

DATE : 24-04-16

CODE - A



# VIBRANT ACADEMY

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### REVIEW TEST-1 (MEGA PHASE-I COURSE-2017) 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 **3** 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/s<sup>2</sup>, 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.

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1. Let  $a, b \in \mathbb{R}$ , ( $a \neq 0$ ). If the function  $f$  defined as  $f(x) = \begin{cases} \frac{2x^2}{a} & , 0 \leq x < 1 \\ a & , 1 \leq x < \sqrt{2} \\ \frac{2b^2 - 4b}{x^3} & , \sqrt{2} \leq x < \infty \end{cases}$  is continuous in the interval

$[0, \infty)$ , then an ordered pair  $(a, b)$  is :

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

2. Let  $a_1, a_2, a_3, \dots, a_n, \dots$  be in A.P. If  $a_3 + a_7 + a_{11} + a_{15} = 72$ , then the sum of its first 17 terms is equal to  
(A) 153      (B) 306      (C) 612      (D) 204

3. If  $\frac{{}^{n+2}C_6}{{}^{n-2}P_2} = 11$ , then  $n$  satisfies the equation :

- (A)  $n^2 + n - 110 = 0$       (B)  $n^2 + 5n - 84 = 0$       (C)  $n^2 + 3n - 108 = 0$       (D)  $n^2 + 2n - 80 = 0$

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**Space For Rough Work**

4. If the coefficients of  $x^{-2}$  and  $x^{-4}$  in the expansion of  $\left(x^{\frac{1}{3}} + \frac{1}{2x^{\frac{1}{3}}}\right)^{18}$ , ( $x > 0$ ), are  $m$  and  $n$  respectively, then  $\frac{m}{n}$  is equal to
- (A)  $\frac{5}{4}$                       (B)  $\frac{4}{5}$                       (C) 27                      (D) 182
5. If  $x$  is a solution of the equation,  $\sqrt{2x+1} - \sqrt{2x-1} = 1$ ,  $\left(x \geq \frac{1}{2}\right)$ , then  $\sqrt{4x^2-1}$  is equal to
- (A) 2                      (B)  $\frac{3}{4}$                       (C)  $2\sqrt{2}$                       (D)  $\frac{1}{2}$
6. If quadratic equations  $x^2 + \lambda x + 1 = 0$  and  $(b-c)x^2 + (c-a)x + (a-b) = 0$  have both the roots common, then  $\lambda$  is :
- (A) -3                      (B) -2                      (C) -1                      (D) 1
7. A circle passes through  $(-2, 4)$  and touches the  $y$ -axis at  $(0, 2)$ . Which one of the following equations can represent a diameter of this circle?
- (A)  $2x - 3y + 10 = 0$       (B)  $3x + 4y - 3 = 0$       (C)  $4x + 5y - 6 = 0$       (D)  $5x + 2y + 4 = 0$

**Space For Rough Work**

8. If a variable line drawn through the intersection of the lines  $\frac{x}{3} + \frac{y}{4} = 1$  and  $\frac{x}{4} + \frac{y}{3} = 1$ , meets the coordinate axes at A and B, ( $A \neq B$ ), then the locus of the midpoint of AB is  
 (A)  $7xy = 6(x + y)$  (B)  $4(x + y)^2 - 28(x + y) + 49 = 0$   
 (C)  $6xy = 7(x + y)$  (D)  $14(x + y)^2 - 97(x + y) + 168 = 0$
9. If  $f(x)$  is differentiable function such that  $f'(2) = 6$ ,  $f'(1) = 4$  and  $\lim_{h \rightarrow 0} \frac{f(h^3 + 3h + 2) - f(2)}{f(2h - 2h^2 + 1) - f(1)} = \frac{9}{k}$  then  $k =$   
 (A) 1 (B) 2 (C) 3 (D) 4
10. The value of  $\sum_{r=1}^{15} r^2 \left( \frac{{}^{15}C_r}{{}^{15}C_{r-1}} \right)$  is equal to  
 (A) 1240 (B) 560 (C) 1085 (D) 680
11. The point (2, 1) is translated parallel to the line  $L : x - y = 4$  by  $2\sqrt{3}$  units. If the new point Q lies in the third quadrant, then the equation of the line passing through Q and perpendicular to L is  
 (A)  $x + y = 2 - \sqrt{6}$  (B)  $2x + 2y = 1 - \sqrt{6}$  (C)  $x + y = 3 - 3\sqrt{6}$  (D)  $x + y = 3 - 2\sqrt{6}$

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**Space For Rough Work**

12. For  $x \in \mathbb{R}$ ,  $x \neq 0$ ,  $x \neq 1$  let  $f_0(x) = \frac{1}{1-x}$  and  $f_{n+1}(x) = f_0(f_n(x))$ ,  $n = 0, 1, 2, \dots$ . Then the value of  $f_{100}(3) + f_1\left(\frac{2}{3}\right) + f_2\left(\frac{3}{2}\right)$  is equal to
- (A)  $\frac{8}{3}$                       (B)  $\frac{4}{3}$                       (C)  $\frac{5}{3}$                       (D)  $\frac{1}{3}$
13. If the function  $f(x) = \begin{cases} -x, & x < 1 \\ a + \cos^{-1}(x+b), & 1 < x \leq 2 \end{cases}$  is differentiable at  $x = 1$ , then  $\frac{a}{b}$  is equal to
- (A)  $\frac{\pi+2}{2}$                       (B)  $\frac{\pi-2}{2}$                       (C)  $\frac{-\pi-2}{2}$                       (D)  $-1 - \cos^{-1}(2)$
14. If  $\lim_{x \rightarrow \infty} \left(1 + \frac{a}{x} - \frac{4}{x^2}\right)^{2x} = e^3$ , then 'a' is equal to
- (A) 2                      (B)  $\frac{3}{2}$                       (C)  $\frac{1}{2}$                       (D)  $\frac{2}{3}$
15. Let  $x, y, z$  be positive real numbers such that  $x + y + z = 12$  and  $x^3y^4z^5 = (0.1)(600)^3$ . Then  $x^3 + y^3 + z^3$  is equal to
- (A) 342                      (B) 216                      (C) 258                      (D) 270

