

DATE : 30-04-17

CODE - A



# VIBRANT ACADEMY

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### REVIEW TEST-1 (MEGA PHASE-I COURSE-2018)

### 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. P(a, b) is a point in first quadrant. If two circles which pass through point P and touches both the coordinate axis, intersect each other orthogonally, then  
(A)  $a^2 - 6ab + b^2 = 0$     (B)  $a^2 - 2ab - b^2 = 0$     (C)  $a^2 - 4ab + b^2 = 0$     (D)  $a^2 - 8ab + b^2 = 0$
2. A quadratic equation with integral coefficients has two different prime numbers as its roots. If sum of the coefficients of the equation is prime, then the sum of the roots is :  
(A) 5                                      (B) 7                                      (C) 8                                      (D) 10
3. If  $L = \lim_{x \rightarrow \pi} \frac{\tan(\pi \cos^2 x)}{(x - \pi)^2}$ , then  $\frac{L}{\pi}$  is equal to  
(A) -1                                      (B)  $-\pi$                                       (C)  $-2\pi$                                       (D) -2
4. Let k be a real number such that inequality  $\sqrt{x-3} + \sqrt{6-x} \geq k$  has a solution. Then maximum value of k is  
(A)  $\sqrt{6} - \sqrt{3}$                                       (B)  $\sqrt{3}$                                       (C)  $\sqrt{6} + \sqrt{3}$                                       (D)  $\sqrt{6}$
- 

**Space For Rough Work**

5. The integral part of  $(\sqrt{2} + 1)^6$  is  
 (A) 198 (B) 196 (C) 197 (D) None of these
6. The sum of real values of  $k$  for which the cubic  $x^3 - kx + k - 1 = 0$  has exactly two distinct real solution  
 (A)  $\frac{13}{4}$  (B)  $\frac{15}{4}$  (C)  $\frac{3}{4}$  (D)  $\frac{11}{4}$
7. The value of  $\sin 47^\circ - \sin 25^\circ + \sin 61^\circ - \sin 11^\circ$  is equal to :  
 (A)  $\cos 7^\circ$  (B)  $\sin 7^\circ$  (C)  $2 \cos 7^\circ$  (D)  $2 \sin 7^\circ$
8. Range of  $f(x) = \sin^{-1} x + \tan^{-1} x + \sec^{-1} x$  is  
 (A)  $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$  (B)  $\left[\frac{\pi}{4}, \frac{3\pi}{4}\right]$  (C)  $\left\{\frac{\pi}{4}, \frac{3\pi}{4}\right\}$  (D) None of these

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13. In a triangle ABC, we have

$$a\cos B + b\cos C + c\cos A = \frac{a+b+c}{2}$$

where A, B, C are internal angles and a, b, c are length of sides opposite to them respectively. Then  $\triangle ABC$  must be

- (A) Equilateral                      (B) Isosceles                      (C) Right angled                      (D) Can't say

14. The sequence  $\{x_n\}$  is defined by  $x_1 = \frac{1}{2}$ ,  $x_{k+1} = x_k^2 + x_k$ , then the greatest integer less than the value of the expression,

$$\left( \frac{1}{x_1+1} + \frac{1}{x_2+1} + \frac{1}{x_3+1} + \dots + \frac{1}{x_{63}+1} \right)$$
 is given by :

- (A) 1                                      (B) 2                                      (C) 4                                      (D) 8

15.  $f(x)$  is a periodic function which satisfies the relation

$$f(a+x) = b + \{b^3 + 1 - 3b^2f(x) + 3b(f(x))^2 - (f(x))^3\}^{\frac{1}{3}} \forall x \in \mathbb{R},$$
 where a, b  $\in \mathbb{R}$  are fixed positive numbers. Then the period of  $f(x)$  is.

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

16. a, b, c are 3 positive numbers such that  $b^2(a-c)^2 = 2(c^2(b-a)^2 + a^2(b-c)^2)$ . Then a, b, c must be in :

- (A) AP                                      (B) GP                                      (C) HP                                      (D) None of these

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17. The value of  $\lim_{\substack{x \rightarrow 1 \\ y \rightarrow 0}} \frac{y^3 + 3y}{x^3 - y^2 - 1}$  as  $(x, y) \rightarrow (1, 0)$  along the line  $y = x - 1$  is :
- (A) 0                                      (B) 1                                      (C) 2                                      (D) 3
18. A function  $f(x)$  is defined as  $f(x) = \frac{1}{1-x}$  and the representations  $f^2(x)$  and  $f^3(x)$  mean  $f(f(x))$  and  $f(f(f(x)))$  respectively, then the number of points of discontinuity of the function  $f^{2017}(x)$  is/are
- (A) 1                                      (B) 2                                      (C) 2017                                      (D) None of these
19. A function  $f(x)$  is defined as  $f(x) = \frac{1}{x} - \frac{2}{e^{2x} - 1}$  ;  $x \neq 0$  and  $f(0)$  is chosen such that  $f(x)$  is continuous at  $x = 0$  then value of right hand derivative at  $x = 0$  is :
- (A)  $\frac{1}{2}$                                       (B)  $-\frac{1}{2}$                                       (C)  $\frac{1}{3}$                                       (D)  $-\frac{1}{3}$
20.  $\phi(x)$  is function given by  $\phi(x) = |\sin x| - |\cos x|$ , then  $\phi'\left(\frac{\pi}{2}\right)$  is
- (A) 1                                      (B) -1                                      (C) 0                                      (D) does not exist

