\times22\times(9.1\times10^{-28})\times0.3} = 1.93 \text{ cm}$

24. Answer: 1

Sol:

$N_2 = \sigma_{1s}^2\sigma_{1s}^{*2}\sigma_{2s}^2\sigma_{2s}^{*2}\pi_{2px}^2 = \pi_{2py}^2\sigma_{2pz}^2$

$N_2^+ = \sigma_{1s}^2\sigma_{1s}^{*2}\sigma_{2s}^2\sigma_{2s}^{*2}\pi_{2px}^2 = \pi_{2py}^2\sigma_{2pz}^1$

25. Answer: 4

Sol:

$r_{e_1} = 5r_{e_2}$

$\frac{25}{z_1} = 5 \times \frac{16}{z_2}$

$\frac{z_1}{z_2} = \frac{5}{16}$

$\frac{v_{e_1}}{v_{e_2}} = \frac{z_1}{z_2} \times \frac{n_2}{n_1}$

$= \frac{5}{10} \times \frac{4}{5}$

26. Answer: 4

Sol:

As we know that anion is formed by taking or gaining electrons to the neutral atom, while cations are formed by the loss of electrons from their outermost shell.

Hence, cation has smaller size but an anion has bigger size than that its neutral atom.

Therefore, here the correct option is - (4) $I^- > I > I^+$.

27. Answer: 1

Sol:

As we know that, for the first emission line in the atomic spectrum of hydrogen atom in the balmer series, n_1 will be equal to 2 and, n_2 will be equal to 3.

And, the wavenumber is given by the formula-

$v' = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right) \text{cm}^{-1} = R\left(\frac{1}{2^2} - \frac{1}{3^2}\right) \text{cm}^{-1}$

$v' = R\left(\frac{1}{4} - \frac{1}{9}\right) \text{cm}^{-1} = \frac{5R}{36} \text{cm}^{-1}$

Hence, the first emission line in the atomic spectrum of hydrogen in the Balmer series appears at $\frac{5R}{36} \text{cm}^{-1}$.

28. Answer: 2

Sol:

$N_2 > O$ (IE)

$2p^3 \quad 2p^4$

(more stable)

29. Answer: 2

30. Answer: 3

Sol:

Based on "n+ ℓ" rule only (B) has pair of electron in degenerate orbitals

31. Answer: 2

Sol:

$\ell = 2$ means e^- is in d-orbital
1. Fe^{+2} [Ar] $3d^6$ pair of d-e^- = 1
2. Co^{2+} [Ar] $3d^7$ pair of d-e^- = 2
3. Ni^{+2} [Ar] $3d^8$ pair of d-e^- = 3
Total pairs = 6
$\therefore$ Total no. of e^- = 12

33. Answer: 4

Sol:

The oxidation number (also called oxidation state) of an element in a compound reflects the number of electrons lost or gained by an atom of that element in the compound compared to a neutral atom.

35. Answer: 4

Sol:

Electrons are lost in oxidation

Sol:

As we move from left to right across a period, the ionization energy of elements increases. This is due to the decrease in the size of atoms across a period.

The right order of ionization potential of Li , Be , B and C is C > Be > B > Li .

The ionization potential of Be is higher than that of B. The electronic configurations of Be and B are $1s^2\ 2s^2$ and $1s^2\ 2s^2\ 2p^1$ respectively. Less energy is required to remove p electron than s electron.

Assertion is correct but Reason is incorrect.

32. Answer: 1

Sol:

Recently discovered element with atomic number 112 is named as Ununbium and its symbol is 'Uub'. The discoverers proposed this name for the element and later on it is accepted by the IUPAC commitee.

Therefore, option - (1) ununbium, uub is the correct ans.

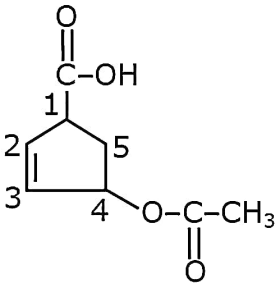
34. Answer: 4

Sol:

The oxidation number of oxygen in OF_2 is +2

36. Answer: 4

Sol:

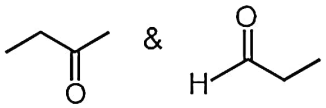


4-ethanoyl oxycyclopent-2-ene carboxylic acid

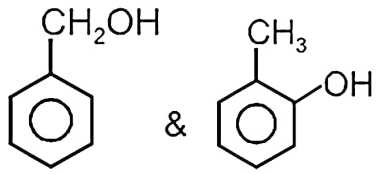
37. Answer: 4

Sol:

The above two compounds are chain isomers.



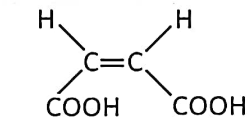
option (B) is **incorrect** as they differ in the molecular formula. Hence, they are not functional isomers



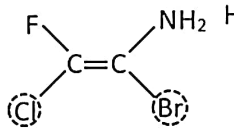
This compounds are functional isomers. Hence, option (C) is **incorrect** as they are not chain isomers.

38. Answer: 2

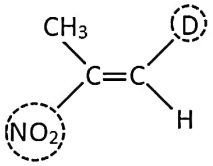
Sol:



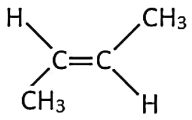
cis isomer



Higher priority group (same side) (Z isomer)



Higher priority group (opposite side) (E isomer)



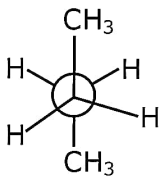
Trans isomer

(a)–(s), (b)–(q), (c)–(p), (d)–(r)

39. Answer: 4

40. Answer: 3

Sol:



Sol:

Structure - (I) shows the cis isomer whereas structure - (II) shows the trans isomer.

1) Boiling point I> II that is boiling point of cis isomer is greater than that of trans isomer because cis isomers are polar and hence they have strong intermolecular forces between the molecules. Because of this high polarity and high intermolecular force, a lot of energy is required to break the bonds. Hence, cis-isomers have higher boiling point.

2) Stability II > I means, trans isomer is more stable than that of cis isomer because in cis isomer, the bulky groups are on the same side of the double bond. The steric repulsion of the groups makes the cis isomer less stable than the trans isomer.

3) Melting point II> I means trans isomers have higher melting point than cis isomer as the former are more symmetrical than the latter. More symmetrical a molecule more easily it can fit well in to the crystal lattice, hence higher melting point.

