

FIITJEE INTERNAL TEST

SECOND YEAR 2018-20

JEE MAINS

REVISION-2 PART TEST - 5

Time: 3 hours

Maximum Marks: 300

INSTRUCTIONS:

17th May 2020

Instructions to the Candidates

A. General

1. This booklet is your Question Paper containing 75 questions.
2. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed to be carried inside the examination hall.
3. Fill in the boxes provided for Name and Enrolment No.
4. The answer sheet, a machine-readable Objective Response (ORS), is provided separately.
5. DO NOT TAMPER WITH / MULTILATE THE ORS OR THE BOOKLET.

B. Filling in the OMR:

6. The instructions for the OMR sheet are given on the OMR itself.

C. Question paper format:

7. The question paper consists of **3 parts (Mathematics, Physics and Chemistry)**. Each part consists of **two sections**.
8. **Section I** contains **20 Multiple Choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE** is correct.
9. **Section II** contains **5 questions**. Each question is numerical value. For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to second decimal place.
(e.g. 6.25, 7.00, - 0.33, - .30, 30.27, - 127.30)
10. **Q.No. 21-25, 46-50, 71-75** are Numerical based questions with answer is of the type xxxx.xx. Suppose your answer is 25.3 (example-1) you need to write answer as 0025.30, if your answer is only 1 (example-2) then you have bubble like 0001.00 and bubble accordingly including zero's and dot.

D. Marking Scheme

11. For each question in **Section I**, you will be awarded **4 marks** if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases **zero (0) marks** will be awarded. **-1 negative marks** will be awarded for incorrect answers in this section.
12. For each question in **Section II**, you will be awarded **4 marks** if you darken the bubble corresponding to the correct answer **ONLY**. In all other cases **zero (0) marks** will be awarded. **No negative marks** will be awarded for incorrect answers in this section.

Don't write / mark your answers in this question booklet.

If you mark the answers in question booklet, you will not be allowed to continue the exam.

NAME:

ENROLLMENT NO.:

MATHEMATICS

Section-I :: Single Correct Answer Type

1. If $f(x) = \begin{cases} -2, & x \leq -1 \\ ax - b, & -1 < x < 1 \\ 3, & x \geq 1 \end{cases}$ is continuous at every x , then $a + b$ is
 (A) 0 (B) 1 (C) 2 (D) 3
2. A dynamic blast blows a rock straight up with some initial velocity. It reaches a height of $s = 10t - t^2$ in t seconds. How high does the rock reach?
 (A) 25 m (B) 50 m (C) 75 m (D) 100 m
3. Slope of the normal to the curve $x^3 + y^3 - 9xy = 0$ at the point $(2, 4)$ is
 (A) $\frac{4}{5}$ (B) $-\frac{5}{4}$ (C) $-\frac{4}{5}$ (D) $\frac{5}{4}$
4. The number of points where the function $f(x) = \frac{1}{\log|x|}$ is discontinuous is
 (A) 1 (B) 2 (C) 3 (D) 4
5. The absolute maximum value of $f(x) = x^{2/3}$ is
 (A) 0 (B) $\sqrt[3]{4}$ (C) $\sqrt[3]{9}$ (D) None of these
6. The function $f(x)$ whose derivative is $\sin x$ and whose graph passes through the point $(0, 2)$ is given by $f(x) = k \cos x + p$, then $k + p$ is
 (A) 1 (B) 2 (C) 3 (D) 4
7. With in the interval $0 \leq x \leq 2\pi$, the sum of the critical points of $f(x) = \sin^2 x - \sin x - 1$ is
 (A) π (B) 2π (C) 3π (D) 4π
8. The x -coordinate of the inflection point of the function $f(x) = x^3 - 3x^2 + 2$ is
 (A) 1 (B) 2 (C) 3 (D) 4
9. The average value of $f(x) = \sqrt{4 - x^2}$ on $[-2, 2]$ is
 (A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{2}$ (D) $\frac{2\pi}{3}$
10. The area of the region between the x -axis and the graph of $f(x) = x^3 - x^2 - 2x$, $-1 \leq x \leq 2$ is
 (A) $\frac{5}{12}$ (B) $\frac{37}{12}$ (C) 20 (D) None
11. $\int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{(\sin x - \cos x)^2 - 4} dx =$
 (A) $\log 3$ (B) $\frac{1}{4} \log 3$ (C) $\frac{1}{4} \log 2$ (D) None
12. If $I_n = \int_0^{\frac{\pi}{4}} \tan^n \theta d\theta$, then $I_6 + I_8 =$
 (A) $\frac{1}{7}$ (B) $\frac{2}{7}$ (C) $\frac{3}{7}$ (D) $\frac{4}{7}$

