

DATE : 19-04-15

CODE - A



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REVIEW TEST-1 (MEGA PHASE-I COURSE-2016)

JEE Mains

Time : 3 Hours

Maximum Marks : 360

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

INSTRUCTIONS

A. General :

1. This booklet is your Question Paper containing **90** questions. The booklet has **32** pages.
2. The **question paper CODE** is printed on the right hand top corner of this sheet and on the back page (page no. **32**) of this booklet.
3. The question paper contains **4** blank pages for your rough work. No additional sheets will be provided for rough work.
4. 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.
5. Fill in the boxes provided below on this page and also write your **Name** and **VA Roll No.** in the space provided on the back page (page no. **32**) of this booklet.
6. The answer sheet, a machine-readable Objective Response Sheet (**ORS**), is provided separately.
7. DO NOT TAMPER WITH / MUTILATE THE ORS OR THE BOOKLET.
8. Do not open the question-paper booklet before being instructed to do so by the invigilators.

B. Question paper format

Read the instructions printed on the back page

C. Marking scheme

(page no. **32**) of this booklet.

Name of the candidate

VA Roll Number

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I have read all the instructions and shall abide by them.

I have verified all the information filled in by the candidate.

.....
Signature of the Candidate

.....
Signature of the invigilator

USEFUL DATA

Atomic weights: H = 1, He = 4, Li = 7, g = 10 m/s², B = 11, C = 12, N = 14, O = 16, F = 19, Ne = 20, Na = 23, Mg = 24, Al = 27, P = 31, S = 32, Cl = 35.5, K = 39, Ca = 40, Ar = 40, Ti = 48, Cr = 52, Mn = 55, Fe = 56, Co = 59, Cu = 63.5, Zn = 65.5, Br = 80, Mo = 96, Ag = 108, I = 127, Ba = 137, U = 238

PART I : MATHEMATICS
Single Correct Choice Type

This section contains 30 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

1. Let $f(x) = \tan^{-1}(\sin x + \cos x)$ then $f'(0)$ equals
- (A) $\frac{1}{2}$ (B) 0 (C) 1 (D) Does not exist
2. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a function defined by $f(x) = \min\{x + 1, |x| + 1\}$. Then which of the following is true ?
- (A) $f(x) \geq 1 \forall x \in \mathbb{R}$ (B) $f(x)$ is not differentiable at $x = 0$.
(C) $f(x)$ is not differentiable at $x = 1$. (D) $f(x)$ is differentiable everywhere.
3. Let $f(x) = \begin{cases} \frac{1}{x} - \frac{2}{e^{2x} - 1} & ; x \neq 0 \\ \lambda & ; x = 0 \end{cases}$
- The value of λ for which $f(x)$ is continuous at $x = 0$
- (A) 0 (B) 1 (C) -1 (D) No value
4. If $f : \mathbb{R} \rightarrow \mathbb{R}$ satisfies $f(x)f(y) = f(xy) + x + y \forall x, y \in \mathbb{R}$, ($f(1) \neq -1$) then $f'(1) =$
- (A) 0 (B) 1 (C) 2 (D) None of these
-

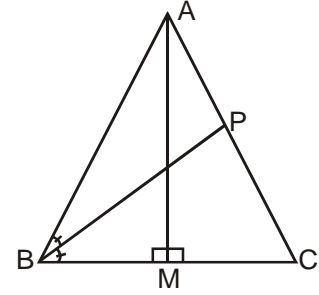
Space For Rough Work

5. The number of points of discontinuity of $f(x) = [\tan x [\cot x]]$; $x \in \left(\frac{\pi}{12}, \frac{\pi}{2}\right)$.
 (where $[\cdot]$ represent greatest integer function).
 (A) 0 (B) 1 (C) 2 (D) More than 2
6. Let $f : (0, \infty) \rightarrow \mathbb{R}$ and $g : (0, \infty) \rightarrow \mathbb{R}$ be two functions where $g(x) = x + \frac{1}{x}$. If $9 < f(x).g(x) < 99 \forall x > 0$ then $\lim_{x \rightarrow \infty} f(x)$ is
 (A) 0 (B) 54 (C) 100 (D) Can not be determined
7. $\lim_{x \rightarrow 0} \frac{d}{dx} \left(\frac{e^{e^{x^2}} - e}{x} \right)$ is
 (A) 0 (B) e (C) e^2 (D) $-e$
8. Let $f(x) = x|x|$, $g(x) = \sin x$ and $h(x) = (g \circ f)(x)$. Then
 (A) $h(x)$ is not differentiable at $x = 0$.
 (B) $h(x)$ is differentiable at $x = 0$ but $h'(x)$ is discontinuous at $x = 0$.
 (C) $h'(x)$ is continuous at $x = 0$ but not differentiable at $x = 0$.
 (D) $h'(x)$ is differentiable at $x = 0$.