41. Answer: 1

Sol:

N_2O_5 : acidic

ZnO : Amphoteric

BeO : Amphoteric

K_2O : Basic

42. Answer: 1

Sol:

Due to smaller size and high EN of 2^{nd} period 'p' block elements shows anamalous behaviour in their group.

43. Answer: 3

Sol:

The lanthanide contraction caused by presence of larger number of electron having poor sheilding effect.due to this Zeff increase and size decrease.

44. Answer: 2

Sol:

Given mass of Cu = 3.2 g

mass of Iron = 2.8 g

equivalent mass of Fe = 28

By the law of equivalence, for chemical reaction equivalent of Fe = equivalent of Cu = $\frac{\text{weight}}{\text{equivalent weight}}$

$\Rightarrow \frac{2.8}{28} = \frac{3.2}{E_{Cu}}$

$\Rightarrow E_{Cu} = \frac{3.2}{0.1} = 32$

Therefore the correct option is (2).

45. Answer: 2

46. Answer: 4

Sol:

H^+ < $Li^+ < H^-$

smallest cation in the periodic table

Isoelectronic species

z↓zeff↓radii↑

Sol:

$$\underset{\text{mass}}{C_xH_y+} \quad \underset{120g}{\left(x+\frac{y}{2}\right)O_2 \rightarrow} \quad \underset{330g}{xCO_2+} \quad \underset{270g}{\frac{y}{2}H_2O}$$

$$\text{moles} \qquad \frac{330}{44}=7.5 \qquad \frac{270}{18\times 2}=7.5$$

Moles of CO_2 = Moles of 'C'

⇒so mass of carbon = n × Atomic mass

= 7.5 × 12

= 90 gram

% of carbon in organic compound

$= \frac{90}{120} \times 100 = 75\%$

% of hydrogen in organic compound

$= \frac{30}{120} \times 100$

= 25 %

47. Answer: 3

Sol:

$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

$\because$ 28 gm C_2H_4 requires 96gm oxygen

$\therefore$ 2.8×10^3 gm C_2H_4 requires

$= \frac{96}{28} \times 2.8 \times 10^3$ gm

$= 9.6 \times 10^3 \text{ gm} = 9.6 \text{ kg}$

48. Answer: 4

Sol:

The main focused of the J.J Thomson model was about the uniformly distribution of the mass of the atom.

49. Answer: 2

Sol:

Given :- Energy (E) = 6.2 eV, Work function (W_0) = 4.2 eV

By photoelectric effect,

$E = W_0 + K.E.$

K.E. = 6.2 – 4.2 = 2eV {$\because$1eV = 1.6×10^{-19} J}

K.E. = $2\times1.6\times10^{-19}$ J = 3.2×10^{-19} J ≈ 3×10^{-19} J

50. Answer: 2

Sol:

XY_2Z_6

+2+2(+5)+6(–2)

+2+10–12 = 0

51. Answer: 3

Sol:

Pneumatophores are specialised roots which grow vertically upwards into the air from roots embedded in the mud. Since they are loosely constructed, these make gaseous exchange possible for submerged roots. These are found in plants growing in marshes or saline swamps.

52. Answer: 4

Sol:

11^{th} NCERT PAGE NO. 5

53. Answer: 4

Sol:

(1) The region of the stem where leaves are born are called nodes while internodes are the between two nodes.

(3) Underground stems of some plants such as grass spread to new niches when older parts dies new plants are formed.

So, correct option (1) & (3) both

54. Answer: 4

Sol:

11th NCERT PAGE NO. 5

55. Answer: 2

Sol:

In pinnately compound leaves, the leaflets are present on a common axis, the rachis, which represents the midrib. For example, in neem.

In palmately compound leaves, the leaflets are attached at a common point i.e., at the tip of the petiole. For example, in silk cotton.

56. Answer: 2

Sol:

11th NCERT PAGE NO. 4

57. Answer: 1

Sol:

A flower is a **modified shoot** meant for **sexual reproduction** wherein the shoot apical meristem changes to floral meristem. Internodes do not elongate and the axis gets condensed. The apex produces different kinds of floral appendages laterally at successive nodes instead of leaves. The arrangement of flowers on the floral axis is termed as **inflorescence**

Therefore, a is Modified shoot , b is Sexual reproduction, c isInflorescence.

Class 11^{th} NCERT Page No. 61

58. Answer: 2

Sol:

11th NCERT PAGE NO. 5

59. Answer: 2

60. Answer: 2

Sol:

A flower is defined as a modified shoot because it is a specialized structure developed to reproduce seeds. To perform the function of the reproduction, the shoots gets modified into flowers. The sepals and petals in flowers are considered as modified leaves. Hence, flower is a modified shoot because it consists of modified leaves.

61. Answer: 4

Sol:

Petunia

63. Answer: 3

Sol:

$\oplus$

65. Answer: 1

Sol:

Liliaceae :

Floral characters :-

Inflorescence: solitary / cymose; often umbellate clusters.

Flower: bisexual; actinomorphic Perianth tepal six (3+3), often united into tube; valvate aestivation.

Androecium: stamen six, 3+3, epitepalous.

Gynoecium: tricarpellary, syncarpous, ovary superior, trilocular with many ovules; axile placentation.

Fruit: capsule, rarely berry.

Seed: endospermous.

Floral Formula: Br $\oplus$ $P_{(3+3)}$ A_{3+3} $G_{(3)}$.

67. Answer: 2

Sol:

Axile

69. Answer: 3

Sol:

Mustard plant

71. Answer: 4

Sol:

All living organism are linked to one another because they share common genetic material that is D.N.A. and R.N.A. but it can vary to some degrees and also have common cellular organization.

11th NCERT PAGE NO. 5

62. Answer: 1

Sol:

11th NCERT PAGE NO. 6

64. Answer: 4

Sol:

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66. Answer: 4

Sol:

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68. Answer: 2

Sol:

11th NCERT PAGE NO. 17

70. Answer: 2

Sol:

11th NCERT PAGE NO. 18

72. Answer: 3

Sol:

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Sol:

Woody axis in flowering plant is secondary xylem which is produced by secondary meristem i.e. vascular cambium. The meristem that occurs in the mature regions of roots and shoots of many plants, particularly those that produce woody axis and appear later than primary meristem is called the secondary or lateral meristem. They are cylindrical meristems.

A primary meristem is a type of meristematic tissue that is responsible for the primary growth. Intercalary meristems are capable of cell division, and they allow for rapid growth and regrowth of many monocots. Intercalary meristems at the nodes of bamboo allow for rapid stem elongation, while those at the base of most grass leaf blades allow damaged leaves to rapidly regrow.