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21. If  $x_1, x_2, x_3, \dots, x_{13}$  are in A.P., then the value of  $\begin{vmatrix} (\sqrt{2})^{x_1} & (\sqrt{2})^{x_4} & (\sqrt{2})^{x_7} \\ (\sqrt{2})^{x_4} & (\sqrt{2})^{x_7} & (\sqrt{2})^{x_{10}} \\ (\sqrt{2})^{x_7} & (\sqrt{2})^{x_{10}} & (\sqrt{2})^{x_{13}} \end{vmatrix}$  is
- (A)  $\sqrt{2}$  (B) 2  
(C) 0 (D) Depends on  $x_1, x_4, x_7, \dots, x_{13}$
22. The equation of straight line belonging to both the families of lines  $x - y + 1 + \lambda_1(2x - y - 2) = 0$  and  $5x + 3y - 2 + \lambda_2(3x - y - 4) = 0$ , where  $\lambda_1, \lambda_2$  are arbitrary numbers is
- (A)  $5x - 2y - 7 = 0$  (B)  $2x + 5y - 7 = 0$  (C)  $5x + 2y - 7 = 0$  (D)  $2x - 5y - 7 = 0$
23. The number of solutions of  $\tan x = 2\cos x - \frac{1}{\cos x}$  in  $[-\pi, 2\pi]$  is
- (A) 2 (B) 4 (C) 0 (D) 3
24. Let  $f_1(x) = \frac{4-2x}{x+2}$  and  $f_n(x) = f_{n-1}(f_1(x))$  for  $n \geq 2, n \in \mathbb{N}$ . If  $\phi_n(x) = f_2(x) + f_4(x) + f_6(x) + \dots + f_{2n}(x), n \in \mathbb{N}$  then
- (A)  $\phi_{n+1}(x) > \phi_n(x) \forall x \in \mathbb{R}^+$  (B)  $\phi_{n+1}(x) > \phi_n(x) \forall x \in \mathbb{R}$   
(C)  $\phi_{n+1}(x) < \phi_n(x) \forall x \in \mathbb{R}^+$  (D) None of the above is correct

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**Space For Rough Work**

25. Let  $f : [-10, 10] \rightarrow [a, b]$ ,  $f(x) = \tan^{-1}(x) + \sin x + 3x^3 - x$  be an onto function, then  
 (A)  $2a + b < 0$                       (B)  $3a + b > 0$                       (C)  $a + 2b < 0$                       (D)  $3a + 4b < 0$
26.  $\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{2}{9}\right)$  is equal to  
 (A)  $\frac{1}{2} \cos^{-1}\left(\frac{3}{5}\right)$                       (B)  $\sin^{-1}\left(\frac{4}{5}\right)$                       (C)  $\frac{1}{2} \tan^{-1}\left(\frac{3}{5}\right)$                       (D)  $\tan^{-1}\left(\frac{8}{9}\right)$
27. If for some real number  $k$ ,  $\lim_{x \rightarrow 0} \frac{\sin 2x + k \sin x}{x^3}$  exists, then the limit is equal to  
 (A)  $\frac{k}{2}$                                       (B)  $k + 2$                                       (C)  $k^2$                                       (D) None of these

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**Space For Rough Work**



28. If the function  $f(x) = \begin{cases} \frac{\sqrt{2 + \cos x} - 1}{(\pi - x)^2}, & x \neq \pi \\ k, & x = \pi \end{cases}$  is continuous at  $x = \pi$ , then  $k$  equals

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

29. Let  $f(x) = |x| + \tan\left(x + \frac{\pi}{4}\right) + |\cos x|$ . No. of points in the interval  $(-1, \pi)$  where  $f$  is non-differentiable is/are :

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

30. Sum of all the values of  $x$  satisfying the equation  $\log_{1331} \log_{11} (\sqrt{x+11} + \sqrt{x}) = 0$  is \_\_\_\_\_

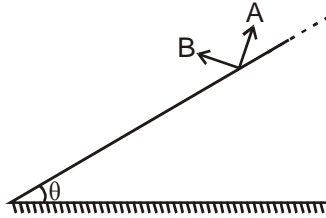
- (A) 25                      (B) 36                      (C) 171                      (D) 0

**Space For Rough Work**

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

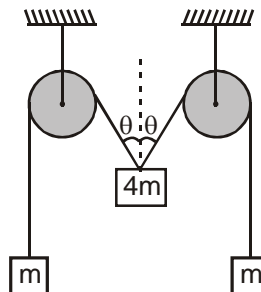
This section contains 30 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

31. Two stones A and B are projected from an inclined plane such that A has range up the incline and B has range down the incline. For range of both stones on the incline to be equal in magnitude, pick up the correct condition. (Neglect air friction).



