

# Goprep Talent Search Exam 2020



**SAMPLE PAPER**

**12<sup>th</sup> | JEE**

# GOPREP TALENT SEARCH EXAM

## QUESTION PAPER

### INSTRUCTIONS:

The duration of the test will be **60 minutes**. Use the time accordingly.

The test paper consists of **50 questions** divided into four sections, **Section A, Section B, Section C & Section D**.

- **Section A** contains **15** questions of Physics.
- **Section B** contains **15** questions of Chemistry.
- **Section C** contains **15** questions of Biology.
- **Section D** contains **5** questions of Aptitude.
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Each question will have **4 choices**, with the only **single choice** being correct.

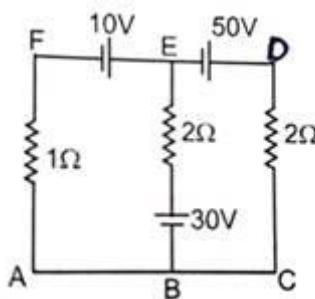
You will get **2 marks** for every correct answer.

There will be **no negative marking** for any wrong answer or unanswered question.

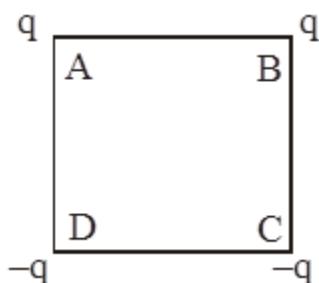
## SECTION | A |

### PHYSICS

1. Current in the wire EB is

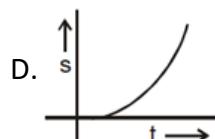
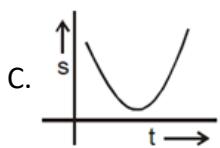
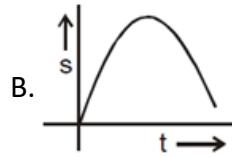
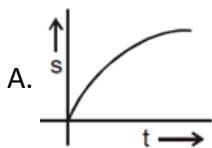


- A. 15 A from B to E      B. 15 A from E to B  
 C. 25 A from B to E      D. 10 A from E to B
2. Charges are placed on the vertices of a square as shown. Let  $\vec{E}$  be the electric field and V the potential at the centre. If the charges on A and B are interchanged with those on D and C respectively, then

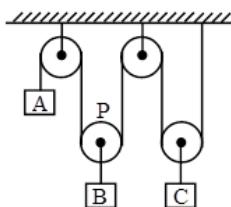


- A.  $\vec{E}$  and V remain unchanged      B.  $\vec{E}$  changes, V remains unchanged  
 C.  $\vec{E}$  remains unchanged, V changes      D. both  $\vec{E}$  and V change
3. A parallel plate capacitor is made of two circular plates separated by a distance of 5 mm and with a dielectric of dielectric constant 2.2 between them. When the electric field in the dielectric is  $3 \times 10^4$  V/m, the charge density of the positive plate will be close to :  
 A.  $3 \times 10^4$  C/m<sup>2</sup>      B.  $6 \times 10^4$  C/m<sup>2</sup>      C.  $6 \times 10^{-7}$  C/m<sup>2</sup>      D.  $3 \times 10^{-7}$  C/m<sup>2</sup>
4. If the earth were to suddenly contract to  $\frac{1}{n}^{th}$  of its present radius without any change in its mass, the duration of the new day will be nearly  
 A.  $\frac{24}{n}$  hr      B.  $24n$  hr      C.  $\frac{24}{n^2}$  hr      D.  $24n^2$  hr
5. The length and breadth of a rectangle are  $(5.7 \pm 0.1)$  cm and  $(3.4 \pm 0.2)$  cm. The area of the rectangle with error limits is

- A.  $(19.0 \pm 1.5)$  sq.cm.      B.  $(19.0 \pm 2.5)$  sq.cm.  
 C.  $(19.0 \pm 3.5)$  sq.cm.      D.  $(19.0 \pm 4.5)$  sq.cm.
6. A simple harmonic motion having an amplitude A and time period T is represented by the equation:  $y = 5 \sin\pi(t + 4)$  m. Then the values of A (in m) and T (in sec) are  
 A. A = 5; T = 2      B. A = 10; T = 1      C. A = 5; T = 1      D. A = 10; T = 2
7. The displacement of a ball falling from rest in a viscous medium is plotted against time. Choose a possible option.



