

Test Booklet Code

**A**

**PCE-2009**

Test Booklet No.

**809301**

This booklet contains 32 pages.

**DO NOT open this Test Booklet until you are asked to do so.**

**Important Instructions :-**

1. The PHYSICS & CHEMISTRY test consists of **80** questions. Each question carries **1** mark. For each correct response the candidate will get **1** mark. For each incorrect response,  $\frac{1}{4}$  mark will be deducted. The maximum mark is **80**.
2. The Test is of **2 hours** duration.
3. Use **Black Ball Point Pen only** for writing particulars on OMR Answer Sheet marking  
• responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must handover the Answer Sheet to the Invigilator in the Room / Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **A**. Make sure that the CODE printed on the Answer Sheet is the same as that on this booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidate should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet.
8. Do not write your Seat No. anywhere else, except in the specified space in the Test Booklet / Answer Sheet.
9. Use of White fluid for correction is not permissible on the Answer Sheet.
10. Each candidate must show on demand his / her Admission Card to the Invigilator.
11. No candidate, without special permission of the Superintendent or Invigilator, should leave his / her seat.
12. Use of Manual Calculator is permissible.
13. The candidate should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and must sign the Attendance Sheet (Patrak - 01). Cases where a candidate has **not** signed the Attendance Sheet (Patrak-01) be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.
14. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
15. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
16. The candidates will write the Correct Test Booklet Code as given in the Test Booklet / Answer Sheet in the Attendance Sheet. (Patrak-01)

Candidate's Name .....

Exam. Seat No.(in figures) ..... (in words) .....

Name of Exam. Centre .....Exam. Centre No. : .....

Test Booklet Code : ..... Test Booklet No. : .....

Candidate's Sign ..... Block Supt. Sign .....

# PHYSICS

1. The potential energy of system of two equal negative point charges of  $2\mu\text{C}$  each held 1m apart in air is .....

( $k = 9 \times 10^9$  SI unit)

- (A)  $3.6 \times 10^{-3}$  J                      (B)  $3.6 \times 10^{-2}$  J  
(C) 36 J                                      (D) 3.6 J

2. Torque acting on an electric dipole in a uniform electric field is maximum when angle between  $\vec{p}$  and  $\vec{E}$  is .....

- (A)  $0^\circ$                                       (B)  $45^\circ$   
(C)  $180^\circ$                                   (D)  $90^\circ$

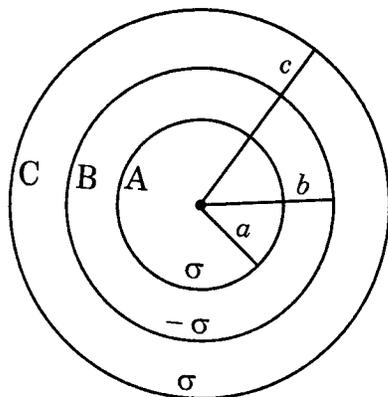
3. If the coulombian force acting between two protons separated by a distance  $r$  is  $F$ , what would be the force acting between two alpha particles separated by a distance  $2r$  ?

- (A)  $F$     (B)  $3F$   
(C)  $F/2$                                       (D)  $2F$

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(Space for Rough Work)

4. Consider three concentric shells of metal A, B and C are having radii  $a$ ,  $b$  and  $c$  respectively as shown in the figure ( $a < b < c$ ). Their surface charge densities are  $\sigma$ ,  $-\sigma$  and  $\sigma$  respectively. Calculate the electric potential on the surface of shell A.



- (A)  $\frac{\sigma}{\epsilon_0} \cdot (a - b - c)$                       (B)  $\frac{\sigma}{\epsilon_0} \cdot (a + b - c)$
- (C)  $\frac{\sigma}{\epsilon_0} \cdot (a - b + c)$                       (D)  $\frac{\sigma}{\epsilon_0} \cdot (a^2 + b^2 + c^2)$

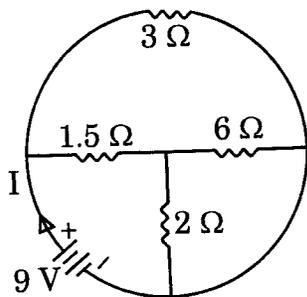
5. A parallel plate capacitor having air as dielectric medium is charged by a potential difference of  $V$  volt. After disconnecting the battery, the distance between the plates of the capacitor is increased using an insulated handle. As a result, potential difference between the plates .....