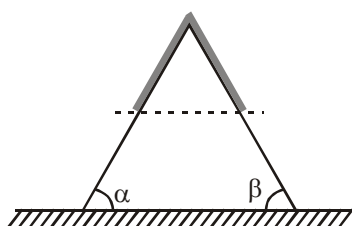
- (A) Component of initial velocity of both stones along the incline should be equal and also component of initial velocity of both stones perpendicular to the incline should be equal.
- (B) Component of initial velocity of both stones perpendicular to the incline should be equal and also horizontal component of initial velocity of both stones should be equal.
- (C) Horizontal component of initial velocity of both stones should be equal and also vertical component of initial velocity of both stones should be equal.
- (D) None of these
32. In the figure shown, the pulleys and strings are massless. The acceleration of the block of mass  $4m$  just after the system is released from rest is ( $\theta = \sin^{-1} 3/5$ )

- (A)  $\frac{2g}{5}$  downwards
- (B)  $\frac{2g}{5}$  upwards
- (C)  $\frac{5g}{11}$  downwards
- (D)  $\frac{5g}{11}$  upwards

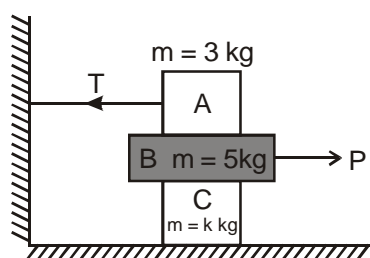


**Space For Rough Work**

33. A uniform rope of length  $L$  and mass  $M$  is placed on a smooth fixed wedge as shown. Both ends of rope are at same horizontal level. The rope is initially released from rest, then the magnitude of initial acceleration of rope is :

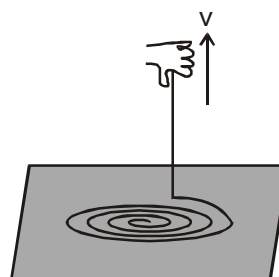


- (A)  $M (\cos \alpha - \cos \beta) g$  (B) zero  
 (C)  $M (\tan \alpha - \tan \beta) g$  (D) None of these
34. Determine the force  $P$  required to just begin the motion of the block B shown in figure. Take coefficient of friction = 0.3 for all surfaces in contact.



- (A) 12 N (B) 33 N (C) 62 N (D) 6 N
35. A uniform rope of linear mass density  $\lambda$  and length  $\ell$  is coiled on a smooth horizontal surface. One end is pulled up with constant velocity  $v$ . Then the average power applied by the external agent in pulling the entire rope just off the horizontal surface is

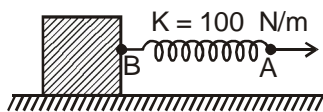
- (A)  $\frac{1}{2} \lambda \ell v^2 + \frac{\lambda \ell^2 g}{2}$   
 (B)  $\lambda \ell g v$   
 (C)  $\frac{1}{2} \lambda v^3 + \frac{\lambda \ell v g}{2}$   
 (D)  $\lambda \ell v g + \frac{1}{2} \lambda v^3$



Space For Rough Work

## PHYSICS

36. A block lying on a smooth surface with spring connected to it is pulled by an external force as shown. Initially the velocity of ends A and B of the spring are 4 m/s and 2 m/s (rightwards both) respectively. If the energy of the spring is increasing at the rate of 20 J/sec, then the stretch in the spring is :