Apical meristem, region of cells capable of division and growth in the root and shoot tips in plants. Apical meristems give rise to the primary plant body and are responsible for the extension of the roots and shoots.

73. Answer: 2

Sol:

.Tracheids are non-perforated. They have only pit pairs, at the regions of union with other tracheids. Conduction of water and minerals is not as efficient as in vessels. Tracheids are found in pteridophytes, most of the gymnosperms.

74. Answer: 4

Sol:

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75. Answer: 2

Sol:

A mature sieve tube is composed of vertical cells placed one above the other with perforated sieve plates at their end walls to serve as the main conducting element of phloem. They lack nucleus but retain protoplast during differentiation. Sieve tube cells do not have lignin in their walls. Vessels are dead, water conducting elements of
xylem and lack nucleus and cytoplasm. Secondary wall of vessels show annual, spiral or scalariform thickening due to deposition of lignin.

76. Answer: 1

Sol:

Archaebacteria generally have the same shape, size, nutrition and appearance as bacteria. They multiply by means of binary fission. However, archaebacteria cell walls do not contain peptidoglycan. They also have different membrane lipid bonds as compared to bacteria and eukarya. Archea membrane lipids have ether bonds whereas bacteria as ester-linked lipids.

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77. Answer: 1

Sol:

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78. Answer: 2

Sol:

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79. Answer: 3

Sol:

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80. Answer: 3

Sol:

11th NCERT PAGE NO. 32

81. **Answer:** 1

Sol:

11th NCERT PAGE NO. 33

82. **Answer:** 1

Sol:

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83. **Answer:** 4

Sol:

11th NCERT PAGE NO. 36

84. **Answer:** 4

Sol:

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85. **Answer:** 3

Sol:

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86. Answer: 3

Sol:

Interfascicular Cambium is a cambium found in between vascular bundles (primary xylem and primary phloem). It forms the secondary meristems. The parenchymatic cells of medullary rays differentiate and become meristematic and form the interfascicular cambium.

87. Answer: 3

Sol:

The innermost layer of the cortex is called the endodermis. The cortical layer comprises barrel-shaped cells of endodermis, which are closely packed, suberized and are called Casparian strips. There are certain cells which are not suberised called as passage cells.

88. Answer: 3

Sol:

The cambial ring becomes active and begins to cut off new cells, both towards the inner and the outer sides.

The cells cut off towards pith, mature into secondary xylem and the cells cut off towards periphery mature into secondary phloem. The cambium is generally more active on the inner side than on the outer.

89. Answer: 4

Sol:

Bark: It refers to all the tissues outside of the vascular cambium and is a non-technical term.

Rest of the optons are incorrect.

So, option 4 is the correct answer.

90. Answer: 3

Sol:

Annual ring (growth ring) are concentric circles visible in cross-sections of woody stems or trunks. Each year the cambium layer produces a layer of xylem, the vessels of which are large and thin-walled in the spring and smaller and thick-walled in the summer, creating a contrast between the rings.

Trees at sea do not have annual rings because in sea shore area being isothermal zones, temperature is constant throughout the year' so their will be no annual ring formation.

91. Answer: 1

Sol:

Heart wood is dark colored, non function due to material deposition in central region hence upward conduction is performed peripherally present sap wood while radial conduction is by parenchyma.

92. Answer: 2

Sol:

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93. Answer: 3

Sol:

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94. Answer: 3

Sol:

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95. Answer: 4

Sol:

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96. Answer: 1

Sol:

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97. Answer: 4

98. Answer: 4

Sol:

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99. Answer: 4

Sol:

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Sol:

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100. Answer: 3

Sol:

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101. Answer: 2

Sol:

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102. Answer: 4

Sol:

The conducting part transports the atmospheric air to the alveoli, also helps in humidification, and also brings the air to body temperature.

The exchange part is the site of the actual diffusion of O_2 and CO_2 between blood and atmospheric air.

So, the Conducting part of the respiratory tract does not help in the diffusion of oxygen and carbon dioxide between blood and air.

Hence, the correct option is "4".

103. Answer: 4

Sol:

Asterias

104. Answer: 2

Sol:

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105. Answer: 2

Sol:

The earthworm's breathing organ is its **skin, so** it breathes through its wet **(moist) cuticle skin.** Air can easily pass through the skin of an earthworm. The exchange of gases usually takes place through its **moist skin and capillaries.**

Insects breathe through the **openings in their skin, or exoskeleton.** These openings are called **spiracles.** The air enters through **spiracles** and goes into the internal respiratory system, which is made up of a densely networked array of tubes called the **trachea.**

The **respiratory organ** of **fish** is the **gills.** Gills help with breathing in water. Gills in fish can extract dissolved oxygen from water and excrete carbon dioxide. Gills are located on the side of the head and have many small blood vessels.

The respiratory organs in **birds, reptiles, and mammals are the lungs.**

106. Answer: 1

Sol:

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107. Answer: 2

Sol:

Ostrich and **Corvus** = Scales on hind limbs

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108. Answer: 2

Sol:

Emphysema is a chronic disorder in which alveolar walls are damaged due to which respiratory surface is decreased. One of the major causes of this is cigarette smoking.

Asthma is a difficulty in breathing causing wheezing due to inflammation of bronchi and bronchioles.

Bronchitis is the inflammation of the bronchi, which is characterised by hypertophy and hyperplasia of sero-mucous gland and goblet cells lining the bronchi.

Long exposure can give rise to inflammation leading to fibrosis (proliferation of fibrous tissues) and thus causing serious lung damage.

109. Answer: 3

Sol:

Statement-I is incorrect but Statement-II is correct.

110. Answer: 3

Sol:

Respiration involves following steps:

Pulmonary ventilation which involves taking in atmospheric air and releasing carbon-dioxide rich air.

Diffusion of oxygen and carbon-dioxide across the alveolar membrane.

Transport of gases by the blood.

Diffusion of O_2 and CO_2 between blood and tissues.

Utilization of oxygen by the cells for catabolic reactions and release of carbon-dioxide.

111. Answer: 3

Sol:

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112. Answer: 2

Sol:

Vital capacity-

It is the total amount of air exhaled after maximal inhalation. The value is about **4600mL** and it varies according to age and body size. It is termed as the maximum air amount a person can breathe after expiration in a forced state. ERV, IRV, RV, VC all included here.

