

**SAMPLE PAPER - 107**

Time : 1 : 15 Hr.

Question : 60

**PHYSICS**

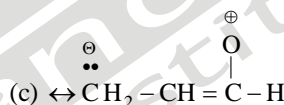
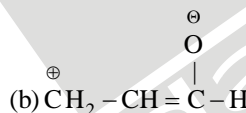
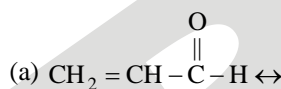
01. Electron in hydrogen atom first jumps from third excited state to second excited state and then from second excited to the first excited state. The ratio of the wavelengths  $\lambda_1 : \lambda_2$  emitted in the two cases is
- (1)  $\frac{7}{5}$       (2)  $\frac{27}{20}$       (3)  $\frac{27}{5}$       (4)  $\frac{20}{7}$
02. The temperature dependence of resistance of Cu and undoped Si in the temperature range 300 – 400 K is best described by
- (1) linear increase for Cu, exponential decrease for Si  
 (2) linear decrease for Cu, linear decrease for Si  
 (3) linear increase for Cu, linear increase for Si  
 (4) linear increase for Cu, exponential increase for Si
03. The red light of a wavelength 6400 Å in the air has a wavelength of 4000 Å in glass. If the wavelength of violet light in air is 4400 Å, then the wavelength in the glass is ( $\mu_{\text{violet}} = \mu_{\text{red}}$ )
- (1) 2570 Å      (2) 2750 Å  
 (3) 1600 Å      (4) 2510 Å
04. A body of mass  $m$  slides down an incline and reaches the bottom with a velocity  $v$ . If the same mass were in the form of a ring which rolls down this incline, the velocity of the ring at bottom would have been:
- (1)  $v$       (2)  $\sqrt{2} v$       (3)  $\frac{1}{\sqrt{2}} v$       (4)  $\sqrt{\frac{2}{5}} v$
05. A thin horizontal circular disc is rotating about a vertical axis passing through its centre. An insect is at rest at a point near the rim of the disc. The insect now moves along a chord of the disc to reach its other end near rim. During the journey of the insect, the angular speed of the disc.
- (1) remains unchanged  
 (2) first decreases and then increases  
 (3) first increases and then decreases  
 (4) continuously increases
06. A transverse harmonic wave on a string is described by  $y(x,t) = 3.0 \sin(36t + 0.018x + \pi/4)$  where  $x$  and  $y$  are in cm and  $t$  is in s. The positive direction of  $x$  is from left to right.
- (I) The wave is travelling from right to left  
 (II) The speed of the wave is 20 m/s  
 (III) Frequency of the wave is 5.7 Hz.  
 (IV) The least distance between two successive crests in the wave is 2.5 cm.
- The correct options are :
- (1) I, II only      (2) I, III only  
 (3) I, II, III only      (4) all
07. Two conducting plates A and B are placed parallel to each other at a small distance between them. Plate A is given a charge  $q_1$  and plate B is given a charge  $q_2$ . Then
- (1) the outer surfaces of A and B get no charge  
 (2) the inner surfaces of A and B get all the charge  
 (3) the inner surfaces of A and B get equal and opposite charge of magnitude  $\left| \frac{q_1 - q_2}{2} \right|$   
 (4) the outer surfaces of A and B get charge of the same polarity and of the magnitude  $\left| \frac{q_1 - q_2}{2} \right|$
08. In vibration magnetometer if length of a thin bar magnetic is shortened to  $\frac{1}{4}$  times keeping its cross-sectional area constant, then time period will become
- (1)  $\frac{1}{2}$  times      (2) 4 times  
 (3) 2 times      (4)  $\frac{1}{4}$  times
09. The inductance of a coil is  $L = 10$  H and resistance  $R = 5\Omega$ . If applied voltage of battery is 10 V and it switches OFF in 1ms, then find the value of induced emf of inductor
- (1)  $2 \times 10^4$  V  
 (2)  $1.2 \times 10^4$  V  
 (3)  $2 \times 10^{-4}$  V  
 (4) None of these