Space For Rough Work

MATHEMATICS

9. The figure shows an isosceles triangle ABC with $\angle B = \angle C$. The bisector of angle B intersects the side AC at the point P. Suppose that BC remains fixed but the altitude AM approaches 0, so that $A \rightarrow M$ (mid-point of BC). Limiting value of BP, is



- (A) $\frac{a}{3}$ (B) $\frac{a}{2}$
 (C) $\frac{2a}{3}$ (D) $\frac{3a}{4}$

where a is fixed side BC.

10. If $f(x) = \begin{cases} \frac{\sqrt{2 + \cos x} - 1}{(\pi - x)^2} & ; x \neq \pi \\ k & ; x = \pi \end{cases}$

is continuous at $x = \pi$, then k equals

- (A) 0 (B) $\frac{1}{2}$ (C) 2 (D) $\frac{1}{4}$

11. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a function such that $|f(x)| \leq x^2, \forall x \in \mathbb{R}$. Then at $x = 0$, f is
 (A) Continuous but not differentiable. (B) Continuous as well as differentiable.
 (C) Neither continuous nor differentiable. (D) Differentiable but not continuous.

12. Let $f(x) = \begin{cases} \frac{x+5}{x-2} & ; x \neq 2 \\ 1 & ; x = 2 \end{cases}$

Number of points of discontinuity of $f(f(x))$ is/are

- (A) 0 (B) 1 (C) 2 (D) 3

Space For Rough Work

13. Let $f : [0, \pi] \rightarrow \mathbb{R}$ be defined as $f(x) = \begin{cases} \sin x & ; \text{ if } x \text{ is irrational} \\ \tan^2 x & ; \text{ if } x \text{ is rational} \end{cases}$

The number of points in $[0, \pi]$ at which f is continuous.

- (A) 6 (B) 4 (C) 2 (D) 0

14. Let $f(x) = 3x^{10} - 7x^8 + 5x^6 - 21x^3 + 3x^2 - 7$

$$265 \left(\lim_{h \rightarrow 0} \frac{h^4 + 3h^2}{(f(1-h) - f(1)) \sin 5h} \right) =$$

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

15. If $f(x)$ has isolated point of discontinuity at $x = a$ such that $|f(x)|$ is continuous at $x = a$ then

- (A) $\lim_{x \rightarrow a} f(x)$ does not exist (B) $\lim_{x \rightarrow a} f(x) + f(a) = 0$
 (C) $f(a) = 0$ (D) None of these

16. Polynomial function $f(x) = x^3 - x^2 + 1$ has a value zero for $x = c$, then c must lie

- (A) $[-1, 0]$ (B) $[0, 1]$ (C) $\left[1, \frac{3}{2}\right]$ (D) None of these

Space For Rough Work

17. $\lim_{x \rightarrow \frac{\pi^-}{2}} \frac{\tan^{-1}(\tan x) - \pi}{\cos^{-1}(\cos x)}$
 (A) -1 (B) 1 (C) Does not exist (D) None of these
18. Number of points of discontinuity of $f(x) = \left\{ \frac{x}{5} \right\} + \left[\frac{x}{2} \right]$ in $x \in [0, 100]$ is/are (where $[\cdot]$ denotes greatest integer function and $\{\cdot\}$ denotes fractional part function)
 (A) 50 (B) 51 (C) 52 (D) 55
19. If $f(x) = [2 + 7 \sin x]$, $0 < x < \pi$, number of points at which the function is non derivable is
 (A) 13 (B) 7 (C) 6 (D) 1
20. Let $f : [1, 10] \rightarrow \mathbb{Q}$ be a continuous function and $f(1) = 10$ then $f(10)$ is equal to
 (A) $\frac{1}{10}$ (B) 10 (C) 1 (D) can't be obtained

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21. $\lim_{x \rightarrow \frac{\pi}{2}} (\sin x)^{\sec x} =$

(A) e (B) e^{-1} (C) 1 (D) does not exist

22. $\lim_{x \rightarrow e} \left(\lim_{n \rightarrow \infty} \frac{(\ln x)^n + 1}{(\ln x)^n - 1} \right) =$

(A) 1 (B) -1 (C) 0 (D) Does not exist

23. $\lim_{x \rightarrow 1} \left[\left(\frac{4}{x^2 - x^{-1}} - \frac{1 - 3x + x^2}{1 - x^3} \right)^{-1} + 3 \left(\frac{x^4 - 1}{x^3 - x^{-1}} \right) \right] =$

(A) 1 (B) 2 (C) 3 (D) 0

Space For Rough Work

24. $\lim_{x \rightarrow 0} |\sin x|^{\lfloor \cos(\sin x) \rfloor} = \dots\dots\dots$, where $\lfloor \cdot \rfloor$ denotes greatest integer function
 (A) Does not exist (B) 0 (C) e (D) 1

25. If $f(2010) = \frac{\pi}{2}$, $f(x) = f(2x) \forall x \in \mathbb{R}$ and $f(x)$ is continuous for $x \in \mathbb{R}$, find the value of

$$\lim_{x \rightarrow 0} \frac{\cos(f(x)) - \sqrt[3]{\cos(f(x))}}{\sin^2(x)}$$
 is