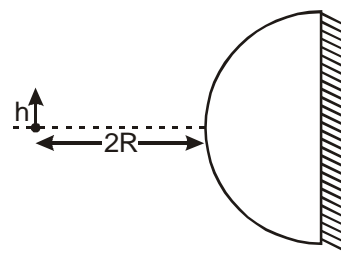


- (A) 1.0 cm                      (B) 2.0 cm                      (C) 10 cm                      (D) 2.0 cm
37. Two masses of 1 gm and 4 gm are moving with equal kinetic energies. The ratio of the magnitude of their linear momenta is :
- (A) 4 : 1                      (B)  $\sqrt{2}$  : 1                      (C) 1 : 2                      (D) 1 : 16
38. A particle of mass  $m = 1$  kg is lying at rest on x-axis, experiences a net force given by law  $F = x(3x - 2)$  Newton, where x is the x-coordinate of the particle in meters. The magnitude of minimum velocity in negative x-direction to be imparted to the particle placed at  $x = 4$  meters such that it reaches the origin is  $\sqrt{P/27}$  m/s. Find the value of P.
- (A) 3500                      (B) 3000                      (C) 2600                      (D) 2000
39. A lateral object of height 0.5 cm is placed on the optical axis of bi-convex lens of focal length 80 cm, at an object distance = 60 cm. The image formed is :
- (A) virtual, erect and 4 cm high                      (B) virtual, inverted and 2 cm high  
(C) virtual, erect and 2 cm high                      (D) real, inverted and 2 high

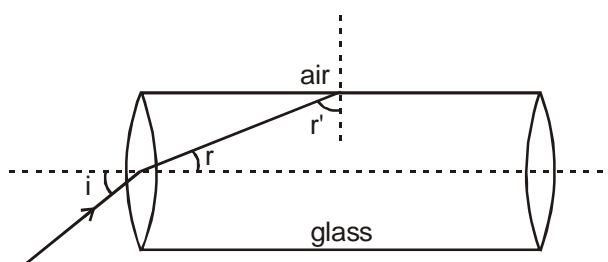
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**Space For Rough Work**

40. A glass hemisphere of radius  $R$  and material having refractive index  $1.5$  is silvered on its flat face as shown in the figure. A small object of height  $h$  is located at a distance  $2R$  from surface of hemisphere. The final image will form
- (A) at a distance of  $R$  from silvered surface, on right side  
 (B) on the object itself  
 (C) at the hemispherical surface  
 (D) at a distance of  $2R$  from the silvered surface on left side



41. The width of man's face is  $10\text{ cm}$ . The distance between the eyes of the man is  $4\text{ cm}$ . Then the minimum width of plane mirror to see his full face, is :
- (A)  $5\text{ cm}$                       (B)  $4\text{ cm}$                       (C)  $3\text{ cm}$                       (D)  $10\text{ cm}$
42. What should be the value of refractive index  $n$  of a glass rod placed in air, so that the light entering at any angle through the flat surface of the rod does not cross the curved surface of the rod.

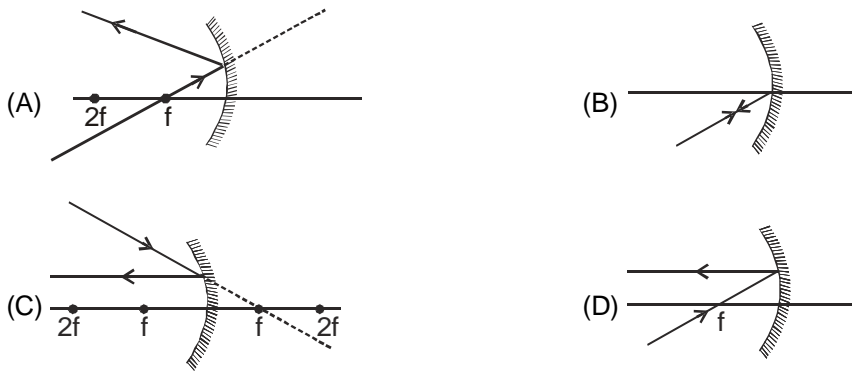


- (A)  $n > \sqrt{2}$                       (B)  $\sqrt{2} > n$                       (C)  $n > \sqrt{3}$                       (D)  $\sqrt{3} > n$

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**Space For Rough Work**

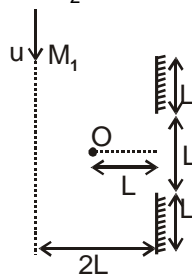
43. Which of the following ray diagram is correct.



44. A plane mirror is moving with velocity  $-2\hat{i} - 3\hat{j} + 4\hat{k}$ . A point object in front of the mirror move with a velocity  $-3\hat{i} + 4\hat{j} - 4\hat{k}$ . There  $\hat{k}$  is along the normal to the plane mirror and facing towards the object. Find velocity of image.