10. The moment of inertia of a uniform disc about an axis perpendicular to plane and through centre is  $\frac{1}{2} MR^2$  ( $M$  = mass,  $R$  = radius of disc). If the disk is rolling on its edge without slipping on a straight line path, then the ratio of rotational kinetic energy to translational one is :
- (1) 1      (2)  $\frac{1}{2}$       (3)  $\frac{1}{4}$       (4)  $\frac{1}{8}$
11. A body moves with speed  $V_1$  for distance  $L$  and then with speed  $V_2$  for distance  $2L$ . The average speed for the motion is
- (1)  $\frac{V_1 + V_2}{2}$       (2)  $\frac{3V_1V_2}{V_1 + 2V_2}$   
 (3)  $\frac{3V_1V_2}{2V_1 + V_2}$       (4)  $\frac{3V_1V_2}{V_1 + V_2}$
12. A stone of mass 0.3 kg attached to a 1.5 m long string is whirled around in a horizontal circle on a frictionless table at a speed of  $6 \text{ ms}^{-1}$ . The tension in the string is
- (1) 10 N      (2) 20 N  
 (3) 7.2 N      (4) None of these
13. A coin placed on a rotating table just slips if it is placed at a distance  $4r$  from the centre. If we double the angular velocity of the table, then the coin will just slip when it is away from the centre at a distance equal to
- (1)  $4r$       (2)  $2r$       (3)  $r$       (4)  $r/4$
14. An elevator weighing 6000 kg is pulled upwards by a cable with an acceleration of  $5 \text{ ms}^{-2}$ . Taking  $g$  to be  $10 \text{ ms}^{-2}$ , the tension in the cable is
- (1) 6000 N      (2) 9000 N  
 (3) 60000 N      (4) 90000 N
15. A pendulum of length 1 m is released from  $\theta = 60^\circ$ . The rate of change of speed of the bob, at  $\theta = 30^\circ$ , is ( $g = 10 \text{ ms}^{-2}$ )
- (1)  $10 \text{ m s}^{-2}$       (2)  $7.5 \text{ m s}^{-2}$   
 (3)  $5 \text{ m s}^{-2}$       (4)  $5\sqrt{3} \text{ m s}^{-2}$

## CHEMISTRY

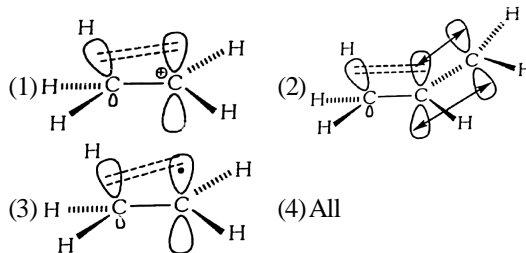
16. Atomic radii of Zr (160 pm) and Hf (159 pm) is a consequence of—
- (1) Transition contraction  
 (2) Inert pair effect  
 (3) poor shielding of 4f electrons  
 (4) Actinoid contraction
17. Bond order increases in which of the cases given below?
- (1)  $\text{CO} \rightarrow \text{CO}^+$       (2)  $\text{N}_2 \rightarrow \text{N}_2^-$   
 (3)  $\text{O}_2 \rightarrow \text{O}_2^{2-}$       (4)  $\text{H}_2 \rightarrow \text{H}_2^-$

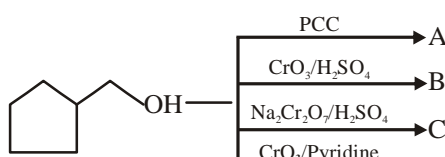
18. Which statement is not true about  $\text{N}_2\text{O}_5$ ?
- (1) It is anhydride of  $\text{HNO}_3$   
 (2) In solid state it exists as  $\text{NO}_2^+\text{NO}_3^-$   
 (3) It is structurally similar to  $\text{P}_4\text{O}_{10}$   
 (4) It can be prepared by heating  $\text{HNO}_3$  over  $\text{P}_2\text{O}_5$
19. Select the correct statement(s) given below for amorphous form of carbon:
- (I) Carbon-black, coke and charcoal are impure amorphous allotropes of carbon.  
 (II) Carbon-black is obtained by burning hydrocarbons or high carbon-content oils in limited supply of air.  
 (III) Charcoal and coke are obtained by heating wood or coal respectively at high temperature in the absence of air.
- (1) (I) only      (2) (I) and (II)  
 (3) (I) and (III)      (4) All (I), (II) and (III)
20. Correct order of stability of the following resonating structure is