8. In the ideal case,



- A. the magnitude of the acceleration of A is the sum of the magnitude of the acceleration of B and C.  
 B. the magnitude of the acceleration of A is arithmetic mean of the magnitude of the acceleration of B and C.  
 C. if P is massless, the net force on the pulley is non-zero.  
 D. None of these.
9. A container with insulating walls is divided into equal parts by a partition fitted with a valve. One part is filled with an ideal gas at a pressure P and temperature T, whereas the other part is completely evacuated. If the valve is suddenly opened, the pressure and temperature of the gas will be :

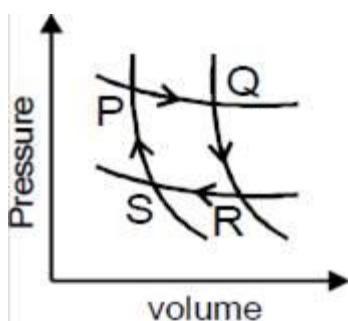
A.  $\frac{P}{2}, \frac{T}{2}$

B. P, T

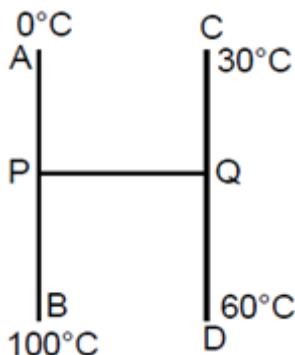
C.  $P, \frac{T}{2}$

D.  $\frac{P}{2}, T$

10. A fixed mass of gas undergoes the cycle of changes represented by PQRSP as shown in figure. In some of the changes, work is done on the gas and in others, work is done by the gas. In which pair of the changes work is done on the gas ?



- A. PQ and RS      B. PQ and QR      C. OR and RS      D. RS and SP
11. A man, sitting firmly over a rotating stool has his arms stretched. If he folds his arms, the work done by the man is  
 A. zero      B. positive  
 C. negative      D. may be positive or negative.
12. Time (T), velocity (C) and angular momentum (h) are chosen as fundamental quantities instead of mass, length and time. In terms of these, the dimensions of mass would be:  
 A.  $[ M ] = [ T^{-1} C^{-2} h ]$       B.  $[ M ] = [ T^{-1} C^2 h ]$   
 C.  $[ M ] = [ T^{-1} C^{-2} h^{-1} ]$       D.  $[ M ] = [ T C^{-2} h ]$
13. A particle performing SHM is found at its equilibrium at  $t = 1$  sec. and it is found to have a speed of 0.25 m/s at  $t = 2$  sec. If the period of oscillation is 6 sec. Calculate amplitude of oscillation  
 A.  $\frac{3}{2\pi} \text{m}$       B.  $\frac{3}{4\pi} \text{m}$       C.  $\frac{6}{\pi} \text{m}$       D.  $\frac{3}{8\pi} \text{m}$
14. Two planets A and B have the same material density. If the radius of A is twice that of B, then the ratio of the escape velocity  $\frac{V_A}{V_B}$  is  
 A. 2      B.  $\sqrt{2}$       C.  $1/\sqrt{2}$       D.  $\frac{1}{2}$
15. Three identical rods AB, CD and PQ are joined as shown. P and Q are mid points of AB and CD respectively. Ends A, B, C and D are maintained at  $0^\circ\text{C}$ ,  $100^\circ\text{C}$ ,  $30^\circ\text{C}$  and  $60^\circ\text{C}$  respectively. The direction of heat flow in PQ is



- A. from P to Q      B. from Q to P  
 C. heat does not flow in PQ      D. data not sufficient