It is calculated by summing tidal volume, inspiratory reserve volume, and expiratory reserve volume. **VC = TV+ IRV+ ERV.**

Functional Residual Capacity is Volume of air that will remain in the lungs after a normal expiration. This includes **ERV+RV.**

FRC=1700 ml to 3500ml

Total Lung Capacity is total volume of air accommodated in the lungs at the end of a forced inspiration. This includes **RV, ERV, TV and IRV** or **vital capacity + residual volume**.

Its around **6000ml**

Inspiratory Capacity is Total volume of air a person can inspire after a normal expiration. This includes tidal volume and inspiratory reserve volume (**TV+IRV).**

Its around **4800 ml**

Hence, the correct option is "2".

113. Answer: 4

Sol:

Earthworms (Pheretima) reproduce **sexually. The development is direct** without a larval stage. After about 2-3 weeks, the young worm crawls out of the **cocoon**.

In **Ascaris (Roundworm**) fertilisation is internal and development may be direct (the young ones resemble the adult) or **indirect**.

Frogs have a larval stage in their life cycle. The larval stage of a frog is also known as the **tadpole stage (indirect)**.

Taenia (Tapeworm) are Fertilisation is internal and development is through many larval stage**s (indirect)**.

114. Answer: 1

Sol:

As the solubility of CO_2 is 20-25 times higher than that of O_2, the amount of CO_2 that can diffuse through the diffusion membrane per unit difference in partial pressure is much higher compared to that of O_2.

115. Answer: 1

Sol:

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116. Answer: 1

Sol:

Basophils are the cells that secrete histamine, serotonin, heparin, etc., and are involved in **inflammatory reactions**.

Neutrophils are most **abundan**t and **phagcocytic** in nature.

Eosinophils resist infections and are also associated with allergic reactions.

Lymphocytes (20-25 per cent) are of two major types – 'B' and 'T' forms. Both B and T lymphocytes are responsible for immune responses of the body.

117. Answer: 2

Sol:

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Incorrect Statement

Presence of a mid-dorsal, solid, and double nerve cord - Animals belonging to phylum Chordata are fundamentally characterised by the presence of a notochord, a dorsal hollow nerve cord and paired pharyngeal gill slits

Presence of a dorsal heart - Chordates, particularly vertebrates, typically have a ventral (located on the underside) heart, not a dorsal heart.

Triploblastic pseudocoelomate animals - Chordates are not pseudocoelomate. Chordates belong to the deuterostome group and have a true coelom.

Correct statements:

Presence of a closed circulatory system - Many chordates, including vertebrates, have a closed circulatory system, where blood is enclosed within vessels, allowing for efficient distribution of oxygen, nutrients, and waste products.

Presence of paired pharyngeal gill slits - One of the defining characteristics of chordates is the presence of pharyngeal gill slits in their embryonic stages. In some chordates, these gill slits are also present in the adult stage and may be used for respiration or other functions.

118. Answer: 3

Sol:

The Bundle of His- It is a network of cardiac muscle fibres that pass from the atrioventricular node (AV node) to the interventricular septum and then the ventricles.

It collect the electrical signal from AV node and transfer into the interventricular septum.

It conducts the electrical impulses that regulate the heartbeat from the right atrium to the left and right ventricles.

119. Answer: 2

Sol:

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120. Answer: 2

Sol:

B, C and D

121. Answer: 3

Sol:

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122. Answer: 4

Sol:

(A) Erythroblastosis foetalis can be avoided by administering anti-Rh antibodies to the mother immediately after the delivery of the first child - **True**
(B) RBC are produced by spleen and destryoed by liver in adult - **False**
(C) The cardic output can be defined as the volume of blood pumped out by each ventricle per minute. - **True**
(D) Platelets are cell fragments produced from megakaryocytes cells in the bone marrow - **True**.

123. Answer: 3

Sol:

(ii), (iv) and (v)

124. Answer: 4

Sol:

(i) **Lymph** is also an important carrier for nutrients, hormones.

(ii) Platelets are cell fragments produced from **megakaryocytes** that are very large bone marrow cells.

(iii) **Globulin** primarily are involved in defense mechanisms of body.

(iv) The end of the T-wave marks the end of **Ventricle systole**.

125. Answer: 3

Sol:

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126. Answer: 2

Sol:

Both (A) and (R) are true but (R) is not the correct explanation of (A).

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127. Answer: 3

Sol:

Bones have a hard and non-pliable ground substance rich in calcium salts and collagen fibres which give bone its strength.

Most of the cartilages in vertebrate embryos are replaced by bones in adults.

128. Answer: 1

Sol:

A. Heart failure: It may be diagnosed whenever a patient with significant heart disease develops the symptoms of low cardiac output, pulmonary congestion or systemic venous congestion.

B. Cardiac arrest: It is the complete stoppage of the heartbeat i.e., sudden and complete loss of cardiac function.

C. Heart attack: Formation of a clot in a narrowed coronary artery stops the blood supply to the part of the heart muscle beyond the clot.

D. Coronary artery disease (CAD): Atherosclerosis is narrowing of the arteries and arterioles due to deposition of fats, including cholesterol, on their lining.

E. Angina pectoris: Meaning pain in the chest. Deprived of oxygen, the heart muscle experiences constricting pain.

129. Answer: 2

130. Answer: 4

Sol:

The air sacs of the lungs, also known as alveoli, are made up of simple squamous epithelium.

Cuboidal epithelium is a single layer of cube-like cells with large, spherical, and central nuclei. It's commonly found in ducts of glands and tubular parts of nephrons in kidneys.

The lining of the stomach is made up of simple columnar epithelium. The main function of the cells is secretion and absorption.

Bronchioles are lined by ciliated epithelium.

131. Answer: 3

Sol:

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133. Answer: 3

Sol:

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135. Answer: 1

Sol:

Class 11th NCERT Page No. 154

Sol:

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132. Answer: 2

Sol:

Class 11th NCERT Page No. 145

134. Answer: 1

Sol:

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136. Answer: 3

Sol:

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137. Answer: 4

Sol:

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138. Answer: 2

Sol:

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139. Answer: 3

Sol:

Additional chambers like **crop and gizzard** in alimentary canal are present in **birds**. *Pavo* (Peacock), *Psittacula (*Parrot*), Corvus (*Crow*)* and *Columba* (Pigeon) *are* **birds**. *Catla* is a **bony fish,** *Crocodilus, Chameleon* and *Bangarus* are **reptiles,** *Bufo* is an **amphibian** and *Balaenoptera* is an aquatic **mammal.**

140. Answer: 2

Sol:

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141. Answer: 4

Sol:

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142. Answer: 4

Sol:

Incorrect statement

4. The chemosensitive area is not highly sensitive to O_2 and Na^+ ions. Instead, it is primarily sensitive to changes in the partial pressure of carbon dioxide (PCO_2) and the pH (acid-base balance) of the cerebrospinal fluid (CSF). It is responsible for detecting these changes in the blood and cerebrospinal fluid and plays a crucial role in regulating respiration to maintain appropriate levels of CO_2 and pH in the body.