- (A) $\frac{1}{4}$ (B) 1 (C) 0 (D) None of these

26. Let $f(x) = \lfloor x \rfloor$ and $g(x) = \begin{cases} 0 & x \in \mathbb{I} \\ x^2 & \text{otherwise} \end{cases}$

Then (where $\lfloor \cdot \rfloor$ represent greatest integer function)

- (A) fog is differentiable function (B) fog is differentiable on $\mathbb{R} - \sqrt{\mathbb{I}}$ ($\mathbb{I} \neq 0$)
 (C) gof is not continuous only at $x = 0$ (D) gof (2) = 1

Space For Rough Work

27. Function $f(x) = |x - 3|$ $x \geq 1$

$$= \frac{x^2}{4} - \frac{3x}{2} + \frac{13}{4} \quad x < 1 \quad \text{Then}$$

Which of the following option is **INCORRECT**

- (A) Continuous at $x = 1$ (B) Continuous at $x = 3$
 (C) Differentiable at $x = 1$ (D) Differentiable at $x = 3$

28. If $y(n) = e^x \cdot e^{x^2} \cdot e^{x^3} \dots e^{x^n}$, $0 < x < 1$ then $\lim_{n \rightarrow \infty} \frac{d(y(n))}{dx}$ at $x = \frac{1}{2}$ is equal to

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

29. If $y = \left(1 + \frac{1}{x}\right)^x$ then $y'(2)$ is equal to

- (A) $\frac{9}{4} \left(\frac{-1}{3} + \log \frac{3}{2}\right)$ (B) $\frac{4}{9} \left(\frac{-1}{3} + \log \frac{3}{2}\right)$ (C) $\frac{9}{4} \left(\frac{-1}{3} - \log \frac{3}{2}\right)$ (D) None of these

30. Given a function $g(x)$ which has derivative $g'(x)$ for all x satisfying $g'(0) = 2$ and $g(x + y) = e^y \cdot g(x) + e^x \cdot g(y)$ for all $x, y \in \mathbb{R}$. $g(5) = 32$ then the value of $g'(5) - 2e^5$ is equal to

- (A) 5 (B) 25 (C) 32 (D) None of these

Space For Rough Work

PART II : PHYSICS
Single Correct Choice Type

This section contains 30 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

31. An observer 'O' at an accelerated trolley observes a projectile Q of mass 5 kg moving under uniform gravitational field of earth acting towards negative z-axis. He observes the momentum \vec{P} of the projectile Q as $\vec{P} = 15t\hat{i} - 10t^2\hat{j} - 50t\hat{k}$ (kg m/s), where t denotes time in second. Find the acceleration of the trolley at t = 2 sec. (Take $g = 10 \text{ m/s}^2$)
- (A) $(6\hat{i} - 8\hat{j} - 20\hat{k}) \text{ m/s}^2$ (B) $(3\hat{i} - 8\hat{j}) \text{ m/s}^2$
(C) $(-3\hat{i} - 8\hat{j}) \text{ m/s}^2$ (D) $(-3\hat{i} + 8\hat{j}) \text{ m/s}^2$
32. A plane thick wall having uniform surface temperature along planes are 0°K and $T_0^\circ\text{K}$ ($T_0 = 300\text{K}$) at $x = 0$ and $x = x_0$ respectively. Thermal conductivity K varies linearly with temperature as $K = K_0(1 + T)$ the temperature of wall at the plane $x = 2x_0$ is approximately : (where T is in kelvin)
- (A) 300 K (B) 400 K (C) 425 K (D) 450 K
33. a projectile is fired with velocity v at angle of θ with horizontal. What would be the radius of curvature of path at instant when rate of change of speed of projectile is minimum ?
- (A) $\frac{v^2 \cos^2 \theta}{g}$ (B) $\frac{v^2}{g \cos \theta}$ (C) $\frac{v^2 \cos \theta}{g}$ (D) $\frac{v^2}{g \cos^2 \theta}$
-

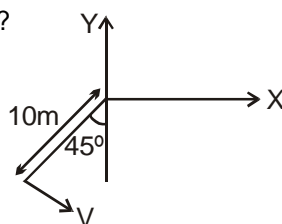
Space For Rough Work

PHYSICS

34. A ball of mass 1 kg attached with string of length 10 m is free to rotate on smooth horizontal plane is subjected to constant force of $-\sqrt{2}(\hat{i} + \hat{j})$ N. What should be the minimum velocity of projection at position

shown in figure, so that it complete full revolution ?

- (A) 10 ms^{-1}
- (B) $2\sqrt{5} \text{ ms}^{-1}$
- (C) $4\sqrt{5} \text{ ms}^{-1}$
- (D) 6 ms^{-1}

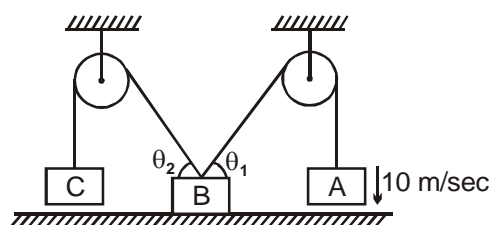


35. A man with least distance of clear vision equals to 30 cm, reads a book with small print using a magnifying glass (simple microscope), a thin convex lens of focal length 15 cm. What is the maximum magnifying power possible using the above simple microscope ?