**Space For Rough Work**

16. The number of distinct real roots of the equation,  $\begin{vmatrix} \cos x & \sin x & \sin x \\ \sin x & \cos x & \sin x \\ \sin x & \sin x & \cos x \end{vmatrix} = 0$  in the interval  $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$  is
- (A) 1                                      (B) 4                                      (C) 2                                      (D) 3

17. For  $x \in \mathbb{R}$ ,  $x \neq -1$ , if

$$(1+x)^{2016} + x(1+x)^{2015} + x^2(1+x)^{2014} + \dots + x^{2016} = \sum_{i=0}^{2016} a_i x^i, \text{ then } a_{17} \text{ is equal to}$$

- (A)  $\frac{2017!}{17! 2000!}$                       (B)  $\frac{2016!}{17! 1999!}$                       (C)  $\frac{2016!}{16!}$                                       (D)  $\frac{2017!}{2000!}$
18. If the four letter words (need not be meaningful) are to be formed using the letters from the word "MEDITERRANEAN" such that the first letter is R and the fourth letter is E, then the total number of all such words is
- (A) 110                                      (B) 59                                      (C)  $\frac{11!}{(2!)^3}$                                       (D) 56

19. The value of  $\cos\left(\frac{1}{2} \cos^{-1} \frac{1}{8}\right)$  is equal to
- (A) 3/4                                      (B) -3/4                                      (C) 1/16                                      (D) 1/4

**Space For Rough Work**

20. The graph of the function  $f(x) = \log_a(x + \sqrt{x^2 + 1})$  is symmetric about  
 (A) x-axis (B) Origin (C) y-axis (D) the line  $y = x$
21. Let  $f(x) = \log_2(|\sin x| + |\cos x|)$ . The range of  $f(x)$  is  
 (A)  $[-1, 0]$  (B)  $[0, 1/2]$  (C)  $[-1/2, 0]$  (D)  $[0, 1]$
22.  $\lim_{x \rightarrow 0} \frac{x \cos x - \log(1+x)}{x^2}$  is equal to  
 (A)  $1/2$  (B) 0 (C) 1 (D) None of these
23.  $\lim_{x \rightarrow 0} \left[ (1 - e^x) \frac{\sin x}{|x|} \right]$  is equal to  
 (where  $[\cdot]$  denotes G.I.F)  
 (A) 0 (B) 1 (C) -1 (D) Does not exist

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**Space For Rough Work**

24. Number of points of discontinuity of the function  $y = f(f(x))$  where  $f(x) = \frac{1}{\ell \ln x}$  in  $(1, \infty)$  is  
 (A) 1 (B) 2 (C) 3 (D) 0
25. Number of value(s) of 'x' satisfying  $5\{x\} = x + [x]$  and  $[x] - \{x\} = \frac{1}{2}$  is/are  
 (where  $[\cdot]$  denotes G.I.F. and  $\{\cdot\}$  denotes fractional part function)  
 (A) 0 (B) 1 (C) 2 (D) More than 2
26. If  $\cos^{-1}\left(\frac{6x}{1+9x^2}\right) = \frac{-\pi}{2} + 2\tan^{-1}(3x)$  then complete set of values of 'x' is  
 (A)  $(-1, 1)$  (B)  $\left[\frac{1}{3}, \infty\right)$  (C)  $\left(\frac{-1}{3}, \frac{1}{3}\right)$  (D) None of these
27.  $\lim_{x \rightarrow 1} \left[ \operatorname{cosec} \frac{\pi x}{2} \right]^{1-x}$  is equal to  
 (where  $[\cdot]$  denotes greatest integer function)  
 (A) 0 (B) 1 (C)  $\infty$  (D) Does not exist

**Space For Rough Work**



28. Let  $f(x) = \frac{a^x + a^{-x} - 2}{x^2} \quad x > 0$  (a > 0)

$= 3\ln(a - x) - 2 \quad x \leq 0$

if f(x) is continuous at x = 0, then 'a' can be

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

29. Let  $f(x) = \max.\{\cos x, x, 2x - 1\}$  where  $x \geq 0$ , then number of point(s) of non-differentiability of f(x) is/are  
 (A) 1 (B) 0 (C) 2 (D) More than 2

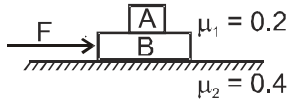
30. Which of the following quantity is negative?  
 (A)  $\tan^{-1}(\tan 4)$  (B)  $\cot^{-1}(\cot 4)$  (C)  $\tan(\cos^{-1}(\cos 5))$  (D)  $\cot(\sin^{-1}(\sin 4))$

**Space For Rough Work**

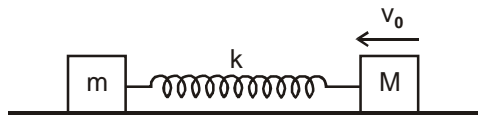
**PART II : PHYSICS**  
**Single Correct Choice Type**

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. In the figure, mass of A = 2 kg and mass of B = 4 kg. For what minimum value of force F, block A starts slipping over block B.