Correct statement

1. Respiratory rhythm center is primarily responsible for the regulation of respiration.

This is correct. The respiratory rhythm center, located in the brainstem, sets the basic rhythm of breathing and controls the rate and depth of respiration.

2. Pneumotaxic center can moderate the functions of the respiratory rhythm center.

This is correct. The pneumotaxic center, also located in the brainstem, modulates and fine-tunes the activities of the respiratory rhythm center. It helps to regulate the inspiratory and expiratory durations during breathing.

3. A chemosensitive area is situated adjacent to the rhythm center.

This is correct. The chemosensitive area, specifically the central chemoreceptors, is located near the respiratory rhythm center in the brainstem. It senses changes in the PCO_2 and pH levels in the cerebrospinal fluid and influences the respiratory rhythm accordingly.

143. Answer: 1

Sol:

Factors favor the binding of oxygen with hemoglobin in alveoli (lungs) such as high pO_2, low pCO_2 lesser H^+ concentration and lower temperature factors are favourable for the formation of oxyhaemoglobin.

Each haemoglobin molecule can carry a maximum of four molecules of O_2. Binding of oxygen with haemoglobin is primarily related to partial pressure of O_2.

144. Answer: 2

Sol:

TABLE: Partial Pressures (in mm Hg) of Oxygen and Carbon dioxide at Different Parts Involved in Diffusion in Comparison to those in Atmosphere

Respiratory Gas	Atmospheric Air	Alveoli	Blood (Deoxygenated)	Blood (Oxygenated)	Tissues
O_2	159	104	40	95	40
CO_2	0.3	40	45	40	45

According to above table, pO_2 in tissues - 40 mm Hg, pO_2 in oxygenated blood - 95 mm Hg, pCO_2 in deoxygenated blood - 45 mm Hg, pO_2 in atmospheric air - 159 mm Hg.

145. Answer: 4

146. Answer: 1

Sol:

Statement II: About 70% of blood flows directly through atria into ventricles i.e. without atrial systole.

Sol:

There are 4 main blood groups (types of blood) – A, B, AB and O. They include –

Blood group A contains antigen A and antibody B

Blood group B contains antigen B and antibody A

Blood group AB contains both the antigens A and B, but no antibody.

Blood group O contains no antigen but has both the antibodies A and B.

147. Answer: 4

Sol:

Blood clotting factors are needed for blood to clot (coagulation). Prothrombin, or factor II, is one of the clotting factors made by the liver. Vitamin K is needed to make prothrombin and other clotting factors. So, blood does not clot in the absence of Vitamin K because it is essential for the synthesis of prothrombin and not because it is an essential component of the clot, platelets or essential for fibrinogen.

148. Answer: 3

Sol:

Allosteric enzymes binds to the allosteric site and does not bring any conformational change in the enzyme active site, no conformational change leads to no binding of substrate. Thus decreasing enzyme activity. The action of an enzyme can be controlled by its product known as feedback or End product Inhibition.

Hence, the correct answer is option "C" - End product.

149. Answer: 3

Sol:

A Zwitterion is an ion or molecule which contains an equal number of positively charged functional groups and negatively charged functional groups.

150. Answer: 4

Sol:

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151. Answer: 4

Sol:

$-Fx = -\frac{1}{2}mv^2$

$\frac{x_2}{x_1} = \left(\frac{v_2}{v_1}\right)^2$ or $x_2 = 4x_1$ ($\because v_2 = 2v_1$)

152. Answer: 2

Sol:

Unit of surface tension is Joule. m^{-2}

since, $T = \frac{W}{A} = \frac{\text{Joule}}{m^2}$ = Joule.m^{-2}

153. Answer: 3

Sol:

$U(x) = x^4 - 5x^2$

$\frac{dU}{dx} = 4x^3 - 10x \Rightarrow \text{Put } = 0$

$x\left(4x^2 - 10\right) = 0$

$x = 0, x = \pm\sqrt{\frac{5}{2}}$

at $x = 0,\ U = 0$

at $x = \pm\sqrt{\frac{5}{2}}, U_{mini} = -6.25$

So $KE + PE = 36$

$KE_{max} + PE_{mini} = 36$

$KE_{max} = 36 + 6.25 = 42.25$

$\frac{1}{2}mv_{max}^2 = 42.25$

$v_{max} \approx 9\ m/s$

154. Answer: 2

Sol:

As given $17.8 \times 3.1143 = 55.4354$

Now as per 3 significant digits = 55.4

155. Answer: 2

Sol:

Work done = change in Potential energy.

The centre of mass of the rod is at its midpoint. When the rod in horizontal position its potential energy is zero.

When the rod is in the vertical position, i.e. stand on one of its end the centre of mass is at the point $h = \frac{\ell}{2}$

Work done = $0 - \left(-mg\frac{\ell}{2}\right)$

$= \frac{mg\ell}{2}$

156. Answer: 2

Sol:

Bulk-Modules :

$[B] = -v\frac{dP}{dv}$

Neglecting (–)ive sign

$[B] = \frac{[dP]}{\left[\frac{dv}{v}\right]}$

$[dP] = \left[\frac{Force}{Area}\right] = \left[\frac{M^1L^1T^{-2}}{L^2}\right] = \left[M^1L^{-1}T^{-2}\right]$

$\left[\frac{dv}{v}\right]$ = dimensionless = $[M^0L^0T^0]$

[B] = $[M^1L^{-1}T^{-2}]$

157. Answer: 3

Sol:

$a = \frac{dv}{dt}$

$\int dv = \int a dt$

$v_f - v_i = \text{ area under } a - t \text{ curve}$

$v_f - 10 = \left\{\left[\frac{1}{2} \times (6) \times (2)\right] - \frac{1}{2} \times (2 \times 6)\right\}$

$v_f - 10 = 6 - 6$

$v_f = 10\ m/s$

158. Answer: 1

Sol:

$\vec{F} = \frac{du}{dx}\hat{i} - \frac{du}{dy}\hat{j} - \frac{du}{dz}\hat{k}$

$\vec{F} = \Delta U \quad [U = \sin(x + y)]$

$= \cos\left(x + y\right)\hat{i} + \cos\left(x + y\right)\hat{j}$

$\vec{F}_{(0\pi/4)} = \cos\frac{\pi}{4}\hat{i} + \cos\frac{\pi}{4}\hat{j}$

$\left|\vec{F}\right| = \sqrt{\left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2} = 1$

