

**JEE (MAIN)**

**PHASE # 3**

**MINOR TEST # 8**

**DATE : 10-11-2024**

**PATTERN : MAIN**

**COURSE :  
ENTHUSE & LEADER**

**READ THE INSTRUCTIONS CAREFULLY**

***Important Instructions:***

1. This paper contains a total number of 75 questions.
2. The Questions appearing in the paper are based on Physics, Chemistry and Mathematics.
3. Duration of the test is 3 hours.

## PART 1 : PHYSICS

### SECTION-I : (Maximum Marks: 80)

This section contains 20 questions. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) Only one option is correct. For each question, marks will be awarded as follows:

**Full Marks** : +4 If correct answer is selected.

**Zero Marks** : 0 If none of the option is selected.

**Negative Marks** : -1 If wrong option is selected.

1. A particle is performing simple harmonic motion with time period  $T$ . At an instant its speed is 60% of its maximum value and is increasing. After an interval  $\Delta t$  its speed becomes 80% of its maximum value and is decreasing. The smallest value of  $\Delta t$  in terms of  $T$  will be :-

(A)  $\frac{T}{4}$                       (B)  $\frac{T}{2}$

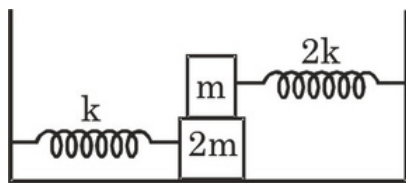
(C)  $\frac{3T}{8}$                       (D)  $\frac{3T}{4}$

2. A particle moves on the  $x$ -axis according to the equation  $x = A + B\sin\omega t$ . The motion is simple harmonic with amplitude :-

(A)  $A$                       (B)  $B$

(C)  $A + B$                       (D)  $\sqrt{A^2+B^2}$

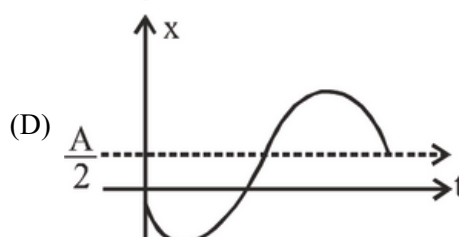
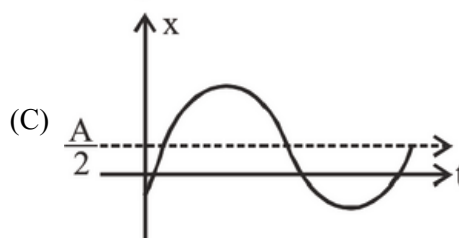
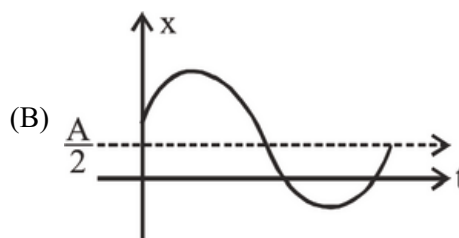
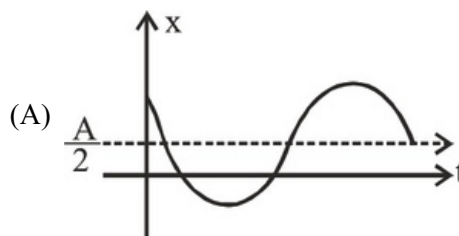
3. In the shown arrangement, the coefficient of friction between the blocks is  $\mu$  and no friction between ground surface and block  $2m$ . The blocks are displaced slightly and released. They move together without slipping on each other. The time period will be :-



(A)  $2\pi\sqrt{\frac{m}{k}}$                       (B)  $2\pi\sqrt{\frac{3m}{2k}}$

(C)  $2\pi\sqrt{\frac{2m}{3k}}$                       (D)  $2\pi\sqrt{\frac{9m}{2k}}$

4. A particle performing S.H.M. about mean position  $x = \frac{A}{2}$  and at  $t = 0$ . It has displacement  $-\frac{3A}{4}$  and moving away from the origin. Then which of the following is its possible graph between position ( $x$ ) and time ( $t$ )



5. A particle moves along  $X$  axis such that its acceleration is given by  $a = -\beta(x - 2)$ . Where  $\beta$  is a positive constant and  $x$  is the position coordinate. The time period of oscillation (in sec) :-

(A)  $\pi$

(B)  $2\pi$

(C)  $\frac{\pi}{\sqrt{\beta}}$

(D)  $\frac{2\pi}{\sqrt{\beta}}$

6. Both the frequency and the intensity of a beam of light falling on the surface of photoelectric material are increased by a factor of two. This will:

- (A) increase both, the maximum kinetic energy of the photo-electrons, as well as photoelectric saturation current by a factor of two.
- (B) increase the maximum kinetic energy of the photo-electrons by a factor greater than two and would increase the photoelectric saturation current by a factor of two.
- (C) increase the maximum kinetic energy of the photoelectrons by a factor greater than two and will have no effect on the magnitude of the photoelectric saturation current produced.
- (D) increase the maximum kinetic energy of the emitted photo-electrons by a factor of two but will have no effect on the saturation photoelectric current.