- (A) 24 N                      (B) 36 N                      (C) 12 N                      (D) 20 N
32. Two blocks of masses m and M are joined with an ideal spring of spring constant k and kept on a rough surface as shown. The spring is initially unstretched and the coefficient of friction between the blocks and the horizontal surface is  $\mu$ . What should be the maximum speed of the block of mass M such that the smaller block does not move?



- (A)  $\mu g \sqrt{\frac{Mm}{(M+m)k}}$       (B)  $\mu g \sqrt{\frac{(M+m)k}{Mm}}$       (C)  $\mu g \sqrt{\frac{(2M+m)k}{kM}}$       (D) None of these
33. Force acting on a block moving along x-axis is given by

$$F = - \left( \frac{4}{x^2 + 2} \right) \text{ Newton}$$

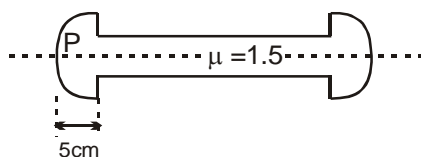
The block is displaced from  $x = -2\text{m}$  to  $x = +4\text{m}$ , the work done will be

- (A) positive                      (B) negative                      (C) zero                      (D) Information insufficient

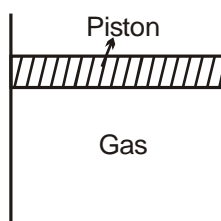
**Space For Rough Work**

**PHYSICS**

34. A glass dumbbell of length 50 cm and refractive index 1.5 has ends of 5 cm radius of curvature. A point object is situated in air at a distance of 20 cm from the end P of the dumbbell along the axis. Find the distance (from P) of image due to refraction at surface of P only.



- (A) 30 cm                      (B) 15 cm                      (C) 10 cm                      (D) 5 cm
35. A graph is plotted with  $PV/T$  on y-axis and mass of the gas along x-axis for different gases. The graph is :  
 (A) a straight line parallel to x-axis for all the gases  
 (B) a straight line passing through origin with a slope having a constant for all the gases.  
 (C) a straight line passing through origin with a slope having different values for different gases  
 (D) a straight line parallel to y-axis for all the gases.
36. A cylinder of ideal gas is closed by an 8.00 kg movable piston (area = 60 cm<sup>2</sup>) as shown in figure. Atmospheric pressure is 100 kPa. When the gas is heated from 30.0°C to 100.0°C, the piston rises 20.0 cm. The piston is then fastened in place, and the gas is cooled back to 30.0°C. If  $\Delta Q_1$  is the heat added to the gas in the heating process, and  $\Delta Q_2$  is the heat lost during cooling find the difference  $|\Delta Q_1| - |\Delta Q_2|$  is.



- (A) 32.5 cal                      (B) 30.0 cal                      (C) 28.5 cal                      (D) 20.0 cal

**Space For Rough Work**

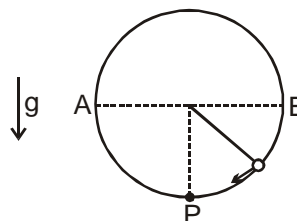
## PHYSICS

37. The focal lengths of the objective and the eye-piece of a compound microscope are 2.0 cm and 3.0 cm, respectively. The distance between the objective and the eye-piece is 15.0 cm. The final image formed by the eye-piece is at infinity. The two lenses are thin. The distance (in cm) of the object and the image produced by the objective, measured from the objective lens, are respectively.

(A) 2.4 and 12.0      (B) 2.4 and 15.0      (C) 4.2 and 12.0      (D) 4.2 and 3.0

38. A particle of mass  $m$  oscillates along APB (speeds zero at A & B) inside a smooth spherical shell of radius  $R$ . At any instant the kinetic energy of the particle is  $K$ . Then the force applied by particle on the shell at this instant is

(A)  $\frac{K}{R}$       (B)  $\frac{2R}{K}$   
(C)  $\frac{3K}{R}$       (D)  $\frac{K}{2R}$



39. A hydrogen cylinder is designed to withstand an internal pressure of 100 atmospheres. At 27°C the hydrogen pumped into the cylinder exerts a pressure of 20 atmospheres. At what temperature does the danger of explosion first set in ?

(A) 1200°C      (B) 1227°C      (C) 1300°C      (D) 1327°C

40. A hollow double concave lens is made of very thin transparent material. It can be filled with air or either of two liquids  $L_1$  or  $L_2$  having refractive indices  $\mu_1$  and  $\mu_2$  respectively. ( $\mu_2 > \mu_1 > 1$ ). The lens will diverge a parallel beam of light if it is filled with

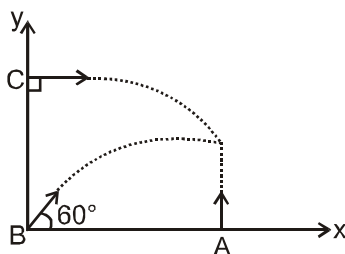
(A) air and placed in air      (B) air and immersed in  $L_1$   
(C)  $L_1$  and immersed in  $L_2$       (D)  $L_2$  and immersed in  $L_1$