- (A)  $-2\hat{i} - 14\hat{j} + 4\hat{k}$       (B)  $2\hat{i} - 14\hat{j} + 4\hat{k}$       (C)  $2\hat{i} + 14\hat{j} - 4\hat{k}$       (D) None

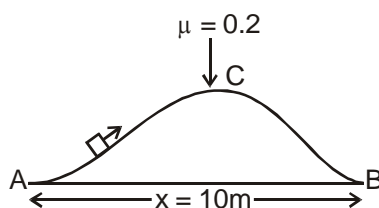
45. Two plane mirrors of length L are separated by a distance L and a man  $M_2$  is standing at a distance L from the connecting line of mirrors as shown in the figure. A man  $M_1$  is walking in a straight line at a distance 2L parallel to mirrors at speed u, then the man  $M_2$  at O will be able to see the image of  $M_1$  for total time :



- (A)  $\frac{4L}{u}$       (B)  $\frac{3L}{u}$       (C)  $\frac{6L}{u}$       (D)  $\frac{9L}{u}$

**Space For Rough Work**

46. A block of mass 1 kg is pulled along the curve path ACB by a tangential force as shown in figure. The work done by the frictional force when the block moves from A to B is



- (A) 5 J                      (B) 10 J                      (C) 20 J                      (D) None of these
47. Water is flowing on a horizontal fixed surface, such that its flow velocity varies with  $y$  (vertical direction) as  $v = k\left(\frac{2y^2}{a^2} - \frac{y^3}{a^3}\right)$ . If coefficient of viscosity for water is  $\eta$ , what will be shear stress between layers of water at  $y = a$ ?
- (A)  $\frac{\eta k}{a}$                       (B)  $\frac{\eta}{ka}$                       (C)  $\frac{\eta a}{k}$                       (D) None of these
48. Following are some statements about buoyant force on a body of certain shape, immersed completely, inside ideal fluid. Select the correct statement(s) (Liquid is of uniform density)
- (A) Buoyant force depends upon orientation of the concerned body inside the liquid  
 (B) Buoyant force depends upon the density of the body immersed  
 (C) Buoyant force depends on the fact whether the system is on moon or on the earth  
 (D) Buoyant force depends upon the depth of the body inside the liquid

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**Space For Rough Work**

## PHYSICS

49. A capillary tube with inner cross-section in the form of a square of side 'a' is dipped vertically in a liquid of density  $\rho$  and surface tension  $\sigma$  which wet the surface of capillary tube with angle of contact  $\theta$ . The approximate height to which liquid will be raised in the tube is (Neglect the effect of surface tension at the corners capillary tube)
- (A)  $\frac{2\sigma \cos\theta}{a\rho g}$       (B)  $\frac{4\sigma \cos\theta}{a\rho g}$       (C)  $\frac{8\sigma \cos\theta}{a\rho g}$       (D) None of these
50. A pump is designed as a horizontal cylinder with a piston having an area of A and an outlet orifice having an area of 'a' arranged near the cylinder axis. Determine the velocity of outflow of a liquid from the pump if the piston moves with a constant velocity under the action of a force F. The density of the liquid is  $\rho$ . ( $a \ll A$ )
- (A)  $\sqrt{\frac{2F}{A\rho}}$       (B)  $\sqrt{\frac{F}{A\rho}}$       (C)  $\sqrt{\frac{F}{2A\rho}}$       (D)  $\sqrt{\frac{2F}{3A\rho}}$
51. A body is executing simple harmonic motion. At a displacement x from mean position, its potential energy is  $E_1 = 2\text{J}$  and at a displacement y from mean position, its potential energy is  $E_2 = 8\text{J}$ . The potential energy E at a displacement (x + y) from mean position is
- (A) 10 J      (B) 14 J      (C) 18 J      (D) 4 J

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**Space For Rough Work**



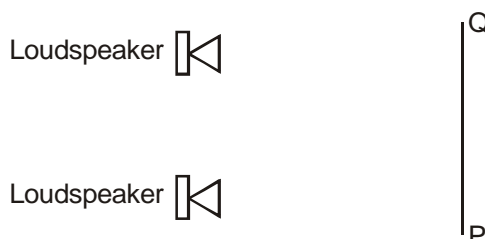
## PHYSICS

52. A simple pendulum has time period  $T_1$ . The point of suspension is now moved upward according to the relation  $y = Kt^2$ , ( $K = 1 \text{ m/s}^2$ ) where  $y$  is the vertical displacement and  $t$  is time. The time period now becomes  $T_2$ . The ratio of  $\frac{T_1^2}{T_2^2}$  is ( $g = 10 \text{ m/s}^2$ )
- (A) 5/6                      (B) 6/5                      (C) 1                      (D) 4/5
53. If the fundamental frequency of a vibrating organ pipe is 200 Hz, then
- (A) The first overtone must be 200 Hz                      (B) The first overtone may be 400 Hz  
(C) The first overtone must be 300 Hz                      (D) None of the above
54. A siren placed at a railway platform is emitting sound of frequency 5 kHz. A passenger sitting in a moving train A records a frequency of 5.5 kHz while the train approaches the siren. During his return journey in a different train B he records a frequency of 6.0 kHz while approaching the same siren. The ratio of the velocity of train B to that of train A is
- (A) 242/252                      (B) 2                      (C) 5/6                      (D) 11/6
55. The extension in a string, obeying Hooke's law, is  $x$ . the speed of sound in the stretched string is  $v$ . If the extension in the string is increased to  $1.5x$ , the speed of sound will be
- (A)  $1.22v$                       (B)  $0.61v$                       (C)  $1.50v$                       (D)  $0.75v$