### SECTION |B|

## CHEMISTRY

- The distance between adjacent, oppositely charged ions in rubidium chloride is 3.285 Å, in potassium chloride is 3.139 Å, in sodium bromide is 2.981 Å and in potassium bromide is 3.293 Å. The distance between adjacent oppositely charged ions in rubidium bromide is
 

A. 3.147 Å      B. 3.385 Å      C. 3.393 Å      D. 3.439 Å
- Two glass bulbs A (of 100 mL capacity), and B (of 150 ml capacity) containing same gas are connected by a small tube of negligible volume. At particular temperature the pressure before opening the valve  $\frac{P_A}{P_B} = \frac{20}{1}$ . The stopcock is opened without changing the temperature. The pressure in A will -
 

A. drop by 75%      B. drop by 57%      C. drop by 25%      D. will remain same
- In hydrogen atom, energy of first excited state is -3.4eV. Then KE of same orbit of hydrogen atom:
 

A. + 3.4 eV      B. + 6.8 eV      C. - 13.6 eV      D. + 13.6 eV
- For heteronuclear diatomic molecule A-B having electronegativity difference ( $X_a - X_b$ ), the bond length can be calculated as:  

$$d_{a-b} = r_a + r_b - m(X_a - X_b)$$
 Then the value of 100m is:
 

A. 4      B. 7      C. 9      D. 14
- The heat of combustion of benzene in a bomb calorimeter (i.e. constant volume) was found to be 3263.9 kJ mol<sup>-1</sup> at 25°C. The heat of combustion of benzene at constant pressure will be

- A. -3490.6 kJ mol<sup>-1</sup>      B. -3476.6 kJ mol<sup>-1</sup>      C. -3267.6 kJ mol<sup>-1</sup>      D. -3467.6 kJ mol<sup>-1</sup>
6. Given:  $E_{\text{Fe}^{3+}/\text{Fe}}^{\circ} = -0.036 \text{ V}$ ,  $E_{\text{Fe}^{2+}/\text{Fe}}^{\circ} = -0.439 \text{ V}$ . The value of standard electrode potential for the change,  $\text{Fe}^{3+}(\text{aq}) + \text{e}^{-} \rightarrow \text{Fe}^{2+}(\text{aq})$  will be:
- A. -0.403 V      B. 0.385 V      C. 0.77 V      D. 0.403 V
7. Element  $\text{M} + \text{N}_2 \xrightarrow{\Delta} \xrightarrow{\text{H}_2\text{O}} \text{NH}_3$
- Element M belonging to group 13 can be
- A. B or Al      B. Ga or Al      C. Mg, Al or B      D. Mg or B
8. Which of the following compounds does not give a precipitate with excess of NaOH?
- A.  $\text{ZnSO}_4$       B.  $\text{FeSO}_4$       C.  $\text{AgNO}_3$       D.  $\text{HgCl}_2$
9. What is the major dehydration product in the following reaction?
- A. 
  
 B. 
  
 C. 
  
 D.
10. A gas occupies 2 L at STP. It is provided 300 J heat so that its volume becomes 2.5 L at 1 atm. Calculate the change in its internal energy.
- A. -249.37 J      B. 249.34 J      C. 195.5 J      D. -50.631 J
11. One mole of nitrogen gas at 0.8 atm takes 38 second to diffuse through a pin hole whereas one mole of an unknown compound of xenon with fluorine at 1.6 atm takes 57 second to diffuse through the same hole. The molecular formula of the compound is
- A.  $\text{XeF}_6$       B.  $\text{XeF}_4$       C.  $\text{XeF}_2$       D.  $\text{XeF}_8$
12. A weak acid type indicator was found to be 60% dissociation at  $\text{pH} = 9$ . What will be the % dissociation at  $\text{pH} = 8$  ?
- A. 13.04 %      B. 11.05 %      C. 19.8%      D. 24.6 %
13.  $\text{BrCH}_2-\text{CH}_2-\text{CH}_2\text{Br}$  reacts with Na in the presence of ether at  $100 \text{ }^{\circ}\text{C}$  to produce -
- A.  $\text{BrCH}_2-\text{CH}=\text{CH}_2$       B.  $\text{CH}_2=\text{C}=\text{CH}_2$       C.      D. All of these
14. Pure  $\text{N}_2$  is prepared in the laboratory by heating a mixture of
- A.  $\text{NH}_4\text{Cl}$  and  $\text{NaOH}$       B.  $\text{NH}_4\text{OH}$  and  $\text{NaCl}$       C.  $\text{NH}_4\text{Cl}$  and  $\text{NaNO}_2$       D.  $\text{NH}_4\text{Cl}$  and  $\text{NaNO}_3$
15. 108 g fairly concentrated solution of  $\text{AgNO}_3$  is electrolysed by using 0.1 F charge. The mass of resulting solution is :
- A. 94 g      B. 11.6 g      C. 96.4 g      D. None of these

