



# Aakash

Medical | IIT-JEE | Foundations

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## FINAL TEST SERIES for NEET-2024

MM : 720

**Test-4**

Time : 3 Hrs. 20 Mins.

### Topics covered :

**Physics** : Thermodynamics, Kinetic Theory, Oscillations, Waves

**Chemistry** : Organic Chemistry-(Some Basic Principles and Techniques), Hydrocarbons

**Botany** : Photosynthesis in Plants, Respiration in Plants

**Zoology** : Excretory Products and Their Elimination, Locomotion and Movement, Neural Control and Coordination

### Instructions :

- (i) There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15.
- (ii) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from the total score. Unanswered / unattempted questions will be given no marks.
- (iii) Use blue/black ballpoint pen only to darken the appropriate circle.
- (iv) Mark should be dark and completely fill the circle.
- (v) Dark only one circle for each entry.
- (vi) Dark the circle in the space provided only.
- (vii) Rough work must not be done on the Answer sheet and do not use white-fluid or any other rubbing material on the Answer sheet.

## PHYSICS

Choose the correct answer :

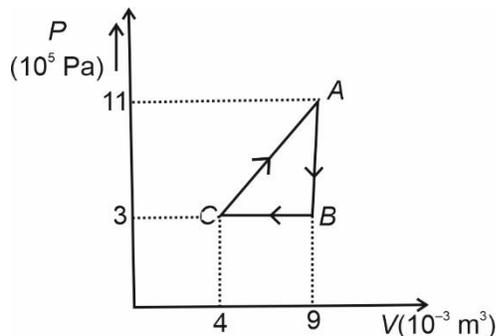
### SECTION - A

1. The change in internal energy of a gas which has absorbed 4 kcal of heat and has done 4000 J of work is (1 cal = 4.2 J)
  - (1) 4 kJ
  - (2) 10.2 kJ
  - (3) 14.4 kJ
  - (4) 12.8 kJ
2. **Statement I:** In an adiabatic process, change in internal energy of a gas is equal to work done on or by the gas in the process.  
**Statement II:** The specific heat of a gas in an adiabatic process is infinite and in an isothermal process is zero.

Consider the above statements and choose the correct option.

- (1) Both statements are correct
  - (2) Both statements are incorrect
  - (3) Statement I is correct and statement II is incorrect
  - (4) Statement II is correct and statement I is incorrect
3. Thermal conductivity of a material depends on
    - (1) Area of cross-section
    - (2) Amount of substance
    - (3) Density of material
    - (4) Nature of material

4. A gas is taken through the cycle  $A \rightarrow B \rightarrow C \rightarrow A$ , as shown. The net work done in the process is



- (1) 20 J                                      (2) 4000 J  
 (3) 2000 J                                    (4) 1000 J
5. A perfect gas at  $127^\circ\text{C}$  is heated at constant pressure so as to triple its volume. The increase in temperature of the gas will be  
 (1)  $927^\circ\text{C}$                                       (2)  $700\text{ K}$   
 (3)  $800^\circ\text{C}$                                       (4)  $133.33^\circ\text{C}$
6. Five gas molecules have their speeds as 3 m/s, 2 m/s, 6 m/s, 5 m/s and 4 m/s respectively. The rms speed of gas molecules is  
 (1) 4.24 m/s                                      (2) 2 m/s  
 (3)  $\sqrt{90}$  m/s                                      (4) 3.14 m/s
7. 4 moles of hydrogen is mixed with 2 moles of neon. The molar specific heat of the mixture at constant pressure is (where symbols have their usual meaning)  
 (1)  $\frac{13R}{6}$     (2)  $R$   
 (3)  $\frac{19R}{6}$     (4)  $\frac{13R}{9}$
8. The mean free path of molecules of a gas of radius  $r$  is directly proportional to  
 (1)  $r^2$     (2)  $r^{-2}$   
 (3)  $r$     (4)  $r^{-1}$

9. A particle vibrating simple harmonically has an acceleration of  $8\text{ cm s}^{-2}$  when it is at a distance of 2 cm from the mean position. Its time period of SHM is

- (1)  $2\pi\text{ s}$     (2)  $\pi\text{ s}$   
 (3)  $\frac{\pi}{2}\text{ s}$     (4)  $4\pi\text{ s}$

10. **Assertion (A):** In S.H.M, kinetic energy is zero when potential energy is maximum.

**Reason (R):** Potential energy and kinetic energy do not vary linearly with position.

- (1) Both assertion and reason are true and reason is the correct explanation of the assertion  
 (2) Both assertion and reason are true but reason is not the correct explanation of the assertion  
 (3) Assertion is true but reason is false  
 (4) Both assertion and reason are false

11. A body undergoes S.H.M according to the equation (in SI units)  $x = 8\cos\left(3\pi t + \frac{\pi}{4}\right)$ . Its displacement from mean position at  $t = 2$  second is

- (1)  $2\sqrt{2}\text{ m}$   
 (2)  $8\text{ m}$   
 (3)  $\sqrt{2}\text{ m}$   
 (4)  $4\sqrt{2}\text{ m}$

12. If the displacement ( $x$ ) and velocity ( $v$ ) of a particle executing simple harmonic motion are related through the expression  $8v^2 = 10 - 2x^2$ , then its time period is (All the quantities are in S. I. unit)

- (1)  $\pi\text{ s}$     (2)  $2\pi\text{ s}$   
 (3)  $3\pi\text{ s}$     (4)  $4\pi\text{ s}$

Space for Rough Work

13. **Statement I:** Sound waves transfer both energy and momentum.  
**Statement II:** Both transverse and longitudinal waves propagate in a solid.  
 Choose the correct statement  
 (1) Both statements are correct  
 (2) Both statements are incorrect  
 (3) Statement I is correct and statement II is incorrect  
 (4) Statement II is correct and statement I is incorrect
14. A plane progressive wave is represented by  $y = 10\sin(6t - 3x)$  m. On this wave how far away are the two points having phase difference of  $\frac{\pi}{2}$ ?  
 (All the quantities are in S. I. unit)  
 (1)  $\frac{\pi}{4}$  m (2)  $\frac{\pi}{6}$  m  
 (3)  $\frac{\pi}{8}$  m (4)  $\frac{\pi}{12}$  m
15. The equation of a stationary wave is given by  $y = 0.5\sin\left(\frac{2\pi}{3}x\right)\cos(120\pi t)$  where  $x, y$  are in m and  $t$  is in s.  
 (a) The frequency of the wave is 3 Hz  
 (b) The speed of the wave is 180 m/s  
 (c) The wavelength of the wave is 60 m  
 Based on above information which of the following conclusion may be correct?  
 (1) a, b and c  
 (2) Only a and b  
 (3) Only b  
 (4) Only c
16. The frequency of the third overtone of the open pipe is equal to the frequency of 2<sup>nd</sup> overtone of the closed organ pipe. The ratio of the lengths of the open organ pipe and the closed organ pipe is  
 (1) 6 : 5 (2) 3 : 2  
 (3) 8 : 5 (4) 4 : 1
17. If the total end correction of an open organ pipe is 0.9 cm, then the inner radius of that pipe will be  
 (1)  $\frac{3}{2}$  cm (2)  $\frac{2}{3}$  cm  
 (3)  $\frac{3}{4}$  cm (4)  $\frac{4}{3}$  cm
18. Which of the following law of thermodynamics forms the basis for the definition of temperature?  
 (1) First law (2) Second law  
 (3) Zeroth law (4) Third law
19. A vessel has 10 g of hydrogen gas at pressure  $P$  and temperature 400 K. A small hole is made in it so that hydrogen leaks out. How much hydrogen leaks out if the final pressure becomes half and temperature becomes  $\frac{3}{4}$ th of its previous value?  
 (1) 1 g (2)  $\frac{3}{4}$  g  
 (3)  $\frac{10}{3}$  g (4)  $\frac{14}{3}$  g
20. A box of negligible mass containing  $n$  moles of an ideal gas of molar mass  $M$  and adiabatic exponent  $\gamma$  moves with constant speed  $v$  on a smooth horizontal surface. If box suddenly stops, then change in temperature of gas will be  
 (1)  $\frac{(\gamma-1)Mv^2}{4R}$  (2)  $\frac{(\gamma-1)Mv^2}{8R}$   
 (3)  $\frac{(\gamma-1)Mv^2}{2R}$  (4)  $\frac{Mv^2}{2(\gamma-1)R}$

Space for Rough Work

21. Which of the following is not an assumption of kinetic theory of gases?
- (1) The volume occupied by the molecules of the gas is negligible in comparison to the volume of the container
  - (2) Intermolecular force of attraction/repulsion between the molecules of gas in a container is negligible
  - (3) All molecules of a gas in a container move with equal speed
  - (4) The collision of the molecules with the wall of container is elastic
22. The rms speed of a large number of molecules of a gas in a vessel is  $600 \text{ m s}^{-1}$ . If 25% of the gas leaks out at constant temperature, then rms speed of the remaining molecules will be
- (1)  $450 \text{ m s}^{-1}$
  - (2)  $800 \text{ m s}^{-1}$
  - (3)  $300 \text{ m s}^{-1}$
  - (4)  $600 \text{ m s}^{-1}$
23. A hollow sphere is filled with water. It is hung by a long thread to make it a simple pendulum. As the water flows out of a hole at the bottom of the sphere, the frequency of oscillation will
- (1) Go on increasing
  - (2) Go on decreasing
  - (3) First increases and then decreases
  - (4) First decreases and then becomes equal to initial value
24. Two simple harmonic motions are represented by equation  $y_1 = 3\sin(10t + \phi)$  and  $y_2 = 5 \cos(10t)$ . The phase difference between their velocities is
- (1)  $\phi$
  - (2)  $-\phi$
  - (3)  $\left(\phi - \frac{\pi}{2}\right)$
  - (4)  $\frac{\pi}{2}$
25. The speed of a wave in a certain medium is  $1080 \text{ m/s}$ . If 1800 waves pass over a certain point of the medium in 30 seconds, then wavelength of the wave is
- (1) 12 m
  - (2) 16 m
  - (3) 18 m
  - (4) 22 m
26. In a closed organ pipe the frequency of fundamental mode is 75 Hz. Choose the frequency that can be produced by this closed organ pipe among the following.
- (1) 150 Hz
  - (2) 225 Hz
  - (3) 200 Hz
  - (4) 300 Hz
27. A tuning fork produces a wave of wavelength 100 cm in air at  $27^\circ\text{C}$ . The wavelength of the wave produced by the fork in air at  $127^\circ\text{C}$  will be nearly
- (1) 80 cm
  - (2) 85 cm
  - (3) 125 cm
  - (4) 115 cm
28. Which of the following quantity is always negative in simple harmonic motion of a particle? (symbols have their usual meanings)
- (1)  $\vec{F} \cdot \vec{r}$
  - (2)  $\vec{a} \cdot \vec{v}$
  - (3)  $\vec{v} \cdot \vec{r}$
  - (4)  $\vec{F} \cdot \vec{v}$
29. If an ideal gas expands according to the law  $PV^2 = \text{constant}$ , then temperature of the gas
- (1) Remains the same
  - (2) Increases
  - (3) Decreases
  - (4) May increase or decrease
30. Differential equation of harmonic progressive waves is represented by (symbols have their usual meanings)
- (1)  $\frac{\partial^2 y}{\partial t^2} = v^2 \frac{\partial^2 y}{\partial x^2}$
  - (2)  $\frac{\partial^2 y}{\partial x^2} = v^2 \frac{\partial^2 y}{\partial t^2}$
  - (3)  $\frac{\partial^2 y}{\partial t^2} = v \frac{\partial^2 y}{\partial x^2}$
  - (4)  $\frac{\partial^2 y}{\partial x^2} = v \frac{\partial^2 y}{\partial t^2}$

Space for Rough Work

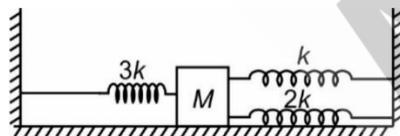
31. The transverse displacement of the particles of a string (clamped at its both ends) is given by

$$y(x,t) = 0.04 \sin\left(\frac{\pi x}{3}\right) \cos(100\pi t) \text{ (where symbols}$$

have their usual meanings).

All the particles on string between two consecutive nodes vibrate with

- (1) Same phase (2) Same amplitude  
 (3) Same frequency (4) Both (1) and (3)
32. A particle is oscillating simple harmonically with frequency ' $f$ '. The frequency of its total energy is
- (1)  $f$  (2)  $2f$   
 (3)  $\frac{f}{2}$  (4) Zero
33. For a simple pendulum, graph between  $L$  and  $T^2$  will be
- (1) Rectangular hyperbola  
 (2) Parabola  
 (3) Straight line passing through origin  
 (4) Elliptical
34. During isothermal expansion, the magnitude of slope of  $P$ - $V$  graph
- (1) Decreases  
 (2) Increases  
 (3) Remains same  
 (4) May increase or decrease
35. Three light springs are connected to a block of mass  $M$  kept on a frictionless plane as shown in the figure. Frequency of small oscillations of the block will be



- (1)  $\frac{1}{2\pi} \sqrt{\frac{5k}{6M}}$  (2)  $\frac{1}{2\pi} \sqrt{\frac{6k}{M}}$   
 (3)  $\frac{1}{2\pi} \sqrt{\frac{6k}{5M}}$  (4)  $\frac{1}{2\pi} \sqrt{\frac{M}{6k}}$

**SECTION-B**

36. The transverse displacement of a string fixed at both ends is given by

$$y = 0.05 \sin\left(\frac{4\pi x}{3}\right) \cos(60\pi t) \text{ where } x \text{ and } y \text{ are in}$$

metres and  $t$  is in seconds. The length of the string is 2 m and mass is  $4 \times 10^{-2}$  kg. The tension in the string is

- (1) 405 N (2) 40.5 N  
 (3) 4050 N (4) 81 N
37. 51 tuning forks are arranged such that every fork gives 4 beats/second with the next. The last fork has a frequency that is five times of the first. The frequency of the first fork is
- (1) 50 Hz (2) 100 Hz  
 (3) 150 Hz (4) 200 Hz
38. A bottle weighing 400 g and of area of cross-section  $160 \text{ cm}^2$  and height 5 cm oscillates on the surface of water in vertical position. Its frequency of oscillation is (Take  $g = 10 \text{ m/s}^2$ )
- (1) 2.5 Hz (2) 3.18 Hz  
 (3) 4.25 Hz (4) 1.28 Hz
39. A person measures the time period of simple pendulum inside a stationary lift and finds it to be  $T$ . If the lift starts accelerating upwards with an acceleration  $\frac{g}{4}$ , the time period of the pendulum will be

- (1)  $\frac{2}{\sqrt{3}} T$  (2)  $\frac{\sqrt{3}}{2} T$   
 (3)  $\frac{\sqrt{5}}{2} T$  (4)  $\frac{2}{\sqrt{5}} T$