- (A) does not change.                      (B) decreases.
- (C) increases.                              (D) becomes zero.

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**(Space for Rough Work)**

6. Two capacitors of capacitance  $2\mu\text{F}$  and  $4\mu\text{F}$  respectively are connected in series. The combination is connected across a potential difference of 10 V. The ratio of energies stored by capacitors will be .....
- (A) 2 : 1 (B) 4 : 1  
(C)  $1:\sqrt{2}$  (D) 1 : 4
7. In a Hydrogen atom, the electron moves around the nucleus in a circular orbit of radius  $5 \times 10^{-11}$  m. Its time period is  $1.5 \times 10^{-16}$  seconds. The current associated with the electron motion is .....
- (Charge of electron is  $1.6 \times 10^{-19}$  C)
- (A)  $1.066 \times 10^{-3}$  A (B)  $1.66 \times 10^{-3}$  A  
(C) 1.00 A (D)  $1.81 \times 10^{-3}$  A
8. The total current supplied to the given circuit by the battery is .....



- (A) 6 A (B) 4 A  
(C) 9 A (D) 2 A

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(Space for Rough Work)

9. An electron and a proton of equal linear momentum enter in the direction perpendicular to uniform magnetic field. If the radii of their circular paths be

$r_e$  and  $r_p$  respectively, then  $\frac{r_e}{r_p}$  is equal to .....

$m_e$  = mass of electron

$m_p$  = mass of proton

- (A)  $m_p/m_e$  (B) 1  
(C)  $\left(\frac{m_p}{m_e}\right)^{1/2}$  (D)  $\left(\frac{m_e}{m_p}\right)^{1/2}$

10. A uniform wire has resistance  $24 \Omega$ . It is bent in the form of a circle. The effective resistance between the two end points on any diameter of the circle is .....

- (A)  $12 \Omega$  (B)  $24 \Omega$   
(C)  $6 \Omega$  (D)  $3 \Omega$

11. If 1 A of current is passed through  $\text{CuSO}_4$  solution for 10 seconds, the number of Copper atoms deposited at the cathode will be .....

- (A)  $3.1 \times 10^{19}$  (B)  $1.6 \times 10^{20}$   
(C)  $8 \times 10^{19}$  (D)  $6.2 \times 10^{19}$

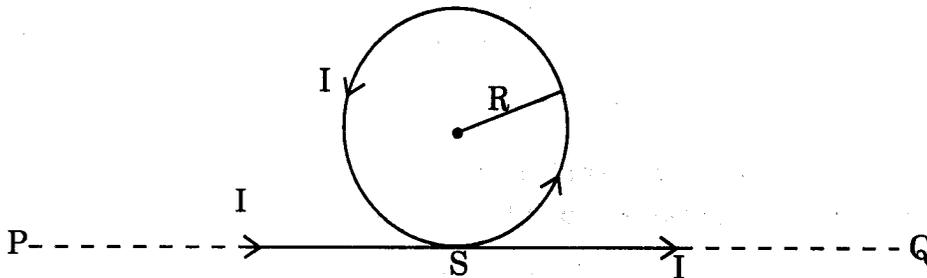
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(Space for Rough Work)

12. Two bulbs of 250 V and 100 W are first connected in series and then in parallel with a supply of 250 V. Total power in each of the cases will be ..... respectively.

- (A) 50 W, 100 W                      (B) 50 W, 200 W  
(C) 100 W, 50 W                      (D) 200 W, 150 W

13. An infinite straight current carrying conductor is bent in such a way that a circular loop is formed on it as shown in the figure. If the radius of the loop is R, the magnetic field at the centre of the loop is .....