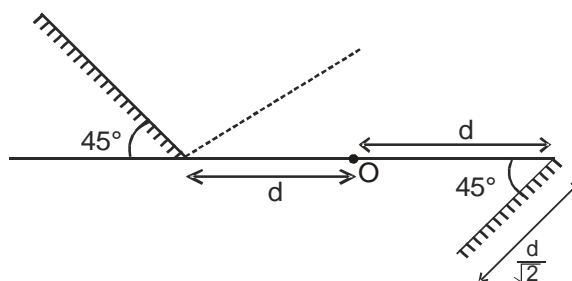
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**Space For Rough Work**

56. In the diagram below (not to scale), each of the loudspeaker emits a continuous sound of the same frequency. A microphone moved along the line PQ detects a series of maximum and minimum sound intensities. Which one of the following actions on its own, will lead to an increase in the distance between the points of maxima of sound intensity?



- (A) Decreasing the frequency of the sound emitted by the loudspeakers  
 (B) Increasing the frequency of the sound emitted by the loudspeakers  
 (C) Increasing the separation of the loudspeakers  
 (D) Decreasing the distance of the loudspeakers from the line PQ
57. Find number of images of O formed by system of mirrors?



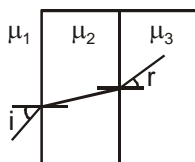
- (A) 1                      (B) 2                      (C) 3                      (D) 4
58. The focal length of a concave mirror is 30 cm. Find the position of the object in front of the mirror, such that the image is three times the size of the object.  
 (A) 40 CM                      (B) – 20 cm                      (C) Both                      (D) Neither

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59. A point object is between the Pole and Focus of a concave mirror, and moving away from the mirror with a constant speed. The velocity of the image is :
- (A) away from the mirror and increasing in magnitude
  - (B) towards the mirror and increasing in magnitude
  - (C) away from the mirror and decreasing in magnitude
  - (D) towards the mirror and decreasing in magnitude

60. In the figure shown  $\frac{\sin i}{\sin r}$  is equal to :



- (A)  $\frac{\mu_2^2}{\mu_3\mu_1}$
- (B)  $\frac{\mu_3}{\mu_1}$
- (C)  $\frac{\mu_3\mu_1}{\mu_2^2}$
- (D) None of these

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

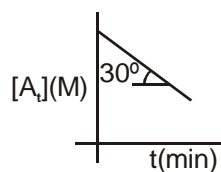
This section contains 30 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

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61. Which pair of molecules have hybrid H.O.M.O  
(A)  $H_2, Li_2$                       (B)  $N_2, P_2$                       (C)  $O_2, S_2$                       (D)  $F_2, Cl_2$
62. A first order reaction 75% completed in 50 min. Find the fraction of initial concentration of reactant dissociated in next 50 min.  
(A) 6.25%                      (B) 18.75%                      (C) 75%                      (D) 93.75%
63. Identify the intermediate formed in below reaction  
$$CH_3 - C \equiv CH \xrightarrow[\text{dil. } H_2SO_4]{Hg^{2+}} \text{Major}$$
  
(A)  $CH_3 - \overset{OH}{C} = CH_2$                       (B)  $CH_3 - CH = \overset{OH}{CH}$                       (C)  $CH_3 - \overset{O}{C} - CH_3$                       (D)  $CH_3 - CH_2 - CH = O$
64. Which s-block metal carbonates's solubility increases as atomic number increases down the group  
(A) Only alkali metals                      (B) Only alkaline earth metals  
(C) Alkali as well as alkaline earth metals                      (D) Neither alkali alkaline nor alkaline earth metals
- 

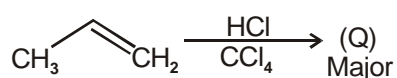
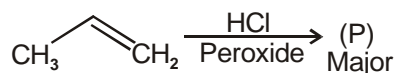
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65. For a reaction  $2A(g) \longrightarrow B(g) + C(g)$  concentration of reactant A and time 't' is plotted as



Find rate of appearance of B at time  $t = 30$  sec. If initial concentration of A is 0.5 M.

- (A) Zero (B) 0.25 M/sec (C) 0.289M/sec (D) 1.732 M/sec
66. Identify the correct relationship between P & Q.