159. Answer: 2

Sol:

$U_A = -\frac{3GM^2}{a}$

$U_B = -\frac{3GM^2}{2a}$

work done = $\Delta U = U_B - U_A = \frac{3GM^2}{2a}$

161. Answer: 2

Sol:

* At maximum height (v=0)

ds = vdt

$\int_0^{H_{max}} ds = \int_0^3 vdt = \text{Area under } v-t \text{ graph}$

$H_{max} = \frac{1}{2} \times 3 \times 30 = 45m$

160. Answer: 4

Sol:

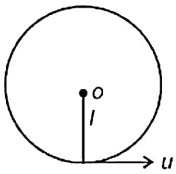
Density $= \frac{\text{mass}}{\text{volume}}$ or $d = \frac{m}{a^3}$

Percentage error in density
$\%d = \%m + 3 \times \%a$

$\Rightarrow \%d = 3 + 3 \times 2 = 9\%$

162. Answer: 1

Sol:



When stone reaches a position where string is horizontal, it attains the energy partially as kinetic and partially as potential. When stone is at its lowest position, it has only kinetic energy, given by $k = \frac{1}{2}mu^2$

At the horizontal position, it has energy

$E = U + K = \frac{1}{2}mu'^2 + mgl$

According to conservation of energy,

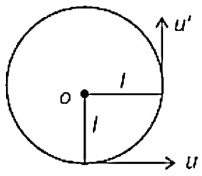
Kinetic energy = Potential energy

$\frac{1}{2}mu^2 = \frac{1}{2}mu'^2 + mgl$

or $\frac{1}{2}mu'^2 = \frac{1}{2}mu^2 - mgl$

or $u'^2 = u^2 - 2gl$

or $u' = \sqrt{u^2 - 2gl}$ ...(i)

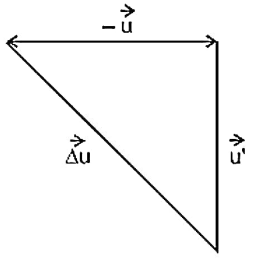


So, the magnitude of change in velocity

$\left|\Delta\vec{u}\right| = \left|\vec{u}\right| = \sqrt{u'^2 + u^2 + 2u'u\cos 90^\circ}$

$\left|\Delta\vec{u}\right| = \sqrt{u'^2 + u^2}$

$= \sqrt{2(u^2 - gl)}$



[from Eq. (i)]

163. Answer: 1

Sol:

Power of gun = $\frac{\text{Total K.E. of fired bullet}}{\text{time}}$

$= \frac{n \times \frac{1}{2} mv^2}{t} = \frac{360}{60} \times \frac{1}{2} \times 2 \times 10^{-2} \times (100)^2$

= 600 W

164. Answer: 3

Sol:

Given: H = 25 m, u = 40 ms^{-1}

$H = \frac{u^2 \sin^2\theta}{2g} \Rightarrow 25 = \frac{1600 \sin^2\theta}{2(10)}$

$\sin\theta = \sqrt{\frac{5}{16}} \therefore \cos\theta = \sqrt{\frac{11}{16}}$

$R = \frac{u^2 \times 2 \sin\theta \cos\theta}{g} = \frac{1600 \times 2 \times \sqrt{\frac{5}{16}} \times \sqrt{\frac{11}{16}}}{10}$

$\simeq$ 150 m

165. Answer: 1

Sol:

acceleration for the first particle

$a_1 = \frac{d^2x_1}{dt^2} = 0$

similarly acceleration for the second particle

$a_2 = \frac{d^2x_2}{dt^2} = 0$

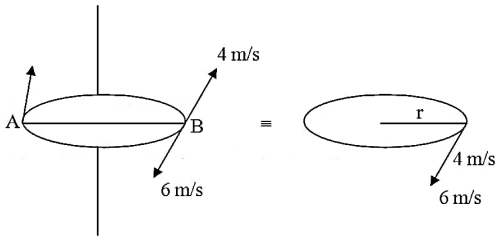
Acceleration for both the particle is zero ,

that means there is no external force on the system,

$\therefore$ velocity of center of mass remains constant.

166. Answer: 2

Sol:



time of collision

$(t_{collision}) = \frac{\text{distance}}{\text{speed}}$

$= \frac{2\pi r}{v_A + V_B}$

$= \frac{2\pi \times 4}{10}$

= 2.5 sec

167. Answer: 4

Sol:

$p_i = p_f$

$0 = m_1v_1 + m_2v_2$

$\rho\nu_1 v_1 = -\rho\nu_2 v_2$

$\frac{4}{3}\pi r_1^3 v_1 = \frac{4}{3}\pi r_2^3 v_2$

$\left(\frac{r_1}{r_2}\right)^3 = \frac{v_2}{v_1}$

$\frac{v_1}{v_2} = \frac{8}{1}$

8 : 1

168. Answer: 3

Sol:

Given :- mass (m) = 20 kg, initial velocity (u) = 20 ms, Final velocity (v) = 5m/s distance (s) = 100 m

From third equation of motion;

$V^2 = u^2 + 2as$

$(5)^2 = (20)^2 + 2 \times a \times 100$

$a = -1.875$ m/sec^2

The magnitude of force is given as;

F = ma

F = 20 × (1.875)

$\Rightarrow$ F = 37.5 N

169. Answer: 1

170. Answer: 2

Sol:

$F_1 + F_2 + \ldots\ldots F_n = 0$

$(F_2 + F_3 + \ldots\ldots F_n) = -F_1$

$a = -\frac{\vec{F_1}}{m}$

Sol:

Applying conservation of energy

As mass m falls from height h on the spring then spring will compress and potential energy of mass m will convert to the potential energy of spring

$\frac{1}{2}kx^2 = mgh$

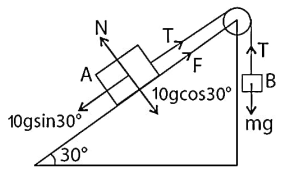
$\Rightarrow \frac{1}{2} \times 1960 \times x^2 = 2 \times 9.8 \times 0.4$

$x^2 = \frac{2\times4}{100\times10}$

$x = \sqrt{\frac{8}{1000}}\,m = 0.08944m = 9\ cm$

171. Answer: 2

Sol:



Net pulling force on the system should be zero, as velocity is constant. Hence,

$m_A g \sin 30° = \mu m_A g \cos 30° + m_B g$

$\therefore m_B = \left(\frac{m_A}{2}\right) - \left(\frac{\mu m_A \sqrt{3}}{2}\right)$

$= 10\left[\frac{1}{2} - 0.2 \times \frac{\sqrt{3}}{2}\right] = 3.3\ kg$

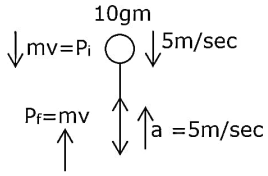
172. Answer: 2

Sol:

Given: m = 10gm = $\frac{10}{1000}\text{kg} = 10^{-2}\text{kg}$

v = 5m/sec. ; average force = ?