### SECTION |C|

## MATHEMATICS

1. The focus of parabola  $(y - 8)^2 = 12x$  is?
  - A. (-3, -8)
  - B. (-3, 8)
  - C. (3, -8)
  - D. (3, 8)
2. The point on the line  $4x + 3y = 5$ , which is equidistant from (1,2) and (3,4) is
  - A. (7, -4)
  - B. (-10, 15)
  - C.  $\left(\frac{1}{7}, \frac{8}{7}\right)$
  - D.  $\left(0, \frac{5}{4}\right)$
3. If the ratio of the sum of  $n$  terms of two AP's is  $2n : (n+1)$ , then ratio of their sum of 8 terms is-
  - A. 15 : 8
  - B. 8 : 13
  - C.  $n : (n-1)$
  - D. 5 : 17
4. If  $\tan \theta = \frac{\sin \alpha - \cos \alpha}{\sin \alpha + \cos \alpha}$ , then  $\sin \alpha + \cos \alpha$  and  $\sin \alpha - \cos \alpha$  must be equal to
  - A.  $\sqrt{2} \cos \theta, \sqrt{2} \sin \theta$
  - B.  $\sqrt{2} \sin \theta, \sqrt{2} \cos \theta$
  - C.  $\sqrt{2} \sin \theta, \sqrt{2} \sin \theta$
  - D.  $\sqrt{2} \cos \theta, \sqrt{2} \cos \theta$
5. If one root of the equation  $x^2 + px + 12 = 0$  is 4, while the equation  $x^2 + px + q = 0$  has equal roots then the value of 'q' is
  - A.  $49/4$
  - B. 12
  - C. 3
  - D. 4
6. The ratio of the coefficient of  $x^{15}$  to the term independent of  $x$  in the expansion of  $\left(x^2 + \frac{2}{x}\right)^{15}$  is :
  - A. 7 : 16
  - B. 7 : 64
  - C. 1 : 4
  - D. 1 : 32
7. Ten different letters of an alphabet are given. Words with five letters are formed from these given letters. Determine the number of words which have at least one letter repeated.
  - A. 69762
  - B. 69676
  - C. 69760
  - D. 69766
8. The sum of the real roots of the equation  $x^3 + 3x^2 + 2x = x + 2$  is
  - A. -2
  - B. -3
  - C. -1
  - D.  $-\sqrt{5}$
9. If  $f(x) = \begin{cases} x^2 - 3, & 2 < x < 3 \\ 2x + 5, & 3 < x < 4 \end{cases}$ , the equation whose roots are  $\lim_{x \rightarrow 3^-} f(x)$  and  $\lim_{x \rightarrow 3^+} f(x)$  is
  - A.  $x^2 - 7x + 3 = 0$
  - B.  $x^2 - 20x + 66 = 0$
  - C.  $x^2 - 17x + 66 = 0$
  - D.  $x^2 - 18x + 60 = 0$

10. Let  $f(x)$  be defined for all  $x > 0$  and be continuous. Let  $f(x)$  satisfy  $f\left(\frac{x}{y}\right) = f(x) - f(y)$  for all  $x, y$  and  $f(e) = 1$  then