- (A) 1.5
- (B) 2.5
- (C) 3
- (D) 3.5

36. If $V_A = 10 \text{ m/sec}$, what would be the velocity of C ? $\theta_1 = 30^\circ$, $\theta_2 = 60^\circ$. B is very heavy and remains on ground.

- (A) $\frac{10}{\sqrt{3}} \text{ m/sec}$
- (B) $10\sqrt{3} \text{ ms}^{-1}$
- (C) 10 ms^{-1}
- (D) $5\sqrt{3} \text{ ms}^{-1}$

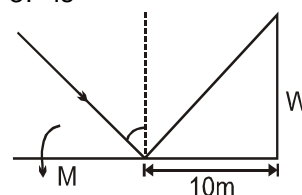


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PHYSICS

37. A light ray is incident on a plane mirror M. The mirror is rotated in direction as shown in figure by an arrow at frequency $(9/\pi)$ revolution/sec. The light reflected by the mirror is received on the wall W at a distance of 10 m from axis of rotation. Speed of the spot on wall when angle of incident = 37° is

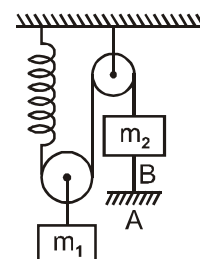
- (A) 10 m/sec
 (B) 1000 m/sec
 (C) 360 m/sec
 (D) 500 m/sec



38. Initially spring is relaxed and m_1 is released from rest. When m_1 come to rest for a moment string AB is cut at the same moment. Find the acceleration of m_2 just after cutting the thread.

(A) $a = \left[\frac{m_1}{m_2} - 1 \right] g$ (B) $a = \left[\frac{2m_1}{m_2} - 1 \right] g$

(C) $a = \left[\frac{m_1}{2m_2} - 1 \right] g$ (D) $a = \left[\frac{3m_1}{m_2} - 1 \right] g$



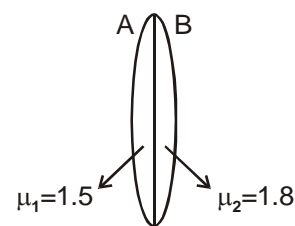
39. A compound microscope consist of an objective lens of focal length 2.0 cm, and an eye piece of focal length 6.25 cm, separated by a distance of 15 cm. How far from the objective should an object be placed in order to obtain the final image at least distance of distinct vision (25 cm).

- (A) 1.5 cm (B) 2.5 cm (C) 3.0 cm (D) 3.5 cm

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PHYSICS

40. A convex lens is made of two different materials having radius of curvature of surface A and surface B as 25 cm and 24 cm respectively. The effective focal length of lens is
- (A) 75/4 cm
 (B) 75 cm
 (C) 50 cm
 (D) 30 cm



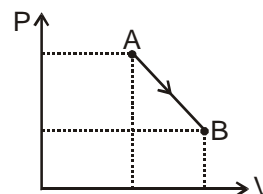
41. Potential energy of a system of two particles is $U = \frac{K}{r}$, where r is the distance between them. If both the particles are set free,
- (A) r will increase if K is positive.
 (B) r will increase if K is negative.
 (C) r may decrease or increase, it does not depends on sign of K .
 (D) From given information we can not conclude whether r will increase or decrease.

42. One mole of an ideal gas undergoes a process AB where A ($2P_0, V_0$) & B ($1.5 P_0, 1.5 V_0$). The process is shown in the PV diagram. The temperature of the gas (select the **WRONG** statement) :

- (A) Increases and then decreases.
 (B) Only increases.

- (C) Has a maximum value of $\frac{9 P_0 V_0}{4 R}$

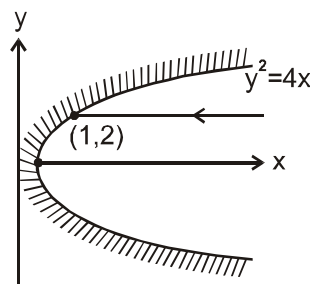
- (D) Is more at B than at A.