40. At what temperature will the rms speed of air molecules be tripled that of the speed at 273 K?

- (1)  $2457^\circ\text{C}$  (2)  $2184^\circ\text{C}$   
 (3)  $0^\circ\text{C}$  (4)  $546^\circ\text{C}$

Space for Rough Work

41. The total internal energy of three moles of rigid diatomic gas is (Where symbols have their usual meaning.)

- (1)  $\frac{9RT}{2}$
- (2)  $5RT$
- (3)  $\frac{13RT}{2}$
- (4)  $\frac{15RT}{2}$

42. In Column-I certain thermodynamic processes are given while in Column-II the equation of processes are given. Match correct entries in column-I with correct entries in column-II.

| Column-I              | Column-II                           |
|-----------------------|-------------------------------------|
| a. Isochoric process  | (p) $\frac{V}{T} = \text{constant}$ |
| b. Isothermal process | (q) $PV^\gamma = \text{constant}$   |
| c. Isobaric process   | (r) $PV = \text{constant}$          |
| d. Adiabatic process  | (s) $\frac{P}{T} = \text{constant}$ |

Choose the **correct** answer from the options given below

- (1) a(s), b(r), c(q), d(p)
- (2) a(r), b(s), c(p), d(q)
- (3) a(s), b(r), c(p), d(q)
- (4) a(s), b(p), c(r), d(q)

43. An electric appliance supplies a heat of 9000 J/min to the system. If system delivers a power of 120 W then the time long it would take to increase the internal energy by  $6 \times 10^3$  J is

- (1) 100 s
- (2) 150 s
- (3) 200 s
- (4) 250 s

44. Equation of a plane progressive travelling wave on a string is given by  $y = 10\sin\left(4\pi t - \frac{\pi}{16}x\right)$ . If  $x$

and  $y$  are in centimetres and it represents time in seconds, then velocity of wave is

- (1) 32 cm s<sup>-1</sup> in positive x-direction
- (2) 64 cm s<sup>-1</sup> in positive x-direction
- (3) 32 cm s<sup>-1</sup> in negative x-direction
- (4) 64 cm s<sup>-1</sup> in negative x-direction

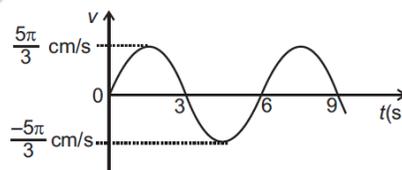
45. The two waves having intensities in the ratio 1 : 9 produce interference. The ratio of the maximum to the minimum intensities is equal to

- (1) 81 : 1
- (2) 3 : 1
- (3) 4 : 1
- (4) 9 : 1

46. Internal energy of  $n_1$  moles of hydrogen at temperature  $T$  is equal to the internal energy of  $n_2$  moles of helium at temperature  $2T$ . The value of ratio  $\frac{n_1}{n_2}$  is (neglect vibrational modes in hydrogen)

- (1)  $\frac{5}{3}$
- (2)  $\frac{3}{4}$
- (3)  $\frac{6}{5}$
- (4)  $\frac{3}{7}$

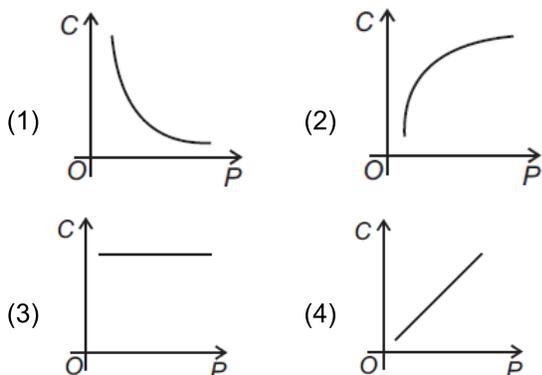
47. The velocity-time ( $v-t$ ) graph of a particle executing S.H.M is shown below. The acceleration of the particle at  $t = \frac{3}{2}$  s will be



- (1)  $\frac{7\pi}{3\sqrt{2}}$  cm/s<sup>2</sup>
- (2)  $\frac{-5\pi}{3\sqrt{2}}$  cm/s<sup>2</sup>
- (3)  $\frac{5\pi}{6}$  cm/s<sup>2</sup>
- (4) Zero

Space for Rough Work

48. Which of the following graph best represents the variation of compressibility  $C = \left(-\frac{dV}{VdP}\right)$  with pressure  $P$ , for an ideal gas at constant temperature?



49. A simple pendulum of length  $L_1$  has time period ' $T_1$ ' and another pendulum of length  $L_2$  has time period ' $T_2$ ' then the time period of pendulum of length  $(L_1 + L_2)$  is

- (1)  $T_1 + T_2$  (2)  $\sqrt{T_1 + T_2}$   
 (3)  $\sqrt{T_1 T_2}$  (4)  $\sqrt{T_1^2 + T_2^2}$

50. A progressive wave of frequency 600 Hz is travelling with a velocity of 300 m/s. Minimum distance between two points having phase difference  $60^\circ$  is

- (1)  $\frac{1}{4}$  m (2)  $\frac{1}{10}$  m  
 (3)  $\frac{1}{12}$  m (4)  $\frac{1}{24}$  m

## CHEMISTRY

### SECTION - A

51. The most stable carbocation among the following is

- (1)  $\text{CH}_2 = \overset{+}{\text{C}}\text{H}$   
 (2)  $\text{CH}_3 - \overset{+}{\text{C}}\text{H} - \text{O} - \text{CH}_3$   
 (3)  $\text{CH}_3 - \overset{+}{\text{C}}\text{H}_2$   
 (4)  $\text{CH}_3 - \overset{+}{\text{C}}\text{H} - \text{NH}_2$

52.  $\xrightarrow[\text{Anhyd. AlCl}_3]{\text{CH}_3\text{COCl}}$  Products

The above reaction can be classified as

- (1) Elimination reaction  
 (2) Electrophilic addition reaction  
 (3) Nucleophilic addition reaction  
 (4) Electrophilic substitution reaction

53. Carius method is used for estimation of

- (1) C (2) Cl  
 (3) N (4) Na

54. Which of the following techniques is based on adsorption of organic compounds on an adsorbent to different degrees?

- (1) Sublimation (2) Crystallisation  
 (3) Distillation (4) Chromatography

55. Which of the following compounds contains most acidic H-atom?

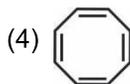
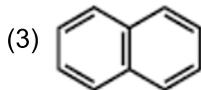
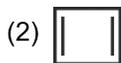
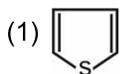
- (1)  $\text{CH}_3\text{OCH}_3$   
 (2)  $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH}_3$   
 (3)  $\text{CH} \equiv \text{CH}$   
 (4)  $\text{CH}_2 = \text{CH}_2$

56. Primary amines (structural isomers only) possible for compounds with molecular formula  $\text{C}_4\text{H}_{11}\text{N}$  is

- (1) 4 (2) 5  
 (3) 6 (4) 3

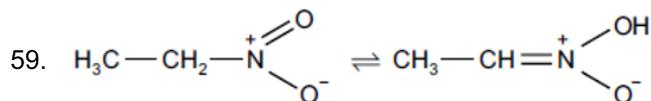
Space for Rough Work

57. Which of the following is a non-aromatic compound?



58. Upon heating a mixture of sodium benzoate and soda lime, the product obtained is

- (1) Toluene
- (2) Xylene
- (3) Benzene
- (4) Benzoic acid



The above pair of compounds are

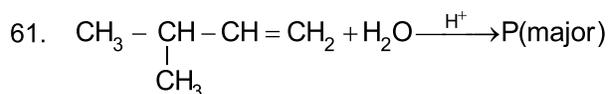
- (1) Chain isomers
  - (2) Conformers
  - (3) Tautomers
  - (4) Geometrical isomers
60. Given below are two Statements: One labelled as Assertion (A) and the other is labelled as Reason (R)

**Assertion (A):** Pent-1-yne and Pent-2-yne can be distinguished using ammoniacal silver nitrate.

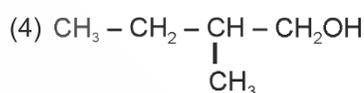
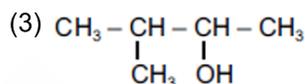
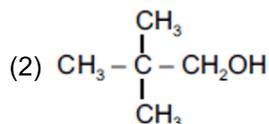
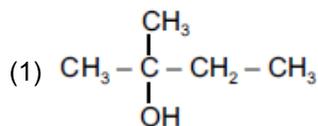
**Reason (R):** Terminal alkynes have acidic hydrogen, therefore give white precipitate with ammoniacal silver nitrate

In the light of above statements, choose the most appropriate answer from the options given below.

- (1) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (2) (A) is correct but (R) is not correct
- (3) (A) is not correct but (R) is correct
- (4) Both (A) and (R) are correct and (R) is the correct explanation of (A)



The major product P is



62. Consider the following statements

**Statement I:** Reductive ozonolysis of 1 mole of 2-methylprop-1-ene results into the formation of 2 moles of propanone.

**Statement II:** Reductive ozonolysis of 1 mol of propene forms 2 moles of aldehydes.

Choose the correct option

- (1) Statement I is true but statement II is false
- (2) Statement I is false but statement II is true
- (3) Both statement I and II are true
- (4) Both statement I and II are false

63. Propyne when passed through hot iron tube at 873 K, it produces an aromatic compound X. The compound X is

- (1) Benzene
- (2) Toluene
- (3) Xylene
- (4) Mesitylene

Space for Rough Work

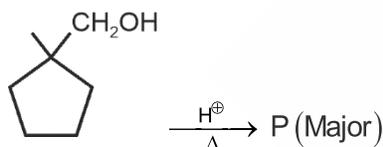
64. Match the alkyl groups given in column-I with their structure given in Column II

|     | Column-I           |       | Column-II  |
|-----|--------------------|-------|--|
| (a) | <i>sec</i> -Butyl  | (i)   | $\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_3 - \text{CH} - \text{CH}_2 - \end{array}$                           |
| (b) | <i>Isobutyl</i>    | (ii)  | $\begin{array}{c} \text{CH}_3 \\   \\ \text{H}_3\text{C} - \text{C} - \\   \\ \text{CH}_3 \end{array}$               |
| (c) | <i>tert</i> -Butyl | (iii) | $\begin{array}{c} \text{CH}_3 \\   \\ \text{H}_3\text{C} - \text{C} - \text{CH}_2 - \\   \\ \text{CH}_3 \end{array}$ |
| (d) | <i>Neopentyl</i>   | (iv)  | $\begin{array}{c} \text{CH}_3 - \text{CH}_2 - \text{CH} - \\   \\ \text{CH}_3 \end{array}$                           |

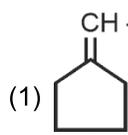
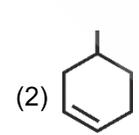
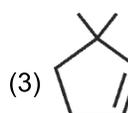
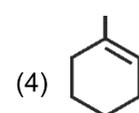
Choose the correct option.

- (1) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)  
 (2) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)  
 (3) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)  
 (4) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

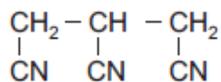
65. Consider the following reaction.



'P' will be

- (1)  (2)   
 (3)  (4) 

66. The IUPAC name of the given compound is



- (1) 1, 2, 3-tricyanopropane  
 (2) 2-cyanopentanedinitrile  
 (3) 1, 3-dicarbonitrilepropane  
 (4) Propane-1,2,3-tricarbonitrile
67. Which of the following can act as a nucleophile?

- (a)  $\text{AlCl}_3$  (b)  $\text{BF}_3$   
 (c)  $\text{NH}_2 - \text{NH}_2$  (d)  $\text{H}_2\text{O}$

- (1) (a) and (c) only  
 (2) (b), (c) and (d) only  
 (3) (c) and (d) only  
 (4) (d) only

68. The correct decreasing order of acidity is represented by

- (a)  $\text{CH}_3 - \text{NO}_2$   
 (b)  $\text{NO}_2 - \text{CH}_2 - \text{NO}_2$   
 (c)  $\text{CH}_3 - \text{CH}_2 - \text{NO}_2$   
 (d)  $\begin{array}{c} \text{NO}_2 - \text{CH} - \text{NO}_2 \\ | \\ \text{NO}_2 \end{array}$

- (1) (d) > (b) > (a) > (c) (2) (d) > (b) > (c) > (a)  
 (3) (b) > (d) > (a) > (c) (4) (c) > (a) > (d) > (b)

69. Consider the following statements

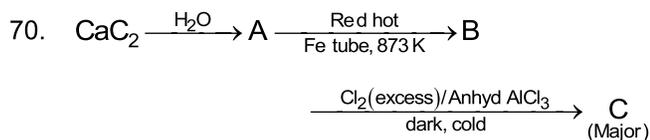
**Statement I:** *trans*-But-2-ene is observed to have higher melting point than that of *cis*-But-2-ene.

**Statement II:** *trans*-But-2-ene is non-polar.

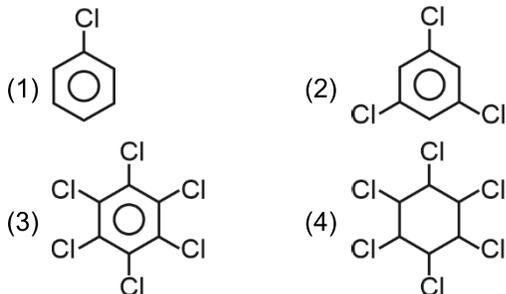
In the light of above statements, select the correct option.

- (1) Statement I is true but statement II is false  
 (2) Statement I is false but statement II is true  
 (3) Both statement I and statement II are true  
 (4) Both statement I and statement II are false

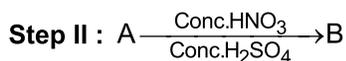
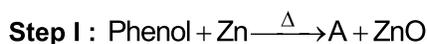
Space for Rough Work



Product C in the above reaction is



71. Consider the following reaction sequence:



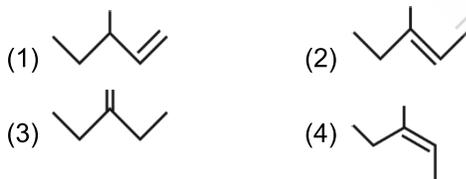
Which of the following is **incorrect** statement?