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

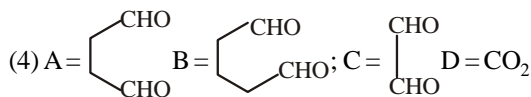
21. Hyperconjugation can be represented as:



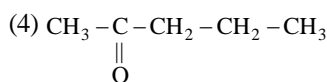
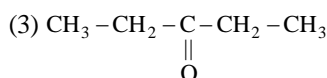
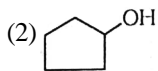
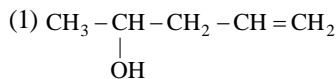
22. 

Identify A, B, C and D

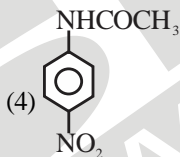
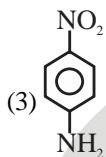
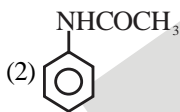
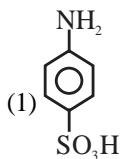
- (1)  $\text{A} = \text{D} = \text{Cyclopentyl-CHO}$  ;  $\text{B} = \text{C} = \text{Cyclopentyl-COOH}$   
 (2)  $\text{A} = \text{D} = \text{Cyclopentyl-COOH}$  ;  $\text{B} = \text{C} = \text{Cyclopentyl-CHO}$   
 (3)  $\text{A} = \text{B} = \text{Cyclopentyl-COOH}$  ;  $\text{C} = \text{D} = \text{Cyclopentyl-CHO}$



23. An organic compound contains 69.77% carbon, 11.63% hydrogen and rest of oxygen. The molecular mass of the compound is 86. It does not reduce tollen's reagent but forms an addition compound with sodium hydrogen sulphite and gives positive iodoform test. On vigorous oxidation it gives ethanoic acid and propanoic acid. The possible structure of the compound is:



24. Aniline on acetylation followed by treatment with nitrating mixture gives a product which on hydrolysis gives compound 'X'. X is



25. 'A'  $\xrightarrow{\text{Br}_2 + \text{NaOH}}$   $\text{CH}_3 - \underset{\text{CH}_3}{\text{CH}} - \text{CH}_2 - \text{NH}_2$  Find out the

Reduction Product of 'A'

- (1) Iso Amyl amine (2) Active amyl amine  
(3) Active Iso amine (4) Tertiary amyl amine

26. The values of observed and calculated molecular weights of silver nitrate are 92.64 and 170, respectively. The degree of dissociation of silver nitrate is  
(1) 60% (2) 83.5% (3) 46.7% (4) 60.23%

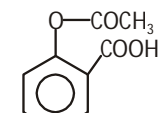
27. Two moles of zinc is dissolved in HCl at 25°C. The work done in open vessel is  
(1) -2.477 kJ (2) -4.955 kJ  
(4) 0.0489 kJ (3) none

28.  $\text{CH}_3 - \text{CO} - \text{CH}_3(\text{g}) \rightleftharpoons \text{CH}_3 - \text{CH}_3(\text{g}) + \text{CO}(\text{g})$   
Initial pressure of  $\text{CH}_3\text{COCH}_3$  is 100 mm. When equilibrium is set up, mole fraction of  $\text{CO}(\text{g})$  is 1/3. Hence,  $K_p$  is

- (1) 100 mm (2) 50 mm  
(3) 25 mm (4) 150 mm

29. 2 mol  $\text{PCl}_5$ , 1 mol  $\text{Cl}_2$  and 1 mol  $\text{PCl}_3$  are taken in 1 L flask. When equilibrium is set up,  $\text{PCl}_5$  is found to 50% dissociated into the products. Hence,  $K_c$  is

- (1) 4 mol L<sup>-1</sup> (2) 1.5 mol L<sup>-1</sup>  
(3) 1 mol L<sup>-1</sup> (4) 0.17 mol L<sup>-1</sup>