- (A) Infinite                      (B) Zero  
(C)  $\frac{\mu_0}{4\pi} \cdot \frac{2I}{R} \pi$                       (D)  $\frac{\mu_0}{4\pi} \cdot \frac{2I}{R} (\pi + 1)$

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(Space for Rough Work)

14. Which of the following is represented by the area enclosed by a hysteresis loop (B – H curve)?
- (A) Retentivity
  - (B) Susceptibility
  - (C) Permeability
  - (D) Heat energy lost per unit volume in the sample.
15. In which direction, the magnetic field on the axis at a distance  $z$  from the centre of the bar magnet would be ?
- (A) In the direction of the magnetic dipole moment ( $\vec{M}$ ) of the magnet.
  - (B) In the opposite direction of the magnetic dipole moment ( $\vec{M}$ ) of the magnet.
  - (C) In the perpendicular direction of the magnetic moment ( $\vec{M}$ ) of the magnet.
  - (D) Its direction depends on the magnitude of the magnetic moment ( $\vec{M}$ ) of the magnet.
16. Magnetic Flux linked with a coil is  $\phi = 5t^2 + 2t + 3$ , where  $t$  is in second and  $\phi$  is in weber. At time  $t = 1$  sec., the value of induced emf is ..... volt.
- (A) 1.2
  - (B) 6
  - (C) 14
  - (D) 12

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**(Space for Rough Work)**

17. In a series resonant circuit, the A. C. voltages across resistance R, inductor L and capacitor C are 5 V, 10 V and 10 V respectively. The A.C. voltage applied to the circuit will be .....
- (A) 25 V (B) 20 V  
(C) 10 V (D) 5 V
18. What is the average power dissipation in an ideal capacitor in A.C. circuit ?
- (A)  $\frac{1}{2}CV^2$  (B)  $CV^2$   
(C)  $2CV^2$  (D) Zero
19. A coil has self inductance  $L = 0.04$  H and resistance  $R = 12$  Ohm. When it is connected to 220 V, 50 Hz supply; what will be the current flowing through the coil ?
- (A) 12.7 A (B) 14.7 A  
(C) 11.7 A (D) 10.7 A
20. Find the time required for a 50Hz alternating current to become its value from zero to the *rms* value.
- (A) 2.5 ms (B) 5.0 ms  
(C) 10.0 ms (D) 15.0 ms

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(Space for Rough Work)

21. The Sun delivers  $10^3 \text{ Wm}^{-2}$  of Electromagnetic Flux on the Earth's surface. The total power that is incident on a roof of dimensions 6 m.  $\times$  30 m. is .....
- (A)  $7.2 \times 10^5 \text{ W}$  (B)  $4.5 \times 10^5 \text{ W}$   
(C)  $1.8 \times 10^5 \text{ W}$  (D)  $0.9 \times 10^5 \text{ W}$
22. A real object is placed at a distance  $f$  from the pole of a convex mirror, in front of the convex mirror. If focal length of the mirror is  $f$ , then distance of the image from the pole of the mirror is .....
- (A)  $\frac{f}{2}$  (B)  $\frac{f}{4}$   
(C)  $2f$  (D)  $4f$
23. For a prism of refractive index 1.732, the angle of minimum deviation is equal to the angle of prism. Then the angle of the prism is .....
- (A)  $60^\circ$  (B)  $70^\circ$   
(C)  $50^\circ$  (D) None of these
24. A convex lens is immersed in a liquid, whose refractive index is equal to the refractive index of the material of the lens. Then its focal length will .....
- (A) become zero (B) increase  
(C) decrease (D) become infinite

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(Space for Rough Work)

25. In Young's double slit experiment, distance between two slits is 0.28 mm and distance between slits and screen is 1.4 m. Distance between central bright fringe and third bright fringe is 0.9 cm, what is the wavelength of light used ?
- (A) 6000 Å                      (B) 5000 Å  
(C) 4000 Å                      (D) 3000 Å
26. An astronomical telescope has objective and eye-piece lenses of powers 0.5 D and 20 D respectively. What will be its magnifying power ?
- (A) 10                              (B) 20  
(C) 30                              (D) 40
27. Which of the following cannot be polarized?
- (A) Ultra-sonic waves              (B) Radio-waves  
(C) Ultra-violet rays              (D) X-rays
28. The ratio of Kinetic energy and the total energy of the electron in the  $n$ th quantum state of Bohr's atomic model of Hydrogen atom is .....
- (A) -1                              (B) +1  
(C) -2                              (D) +2