- (1) Product A is benzene  
 (2) Step II is electrophilic aromatic substitution of benzene  
 (3) The reactive species in step II is  $\text{NO}^+$   
 (4) Product B has m-directive influence for nitration

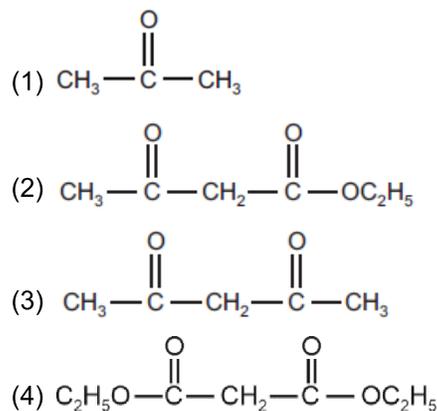
72. Non-benzenoid aromatic compound is

- (1) Naphthalene (2) Tropone  
 (3) Toluene (4) Hydroquinone

73. Which of the following has maximum heat of hydrogenation?



74. Molecule that will have maximum enol content is



75. The general molecular formula, which represents the homologous series of alkanols is

- (1)  $\text{C}_n\text{H}_{2n}\text{O}$  (2)  $\text{C}_n\text{H}_{2n-1}\text{O}$   
 (3)  $\text{C}_n\text{H}_{2n+2}\text{O}$  (4)  $\text{C}_n\text{H}_{2n+1}\text{O}$

76. Given below are two Statements: One labelled as Assertion (A) and the other is labelled as Reason (R).

**Assertion (A):** Neopentane has higher boiling point than n-pentane.

**Reason (R):** Boiling point decreases with increase in branching.

In the light of above statements, choose the most appropriate answer from the options given below.

- (1) Both (A) and (R) are correct but (R) is not the correct explanation of (A)  
 (2) Both (A) and (R) are correct and (R) is the correct explanation of (A)  
 (3) (A) is correct but (R) is not correct  
 (4) (A) is not correct but (R) is correct

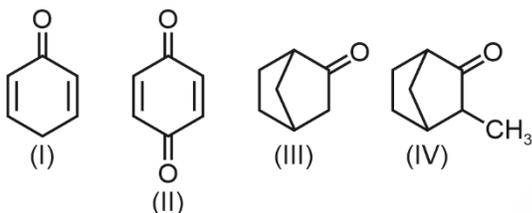
77. Which of the following products is not obtained during Kolbe's electrolysis of sodium ethanoate?

- (1)  $\text{C}_2\text{H}_6$  (2)  $\text{O}_2$   
 (3)  $\text{H}_2$  (4)  $\text{CO}_2$

Space for Rough Work

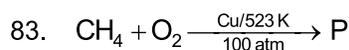
78. Which of the following statement(s) is/are correct?
- (a) Furan and thiophene are heterocyclic aromatic compounds.
- (b) Anthracene has  $10\pi$  electrons which are delocalised.
- (c) Benzene does not form a triozonide when treated with ozone.
- (d)  $-\text{NHCOCH}_3$  group activates the benzene ring for electrophilic attack.
- (1) Only (b) and (d)      (2) Only (a), (b) and (c)  
 (3) Only (a) and (d)      (4) Only (c) and (d)

79. Consider following molecules



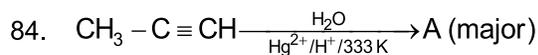
Which of the above molecule(s) form(s) tautomer(s)?

- (1) Only (I) and (II)      (2) Only (III)  
 (3) Only (I), (III) and (IV)      (4) (I), (II), (III) and (IV)
80. In IUPAC naming, highest priority group among the following is
- (1)  $-\text{CN}$       (2)  $-\text{CHO}$   
 (3)  $-\text{CO}-$       (4)  $-\text{CONH}_2$
81. Ammonium phosphomolybdate is
- (1)  $(\text{NH}_4)_3\text{PO}_4 \cdot 12\text{MoO}_3$       (2)  $(\text{NH}_4)_3\text{PO}_4 \cdot 12\text{MoO}_2$   
 (3)  $(\text{NH}_4)_3\text{PO}_4 \cdot 10\text{MoO}_3$       (4)  $(\text{NH}_4)_3\text{PO}_4 \cdot 10\text{MoO}_2$
82. Minimum rate of halogenation of alkane is given by
- (1)  $\text{F}_2$       (2)  $\text{Cl}_2$   
 (3)  $\text{Br}_2$       (4)  $\text{I}_2$



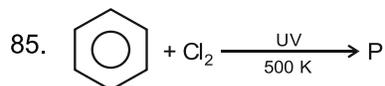
Product P is

- (1)  $\text{CH}_3\text{OH}$       (2)  $\text{HCHO}$   
 (3)  $\text{HCOOH}$       (4)  $\text{CO}_2$



Product A is

- (1)  $\text{CH}_3\text{CH}_2\text{CHO}$       (2)  $\text{CH}_3\text{COCH}_3$   
 (3)  $\text{CH}_3\text{CH}_2\text{COOH}$       (4)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

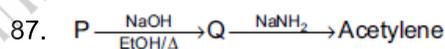


Product P is

- (1)      (2)   
 (3)      (4)

### SECTION - B

86. 0.16 g of an organic compound gave 0.233 g of  $\text{BaSO}_4$ . Percentage of sulphur in the compound is (M.W. of  $\text{BaSO}_4 = 233$ )
- (1) 15%      (2) 20%  
 (3) 25%      (4) 74%

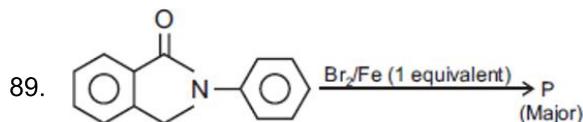


The compound P is

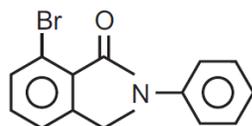
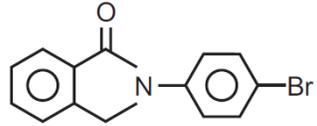
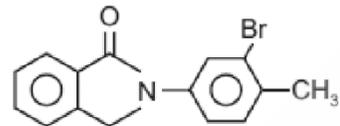
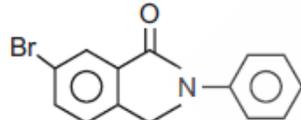
- (1) 1, 3-Dibromopropane  
 (2) Bromoethane  
 (3) 1,2,3-Tribromopropane  
 (4) 1, 2-Dibromoethane

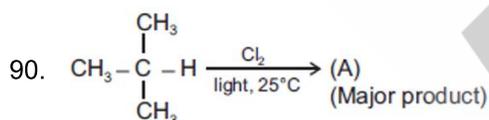
Space for Rough Work

88. The correct statements among the following are
- Allyl carbocation does not show hyperconjugation
  - Resonance effect operates through sigma bond
  - Resonance effect is a permanent effect
  - Inductive effect is a temporary effect
- (1) (i), (ii) and (iii) only    (2) (i) and (iii) only  
 (3) (ii) only    (4) (i), (ii), (iii) and (iv)



The major product P is

- 
- 
- 
- 



Correct statement about A is

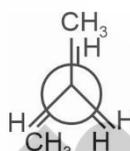
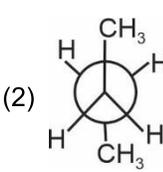
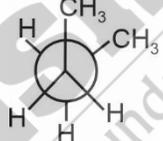
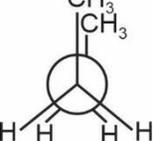
- It is a primary alkyl halide
- It is a secondary alkyl halide
- It is a tertiary alkyl halide
- It is an alkene

91. The total number of  $\sigma$  and  $\pi$  bonds in cyano benzene respectively are
- 13 and 3    (2) 13 and 4
  - 11 and 5    (4) 13 and 5

92. The product obtained upon reaction of propene with  $\text{Cl}_2$  in presence of  $\text{CCl}_4$  is

- $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{Cl}$
- $\text{CH}_3 - \underset{\text{Cl}}{\text{CH}} - \text{CH}_3$
- $\text{CH}_3 - \underset{\text{Cl}}{\text{CH}} - \underset{\text{Cl}}{\text{CH}_2}$
- $\text{CH}_3 - \text{CH}_2 - \underset{\text{Cl}}{\overset{\text{Cl}}{\text{CH}}}$

93. The most stable conformation of n-butane is

- 
- 
- 
- 

94.  $\text{CH}_2 = \text{CH}_2$  on reaction with cold dilute, aqueous solution of  $\text{KMnO}_4$  gives

- $\text{CH}_3\text{CH}_2\text{OH}$     (2)  $\begin{array}{c} \text{CH}_2 - \text{OH} \\ | \\ \text{CH}_2 - \text{OH} \end{array}$
- $\text{CH}_3\text{CHO}$     (4)  $\text{HCOOH}$

95. Geometrical isomerism can be shown by

- $(\text{CH}_3)_2\text{C} = \text{CHCH}_3$
- $(\text{CH}_3)_2\text{C} = \text{C}(\text{CH}_3)_2$
- $\text{CH}_3\text{CH}_2\text{CH} = \text{CHCH}_3$
- $\text{CH}_3\text{CH}_2\text{CH} = \text{C}(\text{CH}_3)_2$

Space for Rough Work



104. Which of the following pigments is considered as the chief pigment associated with photosynthesis?
- (1) Chlorophyll *a*                      (2) Chlorophyll *b*  
(3) Xanthophylls                      (4) Carotenoids
105. All of the following events occur during photochemical phase of photosynthesis, **except**
- (1) Light absorption                      (2) CO<sub>2</sub> fixation  
(3) O<sub>2</sub> release                      (4) Formation of ATP
106. Law of limiting factors was given by
- (1) Blackman                      (2) Cornelius van Niel  
(3) Julius von Sachs                      (4) T. W. Engelmann
107. In plants, phosphoglycolate formation occurs during
- (1) C<sub>3</sub> cycle  
(2) C<sub>4</sub> cycle  
(3) Photorespiration  
(4) Non-cyclic photophosphorylation
108. Primary CO<sub>2</sub> fixation in C<sub>4</sub> plants is catalysed by
- (1) PEPcase                      (2) PEP synthetase  
(3) RuBisCO                      (4) Hexokinase
109. Decarboxylation during C<sub>4</sub> pathway occurs in
- (1) Guard cell of stomata  
(2) Endodermal cells in leaves  
(3) Mesophyll cells of leaves  
(4) Bundle sheath cells of leaves
110. Which of the following steps is critical for the uninterrupted occurrence of Calvin cycle?
- (1) Carboxylation of RuBP  
(2) Regeneration of RuBP  
(3) Reduction of RuBP  
(4) Transamination of RuBP
111. Identify the **incorrect** statement.
- (1) Light duration does not affect the rate of photosynthesis, but it affects the overall photosynthesis.  
(2) Maximum photosynthesis takes place in red and blue light of the visible spectrum.  
(3) Light rarely becomes a limiting factor except for plants in shades or in dense forests.  
(4) There is always a linear relationship between incident light and rate of photosynthesis at higher light intensities at any CO<sub>2</sub> concentration.
112. Regarding chemiosmotic hypothesis,
- (1) Protons are accumulated in stroma by the splitting of water  
(2) H<sup>+</sup> carrier molecule removes a proton from lumen of thylakoid to stroma while transporting an electron  
(3) Breakdown of proton gradient provides energy to cause a conformational change only in F<sub>0</sub> part of ATPase  
(4) Proton gradient is broken down due to the movement of protons into the stroma through transmembrane channel of ATP synthase.
113. Mark the **incorrect** statement w.r.t. oxidative phosphorylation.
- (1) Complete oxidation of one FADH<sub>2</sub> forms 2 ATP molecules  
(2) Outer mitochondrial membrane is permeable to protons in region of F<sub>0</sub>-F<sub>1</sub> complex  
(3) Proton gradient required for phosphorylation is obtained with use of energy of oxidation and reduction  
(4) There will be a decrease in pH in the intermembrane space of mitochondria during the establishment of proton gradient.

Space for Rough Work

114. Read the following statements and state them as true (T) or false (F).

- (a) PEPcase enzyme is present in mesophyll cells of  $C_4$  plants.
- (b) During  $C_4$  pathway 4-carbon OAA is formed in bundle-sheath cells of  $C_4$  plants.
- (c)  $C_4$  plants have higher temperature optimum than  $C_3$  plants.
- (d) Calvin cycle occurs in  $C_3$  plants as well as in  $C_4$  plants.

Choose the **correct** option.

|     | (a) | (b) | (c) | (d) |
|-----|-----|-----|-----|-----|
| (1) | T   | T   | F   | T   |
| (2) | T   | F   | T   | T   |
| (3) | F   | F   | T   | T   |
| (4) | T   | F   | T   | F   |

115. Find the **correctly** matched pair.

- (1)  $C_4$  plants – At high light intensities photosynthesis saturates only beyond  $460 \mu\text{L}^{-1}$
- (2)  $C_3$  plants – Primary  $\text{CO}_2$  acceptor is 3C compound
- (3)  $C_3$  plants – Efficient process of  $\text{CO}_2$  fixation
- (4)  $C_4$  plants – Bundle sheath has agranal chloroplast

116. NADP reductase enzyme is

- (1) Located on the lumen side of thylakoid membrane
- (2) Attached to cytochrome b<sub>6</sub>f complex
- (3) Located on the stroma side of thylakoid membrane
- (4) Located on the outer membrane of chloroplast

117. Find the **incorrect** match w.r.t. scientists and the organisms used in their experiment regarding photosynthesis.

- (1) Jan Ingenhousz – *Hydrilla*
- (2) Cornelius van Niel – Purple and green sulphur bacteria
- (3) Joseph Priestley – Mint plant
- (4) T.W. Engelmann – Anaerobic bacteria

118. Number of ATP required to synthesize one glucose molecule through photosynthesis in  $C_4$  plants, is

- (1) 24
- (2) 30
- (3) 12
- (4) 18

119. All of the below given features or events are similar between alcoholic fermentation and lactic acid fermentation, **except**

- (1)  $\text{NADH} + \text{H}^+$  is reoxidised to  $\text{NAD}^+$
- (2) Involvement of decarboxylase enzyme
- (3) Occur in anaerobic conditions
- (4) Incomplete oxidation of pyruvate

120. Link reaction of respiration

- a. Occurs in mitochondrial matrix
- b. Is catalysed by dehydrogenase enzyme
- c. Involves oxidative decarboxylation and oxidative phosphorylation