7. The binding energies of deuteron ( ${}^2_1\text{H}$ ) and  $\alpha$ -particle ( ${}^4_2\text{He}$ ) are 1.125 and 7.2 MeV/nucleon respectively. In the process  ${}^1_1\text{H} + {}^1_1\text{H} \rightarrow {}^2_1\text{H} + \gamma$ , Amount of energy transferred is & which nucleus is more stable ?

- (A) 24.3 MeV liberated,  ${}^2_1\text{H}$
- (B) 24.3 MeV liberated,  ${}^4_2\text{He}$
- (C) 24.3 MeV supplied,  ${}^2_1\text{H}$
- (D) 24.3 MeV supplied,  ${}^4_2\text{He}$

8. A photoelectric material having work-function  $\phi_0$  is illuminated with light of wavelength  $\lambda$  ( $\lambda < hc/\phi_0$ ). The fastest photoelectron has a de Broglie wavelength  $\lambda_d$ .

A change in wavelength of the incident light by  $\Delta\lambda$  results in a change  $\Delta\lambda_d$  in  $\lambda_d$ . Then the ratio  $\frac{\Delta\lambda_d}{\Delta\lambda}$  is proportional to

- (A)  $\frac{\lambda_d^3}{\lambda^2}$                       (B)  $\frac{\lambda_d^3}{\lambda}$
- (C)  $\frac{\lambda_d^2}{\lambda^2}$                       (D)  $\frac{\lambda_d}{\lambda}$

9. If the binding energy of the electron in a hydrogen atom is 13.6 eV, the energy required to remove the electron from the first excited state of  $\text{Li}^{2+}$  is-

- (A) 30.6 eV                      (B) 13.6 eV
- (C) 3.4 eV                      (D) 122.4 eV

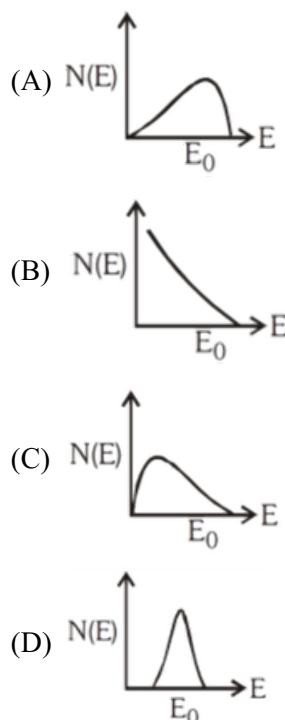
10. Energy levels A, B and C of a certain atom correspond to increasing values of energy i.e.  $E_A < E_B < E_C$ . If  $\lambda_1, \lambda_2$  and  $\lambda_3$  are wave lengths of radiations corresponding to transitions C to B, B to A and C to A respectively, which of the following relations is correct :

- (A)  $\frac{1}{\lambda_3} = \frac{1}{\lambda_1} + \frac{1}{\lambda_2}$                       (B)  $\lambda_3 = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$
- (C)  $\lambda_1 + \lambda_2 + \lambda_3 = 0$                       (D)  $\lambda_1^2 + \lambda_2^2 + \lambda_3^2 = 0$

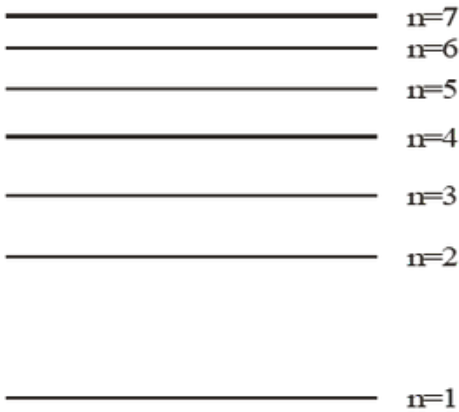
11. If each fission in a  ${}^{235}\text{U}$  nucleus releases 200 MeV, how many fissions must occur per second to produce a power of 1 KW

- (A)  $1.325 \times 10^{13}$                       (B)  $3.125 \times 10^{13}$
- (C)  $1.235 \times 10^{13}$                       (D)  $2.135 \times 10^{13}$

12. The energy spectrum of  $\beta$ -particles, number  $N(E)$  as a function of  $\beta$ -energy  $E$  emitted from a radioactive source is-