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(Space for Rough Work)

29. If the radii of nuclei of  ${}_{13}\text{Al}^{27}$  and  ${}_{30}\text{Zn}^{64}$  are  $R_1$  and  $R_2$  respectively,

then  $\frac{R_1}{R_2} = \dots\dots\dots$

(A)  $\frac{64}{27}$

(B)  $\frac{3}{4}$

(C)  $\frac{27}{64}$

(D)  $\frac{4}{3}$

30. The end product of the decay of  ${}_{90}\text{Th}^{232}$  is  ${}_{82}\text{Pb}^{208}$ . The number of alpha and beta particles emitted are respectively .....

(A) 3, 3

(B) 6, 0

(C) 6, 4

(D) 4, 6

31. If the linear momentum of a particle is  $2.2 \times 10^4 \text{ Kg ms}^{-1}$ , then what will be its de-Broglie wavelength ?

(Take  $h = 6.6 \times 10^{-34} \text{ Js.}$ )

(A)  $3 \times 10^{-29} \text{ nm}$

(B)  $6 \times 10^{-29} \text{ nm}$

(C)  $3 \times 10^{-29} \text{ m}$

(D)  $6 \times 10^{-29} \text{ m}$

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(Space for Rough Work)



35. Electrically, an isolated P-type semi conductor is .....
- (A) Positively charged. (B) Negatively charged.  
(C) Neutral. (D) None of the given.
36. In a common base transistor circuit,  $I_C$  is the Output current and  $I_E$  is the input current. The current gain  $\alpha_{dc}$  is .....
- (A) Greater than one. (B) Less than one.  
(C) Equal to one. (D) None of these.
37. Name the gate, which represents the Boolean expression  $y = \overline{A \cdot B}$ .
- (A) AND (B) NOR  
(C) NAND (D) NOT

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(Space for Rough Work)





# CHEMISTRY

41. Which of the following is the correct form of "Schrodinger wave equation"?

(A)  $\frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} + \frac{\partial^2 \psi}{\partial z^2} + \frac{8\pi^2 m^2}{h^2} (E - V) \psi = 0$

(B)  $\frac{\partial \psi^2}{\partial x^2} + \frac{\partial \psi^2}{\partial y^2} + \frac{\partial \psi^2}{\partial z^2} + \frac{8\pi^2 m^2}{h^2} (E - V) \psi = 0$

(C)  $\frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} + \frac{\partial^2 \psi}{\partial z^2} + \frac{8\pi^2 m}{h^2} (E - V) \psi = 0$

(D)  $\frac{\partial^2 \psi}{\partial^2 x} + \frac{\partial^2 \psi}{\partial^2 y} + \frac{\partial^2 \psi}{\partial^2 z} + \frac{8\pi^2 m}{h^2} (E - V) \psi = 0$

42. Which of the following has the highest value of energy gap?

- (A) Diamond
- (B) Germanium
- (C) Silver
- (D) Aluminium

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(Space for Rough Work)

43. Arrangement of Sulphide ions in Zinc blende is .....
- (A) FCC
  - (B) BCC
  - (C) HCP
  - (D) Simple cubic
44. In Feldspar and Zeolite,  $\text{Si}^{4+}$  ions are replaced by which ions ?
- (A) Potassium ion
  - (B) Aluminium ion
  - (C) Hydroxide ion
  - (D) Oxide ion
45. How many grams of NaOH will be required to prepare 500 gram solution containing 10% w/w NaOH solution ?
- (A) 5.0 grams
  - (B) 0.5 grams
  - (C) 50 grams
  - (D) 100 grams

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(Space for Rough Work)

46. The increase in boiling point of a solution containing 0.6 gram Urea in 200 gram water is  $0.50^{\circ}\text{C}$ . Find the molal elevation constant.
- (A)  $1.0 \text{ K kg mole}^{-1}$   
(B)  $10 \text{ K kg mol}$   
(C)  $10 \text{ K gram mol}^{-1}$   
(D)  $10 \text{ K kg mole}^{-1}$
47. What will be the value of  $\Delta G$  for ice at  $8^{\circ}\text{C}$  temperature ?
- (A) Zero (B) Positive  
(C) Negative (D) One
48. A piece of ice kept at room temperature melts of its own. This reaction is governed by which law ?
- (A) Zeroth law of Thermodynamics  
(B) Third law of Thermodynamics  
(C) First law of Thermodynamics  
(D) Second law of Thermodynamics