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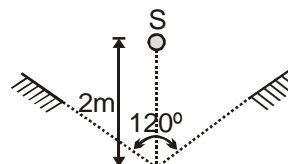
43. A light ray parallel to x-axis is incident on a parabolic concave mirror in XY plane. The focus of this parabola is at (1, 0). The unit vector along the reflected ray will be

- (A) \hat{j}
 (B) $-\hat{j}$
 (C) $\frac{\hat{i} + 4\hat{j}}{\sqrt{17}}$
 (D) $-\hat{i}$

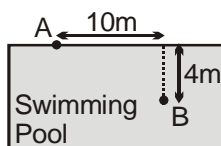


44. Area of triangle formed by S and its two images is

- (A) $3\sqrt{3} \text{ m}^2$ (B) $\frac{3\sqrt{3}}{4} \text{ m}^2$
 (C) $\frac{4}{3\sqrt{3}} \text{ m}^2$ (D) Can't be determined



45. On one boundary of a swimming pool, there is a person at point A, whose speed of running on ground (boundary) is 10 ms^{-1} , while that of swimming is 6 ms^{-1} . He has to reach a point B in the swimming pool. The distance covered on the boundary so that the time required to reach the point B in the pool is minimum, is



- (A) 10 m (B) 6 m (C) 7 m (D) $\sqrt{116} \text{ m}$

46. For a process, relation between temperature and volume is $TV^3 = \text{constant}$. If a monatomic gas follows this process, then find the molar specific heat for this process [R is a gas constant].

- (A) $\frac{7R}{6}$ (B) $\frac{R}{3}$ (C) $\frac{11R}{6}$ (D) zero

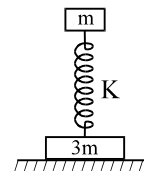
Space For Rough Work

PHYSICS

47. The potential energy of a 1 kg particle free to move along the x-axis is given by $U(x) = \left[\frac{x^4}{4} - \frac{x^2}{2} \right]$ J. The total mechanical energy of the particle is 2J. Then, the maximum speed of particle (in m/s) is

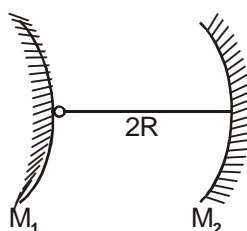
- (A) $\frac{1}{\sqrt{2}}$ (B) 2 (C) $\frac{3}{\sqrt{2}}$ (D) $\sqrt{2}$

48. In the figure shown, the spring constant is K. The mass of the upper disc is m and that of the lower disc is 3m. The upper block is depressed down from its equilibrium position by a distance $\delta = 5mg/K$ and released at $t = 0$. Find the velocity of 'm' when normal reaction on 3m is mg.



- (A) zero (B) $g[m/K]^{1/2}$
 (C) $2g[m/K]^{1/2}$ (D) $4g[m/K]^{1/2}$

49. Two spherical mirror, one convex and other concave, each of same radius of curvature R are arranged coaxially at a distance 2R from each other. A small circle of radius a is drawn on the convex mirror near the pole as shown in figure. The radius of 2nd image (taking the first reflection at the concave mirror, then the reflection at the convex mirror) of the circle is $\left(\frac{3a}{30 + x} \right)$, then value of x is

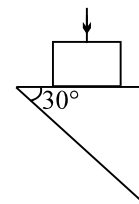


- (A) 1 (B) 2 (C) 3 (D) 4

Space For Rough Work

PHYSICS

50. A particle moves in a circle with a uniform speed, when it goes from a point A to a diametrically opposite point B, the momentum of the particle changes by $\vec{P}_A - \vec{P}_B = 2\text{kg} \cdot \text{m} / \text{s}(\hat{j})$ and the centripetal force acting on it changes by $\vec{F}_A - \vec{F}_B = 8\text{N}(\hat{i})$ where \hat{i}, \hat{j} are unit vectors. Then the angular velocity (in rad/s) of the particle is
(A) 1 (B) 2 (C) 4 (D) 8
51. The distance between object and screen is 96 cm. The ratio of length of two images formed by a convex lens placed between them is 4.84. The focal length f is nearly
(A) 22 cm (B) 20.6 cm (C) 24 cm (D) 24.2 cm
52. A ray of light incident normally on the horizontal face of the slab and just fail to emerge from the diagonal face of the prism. If prism angle is 30° , refractive index of the prism is
(A) $\sqrt{2}$ (B) 2
(C) slightly greater than 2 (D) slightly less than 2
53. For a glass prism of R.I. = 1.732 the angle of minimum deviation is equal to the angle of the prism. The angle of the prism in degrees is nearly
(A) 80 (B) 30 (C) 60 (D) 90



Space For Rough Work

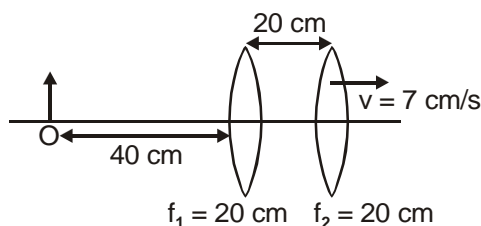
54. The limiting angle of incidence of a ray that can be transmitted by an equilateral prism of $\mu = \sqrt{\frac{7}{3}}$ will be
 (A) 60° (B) 30° (C) 45° (D) None of these
55. A point object is moving on the principle axis of concave mirror of focal length 24 cm towards it. When it is at a distance of 60 cm from the mirror, its velocity is 9 cm/s. What is the velocity of its image in cm/s at that instant ?
 (A) 5 cm/s towards the mirror (B) 4 cm/s towards the mirror
 (C) 4 cm/s away from the mirror (D) 9 cm/s away from the mirror
56. Two particles instantaneously at points A and B respectively 4.5 metres apart are moving with uniform velocities, the former towards B at 1.5 m/sec and the latter perpendicular to AB at 1.125 m/sec. The instant when they are nearest.
 (A) $1\frac{23}{25}$ sec (B) $1\frac{41}{42}$ sec (C) $2\frac{23}{27}$ sec (D) none of these
57. A ray incident at a point at an angle of incidence of 60° enters a glass sphere of $\mu = \sqrt{3}$ and is reflected and refracted at the farther surface of the sphere. The angle between the reflected and refracted rays at this surface is
 (A) 50° (B) 90° (C) 60° (D) 40°