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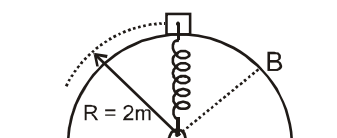
**Space For Rough Work**

## PHYSICS

41. A concave spherical mirror forms a real magnified image of an object which is twice as big as the object. However, if the object is moved by 15 cm away from the mirror the magnification becomes  $-1$ . If the object is moved further by another 15 cm, the magnification will now be  
 (A)  $-0.67$                       (B)  $-1.25$                       (C)  $-0.33$                       (D)  $-1.33$
42. Three particles A, B and C are projected with initial velocities  $v_A$ ,  $v_B$  and  $v_C$  (in vertical plane) as shown in figure. The particles collide at highest point of A. Then  $v_A : v_B : v_C$  is :



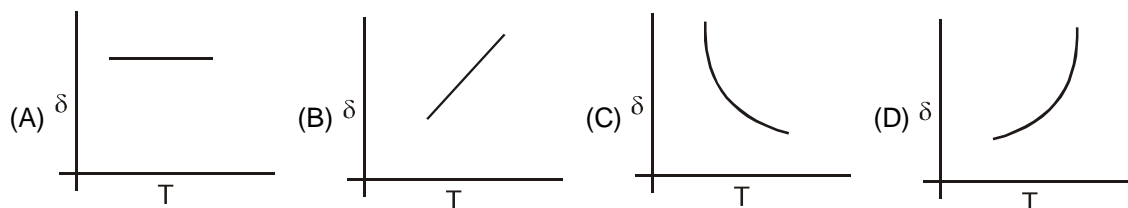
- (A)  $\frac{\sqrt{3}}{2} : 1 : \frac{1}{2}$                       (B)  $\sqrt{3} : 1 : 1$                       (C)  $1 : \frac{\sqrt{3}}{2} : \sqrt{3}$                       (D) None
43. A 2 kg block is gently pushed from rest at A and it slides down along the fixed smooth circular surface. If the attached spring has a force constant  $k = 20 \text{ N/m}$ . What is unstretched length of spring so that it does not allow the block to leave the surface until angle with the vertical is  $\theta = 60^\circ$ ?



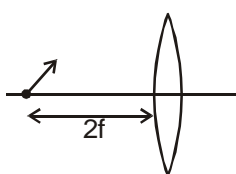
- (A) 1m                      (B) 1.5 m                      (C) 0.5 m                      (D) 0.8 m

**Space For Rough Work**

44. An ideal gas is initially at a temperature  $T$  and volume  $V$ . Its volume is increased by  $\Delta V$  due to an increase in temperature  $\Delta T$ , pressure remains constant. The quantity  $\delta = \frac{\Delta V}{V\Delta T}$  varies with temperature as :

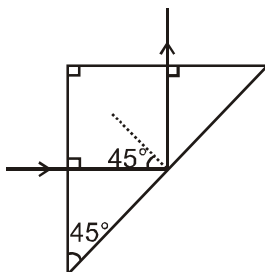


45. A small straight rod is placed at an inclination with the optical axis of a thin lens as shown in the figure. The base of the rod is on the optical axis and at a distance  $2f$  ( $f$  = focal length of the lens) from the lens. The image of the rod would be like :



- (A) (B) (C) (D) (Note: The original image shows (C) and (D) as curved arrows, but the description is simplified to match the visual representation.)

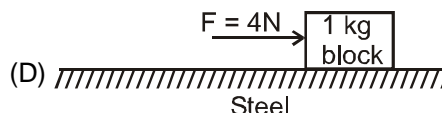
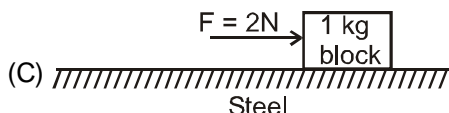
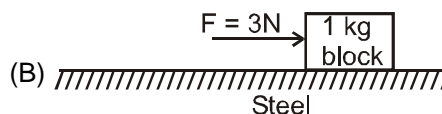
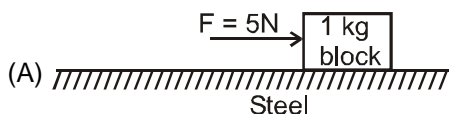
46. A light ray is incident perpendicular to one face of a  $90^\circ$  prism and is total internally reflected at the glass-air interface. If the angle of reflection is  $45^\circ$ , we conclude that (the refractive index of glass is  $n$ ).



- (A)  $n < \frac{3}{2\sqrt{2}}$  (B)  $n > \frac{3}{2\sqrt{2}}$  (C)  $n < \frac{4\sqrt{2}}{3}$  (D) None

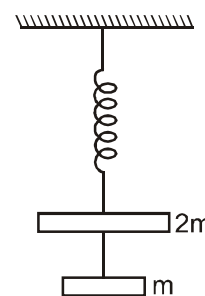
Space For Rough Work

47. The image formed by an objective of a compound microscope is  
 (A) virtual and diminished (B) real and diminished  
 (C) real and enlarged (D) virtual and enlarged
48. Different forces are applied to each of four 1 kg blocks to slide them across a surface at constant speed as shown. In which diagram is the coefficient of friction between the block and the steel smallest ?