13. $\int_0^{1.5} [x^2] dx =$ ([.] indicates greatest integer)
 (A) $\sqrt{2}$ (B) $2 + \sqrt{2}$ (C) $2 - \sqrt{2}$ (D) None
14. $\int_1^1 \{x\}$ is equal to, where $\{.\}$ denotes the fractional part.
 (A) 0 (B) 1 (C) 2 (D) None
15. $\int_0^{\pi/2} (2 \log \sin x - \log \sin 2x) dx =$
 (A) $\pi \log 2$ (B) $\frac{\pi}{2} \log 2$ (C) $-\frac{\pi}{2} \log 2$ (D) None of these
16. The area of the region bounded by the curve $y = x^3$, $y = 8$ and $x = 0$ is
 (A) 4 (B) 8 (C) 12 (D) 16
17. The equation of the curve passing through the origin and satisfying the differential equation $\frac{dy}{dx} = x - y$ is
 (A) $e^x(1 - x + y) = 1$ (B) $x - y + 1 = e^x$
 (C) $e^{2x}(1 - x + y) = 1 + x - y$ (D) None
18. The integrating factor of the differential equation $(x \log x) \frac{dy}{dx} + y = \log x$ is
 (A) e^x (B) $\log x$ (C) $\log(\log x)$ (D) None of these
19. The degree of the differential equation of all tangent lines to the parabola $x^2 = 4y$ is
 (A) 1 (B) 2 (C) 3 (D) 4
20. If $\int \frac{\cos x - \sin x}{\sqrt{3 - \sin 2x}} dx = \sin^{-1}\left(\frac{\sin x + \cos x}{a}\right) + c$, then $a =$
 (A) 1 (B) 2 (C) 3 (D) 4

Section-II :: Numerical Based:

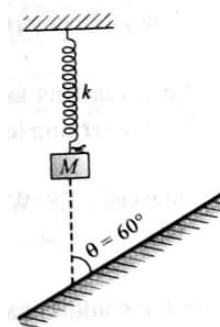
21. The value of a so that the sum of the squares of the roots of the equation $x^2 - (a+2)x + (a-1) = 0$ assumes the least value is _____
22. If the sum of the intercepts on the axes cut off by the tangent to the curve $x^{1/3} + y^{1/3} = a^{1/3}$ ($a > 0$) at $\left(\frac{a}{8}, \frac{a}{8}\right)$ is 8, then the value of a is _____
23. Suppose $f(x)$ is differentiable for all x and $\lim_{h \rightarrow 0} \frac{1}{h} f(1+h) = 5$, then $f'(1)$ is equal to
24. The absolute value of $\lim_{x \rightarrow 0} \frac{e^x + \log(1+x) - (1-x)^{-2}}{x^2}$ is
25. The area between the graph of $f(x) = \sin x$ and the x -axis over $[0, 2\pi]$ is

PHYSICS

Section-I :: Single Correct Answer Type

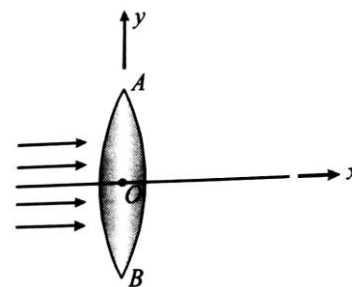
26. An insert of negligible mass is sitting on a block of mass M , tied with a spring of force constant k . The block performs simple harmonic motion with amplitude A in front of a plane mirror placed as shown in figure. The maximum speed of insert relative to its image will be

(A) $A\sqrt{\frac{k}{M}}$ (B) $\frac{A\sqrt{3}}{2}\sqrt{\frac{k}{M}}$
 (C) $A\sqrt{3}\sqrt{\frac{k}{M}}$ (D) $2A\sqrt{\frac{M}{k}}$