$\Delta t = 0.01\,\text{sec.}$



By Newtons second law of motion

$F_{avg} = \frac{dP}{\Delta t} = \frac{P_{final} - P_{initial}}{\Delta t}$

$F_{avg} = \frac{mv-(-mv)}{\Delta t} = \frac{2mv}{\Delta t}$

$= \frac{2\times10^{-2}\times5}{0.01} = 10N$

173. Answer: 2

Sol:

Here $\frac{mv^2}{r} = \frac{k}{r^2} \therefore K.E. = \frac{1}{2}mv^2 = \frac{K}{2r}$

$U = -\int_{\infty}^{r} F.dr = -\int_{\infty}^{r}\left(-\frac{K}{r^2}\right)dr = -\frac{K}{r}$

Total energy $E = K.E. + P.E. = \frac{K}{2r} - \frac{K}{r} = -\frac{K}{2r}$

174. Answer: 4

Sol:

Force required to stop sliding

$F_1 = (mg \sin\theta - \mu mg\cos\theta)$

Force required to pull upwards

$F_2 = (mg \sin\theta + \mu mg \cos\theta)$

$F_2 = 2F_1$

$2(mg \sin\theta - \mu mg\cos\theta) = (mg \sin\theta + \mu mg\cos\theta)$

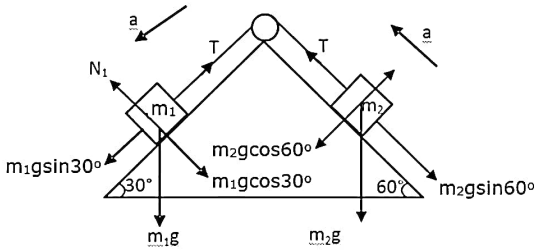
$\tan\theta = 3\mu$

$\theta = \tan^{-1}(3\mu)$

175. Answer: 1

176. Answer: 2

Sol:



Free body diagram :– Let the acceleration of blocks is 'a' and tension in string is 'T'

resolving the compound along the incline plane

For block m_1

$m_1 g \sin 30 - T = m_1 a$ ------- (1)

For block m_2

$T - m_2 g \sin 60 = m_2 a$ ------- (2)

Equation (1) + (2)

$m_1 g \sin 30 - m_2 g \sin 60 = (m_1 + m_2)a$

$a = \frac{m_1 g \sin 30 - m_2 g \sin 60}{m_1 + m_2} = \frac{\left[\sqrt{3} \times \frac{1}{2} - 1 \times \frac{\sqrt{3}}{2}\right] g}{\left(\sqrt{3}+1\right)}$

$a = 0$

Put the value a = 0 in equation (1)

$\therefore \quad m_1 g \sin 30 - T = m_1 (0)$

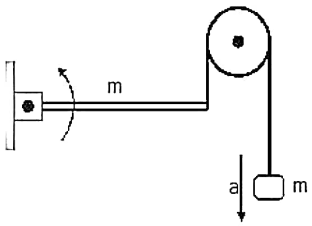
$T = m_1 g \sin 30 = \sqrt{3} \times g \times \frac{1}{2}$

$T = \frac{\sqrt{3} g}{2}$

177. Answer: 3

Sol:

Let us consider that just after releasing the angular acceleration of rod is α & linear acceleration of block is a, then from constraint theory a = lα, where l is the length of rod.



For rod, $T \times l - mg \times \frac{1}{2} = \frac{ml^2}{3}\alpha$

For block, mg – T = ma

Solving above equations we get,

$\frac{g}{2} = \frac{4a}{3}$

$\Rightarrow a = \frac{3g}{8}$ which is also the acceleration of free end on the rod.

Sol:

When a wire is bent in the form of a circular ring, then radius of the wire.

$r = \frac{\ell}{2\pi}$

$\therefore$ Moment of inertia of the ring about its axis,

$I = mr^2 = m\left(\frac{\ell}{2\pi}\right)^2 = \frac{m\ell^2}{4\pi^2}$

178. Answer: 3

Sol:

$\vec{F}_T = 0$

$\Rightarrow \vec{F}_T + mg\left(-\hat{j}\right) = 0$

$\Rightarrow \vec{F}_T = mg\,\hat{j}$

179. Answer: 1

Sol:

The ratio of impulse is calculated as:

$\frac{I_1}{I_2} = \frac{m\sqrt{2gh}+m\sqrt{2gh/4}}{m\sqrt{2gh}+m\sqrt{2gh/16}}$

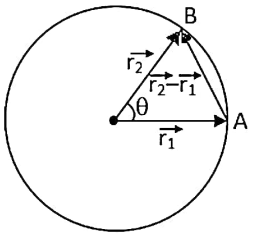
$= \frac{1+\frac{1}{2}}{1+\frac{1}{4}} = \frac{\frac{3}{2}}{\frac{3}{4}} = \frac{6}{5}$

By comparing the given expression and above as:

$5I_1 = 6I_2$

180. Answer: 4

Sol:



Displacement = $\left|\vec{r}_2 - \vec{r}_1\right|$

$\{r_2 = r_1 = R\}$

$= \sqrt{r_2^2 + r_1^2 - 2r_1r_2\cos\theta}$

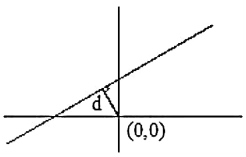
$= \sqrt{2R^2(1-\cos\theta)}$

$= \sqrt{2R^2\left(2\sin^2\theta/2\right)}$

Displacement = $\frac{2R\sin\theta}{2}$

181. Answer: 2

Sol:



perpendicular distance from origin is $\frac{4}{\sqrt{2}} = 2\sqrt{2}$

$L = 5 \times 3\sqrt{2} \times 2\sqrt{2} = 60 \text{ unit.}$

182. Answer: 1

Sol:

To avoid skidding centripetal force will be equal to the frictional force

$ma_{centripetal} = f_{friction}$

$\frac{mv^2}{r} = \mu mg \Rightarrow v = \sqrt{\mu rg}$

$v_{max} = \sqrt{0.5 \times 500 \times 10} = 50$ m/s

Hence, $\nu \leq v_{max}$

183. Answer: 4

Sol:

Speed = constant

In uniform circular motion, velocity and acceleration are constant in magnitude but direction is change. Therefore velocity and acceleration both change.