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(Space for Rough Work)



52. For Fourth Order Reaction, what is the unit of K ?

- (A)  $(\text{mole / litre})^{-3}$
- (B)  $(\text{mole/ litre})^{-3} \text{ second}$
- (C)  $(\text{mol / litre})^{+3} \text{ second}^{-1}$
- (D)  $(\text{mole / litre})^{-3} \text{ second}^{-1}$

53. What is the formula to find the value of  $t_{1/2}$  for a Zero Order Reaction ?

- (A)  $\frac{0.693}{K}$
- (B)  $\frac{[R]_0}{2K}$
- (C)  $\frac{2K}{[R]_0}$
- (D)  $\frac{K}{[R]_0}$

54. From the following, which is not a surface phenomenon ?

- (A) Water and its vapour in a closed vessel.
- (B) Heterogeneous catalysis.
- (C) Crystallisation.
- (D) Corrosion.

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(Space for Rough Work)

55. From the following, which is not an emulsifier ?

- (A) Soap
- (B) Gum
- (C) Milk
- (D) Agar

56. Which element is used in the preparation of Pesticides ?

- (A) Nitrogen
- (B) Antimony
- (C) Bismuth
- (D) Arsenic

57. Iodised salt prevents .....

- (A) Beri-beri
- (B) Goitre
- (C) Anaemia
- (D) T.B.

58. Which element is not considered as 'Chalcogens' ?

- (A) Polonium
- (B) Sulphur
- (C) Oxygen
- (D) Selenium

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(Space for Rough Work)

59. What is the atomic number of the element with  $M^{2+}$  ion having electronic configuration  $[\text{Ar}]3d^8$  ?

- (A) 26 (B) 27  
(C) 28 (D) 25

60. Which Lanthanide compound is used as a pigment ?

- (A)  $\text{Tb}(\text{OH})_3$   
(B)  $\text{Lu}(\text{OH})_3$   
(C)  $\text{Ce}(\text{OH})_3$   
(D)  $\text{CeO}_2$

61. Which complex compound possesses  $sp^3d^2$  hybridisation ?

- (A)  $[\text{Fe}(\text{Cl})_6]^{3-}$   
(B)  $[\text{Fe}(\text{CN})_6]^{3-}$   
(C)  $[\text{Fe}(\text{CN})_6]^{4-}$   
(D)  $[\text{Fe}(\text{NH}_3)_6]^{3+}$

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(Space for Rough Work)

62. The name of the ring structure complex compound formed between metal ion and polydentate ligand is .....
- (A) Polynuclear complex
  - (B) Chelate complex
  - (C) Simple complex
  - (D) None of these
63. In a Decay series,  ${}_{92}^{238}\text{U}$  is obtained in the end to  ${}_{82}^{206}\text{Pb}$ . How many  $\alpha$  and  $\beta$  particles must have been emitted ?
- (A) 6  $\alpha$  and 8  $\beta$
  - (B) 6  $\beta$  and 8  $\alpha$
  - (C) 6  $\beta$  and 6  $\alpha$
  - (D) 8  $\beta$  and 8  $\alpha$
64.  $4n + 1$  series is known by which name ?
- (A) Uranium
  - (B) Thorium
  - (C) Neptunium
  - (D) Actinium

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(Space for Rough Work)

65. A molecule having 3 different chiral carbon atoms, how many stereo-isomers it will have?

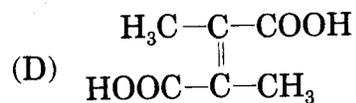
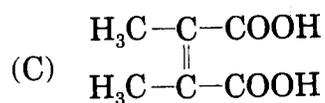
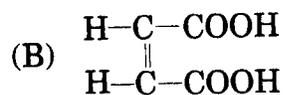
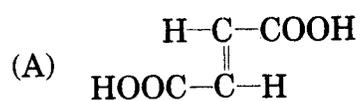
(A) 6