49. The string between blocks of mass  $m$  and  $2m$  is massless and inextensible. The system is suspended by a massless spring and is in equilibrium as shown. If the string is cut find the magnitudes of accelerations of mass  $2m$  and  $m$  (immediately after cutting)

- (A)  $g, g$  (B)  $g, \frac{g}{2}$   
 (C)  $\frac{g}{2}, g$  (D)  $\frac{g}{2}, \frac{g}{2}$

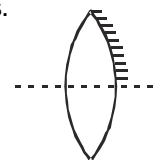


Space For Rough Work

**PHYSICS**

50. Half part of the rear surface of a thin equiconvex lens of focal length 40 cm and refractive index 1.5 is silvered. If parallel rays are incident on this lens, then the distance between the two images.

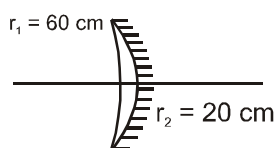
- (A) 50 cm                      (B)  $\frac{80}{3}$  cm  
(C) 40 cm                      (D) None



51. A mango tree is at the bank of river and one of the branch of tree extends over the river. A tortoise lives inside river. A mango falls just above the tortoise. The acceleration of the mango falling from tree appearing to the tortoise is (Refractive index of water is  $\frac{4}{3}$  and the tortoise is stationary)

- (A)  $g$                       (B)  $\frac{3g}{4}$                       (C)  $\frac{4g}{3}$                       (D) None of these

52. Convex surface of thin concavo - convex lens of refractive index 1.5 is silvered as shown. A small object is kept in air at 30 cm left of the lens on its principal axis. the distance of the final image from mirror is



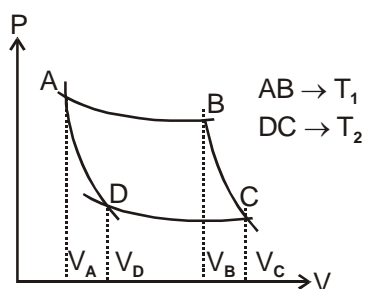
- (A) 20 cm                      (B) 30 cm                      (C) 10 cm                      (D) 15 cm

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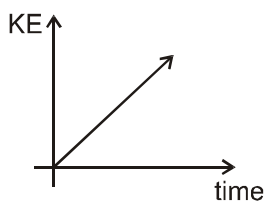


53. In the following P-V diagram of an ideal gas, two adiabats cut two isotherms at  $T_1 = 300\text{K}$  and  $T_2 = 200\text{K}$ . The value of  $V_B/V_C$

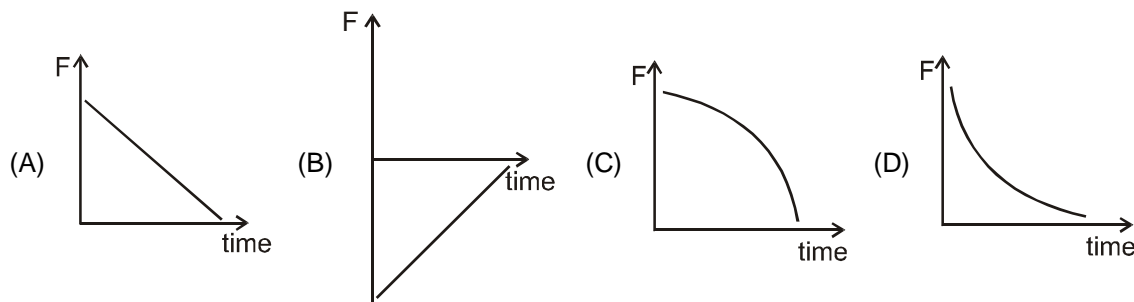


- (A)  $= V_A/V_D$       (B)  $< V_A/V_D$       (C)  $> V_A/V_D$       (D)  $3/2$

54. The kinetic energy (KE) vs time graph for a particle moving along a straight line is shown in the figure.

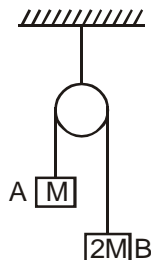


The force vs time graph for the particle may be



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55. A point on P-V diagram represents :  
(A) The state of a system (B) Work done or by a system  
(C) Work done in a cyclic process (D) A thermodynamic process
56. For the system shown in the figure, the tension in the string is  $T$ . The tension will become  $2T$  by adding mass \_\_\_\_\_ on \_\_\_\_\_.



- (A)  $2M$ , B (B)  $4M$ , B (C)  $2M$ , A (D)  $3M$ , A
57. A long solid cylinder is radiating power. It is remoulded into a number of thinner cylinders, each of which has the same length as original cylinder. Each thin cylinder has the same temperature as the original cylinder. The total radiant power emitted by the pieces is twice that emitted by the original cylinder. How many smaller cylinders are there ? Neglect the energy emitted by the flat faces of cylinder.  
(A) 3 (B) 4 (C) 5 (D) 6

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58. In the isothermal expansion of an ideal gas (Choose the **INCORRECT** option) :
- (A) there is no change in the temperature of the gas
  - (B) there is no change in the internal energy of the gas
  - (C) the work done by the gas is equal to the heat supplied to the gas
  - (D) the work done by the gas is equal to the change in its internal energy
59. Two coherent monochromatic light beams of intensities  $I$  and  $4I$  are superposed. The maximum and minimum possible intensities in the resulting beam are
- (A)  $5I$  and  $I$                       (B)  $5I$  and  $3I$                       (C)  $9I$  and  $I$                       (D)  $9I$  and  $3I$
60. In a two-slit experiment, with monochromatic light, fringes are obtained on a screen placed at some distance from the slits. If the screen is moved by  $5 \times 10^{-2} \text{m}$  towards the slits, the change in fringe width is  $10^{-3} \text{m}$ . Then the wavelength of light used is (given that distance between the slits is  $0.03 \text{mm}$ )
- (A)  $4000 \text{ \AA}$                       (B)  $4500 \text{ \AA}$                       (C)  $5000 \text{ \AA}$                       (D)  $6000 \text{ \AA}$