184. Answer: 3

Sol:

$1VSD = \frac{9}{10}$ mm

$\therefore$ Zero error $= 6 \times (1 \text{ mm}) - 6 \times \left(\frac{9}{10}\right) \text{mm}$

$= +0.6 \text{ mm}$

185. Answer: 2

Sol:

Moment of Inertia, $I = Mr^2$

$[I] = [ML^2]$

Moment of force, $\vec{\tau} = \vec{r} \times \vec{F}$

$\left[\vec{\tau}\right] = [L]\left[MLT^{-2}\right] = \left[ML^2T^{-2}\right]$

186. Answer: 1

Sol:

$\frac{1}{2}I\omega^2 = 360$

$\frac{1}{2} \times I \times 900 = 360$

$\Rightarrow I = \frac{720}{900} = 0.8$

187. Answer: 2

Sol:

W.D. = |change in total kinetic energy|

$= \left|0 - \frac{1}{2}mv^2\left(1 + \frac{k^2}{R^2}\right)\right|$

$= \frac{1}{2} \times 100 \times 0.04(1+1) = 4\,J$

188. Answer: 2

Sol:

Work done by the force

$= F.r.\Delta\theta$

$= Fr\theta = FR\theta$

189. Answer: 3

Sol:

torque, $\tau = \frac{dL}{dt}$

$\Rightarrow \tau = \frac{L_2 - L_1}{t}$

Angular momentum of the wheel,

$L_2 = \tau t + L_1 = 10 \times 4 + 2$

$= 40 + 2 = 42\,kg - m^2s^{-1}$

190. Answer: 2

Sol:

In any no. the decimal is in middle then significance no. will total no. of digit after and before the decimal. so the number 200.40 has 5 significant digits.

191. Answer: 4

Sol:

Case (1) $F_1 = \frac{Gm_1m_2}{r^2}$

Case (2) $F_2 = \frac{G(2m_1)(2m_2)}{(2r)^2} = \frac{4}{4}\frac{Gm_1m_2}{r^2} = F_1$

Hence force remains the same.

192. Answer: 2

Sol:

$x^2 = t^2 + 1 \;\; 2x.\frac{dx}{dt} = 2t\,x.\frac{dx}{dt} = t$

$\therefore \frac{dx}{dt} = \frac{t}{x} = \frac{t}{\sqrt{t^2+1}}$

$v = \frac{t}{x}$

$xv = t$

$\frac{xdv}{dt} + \frac{vdx}{dt} = 1$

$xa + v^2 = 1$

$xa = 1 - v^2$

$xa = 1 - \frac{t^2}{x^2}$

$a = \frac{1}{x^3}$

193. Answer: 2

Sol:

As we know g = $\frac{GM}{R^2}$

$\Rightarrow \frac{g_{earth}}{g_{planet}} = \frac{M_e}{M_p} \times \frac{R_p^2}{R_e^2} \Rightarrow \frac{g_e}{g_p} = \frac{2}{1}$

Also $T \propto \frac{1}{\sqrt{g}} \Rightarrow \frac{T_e}{T_p} = \sqrt{\frac{g_P}{g_e}} \Rightarrow \frac{2}{T_P} = \sqrt{\frac{1}{2}}$

As T_e = 2 sec

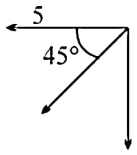
$\Rightarrow T_p = 2\sqrt{2}$sec.

194. Answer: 1

Sol:

Relative the man figure

$x/5 = \tan 45 = 1 \Rightarrow x = 5\,m/s$



195. Answer: 4

196. Answer: 3

Sol:

$V_0 = \sqrt{\frac{GM_e}{R_e}}$

$V_{esc} = \sqrt{\frac{2GM_e}{R_e}} \Rightarrow V_{esc} = \sqrt{2}V_0$

Sol:

$\vec{v}_m = \sqrt{3}\hat{i} + \hat{j}\ ms^{-1}$

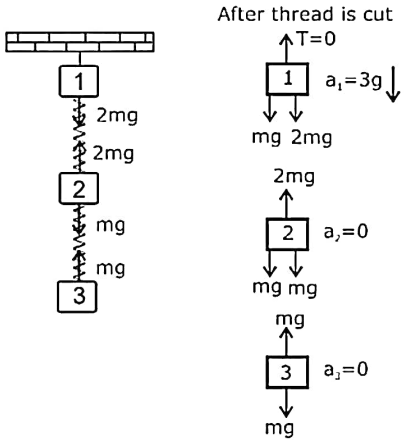
$\vec{v}_m = 5\left(-\hat{j}\right) ms^{-1}$

$\vec{V}_m = \vec{V}_r - \vec{V}_m$

$\Rightarrow V_r = \sqrt{19}\ ms^{-1}$

197. Answer: 1

Sol:



Let the tension in the upper string be T , tension in the middle spring be T_1 and tension in the lower spring be T_2

equation of motion of the upper block-
$T = T_1 + mg$
equation of motion of the middle block-
$T_1 = T_2 + mg$
equation of motion of the lower block-
$T_2 = mg$
As the upper most string is cut,T reduces to zero.
Hence,the upper block falls with force $T_1 + mg$,which equals to 3mg.Also,this is the maximum force,and hence maximum acceleration.
Also,on the middle block,net force remains balanced,and hence second block falls with acceleration g.

198. Answer: 4

Sol:

w' = w(g−a)

a = g

w' = w(g−g)

w' = 0

199. Answer: 4

Sol:

$\because$ r and m are constant

$\therefore T \propto \omega^2$

$\therefore \frac{T_1}{T_2} = \frac{\omega^2}{(2\omega)^2} = \frac{1}{4}$

$\therefore \frac{T}{T_2} = \frac{1}{4}$

$T_2 = 4T$

200. Answer: 2

Sol:

$a_r = a_t$

$\frac{V^2}{R} = 9$

$v^2 = 36$

$v = 6$

$6 = 0 + 9t$

$t = \frac{2}{3}$sec.