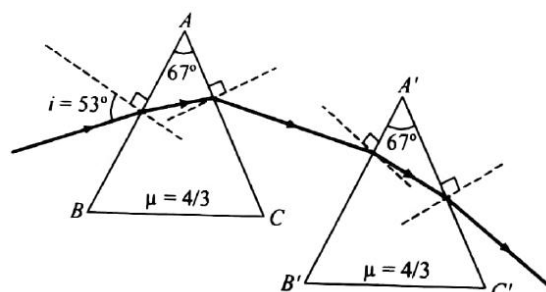
27. Monochromatic light rays parallel to x -axis strike a convex lens AB of refractive index 0.5 . If the lens oscillates such that AB tilts upto a small angle θ (in radian) on either side of y -axis, then find the distance between extreme positions of oscillating image.

(A) $f \sec \theta$ (B) $f \sec^2 \theta$
 (C) $f(\sec \theta - 1)$ (D) The image will not move



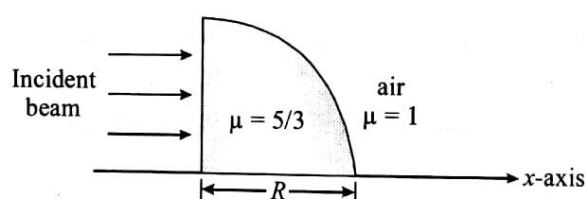
28. A ray is incident on the first prism at an angle of incidence 53° as shown in the figure. The angle between side CA and $B'A'$ for the net deviation by both the prisms to be double of the derivation produced by the first prism, will be

(A) $\sin^{-1} \frac{2}{3} + 53^\circ$ (B) $\sin^{-1} \frac{2}{3} + 37^\circ$
 (C) $\cos^{-1} \frac{2}{3} + 53^\circ$ (D) $2 \sin^{-1} \frac{2}{3}$



29. A uniform, horizontal parallel beam of light is incident upon a prism as shown. The prism is in the shape of a quarter cylinder, of radius 5 cm, and has refractive index $5/3$. The width of the region at which the incident rays after normal incidence on plane surface and subsequent refraction at curved surface intersect on x axis is (Neglect the ray which travels along x -axis)

(A) 4 cm (B) $5/4$ cm (C) $9/4$ cm (D) $25/4$ cm



30. In a semiconducting material $\left(\frac{1}{5}\right)^{\text{th}}$ of the total current is carried by the holes and the remaining is carried by the electrons. The drift speed of electrons is thrice that of holes at this temperature, the ratio between the number densities of electrons and holes is

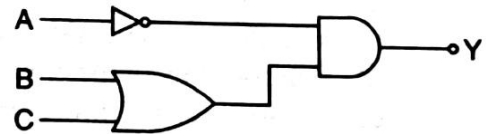
(A) $\frac{21}{6}$ (B) 5 (C) $\frac{3}{8}$ (D) $\frac{4}{3}$

31. If an electron approaches the p - n junction of potential barrier 0.50 V from the n -side with a speed of $5 \times 10^5 \text{ ms}^{-1}$, with what speed will it enter the p -side?

(A) $5 \times 10^5 \text{ ms}^{-1}$ (B) $2.5 \times 10^6 \text{ ms}^{-1}$ (C) $2.7 \times 10^5 \text{ ms}^{-1}$ (D) $1 \times 10^5 \text{ ms}^{-1}$

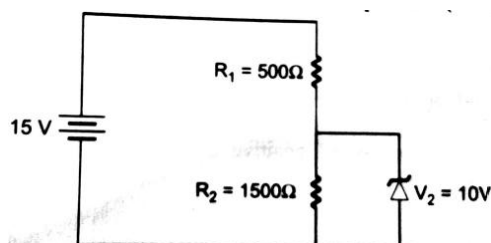
32. The Boolean equation for the circuit given in the figure is

- (A) $Y = \bar{A}.B + C$ (B) $Y = \bar{A}.(\bar{B} + \bar{C})$
 (C) $Y = \bar{A}.(B + \bar{C})$ (D) $Y = \bar{A}.(B + C)$