Space For Rough Work

58. A spherical glass bulb of diameter d is filled with water ($\mu = \frac{4}{3}$). The bulb is viewed along its horizontal diameter. What is the apparent diameter? (Neglect the thickness of glass)

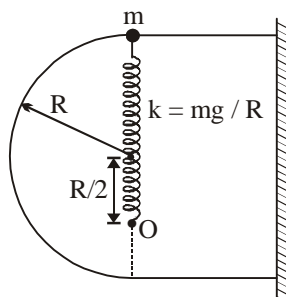
- (A) $2d$ (B) $\frac{3d}{2}$ (C) $\frac{d}{2}$ (D) $\frac{7}{4}d$

59. An object O is located 40 cm from the first of two thin converging lenses (each of focal length 20 cm), as shown in the figure below. If speed of the right lens is 7 cm/s rightwards, speed of final image is $\left(\frac{7x}{4}\right)$ cm/s at the instant shown, find the value of x .



- (A) 1.5 (B) 2.5 (C) 3.5 (D) 3

60. A bead of mass m is tied at one end of a spring of spring constant $k = mg/R$ and unstretched length $R/2$ and other end to fixed point O , as shown in the figure. The smooth semicircular wire frame is fixed in vertical plane. The normal reaction between bead and wire just before it reaches the lowest point is N . Find the ratio of N to weight mg of the bead. (Radius of semicircular frame is R)



- (A) 6 (B) 6.25 (C) 11.2 (D) 16

Space For Rough Work

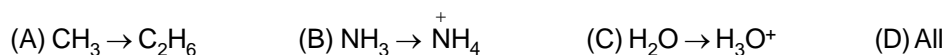
PART III : CHEMISTRY
Single Correct Choice Type

This section contains 30 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

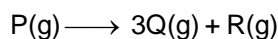
61. Maximum number of plane of symmetry possible in



62. In which of the following conversion both hybridisation as well as shape changes with respect to central atom?



63. Consider the following gaseous reaction where initial pressure of P(g) is 200 mmHg



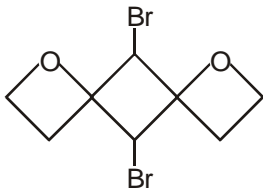
After time t, the pressure of system increases by 450 mm Hg. Calculate the value of t (in second)?

(Given : rate constant of reaction, $k = 4.606 \times 10^{-3} \text{ s}^{-1}$, $\log 2 = 0.3$)

- (A) 600 (B) 300 (C) 50 (D) 5
-

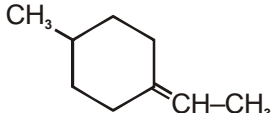
Space For Rough Work

64. Number of optically active tartaric acid is/are possible
 (A) 1 (B) 2 (C) 3 (D) 4
65. $2X(g) + Y(g) + 3Z(g) \longrightarrow \text{Products}$
 The rate equation of the above reaction is given by $\text{Rate} = k[x][y]^0[z]^2$
 Choose **INCORRECT** statement :
 (A) The rate of reaction is doubled by doubling the concentration of X(g) keeping other reactants concentration to be same.
 (B) The half life of Z(g) decreases by increasing its concentration.
 (C) If 50% of X(g) reacts in 10 sec. then 75% of X will react in 20 sec.
 (D) The rate of reaction decreases by reducing the concentration of Y(g) to half of original value.
66. Which of the following general formula represent to pyroxenes :
 (A) $(\text{Si}_2\text{O}_5)_n^{2n-}$ (B) $(\text{SiO}_3)_n^{2n-}$ (C) SiO_4^{4-} (D) $\text{Si}_2\text{O}_7^{6-}$