A.  $f(x) = \ln x$

B.  $f(x)$  is bounded

C.  $f\left(\frac{1}{x}\right) \rightarrow 0$  as  $x \rightarrow 0$

D.  $x f(x) \rightarrow 1$  as  $x \rightarrow 0$

11. If  $A$  and  $B$  are two equivalence relations defined on set  $C$ , then

A.  $A \cap B$  is an equivalence relation

B.  $A \cap B$  is not an equivalence relation

C.  $A \cup B$  is an equivalence relation

D.  $A \cup B$  is not an equivalence relation

12.  $f(x) = \sqrt{x+3}$ ,  $g(x) = x^2 + 1$  then range of  $fog$  is

A.  $[1, \infty)$

B.  $[2, \infty)$

C.  $[1, 2]$

D.  $(-\infty, \infty)$

13. The number of positive integral solutions of  $\cos^{-1}\left(4x^2 - 8x + \frac{7}{2}\right) = \frac{\pi}{3}$  are

A. one

B. two

C. three

D. None of these

14. If  $2 \tan^{-1}(\cos x) = \tan^{-1}(2 \operatorname{cosec} x)$  then find the value of  $\sin x + \cos x = \sqrt{n}$ . Then  $n =$

A.  $2\sqrt{2}$

B. 2

C.  $\frac{1}{\sqrt{2}}$

D.  $\frac{1}{2}$

15. If  $P = \begin{bmatrix} \cos \frac{\pi}{6} & \sin \frac{\pi}{6} \\ -\sin \frac{\pi}{6} & \cos \frac{\pi}{6} \end{bmatrix}$ ,  $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$  and  $Q = PAP^{-1}$  then  $P^T Q^{2011} P =$

A.  $\begin{bmatrix} 1 & \frac{\sqrt{3}}{2} \\ 0 & 2014 \end{bmatrix}$

B.  $\begin{bmatrix} 1 & 2011 \\ 0 & 1 \end{bmatrix}$

C.  $\begin{bmatrix} \frac{\sqrt{3}}{2} & 2014 \\ 0 & 1 \end{bmatrix}$

D.  $\begin{bmatrix} \frac{\sqrt{3}}{2} & -\frac{1}{2} \\ 0 & 2014 \end{bmatrix}$

## SECTION |D|

### APTITUDE

1. The sum of the ages of Ram and his father at present is  $\frac{7}{6}$  of what it was 5 years ago.

Find the sum of their present ages.

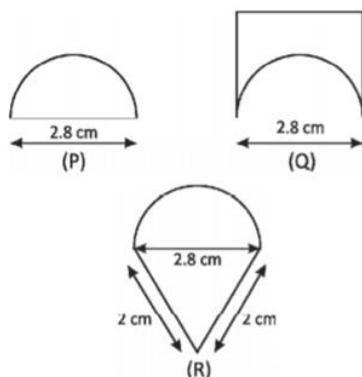
A. 30

B. 35

C. 60

D. 70

2. An ant is moving around a few food pieces of different shape scattered on the floor. For which food – piece would the ant have to take a longer round?



- A. Food piece (P)      B. Food piece (Q)      C. Food piece (R)      D. None of these
3.  $\left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{3}\right)\left(1 - \frac{1}{4}\right) \dots \dots \left(1 - \frac{1}{n-1}\right)\left(1 - \frac{1}{n}\right)$  is equal to:
- A.  $\frac{1}{2n}$       B.  $\frac{1}{5n}$       C.  $\frac{1}{3n}$       D.  $\frac{1}{n}$
4. Arrange the following words according to English Dictionary.
1. Banal      2. Banana      3. Banish      4. Bandage  
5. Bandit
- A. 1, 3, 2, 4, 5      B. 1, 2, 4, 3, 5      C. 1, 2, 4, 5, 3      D. None of these
5. 1024, \_\_\_\_\_, 64, 16, 4
- A. 254      B. 236      C. 256      D. 244



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