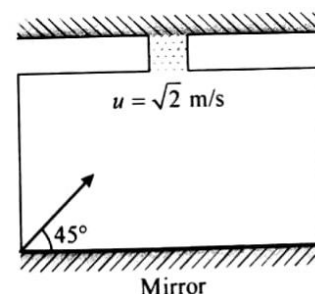
33. Light from sodium lamp is made to pass through two polaroids placed one after the other in the path of light. Taking the intensity of the incident light as 100%, the intensity of the outcoming light that can be varied in the range
 (A) 0% to 100% (B) 0% to 50% (C) 0% to 25% (D) 0% to 75%
34. In a single slit diffraction experiment, the slit width is 2.5λ , where λ is the wavelength of light used. Then on either side of the central maximum there are
 (A) 4 minima, 2 secondary maxima (B) 2 minima, 2 secondary maxima
 (C) 2 minima, 4 secondary maxima (D) 2 minima, 1 secondary maxima
35. A beam of natural light falls on a system of 5 polaroids, which are arranged in succession such that the pass axis of each Polaroid is turned through 60° with respect to the preceding one. The fraction of the incident light intensity that passes through the system is
 (A) $\frac{1}{64}$ (B) $\frac{1}{32}$ (C) $\frac{1}{256}$ (D) $\frac{1}{512}$
36. The transition from the state $n = 4$ to $n = 3$ in a hydrogen-like atom results in ultraviolet radiation. Infrared radiation will be obtained in the transition
 (A) $2 \rightarrow 1$ (B) $3 \rightarrow 2$ (C) $4 \rightarrow 2$ (D) $5 \rightarrow 4$
37. In a Fraunhofer diffraction experiment at a single slit using a light of wavelength 400 nm, the first minimum is formed at an angle of 30° . The direction θ of the first secondary maximum is given by
 (A) $\sin^{-1}(1/4)$ (B) $\tan^{-1}(2/3)$ (C) $\sin^{-1}(2/3)$ (D) $\sin^{-1}(3/4)$
38. The two slits are 1 mm apart from each other and illuminated with a light of wavelength 5×10^{-7} m. If the distance of the screen is 1 m from the slits, then the distance between third dark fringe and fifth bright fringe is
 (A) 1.5 mm (B) 0.75 mm (C) 1.25 mm (D) 0.625 mm
39. A diatomic molecule is made of two masses m_1 and m_2 which are separated by a distance r . If we calculate its rotational energy by applying Bohr's rule of angular momentum quantization, its energy will be given by (n is an integer)
 (A) $\frac{n^2 \hbar^2}{2(m_1 + m_2)r^2}$ (B) $\frac{2n^2 \hbar^2}{2(m_1 + m_2)r^2}$ (C) $\frac{(m_1 + m_2)n^2 \hbar^2}{2m_1 m_2 r^2}$ (D) $\frac{(m_1 + m_2)^2 n^2 \hbar^2}{2m_1^2 m_2^2 r^2}$
40. There is a stream of neutrons with a kinetic energy of 0.0327 eV. If the half-life of neutrons is 700, what fraction of neutrons will decay before they travel a distance of 10 m?
 (A) 4.6×10^{-5} (B) 3.9×10^{-6} (C) 9.2×10^{-5} (D) 7.8×10^{-6}
41. In a nuclear fusion reaction, two nuclei, A and B fuse to produce a nucleus C, releasing an amount of energy ΔE in the process. If the mass defects of the three nuclei are $\Delta M_A, \Delta M_B$ and ΔM_C respectively, then which of the following relations holds? Here, c is the speed of light
 (A) $\Delta M_A + \Delta M_B = \Delta M_C - \Delta E/c^2$ (B) $\Delta M_A + \Delta M_B = \Delta M_C + \Delta E/c^2$
 (C) $\Delta M_A - \Delta M_B = \Delta M_C - \Delta E/c^2$ (D) $\Delta M_A - \Delta M_B = \Delta M_C + \Delta E/c^2$
42. The energy released by the fission of one Uranium atom is 200 MeV. The number of fissions per second required to produce 3.2 W of power is (Take $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$)
 (A) 10^7 (B) 10^{10} (C) 10^{15} (D) 10^{11}