67.  Number of optically active isomer is/are
 (A) 0 (B) 1 (C) 2 (D) 3

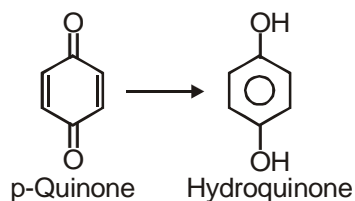
Space For Rough Work

CHEMISTRY

68. 20 V H_2O_2 solution is kept in the open vessel and is allowed to decompose by first order kinetics. After 6 hours, 10 ml of this H_2O_2 sample was taken and diluted to 100 ml by adding water. 10 ml of this diluted solution requires 25 ml of 0.025 M KMnO_4 in acidic medium for titration. Calculate the rate constant for the decomposition of H_2O_2 . [Given : $\log_{10}2 = 0.3$, $\log_{10}7 = 0.84$]
(A) 0.22 hr^{-1} (B) 0.023 hr^{-1} (C) 0.175 hr^{-1} (D) 17.5 hr^{-1}
69. Shortest O–O bond length is present in:
(A) O_2F_2 (B) O_2 (C) $\text{O}_2[\text{BF}_4]$ (D) O_3
70. Number of diastereomers possible for 
(A) 1 (B) 2 (C) 4 (D) 0
71. **Statement-I :** H_3BO_3 (Boric acid) is a weak monobasic lewis acid.
Statement-II : B–O bond length in H_3BO_3 is shorter than than of in its conjugate base $(\text{B}(\text{OH})_4)^-$
(A) Statement-1 is true, Statement-2 is true and Statement-2 is correct explanation for Statement-1
(B) Statement-1 is true, Statement-2 is true and Statement-2 is **NOT** the correct explanation for Statement-1
(C) Statement-1 is true, Statement-2 is false
(D) Statement-1 is false, Statement-2 is true

Space For Rough Work

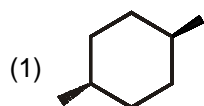
72. Quinones are good oxidising agents. In a cell reaction quinone converts itself into Hydroquinone as given below :



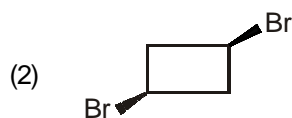
The total number of electrons taken by each quinone molecule in the above process is

- (A) 6 (B) 2 (C) 1 (D) Can't be predicted

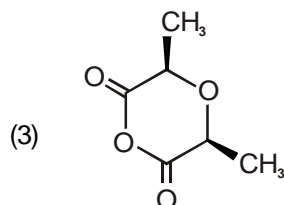
73.



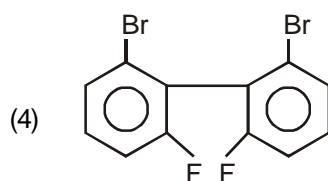
(P) Plane of symmetry



(Q) Meso compound



(R) Number of possible diastereomers are zero



(S) C_2 axis of symmetry

- | | | | | |
|-----|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| (A) | P | S | Q | R |
| (B) | R | Q | P | Q |
| (C) | P | Q | P | R |
| (D) | R | S | Q | Q |

Space For Rough Work

74. Which of the following property is different between NO and O_2^+
 (A) sp mixing (B) Magnetic behaviour (C) Bond order (D) σ and π -bond
75. At low pressure conditions the expression of compressibility factor for one mole of a real gas is given by :
 (A) $Z = 1 - \frac{a}{PRT}$ (B) $Z = 1 - \frac{aP}{z(RT)^2}$ (C) $Z = 1 + \frac{Pb}{RT}$ (D) $Z = 1 + \frac{aV_m}{RT}$
76. Which conformer of butane are chiral in the given form
- (1)

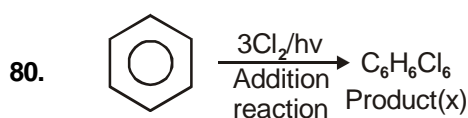
(2)

(3)

(4)
- (A) 1, 2 (B) 2, 3 (C) 2, 4 (D) 1, 3
77. Select the **CORRECT** statement regarding C_2^{2+} molecular species.
 (A) HOMO is Gerade (B) LUMO is Ungerade
 (C) SOMO is Ungerade (D) Both HOMO and LUMO are Gerade

Space For Rough Work

78. If equal volume of oxygen gas and unknown gas take 2.0 and 4.0 minutes to effuse through a membrane respectively. What is the molar mass of unknown gas ?
 (A) 8 g/mole (B) 64 g/mole (C) 128 g/mole (D) 306 g/mole
79. Which of the following molecule is not formed by involvement of co-ordinate bond(s).
 (A) Cl_2O_6 (B) I_2Cl_6 (C) $\text{Al}_2(\text{NH}_2)_6$ (D) $(\text{NH}_4)_2[\text{SiF}_6]$



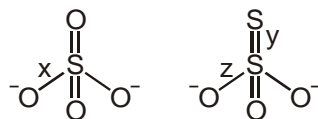
Find the number of meso & optically active isomers possible for product(x) respectively

- (A) 2,7 (B) 3,6 (C) 8,2 (D) 7,2
81. Aqueous NH_4NO_2 decomposes according to the first order reaction :

$$\text{NH}_4\text{NO}_2(\text{aq}) \longrightarrow \text{N}_2(\text{g}) + 2\text{H}_2\text{O}(\ell)$$
 At constant temperature and pressure, the volume of N_2 collected after 20 minutes is 20 ml & after a very long time is 40 ml. The rate constant for the reaction is [Given : $\log 2 = 0.3010$]
 (A) $1.435 \times 10^{-2} \text{ min}^{-1}$ (B) $3.466 \times 10^{-2} \text{ min}^{-1}$ (C) $2.465 \times 10^{-2} \text{ min}^{-1}$ (D) $6.93 \times 10^{-2} \text{ min}^{-1}$