The **correct** one(s) is/are

- (1) a and b only
- (2) b only
- (3) b and c only
- (4) All a, b and c

Space for Rough Work

121. Read the following statements and choose the **correct** option.
- Assertion (A):** During glycolysis, two redox-equivalents are removed from PGAL and it is converted into BPGA.
- Reason (R):** The direct synthesis of all types of high-energy chemical intermediates from metabolites is called substrate level phosphorylation.
- (1) Both (A) and (R) are true and (R) is the correct explanation of (A)  
 (2) Both (A) and (R) are true but (R) is not the correct explanation of (A)  
 (3) (A) is true but (R) is false  
 (4) (A) is false but (R) is true
122. Anoxygenic photosynthesis is characteristic of  
 (1) *Rhodospirillum* (2) *Chlamydomonas*  
 (3) *Fucus* (4) *Spirogyra*
123. All of the following are the components of complex IV of mitochondrial ETS, **except**  
 (1) Cytochrome a (2) Cytochrome a<sub>3</sub>  
 (3) Copper centres (4) FMN
124. Which of the following is **not** required for the activity of pyruvate dehydrogenase?  
 (1) NAD<sup>+</sup> (2) Coenzyme A  
 (3) FAD<sup>+</sup> (4) Mg<sup>2+</sup>
125. How many times decarboxylation takes place during one TCA cycle?  
 (1) 2 (2) 3  
 (3) 4 (4) 5
126. Conversion of sucrose into glucose and fructose is catalysed by  
 (1) Hexokinase (2) Citrate synthase  
 (3) Invertase (4) Pyruvate kinase
127. All of the following scientists are associated in providing the scheme of glycolysis, **except**  
 (1) Gustav Embden (2) Melvin Calvin  
 (3) Otto Meyerhof (4) J. Parnas
128. Which of the following expressions can be used for the calculation of RQ?  
 (1) RQ = Volume of CO<sub>2</sub> evolved × volume of O<sub>2</sub> consumed  
 (2) RQ = Volume of CO<sub>2</sub> evolved + volume of O<sub>2</sub> consumed  
 (3) RQ = Volume of CO<sub>2</sub> evolved – volume of O<sub>2</sub> consumed  
 (4)  $RQ = \frac{\text{Volume of CO}_2 \text{ evolved}}{\text{Volume of O}_2 \text{ consumed}}$
129. Which of the following represents peripheral membrane protein complex in mitochondria?  
 (1) Complex IV of ETS  
 (2) Complex I of ETS  
 (3) F<sub>1</sub> headpiece of ATP synthase  
 (4) F<sub>0</sub> particle of ATP synthase
130. Pyruvate dehydrogenase is involved in  
 (1) Glycolysis  
 (2) Lactic acid fermentation  
 (3) Alcoholic fermentation  
 (4) Link reaction of respiration
131. Choose the **wrong** statement for RQ.  
 (1) It depends on the type of respiratory substrate used during respiration  
 (2) It is also known as respiratory ratio  
 (3) RQ of organic acid is more than that of glucose  
 (4) Substrate having more oxygen as compare to C and H have RQ value less than 1

Space for Rough Work

132. Read the following statements and select the **correct** option.

**Statement A:** In fermentation, there is a net gain of only two molecules of ATP from one molecule of glucose.

**Statement B:** Fermentation occurs under anaerobic conditions.

- (1) Only statement A is correct
- (2) Only statement B is correct
- (3) Both the statements are correct
- (4) Both the statements are incorrect

133. Find the conversion step which is **odd** one w.r.t. release of CO<sub>2</sub>.

- (1) Pyruvic acid → Acetyl CoA
- (2) Oxalosuccinic acid → α-ketoglutaric acid
- (3) α-ketoglutaric acid → Succinyl CoA
- (4) Acetyl CoA + Oxaloacetic acid → Citric acid

134. Aldolase enzyme of EMP pathway catalyses

- (1) Splitting of DHAP
- (2) Splitting of fructose-1,6-bisphosphate into DHAP and PGAL
- (3) Conversion of the DHAP into PGAL
- (4) Conversion of glucose-6-phosphate into fructose-6-phosphate

135. Which of the following represents the component of complex I of mitochondrial electron transport system?

- (1) Cyt *b*, Cyt C<sub>1</sub>
- (2) FMN, Fe-S
- (3) FAD, Fe-S
- (4) Cyt *a*, Cyt a<sub>3</sub>

### SECTION - B

136. The enzyme of TCA cycle that is located in inner mitochondrial membrane

- (1) Is not involved in ETS
- (2) Converts succinic acid to fumaric acid
- (3) Requires NAD<sup>+</sup> for its functioning
- (4) Helps in the transport of pyruvate from cytosol to mitochondria

137. The TCA cycle begins with the

- (1) Regeneration of FAD<sup>+</sup>
- (2) Condensation of acetyl group with oxaloacetic acid and water
- (3) Conversion of α-ketoglutaric acid into succinyl CoA
- (4) Breakdown of ADP

138. Glycolysis is similar to fermentation of pyruvic acid in terms of

- (1) Number of NADH molecules produced
- (2) Location of their occurrence
- (3) The type of end products
- (4) The enzymes used

139. Which of the following is/are never used as respiratory substrate?

- (1) Starch
- (2) Fructose
- (3) Pure fats
- (4) Sucrose

140. Final hydrogen acceptor in mitochondrial ETS is

- (1) Cytochrome oxidase
- (2) Oxygen
- (3) Ubiquinone
- (4) ATP synthase

141. During photosynthesis, following products are formed in which region of chloroplast?

- (a) O<sub>2</sub>
- (b) Triose phosphate
- (c) NADPH
- (d) ATP

Choose the **correct** option.

|     | (a)             | (b)             | (c)             | (d)             |
|-----|-----------------|-----------------|-----------------|-----------------|
| (1) | Stroma          | Thylakoid lumen | Stroma          | Thylakoid lumen |
| (2) | Stroma          | Thylakoid lumen | Thylakoid lumen | Stroma          |
| (3) | Thylakoid lumen | Stroma          | Thylakoid lumen | Stroma          |
| (4) | Thylakoid lumen | Stroma          | Stroma          | Stroma          |

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142. **Correct** sequence for the electron transport chain in ETS of thylakoid membrane is
- (1) PS-II  $\rightarrow$  Cyt  $b_6f$   $\rightarrow$  PQ  $\rightarrow$  PC  $\rightarrow$  PS-I
  - (2) PS-I  $\rightarrow$  PC  $\rightarrow$  Cyt  $b_6f$   $\rightarrow$  PQ  $\rightarrow$  PS-II
  - (3) PS-II  $\rightarrow$  PQ  $\rightarrow$  Cyt  $b_6f$   $\rightarrow$  PC  $\rightarrow$  PS-I
  - (4) PS-I  $\rightarrow$  Cyt  $b_6f$   $\rightarrow$  PC  $\rightarrow$  PQ  $\rightarrow$  PS-II
143. Choose the **correct** statement.
- (1) Thylakoid membrane lacks ATP synthase enzyme and PS-I
  - (2) Non-cyclic photophosphorylation occurs in granal thylakoids
  - (3) PS I and PS II are not interconnected through electron carriers
  - (4) Hexokinase catalyse the breakdown of fructose-1, 6-bisphosphate during glycolysis.
144. RQ values of organic acids is more than unity because
- (1) Organic acids contain high proportion of carbon as compared to oxygen
  - (2) More  $\text{CO}_2$  is liberated than  $\text{O}_2$  consumed in respiration
  - (3) They contain high proportion of hydrogen as compared to oxygen
  - (4) More oxygen is consumed than  $\text{CO}_2$  liberated in respiration
145. Select the **wrong** statement.
- (1) Plants do not have respiratory organs
  - (2) All organisms have the machinery to partially oxidise the glucose
  - (3) Respiratory substrates are oxidised in a single step to release all energy contained in them
  - (4) Roots, stems and leaves respire at rates far lower than animals
146. During light reaction of photosynthesis,  $\text{H}^+$  ions or protons are
- (1) Always pumped out from thylakoid lumen
  - (2) Higher in concentration inside the thylakoid lumen as compared to stroma
  - (3) Not required to form ATP
  - (4) Always in higher concentration in stroma as compared to thylakoid lumen
147. Select the **odd** one w.r.t. ATP synthase enzyme present in chloroplast.
- (1)  $\text{CF}_1$  head has catalytic activity
  - (2)  $\text{CF}_0$  protrude on the outer surface of thylakoid membrane
  - (3) The proton gradient is broken down due to the movement of protons across ATP synthase
  - (4)  $\text{CF}_0$  has the proton channel for proton movement
148. Plants with Kranz anatomy lack
- (1) Double carboxylation steps in photosynthesis
  - (2) Cold sensitive enzyme PEP synthetase
  - (3) Activity of RuBisCO in mesophyll cells
  - (4) Chloroplasts in bundle sheath cells
149. How many carbon atoms are present in
- |   |     |
|---|-----|
| (a) First stable product in $\text{C}_3$ pathway of photosynthesis? | (b) |
| (1) 4   | 5   |
| (2) 3   | 5   |
| (3) 5   | 4   |
| (4) 3   | 4   |
150. Select the **incorrect** statement for non-cyclic photophosphorylation.
- (1) It is associated with release of oxygen
  - (2) It involves only the activity of photosystem II
  - (3) It yields both ATP and NADPH
  - (4) It takes place under optimum light

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## ZOOLOGY

### SECTION - A

151. The type of excretory structure seen in *Amphioxus* is also seen in

- (1) *Planaria*                      (2) *Periplaneta*  
 (3) *Pheretima*                    (4) *Pavo*

152. Towards the centre of the inner concave surface of the kidney is a notch called \_\_\_\_\_ through which ureter, blood vessels and nerves enter.

Choose the option that correctly fills the blank.

- (1) Renal pelvis                    (2) Calyx  
 (3) Hilum                            (4) Column of Bertini

153. The renal tubule begins with a double walled cup-like structure called 'X'. 'X' is characterized by all of the given features, **except**

- (1) Possesses same type of epithelium that lines the glomerular blood vessels  
 (2) Forms the part of filtration membrane that assists in filtration of blood  
 (3) Encloses the tuft of capillaries formed by the afferent arteriole  
 (4) Aids in selective secretion of hydrogen ions, ammonia and potassium ions into the filtrate

154. The passive transport assists in the reabsorption of \_\_\_\_\_ in PCT.

Choose the correct option to fill in the blank.

- (1) Amino acids                    (2) Water  
 (3) Glucose                        (4) Sodium ions

155. Consider the given statements w.r.t. human kidneys and select the correct option.

**Statement (A):** The filtration of blood from glomerulus usually cause the transfer of red blood cells and plasma proteins from blood to the Bowman's capsule.

**Statement (B):** The cells of proximal tubules help to decrease the pH of urine by secreting bicarbonate ions into the filtrate.

- (1) Both statements (A) and (B) are correct  
 (2) Both statements (A) and (B) are incorrect  
 (3) Only statement (A) is correct  
 (4) Only statement (B) is correct

156. The coordinated movements of structures named 'P' in the trachea help us in removing dust particles and some of the foreign substances inhaled alongwith the atmospheric air. 'P' also help in the locomotion of

- (1) *Euglena*                        (2) *Hydra*  
 (3) *Amoeba*                        (4) *Paramecium*

157. Select the **incorrect** statement.

- (1) Cells of the human body exhibit only three types of movements, namely, amoeboid, ciliary and muscular.  
 (2) Methods of locomotion performed by animals vary with their habitats and the demand of the situation.  
 (3) Locomotion requires a perfect coordinated activity of muscular, skeletal and neural systems.  
 (4) About 40-50 per cent of the body weight of a human adult is contributed by muscles.

158. The similar feature between the type of muscles that assists in transportation of gametes through the genital tract and the type of muscles that are involved in pumping activity of heart is

- (1) Presence of striations  
 (2) Absence of multinucleated muscle fibres  
 (3) Presence of unbranched muscle fibres  
 (4) Absence of intercalated discs

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159. A person named 'ABC' had a minor road accident. He was immediately rushed to the hospital where the doctor examined him and found that his ankle bones have been fractured. To explain the situation in a better way to the family members, doctor stated that his 'X' bones have got affected. These 'X' bones have 'Y' joints between them. Choose the option that correctly identifies 'X' and 'Y' respectively.
- (1) Carpals; Pivot (2) Tarsals; Gliding  
(3) Metatarsals; Saddle (4) Phalanges; Hinge
160. Select the **correct** option w.r.t tetany.
- (1) May be caused due to hyposecretion of PTH  
(2) It is an auto-immune disorder affecting neuromuscular junction leading to fatigue of skeletal muscle  
(3) Characterised by accumulation of uric acid crystals in the joints  
(4) It is a genetic disorder
161. Consider the given features
- (A) Large regions that are neither clearly sensory nor motor in function  
(B) Part of forebrain  
(C) Responsible for complex functions like memory and communication
- Choose the part of brain associated with the above given features.
- (1) Hypothalamus (2) Association areas  
(3) Thalamus (4) Amygdala
162. **Assertion (A):** Within a fraction of a second, there is restoration of the resting potential of the axonal membrane at the site of excitation.  
**Reason (R):** The rise in the stimulus-induced permeability to  $K^+$  is extremely short lived. It is quickly followed by a rise in permeability to  $Na^+$ . In the light of above statements, select the **correct** option.
- (1) Both (A) and (R) are true and (R) is the correct explanation of (A)  
(2) Both (A) and (R) are true and (R) is not the correct explanation of (A)  
(3) (A) is true but (R) is false  
(4) (A) is false but (R) is true
163. Choose the **correct** statement.
- (1) Myelinated nerve fibres enveloped with Schwann cells are found in spinal and cranial nerves.  
(2) Unmyelinated nerve fibre is not enclosed by a Schwann cell and is commonly found in autonomous and the somatic neural systems.  
(3) The inner part of cerebral hemisphere is composed of the neuron cell bodies that imparts white color.  
(4) The axons transmit nerve impulses towards the cell body from a neuromuscular junction.
164. Complete the analogy by selecting the **correct** option.
- Autonomic neural system : CNS to cardiac muscles :: Somatic neural system : CNS to \_\_\_\_\_
- (1) Iris muscles  
(2) Endothelium of blood vessels  
(3) Triceps  
(4) Wall of lungs
165. How many of the functions given below in the box are regulated/influenced by human brain?
- Thermoregulation, hearing, speech, memory, intelligence, olfaction, balance, circadian rhythm
- Select the correct option.
- (1) Seven  
(2) Eight  
(3) Six  
(4) Five

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166. Read the given statements and select the option with incorrect statement(s) only.
- (A) Materials are returned to the blood from the filtrate by the process named ultrafiltration.
- (B) DCT and collecting duct concentrate the filtrate about four times in humans under normal physiological conditions.
- (C) The type of nitrogenous waste excreted by *Hyla* and *Pteropus* requires no water for its excretion.

- (1) Only (A)                      (2) (A), (B) and (C)  
 (3) Only (A) and (C)        (4) Only (B) and (C)

167. In order to maintain ionic and acid base balance of body fluids, tubular cells of nephrons secrete certain substances into the filtrate. Select the **odd** one w.r.t it.

- (1)  $\text{HCO}_3^-$                       (2)  $\text{H}^+$   
 (3)  $\text{NH}_3$                         (4)  $\text{K}^+$

168. In humans, urea is produced in the \_\_\_\_\_ from \_\_\_\_\_. Select the option that correctly fills the blanks respectively.

- (1) Kidneys; Glucose  
 (2) Liver; Ammonia and  $\text{CO}_2$   
 (3) Kidneys; Fatty acids and  $\text{NH}_3$   
 (4) Liver; Glycogen

169. Choose the **correct** match w.r.t. humans.

|     |         |   |  |
|-----|---------|---|--|
| (1) | Scapula | – | Situated in the ventral part of the thorax |
| (2) | Sternum | – | Flat bone on the dorsal midline of thorax  |
| (3) | Sacrum  | – | Part of the appendicular skeleton          |
| (4) | Hyoid   | – | Forms the part of skull                    |

170. White muscle fibres and red muscle fibres are different as
- (1) Former possess lesser amount of sarcoplasmic reticulum
- (2) Latter contract for a longer period without fatigue
- (3) Former depend upon aerobic process for energy
- (4) Latter contain lesser number of mitochondria
171. Read the following statements and choose the **correct** option.