43. The mass of ${}^7_3\text{Li}$ nucleus is 0.042 u less than the sum of the masses of all its nucleons. The binding energy per nucleon of ${}^7_3\text{Li}$ nucleus is nearly
 (A) 46 MeV (B) 5.6 MeV (C) 3.9 MeV (D) 23 MeV
44. In Young's double-slit experiment, the distance between the centres of adjacent fringes is 0.10 mm. If the distance of the screen from the slits is doubled, the distance between the slits is halved and the wavelength of light is changed from $6.4 \times 10^{-7} \text{ m}$ to $4.0 \times 10^{-7} \text{ m}$, then the new distance between the fringes will be
 (A) 0.10 mm (B) 0.15 mm (C) 0.20 mm (D) 0.25 mm
45. In the circuit (figure), the current through Zener diode is
 (A) 10 mA (B) 6.67 mA
 (C) 5 mA (D) 3.33 mA

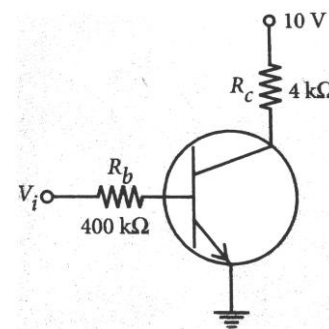


Section-II :: Numerical Based

46. An elevator at rest which is at 10th floor of a building is having a plane mirror fixed to its floor. A particle is projected with a speed $\sqrt{2} \text{ m/s}$ and 45° with the horizontal as shown in the figure. At the very instant of projection, the cable of the elevator starts falling freely. What will be separation between the particle and its image 0.5s after the instant of projection? (in meters)



47. In the circuit shown in figure, when the input voltage to the base resistance is 10 V, V_{be} is zero and V_{ce} is also zero. Value of β is



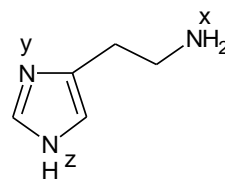
48. In a double slit experiment, the angular width of a fringe is found to be 0.2° on a screen placed 1 m away. The wavelength of light used is 600 nm. The angular width of the fringe if entire experimental apparatus is immersed in water is $\left(\text{Take } \mu_{\text{water}} = \frac{4}{3} \right)$ (in degrees)
49. Two H-atoms in the ground state collide inelastically. The maximum amount by which their combined kinetic energy is reduced is (in eV)
50. A hydrogen atom initially in the ground level absorbs a photon, which excites it to the $n = 4$ level. Determine the wavelength of photon when it again fall back to ground level. (in Å)

CHEMISTRY

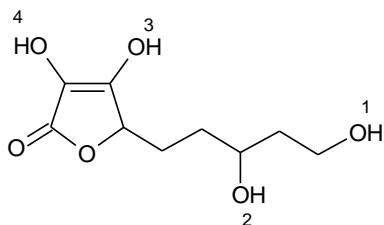
Section-I :: Single Correct Answer Type:

51. The given compound has 3 types of nitrogen notified as X, Y and Z. Identify the most basic nitrogen

- (A) X (B) Y
(C) Z (D) All are equally basic



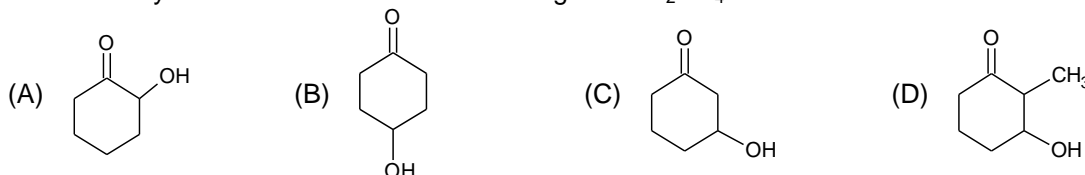
52.