Space For Rough Work

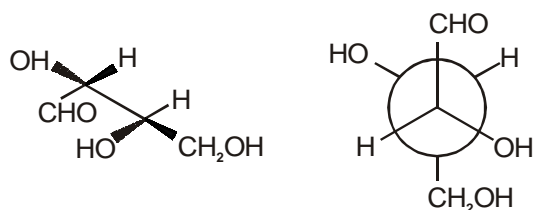
82. For following oxyanions :



Correct order of bond length is :

- (A) $z > y > x$ (B) $z > x > y$ (C) $y > z > x$ (D) $y > x > z$

83. Identify the D or L configuration for the given 2 compounds respectively

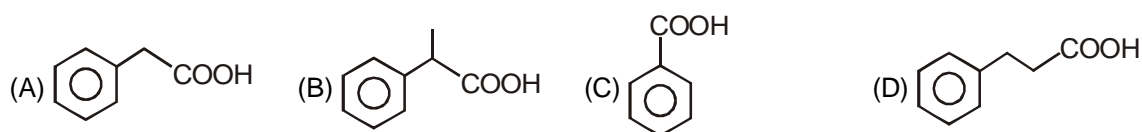


- (A) D, L (B) L, D (C) D, D (D) L, L

84. $X \rightarrow Y$: Initially the rate of reaction is 0.5 M hr^{-1} . The initial conc. of X is 1.0 M . The degree of conversion of X is maximum in one hour if reaction is (Given : $e^{0.5} = 1.65$)

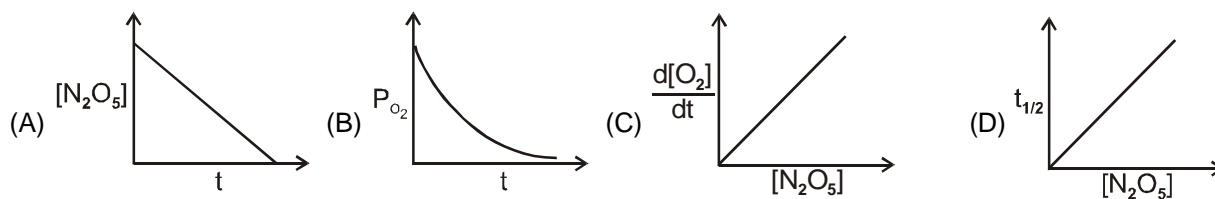
- (A) Zero order reaction (B) First order reaction
(C) Second order reaction (D) Data is not sufficient

Space For Rough Work



86. For first order decomposition of $\text{N}_2\text{O}_5(\text{g})$ to give $\text{NO}_2(\text{g})$ and $\text{O}_2(\text{g})$ at constant temperature, which of the following graph is correct.

(Where : P_{O_2} represents partial pressure of O_2 gas and $t_{1/2}$ represents half life of $\text{N}_2\text{O}_5(\text{g})$)

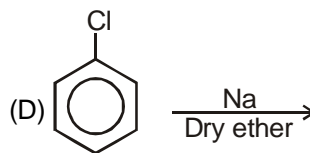
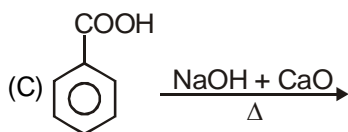
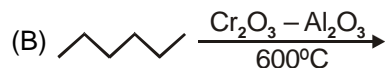
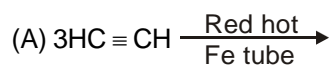


87. Which pair of molecular species has same bond order as well as magnetic moment.

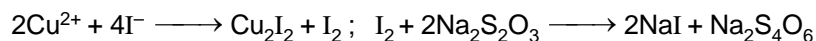
- (A) B_2, O_2 (B) $\text{C}_2, \text{O}_2^{2-}$ (C) S_2, O_2 (D) $\text{N}_2^{2-}, \text{O}_2^{2+}$

Space For Rough Work

88. Which of the following preparation method for benzene is not correct



89. In an iodometric estimation, the following reactions occur



0.15 mole of CuSO_4 was added to excess of KI solution and the liberated iodine required 1M of hypo solution. Used volume of hypo solution was :

- (A) 50 (B) 100 (C) 150 (D) 175

90. Which of the following nonmetal does not form dibasic oxyacid.

- (A) C (B) P (C) S (D) Cl

Space For Rough Work

Space For Rough Work

Space For Rough Work

Space For Rough Work

Space For Rough Work

DATE : 19-04-15

CODE - A

Name of the candidate

VA Roll Number

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B. Question paper format :

9. The question paper consists of 3 parts (Physics, Chemistry and Mathematics).
10. **Parts** contains **30** multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **only one is correct**.

C. Marking Scheme :

11. For each question in **Parts**, you will be **awarded 4 marks** if you have darkened only the bubble corresponding to the correct answer and **zero mark** if no bubbles are darkened. In all other cases, **minus one (-1) mark** will be awarded.