13. The maximum number of emission lines for atomic hydrogen that you would expect to see with naked eye if the only electronic levels involved are those shown in the figure, is



- (A) 6 (B) 5 (C) 21 (D)  $\infty$

14. A particle is travelling 4 times as fast as an electron. Assuming the ratio of de-Broglie wavelength of a particle to that of electron is 2 : 1, the mass of the particle is :-

- (A)  $\frac{1}{16}$  times the mass of  $e^-$   
 (B) 8 times the mass of  $e^-$   
 (C) 16 times the mass of  $e^-$   
 (D)  $\frac{1}{8}$  times the mass of  $e^-$

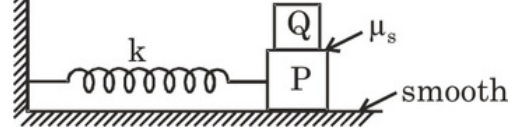
15. Which of the following transitions of  $He^+$  ion will give rise to spectral line which has same wavelength as some spectral line in hydrogen atom ?  
 (A)  $n = 4$  to  $n = 2$  (B)  $n = 6$  to  $n = 5$   
 (C)  $n = 6$  to  $n = 3$  (D) None of these

16. A particle performs S.H.M. of amplitude  $A$  with angular frequency  $\omega$  along a straight line. When it is at a distance  $\frac{\sqrt{3}}{2}A$  from mean position, its kinetic energy gets increased by an amount  $\frac{1}{2}m\omega^2A^2$  due to an impulsive force. Then its new amplitude becomes-

- (A)  $\frac{\sqrt{5}}{2}A$  (B)  $\frac{\sqrt{3}}{2}A$   
 (C)  $\sqrt{2}A$  (D)  $\sqrt{5}A$

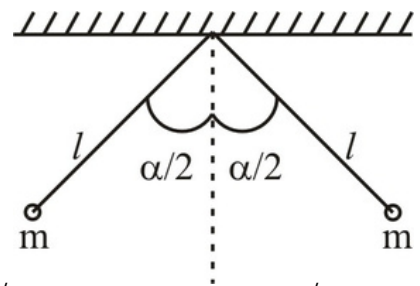
17. A block P of mass  $m$  is placed on a frictionless horizontal surface. Another block Q of mass  $2m$  is kept on P and connected to the wall with the help of a spring of spring constant  $k$  as shown in the

figure.  $\mu_s$  is the coefficient of friction between P and Q. The blocks move together performing SHM of amplitude  $A$ . The maximum value of the friction force between P and Q is



- (A)  $\frac{2kA}{3}$  (B)  $\frac{kA}{2}$   
 (C) zero (D)  $\mu_s mg$

18. A light rigid wire of length  $2\ell$  is bent at centre, two identical particles each of mass  $m$  are attached at two ends of the wire. If angle between two halves of wire is  $\alpha$  and wire is hinged in a vertical plane at centre, then find period of small oscillation of system in vertical plane containing the wire.



- (A)  $2\pi \sqrt{\frac{\ell}{g \cos \alpha}}$  (B)  $2\pi \sqrt{\frac{\ell}{g \sin \alpha}}$   
 (C)  $2\pi \sqrt{\frac{\ell}{g \cos \frac{\alpha}{2}}}$  (D)  $2\pi \sqrt{\frac{\ell}{g}}$

19. A free particle with initial kinetic energy  $E$  and zero potential energy and de-broglie wavelength  $\lambda$ , enters a region in which it has potential energy  $V$ . What is the particle's new wavelength?  
 (A)  $\lambda \sqrt{\frac{1-EV}{1-EV}}$  (B)  $\lambda \sqrt{\frac{1-VE}{1-VE}}$   
 (C)  $\lambda \sqrt{\frac{1-EV}{1-EV}}$  (D)  $\lambda \sqrt{\frac{1-VE}{1-VE}}$

20. In a cricket match, batsman hit the ball (mass = m) high in the air and fielding side player catch the ball near boundary. De broglie wavelength of ball just after hit from bat is  $\lambda_1$  and just before the catch is  $\lambda_2$ . Assume height at which ball is hit by bat and height at which ball is catch are same. Find total work done by air-resistance (Mechanical energy is loss only due to air-resistance)

- (A)  $\frac{h^2}{2m} \left( \frac{1}{\lambda_1} - \frac{1}{\lambda_2} \right)$   
 (B)  $\frac{h^2}{2m} \left( \frac{1}{\lambda_2} - \frac{1}{\lambda_1} \right)$   
 (C)  $\frac{h^2}{2m} \left( \frac{\lambda_1 \lambda_2}{\lambda_1 - \lambda_2} \right)$   
 (D)  $\frac{h^2}{2m} \left( \frac{1}{\lambda_1} - \frac{1}{-\lambda_2} \right)$

SECTION-II : (Maximum Marks: 20)

This section contains 05 questions.