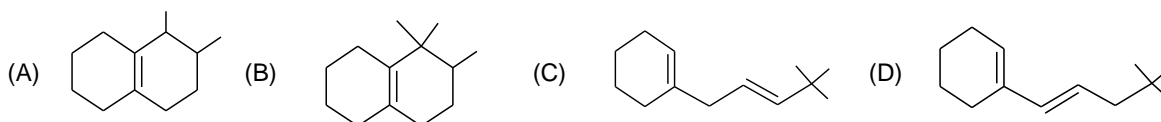
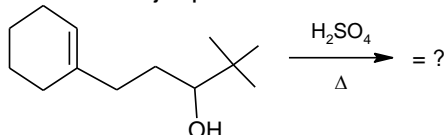
Which of these –OH groups is most acidic

- (A) OH¹ (B) OH² (C) OH³ (D) OH⁴

53. Which is dehydrated to a maximum extent using conc. H₂SO₄?



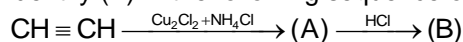
54. Here the major product for the reaction is?



55. A sample of 1.79 mg of a compound of molar mass 90 g mol⁻¹ when treated with excess CH₃MgI releases 1.34 ml of a gas at STP. The number of active hydrogen(s) in the molecule is

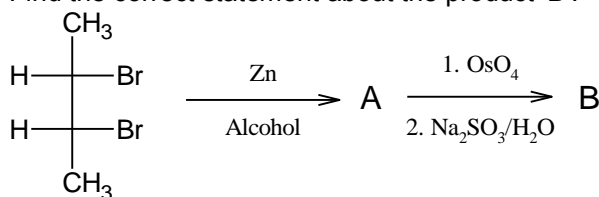
- (A) 1 (B) 2 (C) 3 (D) 4

56. Identify (B) in the following sequence of reactions.

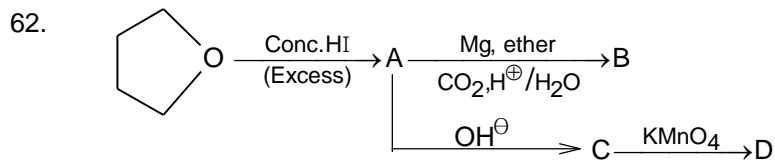


- (A) CH₃CH₂Cl (B) CH₂=CH—CH₂CH₂Cl
(C) (D)

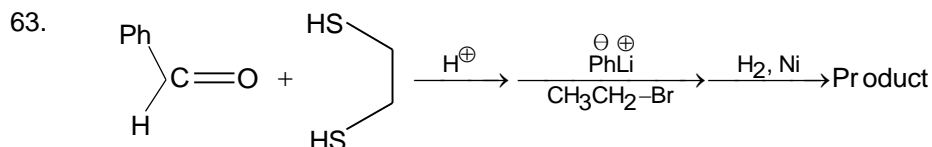
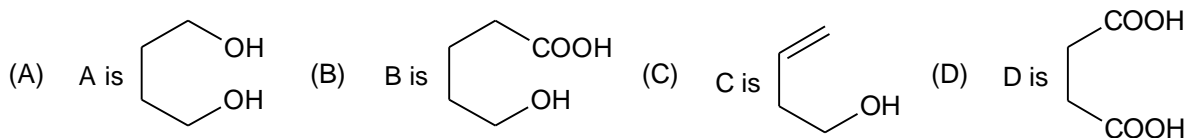
57. Find the correct statement about the product 'B'.