**Statement A:** All voluntary muscle fibres are striated but all striated muscle fibres are not voluntary.

**Statement B:** All involuntary muscle fibres are branched but all branched muscle fibres are not involuntary.

- (1) Both statements A and B are correct  
 (2) Both statements A and B are incorrect  
 (3) Only statement A is correct  
 (4) Only statement B is correct

172. Identify the labelled proteins X, Y and Z. Select the **correct** option w.r.t. their structure/function.



- (1) 'X' masks the active binding sites for thick filament on the actin filament.
- (2) 'Z' has two important parts, a globular head with a short arm and a tail.
- (3) 'Y' is a polymer of monomeric meromyosins.
- (4) Each myosin filament is formed of two helically wound 'Z'.

173. The neurotransmitter released at neuromuscular junction to generate an action potential in the sarcolemma is

- (1) Dopamine                      (2) Acetylcholine  
 (3) Glutamate                      (4) Serotonin

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174. Read the following statements w.r.t. human kidneys and choose the option with only **correct** statements.

- a. The outer layer of kidney is a tough capsule.
- b. Capsule divides the kidney into outer cortex and inner medulla.
- c. Medulla is divided into medullary pyramids by invagination of cortex into medulla.
- d. Calyces project into medullary pyramids.

- (1) a and b                      (2) b and c
- (3) c and d                      (4) a and c

175. From given below box, how many act as accessory excretory organs/structures in humans?

Kidney, skin, liver, lungs, sweat glands  
sebaceous glands, heart, adrenal gland

Choose the correct option.

- (1) Eight                      (2) Six
- (3) Five                      (4) Three

176. Read the following statements A and B and choose the **correct** answer.

**Statement A :** Movement is one of the significant features of living animals.

**Statement B :** Flying is a form of locomotory movements in most of the birds, insects and certain mammals.

- (1) Both statements A and B are incorrect
- (2) Both statements A and B are correct
- (3) Only statement A is correct
- (4) Only statement B is correct

177. Which of the following features is shared by both muscles and some connective tissue fibres?

- (1) Conductivity              (2) Contractility
- (3) Excitability              (4) Elasticity

178. Read the following statements w.r.t. synapses.

- A. Chemical synapse may allow two-way transmission of impulses.
- B. Neurotransmitters are mandatory for transmission of impulses in all type of synapses.
- C. It is always formed by the membranes of a pre-synaptic neuron and a post-synaptic neuron.
- D. Electrical synapses are rare in our body.

State these statements as **true(T)** or **false(F)** and choose the **correct** option.

- |     | A | B | C | D |
|-----|---|---|---|---|
| (1) | F | T | F | T |
| (2) | T | T | F | F |
| (3) | T | F | T | F |
| (4) | F | F | T | T |

179. Neuron with one axon and no dendrite is called

- (1) Multipolar                      (2) Unipolar
- (3) Bipolar                      (4) Apolar

180. Select the **incorrect** statement w.r.t. human brain.

- (1) Cerebral aqueduct passes through the midbrain
- (2) Cerebellum is a structural constituent of brain stem.
- (3) Corpora quadrigemina is present on dorsal side of midbrain.
- (4) Processing for the expression of emotional reactions is a function of brain.

181. Which one of the following is **incorrect** for conduction of an impulse through axon?

- |     |   |     |   |
|-----|---|-----|---|
| (1) | $\begin{array}{c} \text{A} \quad \text{B} \quad \text{C} \\ \text{++++} \text{----} \text{++++} \\ \text{-----} \text{++++} \text{-----} \\ \text{++++} \text{----} \text{++++} \\ \text{-----} \text{++++} \text{-----} \end{array}$ | (2) | $\begin{array}{c} \text{A} \quad \text{B} \quad \text{C} \\ \text{----} \text{----} \text{++++} \text{++++} \\ \text{++++} \text{----} \text{----} \text{----} \\ \text{++++} \text{----} \text{----} \text{----} \\ \text{----} \text{----} \text{----} \text{----} \end{array}$ |
| (3) | $\begin{array}{c} \text{A} \quad \text{B} \quad \text{C} \\ \text{----} \text{----} \text{----} \\ \text{++++} \text{----} \text{++++} \\ \text{++++} \text{----} \text{++++} \\ \text{----} \text{----} \text{----} \end{array}$     | (4) | $\begin{array}{c} \text{A} \quad \text{B} \quad \text{C} \\ \text{++++} \text{++++} \text{----} \\ \text{----} \text{----} \text{----} \text{----} \\ \text{----} \text{----} \text{----} \text{----} \\ \text{++++} \text{++++} \text{----} \end{array}$                         |

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182. The outermost cranial meninx among the following is/are
- (1) Dura mater
  - (2) Arachnoid
  - (3) Pia mater
  - (4) Dura mater and arachnoid
183. A tract of nerve fibres which connects cerebral hemispheres is present in
- (1) Forebrain
  - (2) Midbrain
  - (3) Hindbrain
  - (4) Spinal cord
184. In which of the following conditions, hemodialysis is used as treatment?
- (1) Uremia
  - (2) Anaemia
  - (3) Renal calculi
  - (4) Glycosuria
185. Based on the location, muscles are classified as
- (1) Voluntary and involuntary
  - (2) Striated and smooth
  - (3) Skeletal, smooth and cardiac
  - (4) Skeletal, visceral and cardiac

**SECTION - B**

186. Amount of the filtrate formed by the kidneys per minute is called
- (1) Renal blood flow
  - (2) Renal plasma flow
  - (3) Filtration fraction
  - (4) Glomerular filtration rate
187. Read the following statements A and B w.r.t humans under normal conditions and choose the **correct** answer.
- Statement A** : Kidneys filter about  $1/5^{\text{th}}$  of the cardiac output per minute.
- Statement B** : In an adult man, 180 litre of glomerular filtrate is formed in a day.
- (1) Both statements A and B are correct
  - (2) Both statements A and B are incorrect
  - (3) Only statement A is correct
  - (4) Only statement B is correct
188. Which of the following components of blood is more likely to filter through slit pores formed by podocytes?
- (1) RBCs
  - (2) WBCs
  - (3) Plasma proteins
  - (4) Plasma other than proteins
189. Which of the following is smallest component of a muscle?
- (1) Fascicle
  - (2) Muscle fibre
  - (3) Myofibril
  - (4) Meromyosin
190. In meromyosin molecule, HMM consists of
- (1) Only head
  - (2) Head and short arm
  - (3) Short arm and LMM
  - (4) LMM and cross arm
191. Masking of binding sites of myosin on actin occurs
- (1) Before  $\text{Ca}^{+2}$  is pumped to cytoplasmic cisternae
  - (2) After  $\text{Ca}^{+2}$  is pumped back to the sarcoplasmic cisternae
  - (3) After joining of  $\text{Ca}^{+2}$  with complex protein, troponin
  - (4) When  $\text{Ca}^{+2}$  is found attached with a subunit of tropomyosin.
192. Select the **incorrect** statement.
- (1) A healthy adult human excretes, on an average, 25-30 gm of urea per day
  - (2) An adult human excretes, on an average, 1-1.5 litres of urine per day
  - (3) Dialysing fluid contains all the constituents as in plasma except nitrogen containing proteins
  - (4) Ascending limb of loop of Henle is impermeable to water, whereas the descending limb is permeable to it

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193. Out of 'X' number of total facial and cranial bones in human, 'Y' is the number of paired bones and 'Z' is the number of unpaired bones. Choose the option which **correctly** represents number X, Y and Z.
- | X      | Y  | Z  |
|--------|----|----|
| (1) 22 | 10 | 2  |
| (2) 28 | 10 | 8  |
| (3) 22 | 8  | 6  |
| (4) 28 | 8  | 12 |
194. Read the following statements and choose the **correct** option.
- Statement A** : The neural organisation in *Hydra* is composed of a network of neurons.
- Statement B** : In cockroach, the neural system is organised as a brain along with a number of ganglia and neural tissues.
- (1) Both statements A and B are correct  
 (2) Both statements A and B are incorrect  
 (3) Only statement A is correct  
 (4) Only statement B is correct
195. Brain stem
- (1) Is present between thalamus and hypothalamus  
 (2) Forms connection between the brain and spinal cord  
 (3) Consists of only white matter  
 (4) Consists of only grey matter
196. Thoracic vertebrae, ribs and sternum together form
- (1) Appendicular skeleton  
 (2) Thorax  
 (3) Rib cage  
 (4) Mediastinum
197. Joints are the points of contact between
- a. Bones  
 b. Bones and muscles  
 c. Bones and cartilages  
 d. Bones and tendons
- Choose the **correct** option.
- (1) a and b (2) b and c  
 (3) c and d (4) a and c
198. Which of the following blood vessels contains maximum amount of urea?
- (1) Renal artery (2) Renal vein  
 (3) Hepatic artery (4) Hepatic vein
199. Conditional reabsorption of water under the effect of hormone ADH takes place in
- (1) PCT (2) Loop of Henle  
 (3) Only DCT (4) DCT and CD
200. Nodes of Ranvier in myelinated neurons of PNS
- (1) Possess neurilemma  
 (2) Lack neurilemma  
 (3) Lack axolemma  
 (4) Possess myelin sheath

□ □ □



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**Edition: 2024-25**

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## FINAL TEST SERIES for NEET-2024

MM : 720

**Test - 4**

Time : 3 Hrs. 20 Mins.

### Answers

|         |         |          |          |          |
|---------|---------|----------|----------|----------|
| 1. (4)  | 41. (4) | 81. (1)  | 121. (3) | 161. (2) |
| 2. (3)  | 42. (3) | 82. (4)  | 122. (1) | 162. (3) |
| 3. (4)  | 43. (3) | 83. (1)  | 123. (4) | 163. (1) |
| 4. (3)  | 44. (2) | 84. (2)  | 124. (3) | 164. (3) |
| 5. (3)  | 45. (3) | 85. (4)  | 125. (1) | 165. (2) |
| 6. (1)  | 46. (3) | 86. (2)  | 126. (3) | 166. (3) |
| 7. (3)  | 47. (4) | 87. (4)  | 127. (2) | 167. (1) |
| 8. (2)  | 48. (1) | 88. (2)  | 128. (4) | 168. (2) |
| 9. (2)  | 49. (4) | 89. (2)  | 129. (3) | 169. (4) |
| 10. (2) | 50. (3) | 90. (1)  | 130. (4) | 170. (2) |
| 11. (4) | 51. (4) | 91. (4)  | 131. (4) | 171. (3) |
| 12. (4) | 52. (4) | 92. (3)  | 132. (3) | 172. (1) |
| 13. (1) | 53. (2) | 93. (2)  | 133. (4) | 173. (2) |
| 14. (2) | 54. (4) | 94. (2)  | 134. (2) | 174. (4) |
| 15. (3) | 55. (3) | 95. (3)  | 135. (2) | 175. (3) |
| 16. (3) | 56. (1) | 96. (4)  | 136. (2) | 176. (2) |
| 17. (3) | 57. (4) | 97. (1)  | 137. (2) | 177. (4) |
| 18. (3) | 58. (3) | 98. (1)  | 138. (2) | 178. (4) |
| 19. (3) | 59. (3) | 99. (4)  | 139. (3) | 179. (2) |
| 20. (3) | 60. (4) | 100. (4) | 140. (2) | 180. (2) |
| 21. (3) | 61. (1) | 101. (4) | 141. (4) | 181. (3) |
| 22. (4) | 62. (2) | 102. (1) | 142. (3) | 182. (1) |
| 23. (4) | 63. (4) | 103. (1) | 143. (2) | 183. (1) |
| 24. (3) | 64. (3) | 104. (1) | 144. (2) | 184. (1) |
| 25. (3) | 65. (4) | 105. (2) | 145. (3) | 185. (4) |
| 26. (2) | 66. (4) | 106. (1) | 146. (2) | 186. (4) |
| 27. (4) | 67. (3) | 107. (3) | 147. (2) | 187. (1) |
| 28. (1) | 68. (1) | 108. (1) | 148. (3) | 188. (4) |
| 29. (3) | 69. (3) | 109. (4) | 149. (4) | 189. (4) |
| 30. (1) | 70. (3) | 110. (2) | 150. (2) | 190. (2) |
| 31. (4) | 71. (3) | 111. (4) | 151. (1) | 191. (2) |
| 32. (4) | 72. (2) | 112. (4) | 152. (3) | 192. (3) |
| 33. (3) | 73. (1) | 113. (2) | 153. (4) | 193. (3) |
| 34. (1) | 74. (3) | 114. (2) | 154. (2) | 194. (1) |
| 35. (2) | 75. (3) | 115. (4) | 155. (2) | 195. (2) |
| 36. (2) | 76. (4) | 116. (3) | 156. (4) | 196. (3) |
| 37. (1) | 77. (2) | 117. (4) | 157. (1) | 197. (4) |
| 38. (2) | 78. (3) | 118. (2) | 158. (2) | 198. (4) |
| 39. (4) | 79. (3) | 119. (2) | 159. (2) | 199. (4) |
| 40. (2) | 80. (4) | 120. (1) | 160. (1) | 200. (1) |



# Aakash

Medical | IIT-JEE | Foundations

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## FINAL TEST SERIES for NEET-2024

MM : 720

Test - 4

Time : 3 Hrs. 20 Mins.

### Answers and Solutions

#### PHYSICS

##### SECTION - A

1. Answer (4)

$$\Delta Q = 4 \times 10^3 \times 4.2 = 16800 \text{ J}$$

$$W = 4000 \text{ J}$$

$$\Delta Q = \Delta U + W \Rightarrow \Delta U = 16800 - 4000$$

$$\Delta U = 12800 \text{ J} = 12.8 \text{ kJ}$$

2. Answer (3)

For adiabatic process  $\Delta Q = 0$ 

$$\Delta Q = \Delta U + \Delta W \Rightarrow \Delta U = -\Delta W$$

$$\Rightarrow C = \frac{Q}{m\Delta T}$$

3. Answer (4)

The thermal conductivity of a material depends on the nature of material.