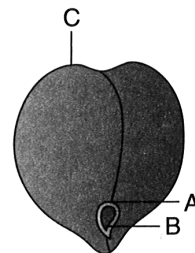
30.  (aspirin) is a pain reliever with  $\text{pK}_a = 2$

Two tablets each containing 0.09 g of aspirin are dissolved in 100 mL solution. pH will be (molar mass of aspirin = 180)

- (1) 0.5 (2) 1.0  
(3) 0.0 (4) 2.0

## BOTANY

31. In a ring girdled plant  
(1) The shoot and root die together  
(2) Neither root nor shoot will die  
(3) The shoot dies first  
(4) The root dies first
32. Which product of glycolysis is consumed in alcoholic fermentation?  
(1) NADH + H<sup>+</sup> (2) ATP  
(3) ATP and NADH + H<sup>+</sup> (4) CO<sub>2</sub>
33. Abscisic acid is called stress hormone as it  
(1) Induces flowering  
(2) Breaks seed dormancy  
(3) Promotes leaf fall  
(4) Promotes stomatal closure
34. Identify A to C in dicotyledonous seed.



- (1) A-Hilum, B-Micropyle, C-Seed coat  
(2) A-Seed coat, B-Hilum, C-Micropyle  
(3) A-Micropyle, B-Seed coat, C-Hilum  
(4) A-Micropyle, B-Hilum, D-Seed coat

35. Which one of the following organisms is correctly matched with its three characteristics?  
 (1) Tomato: Twisted aestivation, Axile placentation, Berry  
 (2) Onion: Bulb, Valvate aestivation, Axile placentation  
 (3) Maize:  $C_3$  pathway, closed vascular bundles, Scutellum  
 (4) Pea:  $C_3$  pathway, Endospermic seed, Vaxillary aestivation

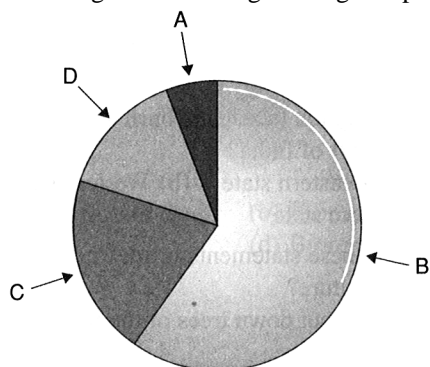
36. Choose the correct sequence representing the ploidy of Nucellus; Megaspore mother cell; Megaspore; Egg cell; Zygote; A polar nucleus of embryo sac; Secondary nucleus and primary endosperm nucleus.  
 (1)  $n$ ;  $2n$ ;  $2n$ ;  $n$ ;  $2n$ ;  $n$ ;  $2n$ ; and  $3n$   
 (2)  $2n$ ;  $2n$ ;  $n$ ;  $2n$ ;  $n$ ;  $2n$ ;  $3n$ ; and  $3n$   
 (3)  $2n$ ;  $2n$ ;  $n$ ;  $n$ ;  $2n$ ;  $n$ ;  $2n$ ; and  $3n$   
 (4)  $2n$ ;  $n$ ;  $n$ ;  $2n$ ;  $3n$ ;  $2n$ ;  $n$ ; and  $3n$

37. The name of Norman Borlaug is associated with:  
 (1) White Revolution (2) Green Revolution  
 (3) Yellow Revolution (4) Blue Revolution

38. Fill in the blanks A, B, C, and D respectively

Species A	Species B	None of interaction
+	+	Mutualism
-	-	___A___
+	-	___B___
+	-	Parasitism
+	0	___C___
-	0	___D___

- (1) A-Commensalism, B-Predation, C-Amensalism, D-Competition  
 (2) A-Predation, B-Parasitism, C-Commensalism, D-Amensalism  
 (3) A-Competition, B-Predation, C-Commensalism, D-Amensalism  
 (4) A-Competition, B-Predation, C-Amensalism, D-Commensalism
39. Out of the total cost of various ecosystem services, the soil account for \_\_\_\_\_%, recreation and nutrient cycling are less than \_\_\_\_\_% each and climate regulation and habitat for wildlife is about \_\_\_\_\_% each.  
 (1) 50, 6, 10 (2) 50, 10, 6  
 (3) 50, 30, 20 (4) 20, 30, 50
40. What is the relative contribution (A, B, C, D) of various greenhouse gases according to the given pi-chart? A