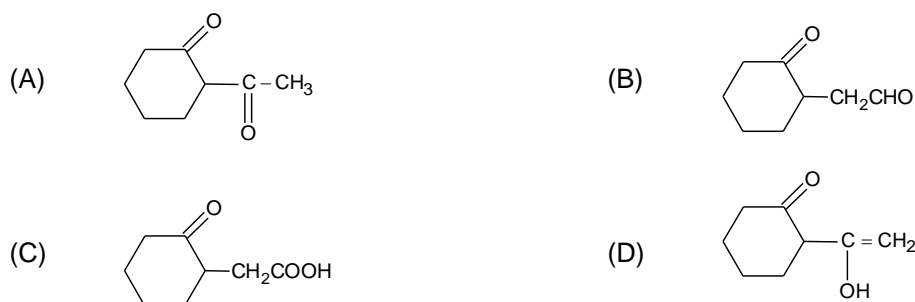
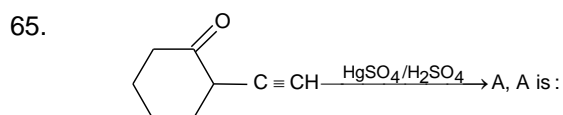
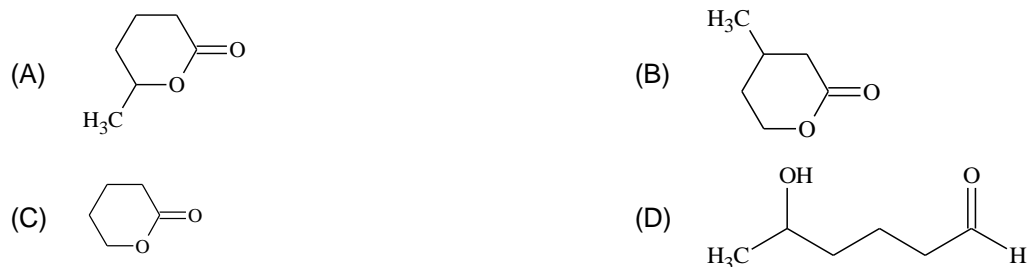
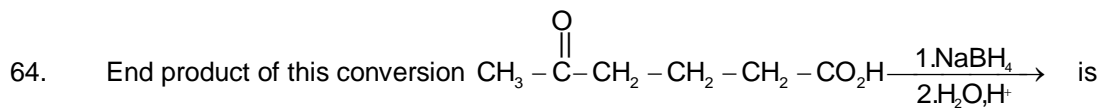
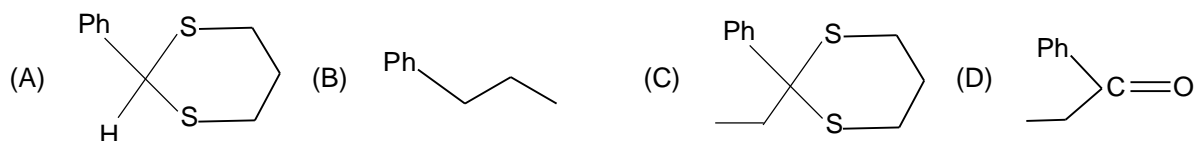
- (A) mixture of (+) and (–) butane-2-ol (B) meso butane-2,3-diol
(C) optically pure (+) isomer of butane-2,3-diol (D) mixture of (+) and (–) butane-2,3-diol



Select the correct option



Find out final product of reaction:



66. When Lassaigne's solution is treated with dil. HNO_3 and AgNO_3 , a white precipitate soluble in ammonium hydroxide shows the presence of

(A) chlorine (B) bromine (C) sulphur (D) nitrogen

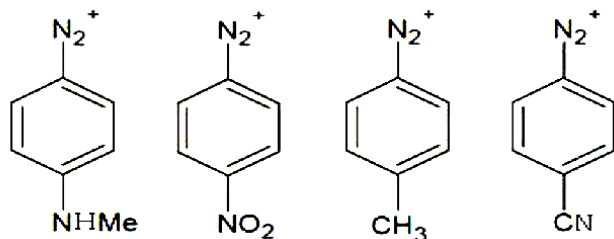
67. The products of oxidation of glucose by bromine water and conc. HNO_3 respectively

(A) gluconic acid and glucaric acid (B) oxalic acid and saccharic acid
(C) glucaric acid and gluconic acid (D) saccharic acid and oxalic acid.

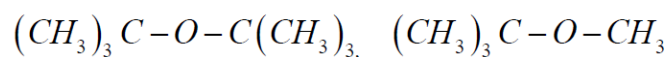
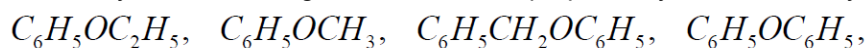
73. How many of the given compounds are monosaccharides.

Glucose (I)	Mannose (II)	Fructose (III)	Galactose (IV)	Lactose (V)	Starch (VI)
Cellulose (VII)	Sucrose (VIII)	Maltose (IX)			

74. The diazonium ions give diazo-coupling with phenol in the presence of dilute NaOH. How many of the following are more reactive than Benzene diazonium chloride?



75. How many of the following ethers cannot be prepared by Williamson's synthesis?



The number of hydroxyl groups present in the product X is/are

** Wish You^{est} all the Best **