4. Answer (3)

$$W = \frac{1}{2} \times (9 - 4) \times 10^{-3} \times (11 - 3) \times 10^5$$

$$W = 2000 \text{ J}$$

5. Answer (3)

$$V_1 = V, V_2 = 3V$$

$$T_1 = 127^\circ\text{C} = 127 + 273 = 400 \text{ K}$$

According to Charles' law

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{V}{400} = \frac{3V}{T_2}$$

$$T_2 = 1200 \text{ K} = 1200 - 273 = 927^\circ\text{C}$$

$$\text{Increase in temperature} = 927 - 127 = 800^\circ\text{C}$$

6. Answer (1)

$$v_{rms} = \sqrt{\frac{(3)^2 + (2)^2 + (6)^2 + (5)^2 + (4)^2}{5}}$$

$$= \sqrt{\frac{9 + 4 + 36 + 25 + 16}{5}}$$

$$= \sqrt{18} = 4.24 \text{ m/s}$$

7. Answer (3)

$$C_p = \frac{n_1 C_{p1} + n_2 C_{p2}}{n_1 + n_2}$$

$$= \frac{4 \times \frac{7R}{2} + 2 \times \frac{5R}{2}}{4 + 2}$$

$$C_p = \frac{19R}{6}$$

8. Answer (2)

$$\lambda = \frac{1}{\sqrt{2}\pi n d^2}$$

$$\lambda = \frac{1}{\sqrt{2}\pi n (2r)^2} = \frac{1}{4\sqrt{2}\pi n r^2}$$

$$\lambda \propto \frac{1}{r^2} \propto r^{-2}$$

9. Answer (2)

$$a = \omega^2 x$$

$$\omega^2 = \frac{a}{x} = \frac{8}{2} = 4$$

$$\omega = 2 \text{ rad/s}$$

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{2} = \pi \text{ s}$$

10. Answer (2)

Total energy (E) = K.E + P.E = constant

$$P.E = \frac{1}{2} m \omega^2 x^2$$

$$K.E = \frac{1}{2} m \omega^2 (a^2 - x^2)$$

11. Answer (4)

At  $t = 2$  second

$$x = 8 \cos \left( 6\pi + \frac{\pi}{4} \right)$$

$$= 8 \cos \frac{\pi}{4}$$

$$x = 8 \times \frac{1}{\sqrt{2}} = 4\sqrt{2} \text{ m}$$

12. Answer (4)

$$8v^2 = 10 - 2x^2$$

Differentiate w.r.t.  $t$ 

$$8 \left( 2v \frac{dv}{dt} \right) = 0 - 2(2x) \frac{dx}{dt}$$

$$16v \frac{dv}{dt} = -4xv$$

$$16a = -4x$$

$$a = -\frac{1}{4}x$$

$$\omega^2 = \frac{1}{4} \Rightarrow \omega = \frac{1}{2}$$

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{(1/2)} = 4\pi \text{ s}$$

13. Answer (1)

Both statements are correct.

14. Answer (2)

$$\phi_2 - \phi_1 = \frac{\pi}{2}$$

$$(6t - 3x_2) - (6t - 3x_1) = \frac{\pi}{2}$$

$$3(x_1 - x_2) = \frac{\pi}{2}$$

$$x_1 - x_2 = \frac{\pi}{6}$$

15. Answer (3)

$$K = \frac{2\pi}{3} = \frac{2\pi}{\lambda} \Rightarrow \lambda = 3 \text{ m}$$

$$\omega = 120\pi \Rightarrow 2\pi f = 120\pi \Rightarrow f = 60 \text{ Hz}$$

$$v = f\lambda = 60 \times 3 = 180 \text{ m/s}$$

16. Answer (3)

$$\frac{4v}{2l_o} = \frac{5v}{4l_c}$$

$$\frac{l_o}{l_c} = \frac{16}{10} = \frac{8}{5}$$

17. Answer (3)

$$2e = 0.9$$

$$2(0.6r) = 0.9$$

$$r = \frac{0.9}{1.2} = \frac{9}{12} = \frac{3}{4} \text{ cm}$$

18. Answer (3)

Definition of temperature is based on Zeroth law of thermodynamics.

19. Answer (3)

$$PV = \frac{m}{M}RT$$

$$\text{Initially } PV = \frac{10}{m} \times R \times 400 \quad \dots(i)$$

Let  $x$  g gas leaks out

$$\text{Finally } \frac{P}{2} \times V = \frac{(10-x)}{m} \times R \times 300 \quad \dots(ii)$$

$$\text{On solving (i) and (ii) } x = \frac{10}{3} \text{ g}$$

20. Answer (3)

$$\frac{1}{2}(nM)v^2 = nC_v\Delta T$$

$$\Rightarrow \Delta T = \frac{Mv^2}{2C_v} = \frac{(\gamma-1)Mv^2}{2R}$$

21. Answer (3)

Molecules of an ideal gas move with different speeds in all possible direction.

22. Answer (4)

The rms speed doesn't depend upon the quantity of gas for a given gas at constant temperature, it remains the same.

23. Answer (4)

As water flows out of the hole at the bottom, the centre of gravity descends from centre towards the bottom, increasing the effective length and consequently  $f$  decreases.

When all the water has flown out, the centre of gravity of hollow sphere is once again at its centre thereby increasing the frequency.

24. Answer (3)

$$y_1 = 3 \sin(10t + \phi), y_2 = 5 \cos(10t)$$

$$v_1 = \frac{dy_1}{dt} = 30 \cos(10t + \phi)$$

$$v_2 = \frac{dy_2}{dt} = -50 \sin(10t)$$

$$= 50 \cos\left(10t + \frac{\pi}{2}\right)$$

$$\text{Phase difference between } v_1 \text{ and } v_2 = \left(\phi - \frac{\pi}{2}\right)$$

25. Answer (3)

$$v = 1080 \text{ m/s}$$

$$\text{frequency } n = \frac{1800}{30} = 60 \text{ Hz}$$

$$\text{Now wavelength } \lambda = \frac{v}{n} = \frac{1080}{60}$$

$$= 18 \text{ m}$$

26. Answer (2)

$$f = \frac{(2n-1)v}{4l}$$

$$f = (2n-1)f_0$$

The frequencies produced by it will be odd integral multiple of fundamental frequency.

27. Answer (4)

$$v = \sqrt{\frac{\gamma P}{\rho}}$$

$$v = \sqrt{\frac{\gamma RT}{M_w}}$$

$$v \propto \lambda$$

$$\frac{\lambda}{\lambda'} = \sqrt{\frac{300}{400}}$$

$$\frac{\lambda}{\lambda'} = \frac{\sqrt{3}}{2} \Rightarrow \lambda' = \frac{2}{\sqrt{3}} \lambda$$

$$\Rightarrow \lambda' = \frac{200}{\sqrt{3}} \approx 115 \text{ cm}$$

28. Answer (1)

Angle between force acting on particle and displacement of particle will always be  $180^\circ$ .

29. Answer (3)

$$PV^2 = \text{constant}$$

$$\left(\frac{RT}{V}\right)V^2 = \text{constant}$$

$$V = KT^{-1}$$

As gas expands, temperature will decrease.

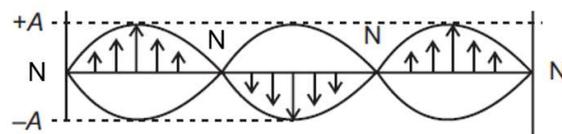
30. Answer (1)

The differential equation of the wave motion is

$$\frac{\partial^2 y}{\partial x^2} = \frac{1}{v^2} \frac{\partial^2 y}{\partial t^2}$$

31. Answer (4)

This is equation of a standing wave.



All particle lying between two consecutive nodes will vibrate with same frequency, different amplitude and in same phase.

32. Answer (4)

Frequency of total energy of particle undergoing SHM is zero as total energy remains constant.

33. Answer (3)

$$T = 2\pi \sqrt{\frac{L}{g}}$$

$$T^2 \propto L$$

34. Answer (1)

$$\frac{dP}{dV} = -\frac{P}{V}$$

35. Answer (2)

$$K_{\text{eff}} = 6K$$

$$f = \frac{1}{2\pi} \sqrt{\frac{6K}{M}}$$

### SECTION-B

36. Answer (2)

$$v = \frac{\omega}{k} = \frac{60\pi}{\frac{4\pi}{3}} = \frac{60\pi \times 3}{4\pi}$$

$$v = 45 \text{ m/s}$$

$$v = \sqrt{\frac{T}{\mu}} \Rightarrow T = \mu v^2$$

$$T = \frac{4 \times 10^{-2}}{2} \times (45)^2 = 40.5 \text{ N}$$

37. Answer (1)

Let frequency of first fork =  $f$

$$\text{Frequency of last (51) fork} = f + (51 - 1)4 = f + 200$$

$$5f = f + 200$$

$$4f = 200 \Rightarrow f = 50 \text{ Hz}$$

38. Answer (2)

Let  $h$  be the depth of bottle in water then

$$Ah\rho g = mg \Rightarrow h = \frac{m}{A\rho} = \frac{400}{160 \times 1} = 2.5 \text{ cm}$$

$$T = 2\pi\sqrt{\frac{h}{g}}$$

$$f = \frac{1}{T} = \frac{1}{2\pi}\sqrt{\frac{g}{h}} = \frac{1}{2 \times \frac{22}{7}}\sqrt{\frac{1000}{2.5}}$$

$$f = \frac{7}{44}\sqrt{400} = \frac{7 \times 20}{44} = 3.18 \text{ Hz}$$

39. Answer (4)

$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$T' = 2\pi\sqrt{\frac{l}{g_{\text{eff}}}} = 2\pi\sqrt{\frac{l}{g+a}}$$

$$= 2\pi\sqrt{\frac{l}{g+\frac{g}{4}}} = 2\pi\sqrt{\frac{4l}{5g}} = \frac{2}{\sqrt{5}}T$$

40. Answer (2)

$$\sqrt{\frac{3RT}{M}} = 3\sqrt{\frac{3RT_0}{M}}$$

$$T = 9T_0 = 9 \times 273 = 2457 \text{ K}$$

$$T = 2184^\circ\text{C}$$

41. Answer (4)

$$U = \frac{f}{2}nRT$$

$$= \frac{5}{2} \times 3 \times R \times T$$

$$= \frac{15RT}{2}$$

42. Answer (3)

Process equation for isochoric process

$$\frac{P}{T} = \text{constant}$$

Process equation for isothermal process

$$PV = \text{constant}$$

Process equation for isobaric process

$$\frac{V}{T} = \text{constant}$$

Process equation for adiabatic process

$$PV^\gamma = \text{constant}$$

43. Answer (3)

$$\Delta Q = \Delta U + \Delta W$$

$$\frac{\Delta Q}{\Delta t} = \frac{\Delta U}{\Delta t} + \frac{\Delta W}{\Delta t}$$

$$\frac{9000}{60} = \frac{6 \times 10^3}{\Delta t} + 120$$

$$\frac{6 \times 10^3}{\Delta t} = 150 - 120 = 30$$

$$\Delta t = \frac{6 \times 10^3}{30} = 200 \text{ s}$$

44. Answer (2)

From given equation of wave,  $\omega = 4\pi$ ,  $k = \frac{\pi}{16}$ 

$$\text{Speed of wave } v = \frac{\omega}{k} = \frac{4\pi}{\frac{\pi}{16}}$$

=  $64 \text{ cm s}^{-1}$  along positive x-direction.

45. Answer (3)

$$\frac{I_{\text{max}}}{I_{\text{min}}} = \frac{(\sqrt{I_1} + \sqrt{I_2})^2}{(\sqrt{I_1} - \sqrt{I_2})^2}$$

$$= \frac{(1+3)^2}{(1-3)^2} = 4$$

46. Answer (3)

$$U_1 = U_2$$

$$f_1 n_1 T_1 = f_2 n_2 T_2$$

$$\frac{n_1}{n_2} = \frac{f_2 T_2}{f_1 T_1} = \frac{3 \times 2T}{5 \times T}$$

$$\frac{n_1}{n_2} = \frac{6}{5}$$

47. Answer (4)

At  $t = \frac{3}{2}$  s, particle is at mean position.

So, acceleration will be zero.

48. Answer (1)

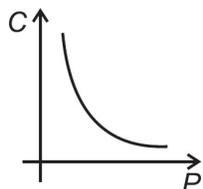
At constant temperature, according to Boyle's Law,

$$PV = \text{constant}$$

$$VdP + PdV = 0$$

$$VdP = -PdV$$

$$\frac{dV}{VdP} = \frac{1}{P}$$



So, graph will be rectangular hyperbola.

49. Answer (4)

$$T = 2\pi\sqrt{\frac{\ell}{g}}$$

$$L_1 = \frac{T_1^2 g}{4\pi^2}$$

$$L_2 = \frac{T_2^2 g}{4\pi^2}$$

$$L_1 + L_2 = \frac{T^2 g}{4\pi^2}$$

$$\frac{T^2 g}{4\pi^2} = \frac{T_1^2 g}{4\pi^2} + \frac{T_2^2 g}{4\pi^2}$$

$$T = \sqrt{T_1^2 + T_2^2}$$

50. Answer (3)

$$\Delta\phi = \frac{2\pi}{\lambda} \cdot \Delta x \Rightarrow \Delta x = \frac{\lambda}{2\pi} \cdot \Delta\phi$$

$$\Delta x = \frac{v}{f \cdot 2\pi} \cdot \frac{\pi}{3} = \frac{300}{600 \cdot 2\pi} \times \frac{\pi}{3} = \frac{1}{12} \text{ m}$$

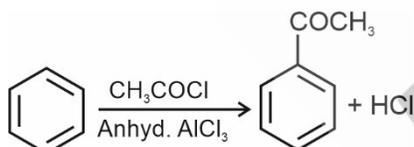
## CHEMISTRY

### SECTION - A

51. Answer (4)

- NH<sub>2</sub> has greater +M effect than -OCH<sub>3</sub>.
- N has lower electronegativity than O.

52. Answer (4)



This is an electrophilic substitution reaction.

53. Answer (2)

In Carius method AgX (X = Cl, Br, I) is precipitated.

54. Answer (4)

Chromatography is based upon the principle of adsorption.

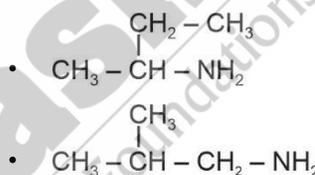
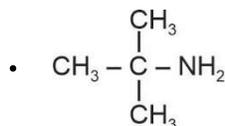
55. Answer (3)

Electron donating group like -CH<sub>3</sub>, decreases the acidity of compound.

56. Answer (1)

C<sub>4</sub>H<sub>11</sub>N:

- CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub>

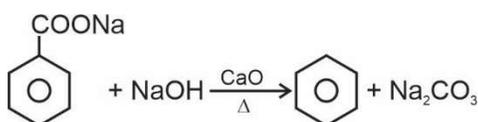


57. Answer (4)

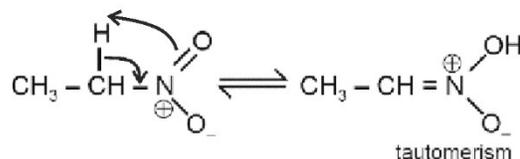
C<sub>8</sub>H<sub>8</sub> is non-planar compound. It has tub shaped structure therefore non-aromatic.

58. Answer (3)

Decarboxylation reaction.