- (A) Positional isomer (B) Chain isomer (C) Functional isomer (D) Identical isomer
67. In which of the following transformation process, symmetry of HOMO of both species is different but their magnetic behaviour is same.
- (A)  $\text{O}_2 \longrightarrow \text{O}_2^{2-}$  (B)  $\text{N}_2 \longrightarrow \text{N}_2^{2-}$  (C)  $\text{C}_2 \longrightarrow \text{C}_2^{2-}$  (D)  $\text{B}_2 \longrightarrow \text{B}_2^-$

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71. Value of x is  
 cis-2-hexene  $\xrightarrow[\text{CCl}_4]{\text{Br}_2}$  (x) products  
 (A) 0 (B) 1 (C) 3 (D) 2
72. The wave number of the spectral line in emission spectrum of hydrogen atom will equal to  $\frac{8}{9}$  times the Rydberg's constant. If electron jumps from \_\_\_\_\_.  
 (A) 9<sup>th</sup> excited state to ground state. (B) 2<sup>nd</sup> excited state to ground state.  
 (C) 2<sup>nd</sup> orbit to ground state. (D) 9<sup>th</sup> orbit to ground state.
73. Which of the following species exists at room temperature.  
 (A) SH<sub>6</sub> (B) FeI<sub>3</sub> (C) XeF<sub>3</sub><sup>-</sup> (D) PI<sub>5</sub>
74.   $\xrightarrow[\text{h}\nu]{\text{Cl}_2}$  A mixture of all isomers possible from mono-chlorination of structure is subjected to fractional distillation. How many fractions will be obtained.  
 (A) 2 (B) 3 (C) 4 (D) 5

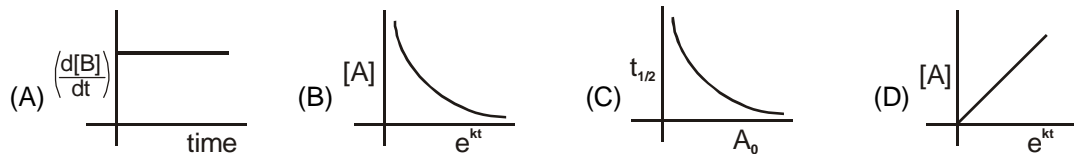
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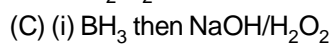
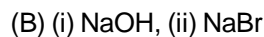
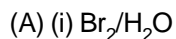
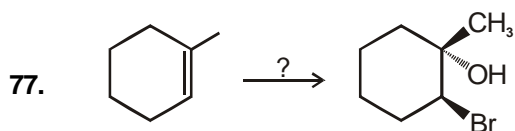
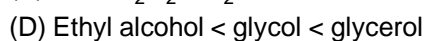
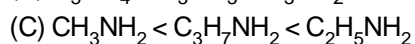
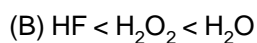
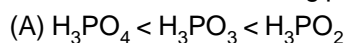
75. For reaction,  $2A \longrightarrow B$ , following data are obtained :

<b>Time</b>	0	t	2t
<b>[A]</b>	a	b	c

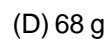
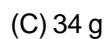
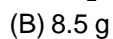
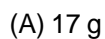
If  $b = \sqrt{a \times c}$  then the only correct graph for reaction is :



76. The correct order of boiling point is



78. The gram-equivalent mass of  $H_2O_2$  in its self decomposition will be :




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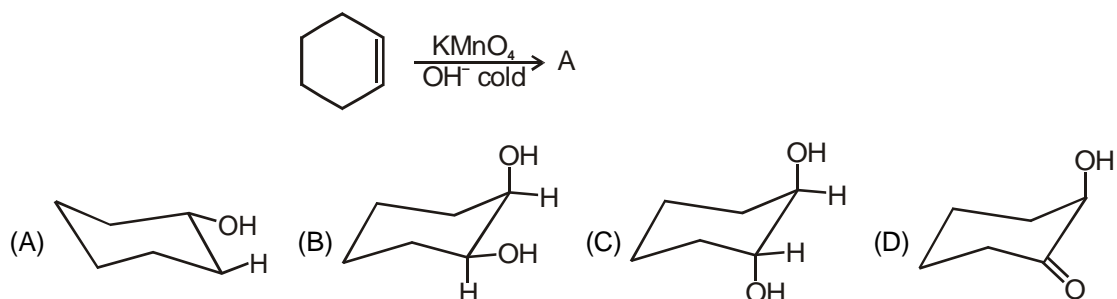
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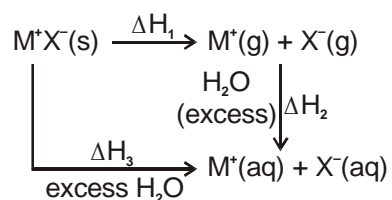
79. In which of the following pair, both the species have same hybridisation.