(B) 9

(C) 3

(D) 8

66. What is the structural formula of Fumaric acid ?



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67. What is the formula of tertiary butyl alcohol ?
- (A)  $(\text{CH}_3)_3\text{C}-\text{OH}$
  - (B)  $\text{CH}_3-\text{CH}(\text{OH})-\text{CH}_2-\text{CH}_3$
  - (C)  $\text{CH}_3-(\text{CH}_2)_2\text{OH}$
  - (D)  $\text{CH}_3-\text{CH}(\text{CH}_3)-\text{CH}_2-\text{OH}$
68. Salicyldehyde is obtained when Phenol is heated with  $\text{CHCl}_3$  and aqueous  $\text{NaOH}$ . This reaction is known by which name ?
- (A) Kolbe - Schmitt reaction
  - (B) Reimer Tiemann reaction
  - (C) Hoffmann's reaction
  - (D) Carbyl amine reaction
69. What is the hybridisation of Carbon and Oxygen in electronic structure of Ether ?
- (A)  $sp^2$  and  $sp^2$
  - (B)  $sp$  and  $sp$
  - (C)  $sp^3$  and  $sp^3$
  - (D)  $sp^3$  and  $sp^2$

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(Space for Rough Work)

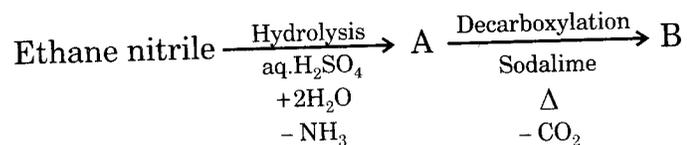
70. What is the oxidation number of carbonyl carbon in Acetophenone ?

- (A) Zero (B) + 2  
(C) + 1 (D) + 3

71. Which product is obtained on reduction of Methanal in the presence of concentrated NaOH ?

- (A) Formic acid  
(B) Methyl alcohol  
(C) CO + H<sub>2</sub>  
(D) Formic acid and Methyl alcohol

72. Identify A and B in the reaction given below :



- (A) Ethanoic acid, Methane  
(B) Ethanoic acid, Ethane  
(C) Acetone, Methane  
(D) Acetic acid, Methanol

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(Space for Rough Work)

73. Oxidation of which compound is not possible ?
- (A)  $\text{CH}_3\text{-CH}_2\text{-OH}$
  - (B)  $\text{CH}_3\text{-CHO}$
  - (C)  $\text{CH}_3\text{-CO-CH}_3$
  - (D)  $\text{CH}_3\text{-COOH}$
74. Which compound is known as 'alkyl carbamate' ?
- (A) Ar . NC
  - (B) Ar . CN
  - (C) R . NC
  - (D) R . CN
75. Which type of chemical substance is Disparlure ?
- (A) Preservative
  - (B) Pheromones
  - (C) Antioxidant
  - (D) Detergent

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(Space for Rough Work)

76. From the following compounds which does not react with  $C_6H_5SO_2Cl$  ?

- (A)  $(C_2H_5)_3N$
- (B)  $(CH_3)_2NH$
- (C)  $CH_3 \cdot NH_2$
- (D)  $C_2H_5 \cdot NH_2$

77. Which polymer is used in controlled drugs capsules ?

- (A) PAN
- (B) PHBV
- (C) PTFE
- (D) SBR

78. Which type of polymer is "Cellulose diacetate fibre" ?

- (A) Natural
- (B) Semi-synthetic
- (C) Synthetic
- (D) None of these

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(Space for Rough Work)

79. Which compound is obtained, when Glucose reacts with excess



- (A) Saccharic acid
- (B) Glucose phenyl hydrazone
- (C) Gluconic acid
- (D) Glucosazone

80. Which lipid is not obtained by the hydrolysis of simple lipid and compound lipid from the following ?

- (A) Terpenes
- (B) Carotenoid
- (C) Neutral fats
- (D) Cholesterols

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(Space for Rough Work)

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**(Space for Rough Work)**

4

SEAL