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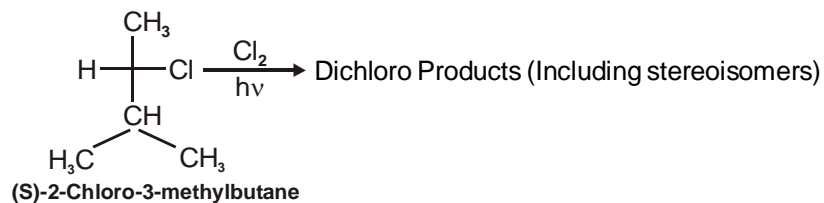
**Space For Rough Work**

**PART III : CHEMISTRY**  
**Single Correct Choice Type**

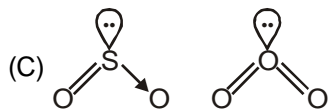
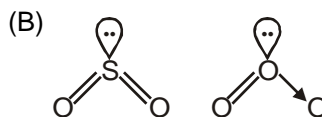
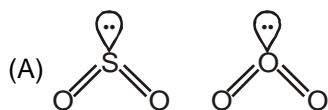
This section contains 30 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

61. A solution contains two cations  $\text{Ba}^{2+}$  and  $\text{Pb}^{2+}$  along with common anion, this common anion is  
 (A)  $\text{Cl}^-$  (B)  $\text{S}^{2-}$  (C)  $\text{CH}_3\text{COO}^-$  (D)  $\text{CrO}_4^{2-}$

62. How many number of fractions are obtained on fractional distillation of products in below reaction?



- (A) 3 (B) 4 (C) 5 (D) 6
63. SO bond energy in  $\text{SO}_2$  molecule is greater than OO bond energy in  $\text{O}_3$  molecule, **correct** set of structure of  $\text{SO}_2$  and  $\text{O}_3$  molecules is



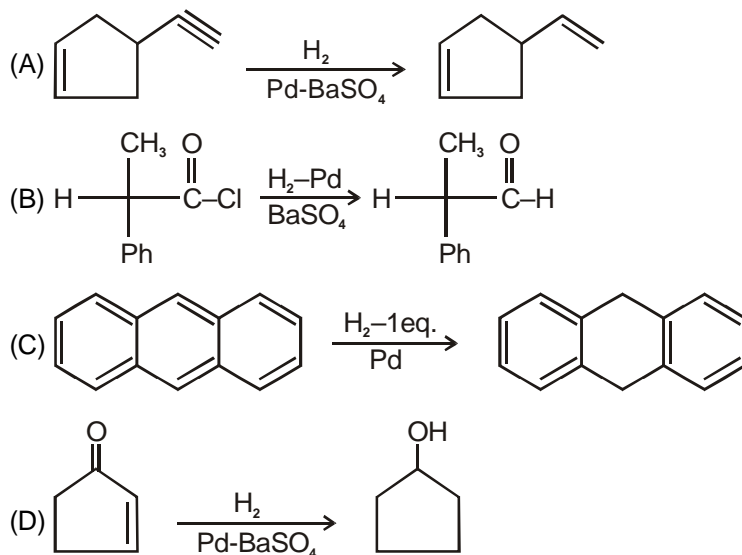
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64.	$X + Y \longrightarrow XY$	Rate = $k[X]^p[Y]^q$
	Initial conc. [X]	Initial conc. [Y]
	0.2 M	0.2 M
	0.1 M	0.2 M
	0.2 M	0.4 M
		Rate (mol litre <sup>-1</sup> second <sup>-1</sup> )
		0.05
		0.025
		0.10

The value of p and q are :

- (A)  $p = 1$   $q = 1$       (B)  $p = 2$   $q = 0$       (C)  $p = 2$   $q = 1$       (D)  $p = 2$   $q = 2$

65. In which of the following major product is **INCORRECT**

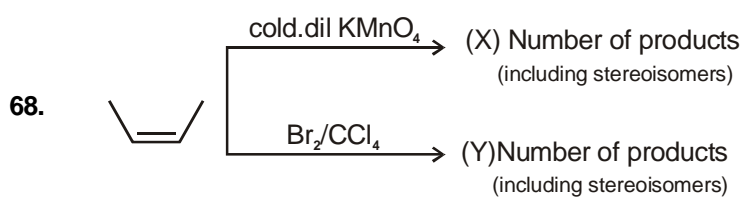
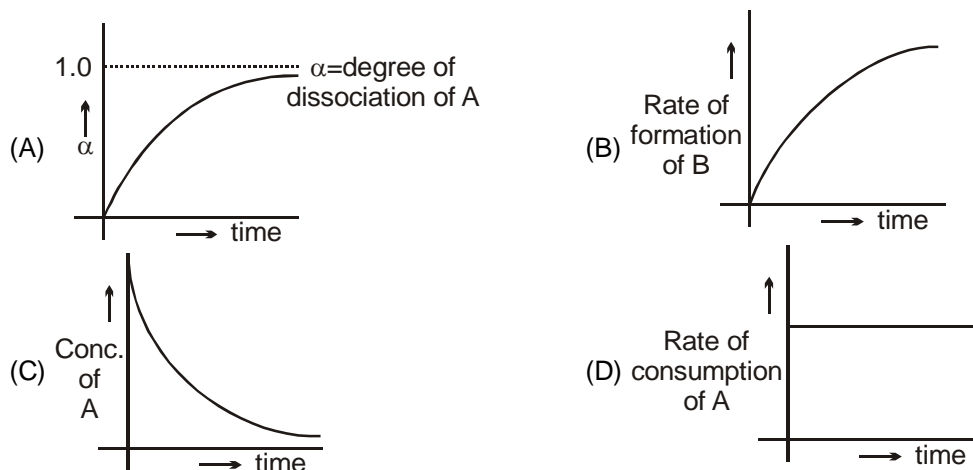