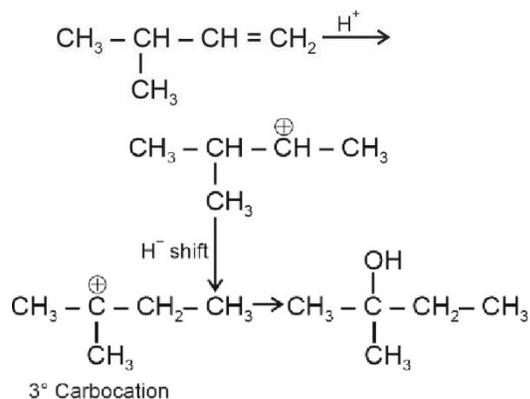
59. Answer (3)



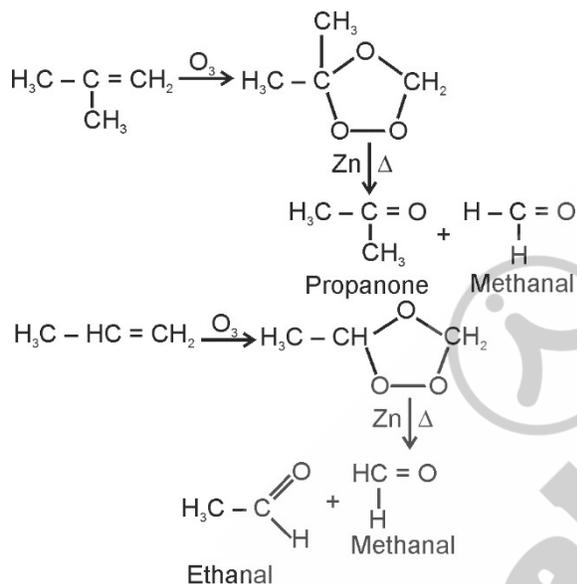
60. Answer (4)

Terminal alkynes have acidic hydrogen So, Pent-1-yne will give white precipitate with ammoniacal silver nitrate but Pent-2-yne will not.

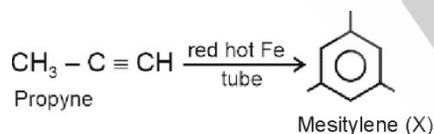
61. Answer (1)



62. Answer (2)



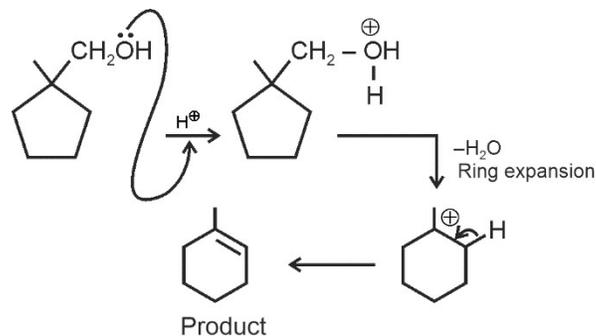
63. Answer (4)



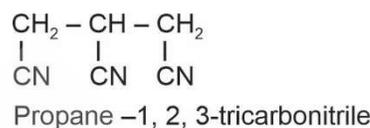
64. Answer (3)

|     |  |   |                    |
|-----|--|---|--------------------|
| (1) | $\text{CH}_3 - \text{CH}_2 - \overset{\text{CH}_3}{\text{CH}}$         | : | <i>sec</i> -Butyl  |
| (2) | $\text{CH}_3 - \overset{\text{CH}_3}{\text{CH}} - \text{CH}_2 -$       | : | Isobutyl           |
| (3) | $\text{H}_3\text{C} - \overset{\text{CH}_3}{\text{C}} -$               | : | <i>tert</i> -Butyl |
| (4) | $\text{H}_3\text{C} - \overset{\text{CH}_3}{\text{C}} - \text{CH}_2 -$ | : | Neopentyl          |

65. Answer (4)



66. Answer (4)



All three  $-\text{CN}$  groups are treated equivalent to each other.

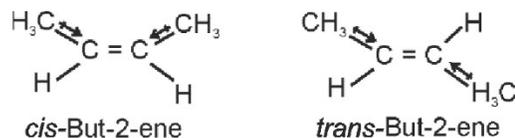
67. Answer (3)

$\text{H}_2\ddot{\text{O}}$  and  $\ddot{\text{N}}\text{H}_2 - \ddot{\text{N}}\text{H}_2$  have lone pair of electrons and hence can act as nucleophile. While  $\text{BF}_3$  and  $\text{AlCl}_3$  are electrophile.

68. Answer (1)

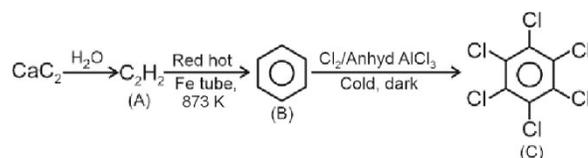
More number of withdrawing groups like  $-\text{NO}_2$  implies more acidic character.

69. Answer (3)

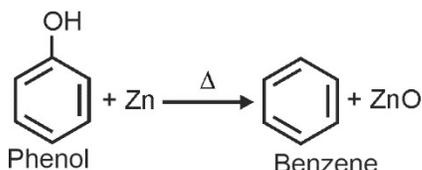
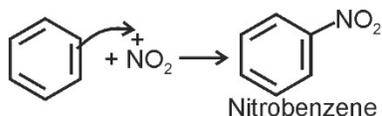
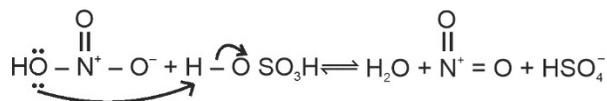


*cis*-but-2-ene is polar while *trans*-but-2-ene is non polar and more symmetrical. Due to symmetry, it has been observed that *trans*-but-2-ene has more melting point than that of *cis*-but-2-ene.

70. Answer (3)

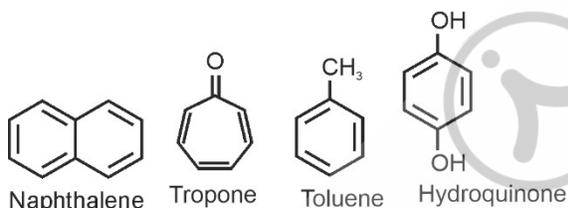


71. Answer (3)

**Step I:**

**Step II: Nitration of benzene:**


72. Answer (2)

The aromatic compound that does not have benzene ring in its structure are non-benzenoid aromatic compound.



73. Answer (1)

Greater is the number of hyperconjugation, more is the stability and less is the heat of hydrogenation.

74. Answer (3)

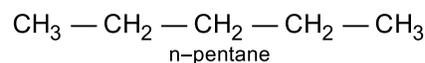
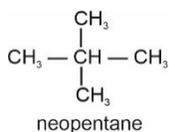
$\text{CH}_3 - \text{C}(=\text{O}) - \text{CH}_2 - \text{C}(=\text{O}) - \text{CH}_3$  has most enol content because of the presence of most acidic methylene group.

75. Answer (3)

 Alkanols :  $\text{C}_n\text{H}_{2n+2}\text{O}$ 

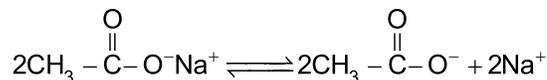
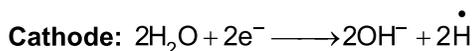
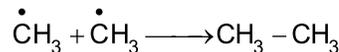
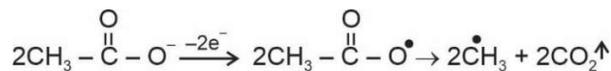
For  $n = 1$ , alkanol is  $\text{CH}_4\text{O}$  i.e.  $\text{CH}_3\text{OH}$ .

76. Answer (4)



neopentane has more branching and has lower boiling point.

77. Answer (2)


**Anode:**


78. Answer (3)

• 

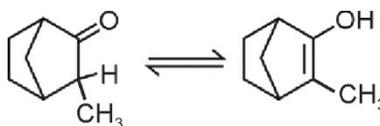
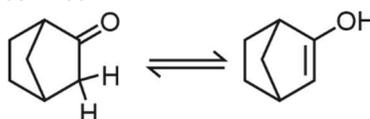
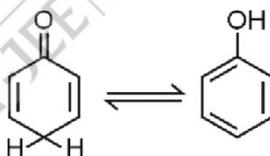
• 

• Benzene forms a triozone with excess of ozone.

•  $-\text{NHCOCH}_3$  is ring-activating group for electrophilic attack.

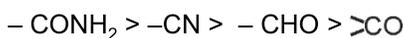
79. Answer (3)

Following molecules undergo tautomerism



80. Answer (4)

Priority order



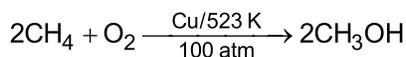
81. Answer (1)

Ammonium phosphomolybdate is  $(\text{NH}_4)_3\text{PO}_4 \cdot 12\text{MoO}_3$

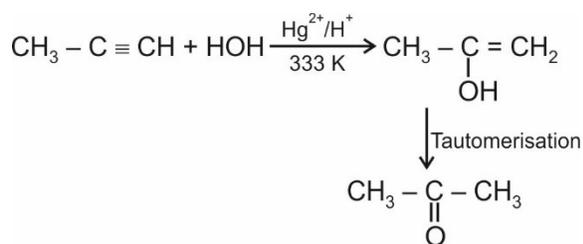
82. Answer (4)

Rate of halogens in halogenation of alkanes:  $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$

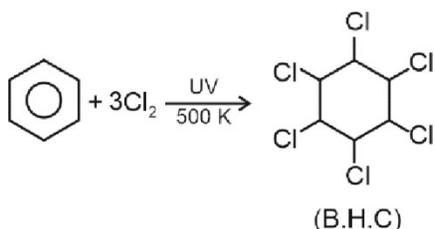
83. Answer (1)



84. Answer (2)



85. Answer (4)

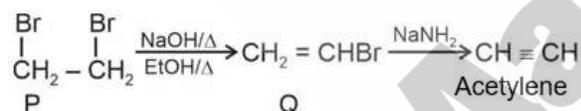
**SECTION - B**

86. Answer (2)

$$\text{Mass of S} = \frac{32 \times 0.233}{233} \text{ g} = 0.032 \text{ g}$$

$$\therefore \% \text{ mass of S} = \frac{0.032}{0.16} \times 100 = 20\%$$

87. Answer (4)

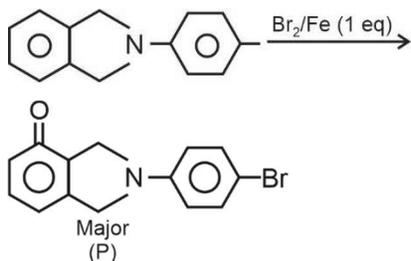


88. Answer (2)

- Resonance effect operates through  $\pi$  bond.
- Inductive effect is permanent effect.
- In allyl carbocation number of  $\alpha$  hydrogen is zero so no hyperconjugation.

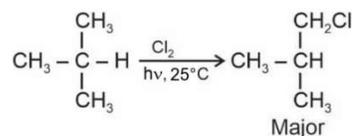
89. Answer (2)

—N< is an activating group for electrophilic aromatic substitution

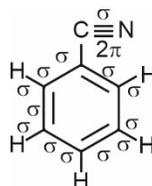


90. Answer (1)

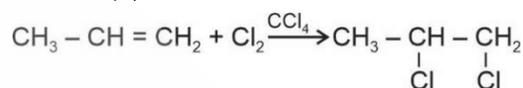
$$\frac{1^\circ \text{ product}}{3^\circ \text{ product}} = \frac{9 \times 1}{1 \times 5} = 9 : 5$$



91. Answer (4)

13 $\sigma$  and 5 $\pi$  bonds.

92. Answer (3)

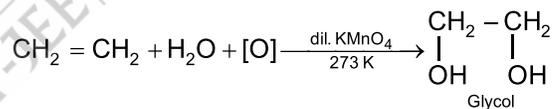


1, 2 - Dichloropropane.

93. Answer (2)

- Higher the torsional strain, lesser is the stability of conformation.
- Full eclipsed conformation is the least stable conformation of n-butane while the staggered form is its most stable conformer.

94. Answer (2)



95. Answer (3)

Alkene in which double bonded carbon atom contains different groups can show geometrical isomerism.

96. Answer (4)

|   |               |
|---|---------------|
| PbS   | Black         |
| Fe <sub>4</sub> [Fe(CN) <sub>6</sub> ] <sub>3</sub> | Prussian Blue |
| [Fe(SCN)] <sup>2+</sup>                             | Blood red     |
| AgI   | Yellow        |

97. Answer (1)

Less the acidity more the pK<sub>a</sub> value of an acid.

—I group attached to the carbon closest to carboxylate ion, stabilise it and carboxylic acid will be the more acidic and has least pK<sub>a</sub> and vice versa. Least acidic compound with highest pK<sub>a</sub> value is CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>COOH.

98. Answer (1)

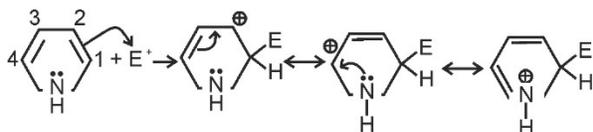
Milli equivalent of  $\text{NH}_3$  = Milli equivalent of  $\text{H}_2\text{SO}_4$   
 $= 10 \times 0.5 = 5$

% of nitrogen =  $\frac{1.4 \times 5}{1} = 7\%$

99. Answer (4)

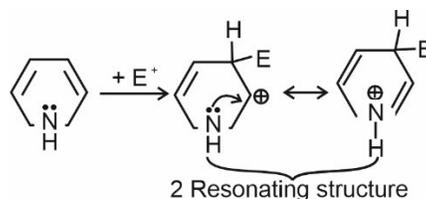
As the electron density is maximum at 1 and 4 position due to the formation of more stable intermediate.

For positions 1 or 4:



3-Resonating structures for electrophilic attack at 1 and 4 position

For position 2 or 3:



100. Answer (4)

Structural isomers with formula  $\text{C}_5\text{H}_{10}$  are(i)  $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$ (ii)  $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{CH}_3$ (iii)  $\text{CH}_3 - \text{C} = \text{CH} - \text{CH}_3$   
 $\quad \quad \quad |$   
 $\quad \quad \quad \text{CH}_3$ (iv)  $\text{CH}_3 - \text{CH} - \text{CH} = \text{CH}_2$   
 $\quad \quad \quad |$   
 $\quad \quad \quad \text{CH}_3$ (v)  $\text{CH}_2 = \text{C} - \text{CH}_2 - \text{CH}_3$   
 $\quad \quad \quad |$   
 $\quad \quad \quad \text{CH}_3$ 

## BOTANY

## SECTION - A

101. Answer (4)

In  $\text{C}_4$  plants photorespiration does not occur. This is because they have a mechanism that increases the concentration of  $\text{CO}_2$  at the enzyme site.

102. Answer (1)

Dark reactions (carbon reactions) of photosynthesis takes place in stroma of chloroplast.

103. Answer (1)

Priestley discovered oxygen in 1774. During his experiment, he concluded that a burning candle or an animal that breathe the air, both somehow, damage the air.

104. Answer (1)

Chlorophyll a is the chief pigment associated with photosynthesis.

105. Answer (2)

$\text{CO}_2$  fixation occurs during dark reaction of photosynthesis.

106. Answer (1)

Law of limiting factors was given by Blackman.