- (i)  $\text{SF}_4, \text{XeF}_4$       (ii)  $\text{I}_3^-, \text{XeF}_2$       (iii)  $\text{ICl}_4^+, \text{SiCl}_4$       (iv)  $\text{ClO}_3^-, \text{PO}_4^{3-}$   
 (A) i, ii      (B) ii, iii      (C) ii, iv      (D) i, ii, iii

80. What is major product expected from following reaction.



81. Consider given Born Haber cycle for dissolution of ionic solid MX into water.

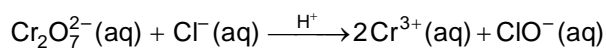


If the sign of  $\Delta H_3$  is negative, then select **incorrect** option.

- (A) Ionic solid  $\text{M}^+\text{X}^-$  is soluble in water.  
 (B)  $|\Delta H_1| < |\Delta H_2|$   
 (C) Dielectric constant of  $\text{H}_2\text{O}$  does not support in making negative value of  $\Delta H_3$ .  
 (D) Hydration energy of  $\text{M}^+$  contributes more to the magnitude  $\Delta H_2$  than hydration energy of  $\text{X}^-$ .

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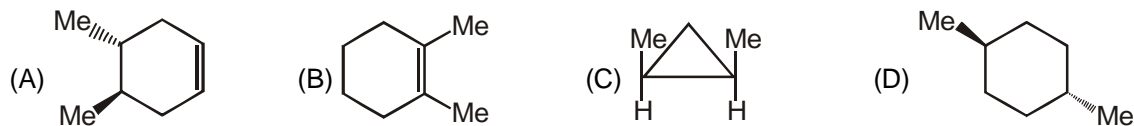
82. For redox reaction,



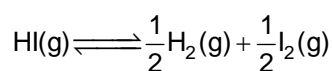
If rate constant of reaction is  $x$  then rate constant for disappearance of  $\text{Cl}^-(\text{aq})$  will be :

- (A)  $3x$                       (B)  $x$                       (C)  $6x$                       (D)  $2x$

83. Which of the following is optical active :



84. At 298 K,  $\text{HI}(\text{g})$  is filled in a rigid container at 10 atm pressure and is allowed to achieve equilibrium as following,

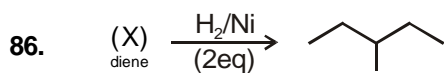


If  $K_c$  of the reaction is  $\frac{1}{3}$  then at equilibrium, the only **incorrect** statement is :

- (A)  $K_p = \frac{1}{3}$                       (B)  $P_{\text{total}} = 10 \text{ atm}$                       (C)  $P_{\text{HI}} = 6 \text{ atm}$                       (D)  $P_{\text{H}_2} = 4 \text{ atm}$

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85. In the following molecules, predict non planar species which forms  $(2p\pi - 2p\pi)$  back bond :
- (I)  $B_3O_3(OH)_3$                       (II)  $[B_3O_3(OH)_4]^-$                       (III)  $[B_3O_3(OH)_5]^{2-}$                       (IV)  $[B_3O_3(OH)_6]^{3-}$   
 (A) I, II, III, IV                      (B) II, III                      (C) I, IV                      (D) III, IV



No. of possible alkene (X) including stereochemistry.

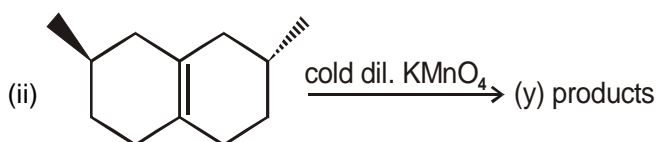
- (A) 3                      (B) 5                      (C) 4                      (D) 6
87. Hydrolysis constant of  $NH_4Cl(aq)$  is  $2 \times 10^{-9}$ . Find % degree of hydrolysis of 0.2 M  $NH_4Cl(aq)$ .  
 (A) 0.1 %                      (B) 0.01 %                      (C) 0.05%                      (D) 0.005%

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## CHEMISTRY

88. If  $d_{xz}$  orbital of atom A and  $p_x$  orbital of atom B form  $\pi$  bond along a particular molecular axis, then which bond will be formed along same molecular axis by combination of  $(d_{xy} + d_{xy})$  orbitals of (A) and (B) atoms.  
(A)  $\sigma$  bond (B)  $\pi$  bond (C)  $\delta$ -bond (D) Non bonding
89. Two glass bulbs of equal volumes are connected by a narrow tube and filled with a gas at  $0^\circ\text{C}$  and pressure of 76 cm of Hg. One of the bulb is then placed in a water bath maintained at  $62^\circ\text{C}$ . If the volume of the connecting tube is negligible, the new value of the pressure inside the bulbs is :  
(A) 75 cm of Hg (B) 80 cm of Hg (C) 83.75 cm of Hg (D) None of these
90. How many products will be formed in these reaction?



Sum of  $(x + y)$

(A) 2

(B) 3

(C) 4

(D) 5

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**Space For Rough Work**

## Space For Rough Work

## Space For Rough Work

## Space For Rough Work

DATE : 30-04-17

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.