66. Which of the following has strongest H-bond.



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67. Given  $A(g) \rightarrow 2B(g)$  concentration of A are in arithmetical progression in equal interval of time. Which is correct statement about this reaction ?



Sum of (X) + (Y) is :

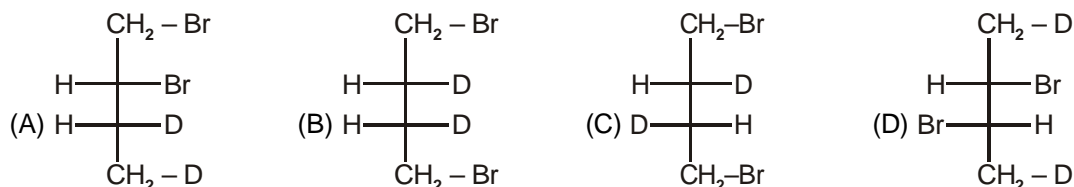
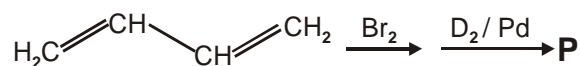
- (A) 2 (B) 3 (C) 4 (D) 5
69. Energy distance relationship between  $\text{HCl} \cdots \text{HCl}$  and  $\text{HF} \cdots \text{HF}$  in solid state is respectively.

- (A)  $\frac{1}{r^3}, \frac{1}{r^3}$  (B)  $\frac{1}{r^3}, \frac{1}{r^4}$  (C)  $\frac{1}{r^4}, \frac{1}{r^3}$  (D)  $\frac{1}{r^4}, \frac{1}{r^4}$

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70. Which is incorrect statement about real gas ?  
 (A) Boyle temperature is greater than critical temperature.  
 (B) At Boyle temperature second virial coefficient of a gas is zero  
 (C) At critical point, attractive force dominate to repulsive force.  
 (D) At critical point repulsive force and attractive force balance to each other.

71. What is the final major product **P** of the following reaction sequence?



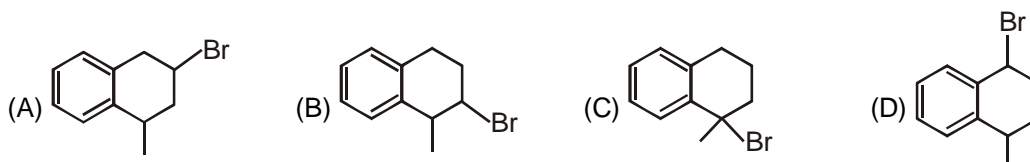
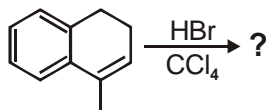
72. A 100 ml mixture of NaOH and  $\text{Na}_2\text{CO}_3$  required 100 ml 0.2 M HCl using phenolphthalein as indicator but 50 ml of same mixture required 75 ml 0.2 M HCl when methyl orange was used as indicator the molar ratio of NaOH and  $\text{Na}_2\text{CO}_3$  in the mixture was.  
 (A) 1 : 1      (B) 1 : 2      (C) 2 : 1      (D) 2 : 3
73. Hybrid orbitals of which central atom have least percentage s-character in their bonds :  
 (A)  $\text{P}(\text{SiH}_3)_3$       (B)  $\text{N}(\text{SiH}_3)_3$       (C) Triplet Carbene      (D)  $\text{O}(\text{SiH}_3)_2$

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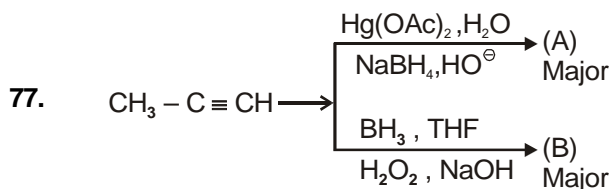
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74. P mole of  $\text{KHC}_2\text{O}_4 \cdot 3\text{H}_2\text{C}_2\text{O}_4$  is oxidised completely by 400 ml 1.0 M  $\text{KMnO}_4$  in acidic medium and Q mole of  $\text{KHC}_2\text{O}_4 \cdot \text{H}_2\text{C}_2\text{O}_4$  is neutralised completely by 300 ml 1.0 M of  $\text{Ca}(\text{OH})_2$  then the ratio of P and Q is :  
 (A) 5 : 4                      (B) 5 : 2                      (C) 10 : 3                      (D) 8 : 3

75. Major product of the following reaction is



76. Element X is an alkaline earth metal, X forms an insoluble carbonate and more soluble than strontium hydroxide, element 'X' is  
 (A) Calcium                      (B) Barium                      (C) Sodium                      (D) Caesium