107. Answer (3)

Phosphoglycolate is formed during photorespiration.

108. Answer (1)

In  $\text{C}_4$  plants, primary  $\text{CO}_2$  fixation is catalysed by PEPcase enzyme.

109. Answer (4)

During  $\text{C}_4$  pathway, decarboxylation occurs in bundle sheath cells of leaves.

110. Answer (2)

Regeneration of the  $\text{CO}_2$  acceptor molecule RuBP is crucial if the cycle is to continue uninterrupted.

111. Answer (4)

Linear relationship between light intensity and rate of  $\text{CO}_2$  fixation occurs at lower light intensities.

112. Answer (4)

In chemiosmosis, proton gradient is broken down due to the movement of protons into the stroma through transmembrane channel of ATP synthase.

113. Answer (2)

Inner mitochondrial membrane is permeable to protons only in region of ATP synthase.

114. Answer (2)

During  $\text{C}_4$  pathway, OAA is formed in mesophyll cell.

115. Answer (4)

Bundle sheath cells of  $\text{C}_4$  plants have agranal chloroplasts.

116. Answer (3)

NADP reductase is located on the stroma side of thylakoid membrane.

117. Answer (4)

T.W. Engelmann has used *Cladophora* and aerobic bacteria.

118. Answer (2)

30 ATPs are required to produce the one glucose molecule from 6 CO<sub>2</sub> molecules in C<sub>4</sub> plants.

119. Answer (2)

Only alcoholic fermentation involves decarboxylase activity and releases CO<sub>2</sub>.

120. Answer (1)

Link reaction involves oxidative decarboxylation and catalysed by enzyme pyruvate dehydrogenase.

121. Answer (3)

Two-redox equivalents are removed (in the form of two hydrogen atoms) from PGAL and transferred to a molecule of NAD<sup>+</sup>. The direct synthesis of ATP from metabolites is called substrate level phosphorylation.

122. Answer (1)

Anoxygenic photosynthesis is observed in *Rhodospirillum*.

123. Answer (4)

Complex IV refers to cytochrome c oxidase complex containing cytochromes a and a<sub>3</sub>, and two copper centres.

124. Answer (3)

NAD<sup>+</sup>, Mg<sup>+2</sup> and coenzyme A are required for the activity of pyruvate dehydrogenase.

125. Answer (1)

Two decarboxylation reactions occur during one TCA cycle.

126. Answer (3)

Sucrose is converted into glucose and fructose by the enzyme invertase.

127. Answer (2)

Melvin Calvin is associated with C<sub>3</sub> cycle.

128. Answer (4)

$$RQ = \frac{\text{Volume of CO}_2 \text{ evolved}}{\text{Volume of O}_2 \text{ consumed}}$$

129. Answer (3)

The F<sub>1</sub> headpiece is a peripheral membrane protein complex and contains the site for synthesis of ATP.

130. Answer (4)

Alcoholic fermentation is catalysed by pyruvic acid decarboxylase and alcohol dehydrogenase.

Link reaction of respiration is catalysed by pyruvate dehydrogenase.

131. Answer (4)

RQ of substrates would be more than 1 if they have more O than C and H.

132. Answer (3)

In fermentation, there is a net gain of only 2 ATP molecules from a glucose molecule and it occurs under anaerobic conditions.

133. Answer (4)

Conversion of acetyl CoA to citric acid release CoA as by product.

134. Answer (2)

Fructose 1,6-bisphosphate  $\xrightarrow{\text{Aldolase}}$  DHAP + PGAL.

135. Answer (2)

Complex I of ETS in mitochondria contains FMN and Fe-S.

### SECTION - B

136. Answer (2)

Succinate dehydrogenase is located in inner mitochondrial membrane and converts succinic acid to fumaric acid. It is involved in ETS and requires FAD<sup>+</sup> for its functioning.

137. Answer (2)

The TCA cycle starts with the condensation of acetyl group with oxaloacetic acid (OAA) and water to yield citric acid.

138. Answer (2)

Both glycolysis and fermentation occurs in cytosol.

139. Answer (3)

Pure proteins or fats are never used as respiratory substrates.

140. Answer (2)

Oxygen acts as the final hydrogen acceptor in mitochondrial ETS.

141. Answer (4)

During photosynthesis, various products formed in different regions of chloroplast are as follows:

| Product        | Region          |
|----------------|-----------------|
| O <sub>2</sub> | Thylakoid lumen |
| Triose sugar   | Stroma          |
| NADPH          | Stroma          |
| ATP            | Stroma          |

142. Answer (3)

Correct sequence in ETS of thylakoid membrane is

PS-II → PQ → Cyt B6f → PC → PS-I

143. Answer (2)

PS I and PS II are interconnected through electron carriers.

Non-cyclic photophosphorylation occurs in granal thylakoids.

144. Answer (2)

RQ value for organic acid is more than unity because more CO<sub>2</sub> is evolved than O<sub>2</sub> consumed.

145. Answer (3)

Respiratory substrates are oxidised in multiple steps to release all the energy contained in them.

146. Answer (2)

H<sup>+</sup> ions are pumped into the thylakoid lumen during light reaction of photosynthesis.

147. Answer (2)

CF<sub>0</sub> is embedded in the thylakoid membrane and forms a transmembrane channel that carries out facilitated diffusion of protons across the membrane.

148. Answer (3)

Plants with Kranz anatomy are C<sub>4</sub> plants. They have activity of RuBisCO in bundle sheath cells.

149. Answer (4)

(a) First stable product is 3-phosphoglycerate (3C-compound) in C<sub>3</sub> pathway.

(b) First stable product is oxaloacetic acid (4C-compound) in C<sub>4</sub> pathway.

150. Answer (2)

Non-cyclic photophosphorylation produces ATP along with NADPH and it involves both PS I and PS II.

## ZOOLOGY

### SECTION - A

151. Answer (1)

Protonephridia or flame cells are the excretory structures in Platyhelminthes (Flatworms, e.g., *Planaria*), rotifers, some annelids and the cephalochordates – *Amphioxus*.

152. Answer (3)

Towards the centre of the inner concave surface of the kidney is a notch called hilum through which ureter, blood vessels and nerves enter.

153. Answer (4)

The renal tubule begins with a double walled cup-like structure called Bowman's capsule, which encloses the glomerulus. The glomerular capillary blood pressure causes filtration of blood through 3 layers, i.e., the endothelium of glomerular blood vessels, the epithelium of Bowman's capsule and a basement membrane between these two layers.

154. Answer (2)

Substances like glucose, amino acids, Na<sup>+</sup>, etc., in the filtrate are reabsorbed actively whereas the nitrogenous wastes are absorbed by passive

transport. Reabsorption of water also occurs passively in the initial segments of the nephron.

155. Answer (2)

The cells of proximal tubule prevent the pH of urine from becoming too acidic by secreting ammonia. The transfer of fluid from the glomerulus to Bowman's capsule is mainly a consequence of blood pressure in the capillaries of the glomerulus.

156. Answer (4)

The coordinated movements of cilia in the trachea help us in removing dust particles and some of the foreign substances inhaled alongwith the atmospheric air. In *Paramoecium*, cilia help in the movement of food through cytopharynx and in locomotion as well. *Hydra* can use its tentacles for capturing its prey and also use them for locomotion.

157. Answer (1)

Cells of the human body exhibit three main types of movements, namely, amoeboid, ciliary and muscular. Flagellar movement helps in the swimming of human spermatozoa.

158. Answer (2)

Skeletal muscles are primarily involved in locomotory actions and changes of body postures while visceral muscles assist in the transportation of food through the digestive tract and gametes through the genital tract. Cardiac muscles are the muscles of heart.

159. Answer (2)

Femur (thigh bone – the longest bone), tibia and fibula, tarsals (ankle bones – 7 in number), metatarsals (5 in number) and phalanges (digits – 14 in number) are the bones of the legs (hind limb).

Gliding joint is present between tarsals.

160. Answer (1)

Tetany: Rapid spasms (wild contractions) in muscle due to low  $\text{Ca}^{++}$  in body fluid. So, tetany may be caused due to hyposecretion of PTH.

161. Answer (2)

The cerebral cortex contains motor areas, sensory areas and large regions that are neither clearly sensory nor motor in function. These regions called the association areas are responsible for complex functions like intersensory associations, memory and communication.

162. Answer (3)

The rise in the stimulus-induced permeability to  $\text{Na}^+$  is extremely short lived. It is quickly followed by a rise in permeability to  $\text{K}^+$ . Within a fraction of a second,  $\text{K}^+$  diffuses outside the membrane and restores the resting potential of the membrane at the site of excitation and the fibre becomes once more responsive to further stimulation.

163. Answer (1)

Myelinated nerve fibres are found in spinal and cranial nerves. Unmyelinated nerve fibre is enclosed by a Schwann cell that does not form a myelin sheath around the axon, and is commonly found in autonomous and the somatic neural systems.

The axons transmit nerve impulses away from the cell body to a synapse or to a neuromuscular junction.

164. Answer (3)

The somatic neural system relays impulses from the CNS to skeletal muscles while the autonomic neural system transmits impulses from the CNS to the involuntary organs and smooth muscles of the body.

165. Answer (2)

The brain is the central information processing organ of our body, and acts as the 'command and control system'. It controls the voluntary movements, balance of the body, functioning of vital involuntary organs (e.g., lungs, heart, kidneys, etc.), thermoregulation, hunger and thirst, circadian (24-hour) rhythms of our body, activities of several endocrine glands and human behaviour. It is also the site for processing of vision, hearing, speech, memory, intelligence, emotions and thoughts.

166. Answer (3)

Uric acid requires minimum amount of water for its excretion.

Materials are returned to the blood from the filtrate by the process named selective reabsorption.

167. Answer (1)

During urine formation, the tubular cells secrete substances like  $\text{H}^+$ ,  $\text{K}^+$  and ammonia into the filtrate. Tubular secretion is also an important step in urine formation as it helps in the maintenance of ionic and acid base balance of body fluids.

168. Answer (2)

Ammonia produced by metabolism is converted into urea in the liver of ureotelic animals and is released into the blood which is filtered and excreted out by the kidneys.

169. Answer (4)

Scapula is a large triangular flat bone situated in the dorsal part of the thorax between the second and the seventh ribs.

Sternum is a flat bone on the ventral midline of thorax.

170. Answer (2)

Myoglobin content is high in some of the muscles which gives them a reddish appearance. Such muscles are called the 'Red fibres'. These muscles also contain plenty of mitochondria which can utilise the large amount of oxygen stored in them for ATP production. These muscles, therefore, can also be called aerobic muscles. On the other hand, some of the muscles possess very less quantity of myoglobin and therefore, appear pale or whitish. These are the 'White fibres'. Number of mitochondria are also few in them, but the amount of sarcoplasmic reticulum is high. They depend on anaerobic process for energy.

171. Answer (3)

Smooth and cardiac muscles are involuntary muscles. Cardiac muscles possess branched muscle fibres but smooth muscles possess unbranched muscle fibres.

172. Answer (1)

Each actin (thin) filament is made of two 'F' (filamentous) actins helically wound to each other. Each 'F' actin is a polymer of monomeric 'G' (Globular) actins. Two filaments of another protein, tropomyosin also run close to the 'F' actins throughout its length. A complex protein troponin is distributed at regular intervals on the tropomyosin. In the resting state, a subunit of troponin masks the active binding sites for myosin on the actin filaments

173. Answer (2)

A neural signal reaching the neuromuscular junction releases a neurotransmitter (Acetyl choline) which generates an action potential in the sarcolemma.

174. Answer (4)

Kidney is differentiated into outer cortex and inner medulla. Medullary pyramids project into calyces.

175. Answer (3)

Skin, lungs, liver, sweat glands and sebaceous glands are considered as accessory excretory structures in humans.

176. Answer (2)

Movement is one of the significant features of living beings. Running, climbing, swimming, flying are some of the examples of locomotory movements.

177. Answer (4)

Conductivity (impulse conduction) is a property of both nerve fibres and muscle fibres. Contractility is unique property of muscle fibres. Elasticity is common feature of both muscles and yellow elastic fibres of connective tissue.

178. Answer (4)

Electrical synapses may allow two-way transmission of impulses.

179. Answer (2)

Bipolar neuron contains single axon and single dendrite only.

180. Answer (2)

Fourth ventricle of the brain is not present in midbrain and spinal cord. Midbrain, pons and medulla forms the brain stem.

181. Answer (3)

Depolarisation can't occur simultaneously at point A and C.

182. Answer (1)

Pia mater is the innermost cranial meninx.

183. Answer (1)

A deep cleft divides the cerebrum longitudinally into two halves, which are termed as the left and right cerebral hemispheres. The hemispheres are connected by a tract of nerve fibres called corpus callosum.

184. Answer (1)

Uremia is a condition of accumulation of urea in blood. Urea is removed from the body with the help of dialysing unit called artificial kidney. This process is termed as hemodialysis.

185. Answer (4)

On the basis of striations, muscles are classified as striated and unstriated. On the basis of their regulation, muscles are classified into two categories – voluntary and involuntary.

#### SECTION - B

186. Answer (4)

Amount of blood passes per minute to kidneys is called renal blood flow; plasma which is filtered per minute is called renal plasma flow. Ratio of GFR to RPF is called filtration fraction.

187. Answer (1)

Blood filtered by kidneys = 1100-1200 mL/min.  
which is nearly  $1/5^{\text{th}}$  of the cardiac output  
GFR = 125 mL/min *i.e.*, 80 L/day

188. Answer (4)

Almost whole plasma except plasma proteins are filtered through filtration slits of podocytes.

189. Answer (4)

Meromyosin is monomeric protein present in myosin filament. Bundle of muscle fibres is called fascicle.

190. Answer (2)

HMM is also called cross arm which consists of head and short arm. LMM is also called tail of meromyosin.

191. Answer (2)

$\text{Ca}^{+2}$  ions are pumped back to the sarcoplasmic cisternae resulting in the masking of actin filaments by troponin-tropomyosin complex.

192. Answer (3)

Dialysing fluid contains all the constituents as in plasma except nitrogenous wastes.

193. Answer (3)

Total number of cranial + facial bones in humans = 22

Facial bones = 14 = 6 paired + 2 unpaired

Cranial bones = 8 = 2 paired + 4 unpaired

Total number of bones → 8 paired + 6 unpaired = 22

194. Answer (1)

Neural organisation of *Hydra* contains apolar neurons.

195. Answer (2)

Brain stem forms the connection between brain and the spinal cord.

196. Answer (3)

Mediastinum is the space between lungs. Rib cage is a part of axial skeleton. Thorax is an air-tight chamber.

197. Answer (4)

Joints are the points of contact between bones or between bones and cartilages.

198. Answer (4)

Hepatic vein drains blood from the liver and thus contains maximum amount of urea.

199. Answer (4)

Facultative reabsorption of water occurs in DCT and CD under the influence of ADH.

200. Answer (1)

At nodes of Ranvier, the myelin sheath is absent, but neurilemma is present outside the axolemma.



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**Edition: 2024-25**

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