- (1) A- $N_2O$  (6%), B-Carbon dioxide (60%), C-Methane (20%), D-CFCs (14%).  
 (2) A-Methane (20%), B-CFCs (14%), C- $N_2O$  (6%), D-Carbon dioxide (60%).  
 (3) A-Carbon dioxide (6%), B- $N_2O$  (6%), C-Methane (20%), D-CFCs (14%).  
 (4) A-CFCs (14%), B-Carbon dioxide (60%), C-Methane (20%), D- $N_2O$  (6%).

41. The process of guttation takes place :  
 (1) when the root pressure is high and the rate of transpiration is low  
 (2) when the root pressure is low and the rate of transpiration is high  
 (3) when the root pressure equals the rate of transpiration  
 (4) when the root pressure as well as rate of transpiration are high

42. Match the followings and choose the correct option:

- |                      |                                  |
|----------------------|----------------------------------|
| (A) Leaves           | (i) Anti-transpirant             |
| (B) Seeds            | (ii) Transpiration               |
| (C) Roots            | (iii) Negative osmotic potential |
| (D) Aspirin          | (iv) Imbibition                  |
| (E) Plasmolyzed cell | (v) Absorption                   |
- (1) (A)-(iii), (B)-(iv), (C)-(i), (D)-(ii), (E)-(v)  
 (2) (A)-(ii), (B)-(iv), (C)-(v), (D)-(i), (E)-(iii)  
 (3) (A)-(iii), (B)-(ii), (C)-(iv), (D)-(i), (E)-(v)  
 (4) (A)-(iii), (B)-(ii), (C)-(i), (D)-(iv), (E)-(v)

43. Match the element with its associated functions/roles and choose the correct option among given below :

- |                |   |
|----------------|---|
| (1) Boron      | (i) Splitting of $H_2O$ to liberate $O_2$ during photosynthesis |
| (2) Manganese  | (ii) Needed for synthesis of auxins                             |
| (3) Molybdenum | (iii) Component of nitrogenase                                  |
| (4) Zinc       | (iv) Pollen germination   |
| (E) Iron       | (v) Component of ferredoxin                                     |
- (1) (1)-(i), (2)-(ii), (3)-(iii), (4)-(iv), (E)-(v)  
 (2) (1)-(iv), (2)-(i), (3)-(iii), (4)-(ii), (E)-(v)  
 (3) (1)-(iii), (2)-(ii), (3)-(iv), (4)-(v), (E)-(i)  
 (4) (1)-(ii), (2)-(iii), (3)-(v), (4)-(i), (E)-(iv)

44. Which light range is least effective in photosynthesis?

- (1) Blue (2) Green  
 (3) Red (4) Motet

45. The reaction that is responsible for the primary fixation  $CO_2$  is catalysed by

- (1) RuBP carboxylase  
 (2) PEP carboxylase  
 (3) RuBP carboxylase and PEP carboxylase  
 (4) PGA synthase

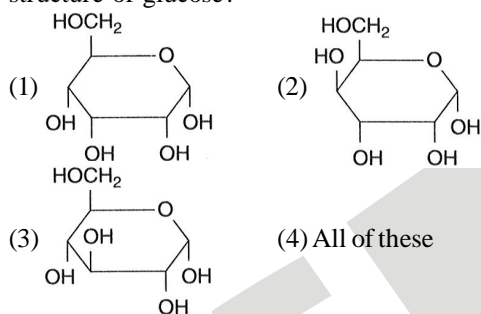


## ZOOLOGY

46. The intestine and stomach in mammals are lined by  
 (1) Cuboidal epithelium (2) Columnar epithelium  
 (3) Squamous epithelium (4) Stratified epithelium
47. Osteomalacia is due to deficiency of :  
 (1) vitamin-A (2) vitamin-C  
 (3) vitamin-E (4) vitamin-D
48. The below diagram shows \_\_\_\_\_ symmetry, which is also found in the following group of organisms.