Relationship between (A) and (B) are

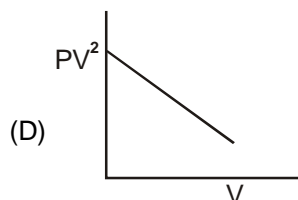
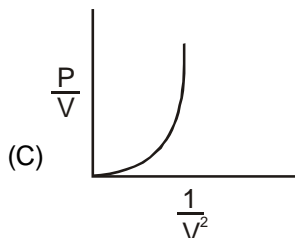
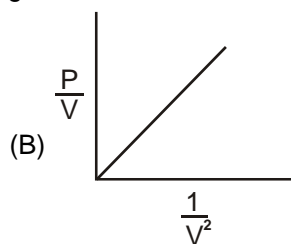
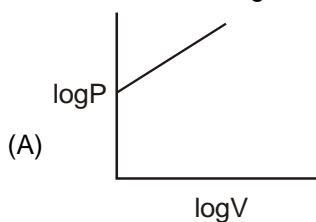
- (A) Diastereomers      (B) Positional isomer      (C) Functional isomer      (D) Identical

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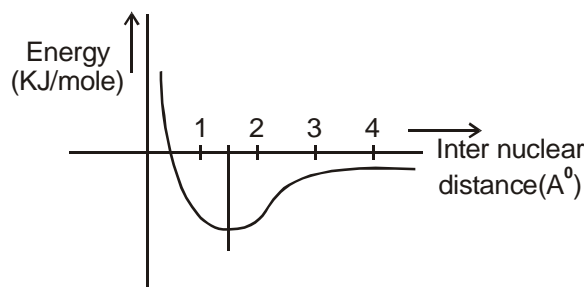
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78. Which of the following curve is correct for an ideal gas of fixed mass at constant temperature ?



79. As two atoms approach each other in space, the potential energy initially decreases and then increases as shown in the diagram below.



Correct two changes attributed to above diagram are

From 4 to 1.5 A<sup>0</sup>

From 1.5 to 0 A<sup>0</sup>

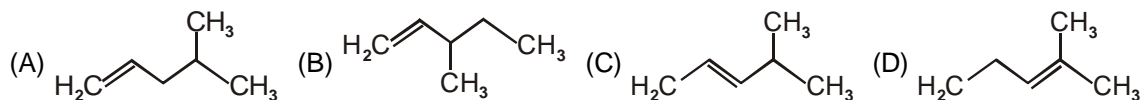
- (A) Proton - Electron attraction increases
- (B) Proton - Electron attraction increases
- (C) Proton - Electron attraction decreases
- (D) Proton - Electron repulsion decreases

- Proton - Proton repulsion increases
- Electron - Electron repulsion decreases
- Electron - Electron repulsion increases
- Proton - Proton repulsion decreases

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## CHEMISTRY

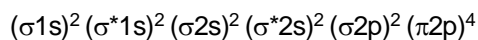
80. An unknown compound  $C_6H_{12}$  (K), decolorises  $Br_2$  and is oxidised by hot acidified  $KMnO_4$  to a resolvable carboxylic acid,  $C_4H_9COOH$ . Identify K.



81. Decomposition of  $H_2O_2(l)$  shows first order kinetics. If rate of decomposition of  $H_2O_2$  is 3.4 g/min. Then rate of formation of  $O_2$  in(g/sec) is :

(A) 1.6 (B) 0.0266 (C) 6.8 (D) 0.113

82. Select **incorrect** statement for a diatomic homonuclear +2 cation having molecular orbital configuration



- (A) Ion is diamagnetic (B) It's neutral diatomic molecule is paramagnetic  
(C) s-p mixing occurs (D) It has higher bond order than respective neutral molecule

83. cis-2-butene  $\xrightarrow[\text{anhydrous}]{CH_3CO_3H}$  (P)

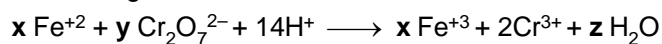
(P) formed is

- (A) meso (B) trans (C) racemic (D) pair of diastereomers

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88. In following redox reaction



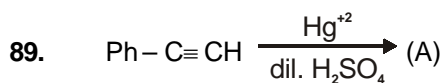
The value of  $x$ ,  $y$ ,  $z$  are

(A)  $x = 6, y = 1, z = 7$

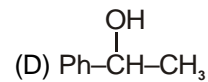
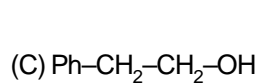
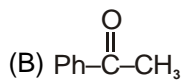
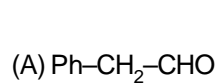
(B)  $x = 3, y = 6, z = 8$

(C)  $x = 6, y = 2, z = 7$

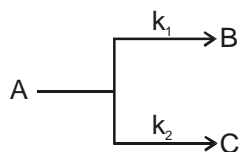
(D)  $x = 4, y = 6, z = 7$



Major product (A) is



90. Given for parallel reaction



$$k_1 = 0.7 \times 10^{-2} \text{ min}^{-1} ; k_2 = 2.1 \times 10^{-2} \text{ min}^{-1} ; \ln 2 = 0.7$$

Which is **correct** statement ?

(A) Percentage distribution of B in product is 75%.

(B) Half life period for disappearance of A is 100 min.

(C) Rate constant of disappearance of A is  $2.8 \times 10^{-2} \text{ min}^{-1}$ .

(D) Concentration of B and C are present in equal proportion after 10 min.

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**Space For Rough Work**

## Space For Rough Work

## Space For Rough Work

## Space For Rough Work

DATE : 24-04-16

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.