- (1) Radial, Adamsia, Asterias, Aplysia  
 (2) Bilateral, Salpa, Hyla, Calotes  
 (3) Bilateral Taenia, Ctenoplana, Antedon  
 (4) Radial, Doliolum, Gorgonia, Sycon
49. Which of the following represents the correct Haworth structure of glucose?



50. Match the columns.

	Column-I (Category)		Column-II (Secondary metabolites)
(A)	Pigments	(1)	Concanavalin A
(B)	Terpenoids	(2)	Monoterpenes, Diterpenes
(C)	Alkaloids	(3)	Morphine, Codeine
(D)	Lectins	(4)	Carotenoids, Anthocyanin
(E)	Toxins	(5)	Abrin, Ricin
(F)	Drugs	(6)	Vinblastine, Curcumin

- (1) A-1, B-3, C-2, D-4, E-5, F-6  
 (2) A-4, B-2, C-3, D-1, E-5, F-6  
 (3) A-6, B-3, C-5, D-2, E-4, F-1  
 (4) A-1, B-2, C-3, D-4, E-5, F-6

51. The total thickness of respiratory diffusion membrane is  
 (1) Less than fm  
 (2) Less than micrometre  
 (3) Much less than mm  
 (4) Less than nm
52. Which of the following statement is correct about pseudopodia?  
 (1) Formed by streaming of protoplasm  
 (2) Formed in amoeba and neutrophil  
 (3) Both (1) and (2) (4) None of these

53. Foetal limbs and digits are formed in the \_\_\_\_\_ month of embryonic development.  
 (1) 4<sup>th</sup> (2) 2<sup>nd</sup> (3) 3<sup>rd</sup> (4) 7<sup>th</sup>
54. Which of these options is correct with regards to statements X and Y?  
 Statement X: Some STDs do not show symptoms in females.  
 Statement Y: Some STDs in females may remain undetected for long time.  
 (1) Statement 'X' and 'Y' are correct and 'X' is the correct explanation for 'Y'.  
 (2) Only statement 'X' is correct.  
 (3) Only statement 'Y' is correct.  
 (4) Statement 'X' and 'Y' are correct.
55. The Bt-toxin is not toxic to human beings because  
 (1) The pro Bt-toxin inactivation requires above human body temperature  
 (2) The Bt-toxin recognizes only insect specific target  
 (3) The Bt-toxin formation from pro Bt-toxin requires pH lower than that present in the human stomach  
 (4) Conversion of pro Bt-toxin to Bt-toxin takes place only in highly alkaline conditions
56. The major inorganic component of vertebrate bone is  
 (1) sodium chloride (2) calcium carbonate  
 (3) calcium phosphate (4) magnesium phosphate
57. Vitamin K is required for  
 (1) synthesis of prothrombin  
 (2) formation of thromboplastin  
 (3) conversion of fibrinogen to fibrin  
 (4) conversion of prothrombin to thrombin
58. Blood does not clot inside the vessels because  
 1. Constant speedy flow of blood prevents accumulation of fibrin threads, if at all formed  
 2. Absence of heparin, an anticoagulant having antithrombin activity, in blood  
 3. Smoothness of the endothelial lining prevents rupture by platelets and formation of thromboplastin from them.  
 4. Presence of monomolecular layer of negatively charged protein adsorbed to the inner surface of endothelium, which attracts the clotting factors  
 (1) 1 and 2 are correct (2) 2 and 4 are correct  
 (3) 1 and 3 are correct (4) 1,2 and 3 are correct
59. Wharton's duct is associated with  
 (1) Sublingual salivary gland  
 (2) Parotid salivary gland  
 (3) Submaxillary salivary gland  
 (4) Brunner's gland
60. A certain person is eating boiled potato. One of the food components in it is  
 (1) Lactose which is indigestible  
 (2) Starch which does not get digested  
 (3) DNA which gets digested by pancreatic DNase  
 (4) Cellulose which is digested by cellulase