The answer to each question is a Numerical Value.

For each question, enter the correct integer value (In case of non-integer value, the answer should be rounded off to the nearest Integer).

Answer to each question will be evaluated according to the following marking scheme:

*Full Marks* : +4 If correct answer is entered.

*Zero Marks* : 0 If the question is unanswered.

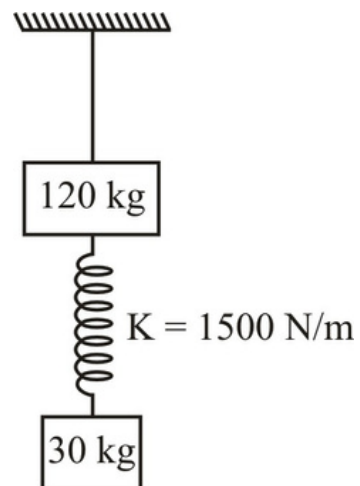
*Negative Marks* : -1 If wrong answer is entered.

1. Ratio of debroglie wavelength of electron in third orbit of hydrogen atom to the debroglie wavelength of electron in first orbit of hydrogen is

2. A hydrogen like atom has one electron revolving around a stationary nucleus. The energy required to excite the electron from the second orbit to the third orbit is 47.2 eV. The atomic number of the atom is \_\_\_\_\_.

3. In an experiment on photoelectric effect, the slope of the cut-off voltage (y-axis) versus frequency (x-axis) of incident light is found to be  $4.12 \times 10^{-15}$  V s. If the value of Planck's constant is  $P \times 10^{-15}$  eV-s then value of  $100 \times P \times 10^{-15}$  will be.

4. The system shown is in equilibrium. The string is cut at  $t = 0$ . The spring comes to its natural length at  $t = t_1$  sec. If minimum value of  $t_1$  is T then value of  $5T$  will be (Take :  $\pi^2 = 10$ )



5. Three SHM in the same direction, having same amplitude and same period, are superimposed. If each differ in phase from the next by  $45^\circ$ . Then, find the energy associated with resulting motion taking energy associated with each of given SHM as 1 J. If the calculated energy is E then value of  $100E$  will be.

**PART 2 : CHEMISTRY**

**SECTION-I : (Maximum Marks: 80)**

This section contains 20 questions. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) Only one option is correct. For each question, marks will be awarded as follows:

**Full Marks** : +4 If correct answer is selected.

**Zero Marks** : 0 If none of the option is selected.

**Negative Marks** : -1 If wrong option is selected.

1. 1 mol of nitrogen is mixed with 3 moles of hydrogen in a  $\sqrt{3}$  litre container where 66.67 % of nitrogen is converted in to ammonia by the following reaction :



(A) 2 M (B) 1/2 M  
(C) 4 M (D) 1/4 M

2. For the reaction  $\text{A}(\text{s}) + 2\text{B}(\text{g}) \rightleftharpoons \text{C}(\text{g}) + 3\text{D}(\text{g})$ , which of the following relation is incorrect ?

(A)  $K_p = K_c (RT)^1$

(B)  $K_p = K_c (RT)^2$

(C)  $\log \frac{K_p}{K_c} - 2 \log RT = 0$

(D)  $K_c = \frac{[\text{C}]_{\text{eq}} [\text{D}]_{\text{eq}}^3}{[\text{B}]_{\text{eq}}^2}$

3.  $(\text{NH}_4)_2\text{CO}_3(\text{s}) \rightleftharpoons 2\text{NH}_3(\text{g}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{g})$

The value of  $K_p$  for above equilibrium is  $64 \text{ atm}^4$ .

The equilibrium pressure of the system is

(A) 4 atm (B) 8 atm

(C) 2 atm (D) 6 atm

4. At  $25^\circ\text{C}$ ,  $K_a$  of weak monobasic acid, HA, is  $5 \times 10^{-6}$ .  $K_b$  of  $\text{A}^-$  is -

(A)  $5 \times 10^{-6}$  (B)  $2 \times 10^5$

(C)  $2 \times 10^{-9}$  (D)  $5 \times 10^{-8}$

5. What value of  $K_{sp}$  must another salt  $\text{MX}_3$  have if the molar solubility of the two salts is to be identical :

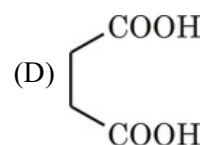
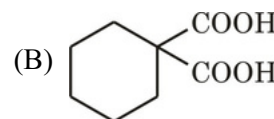
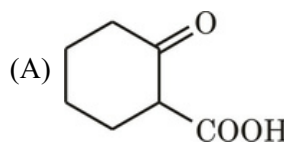
(A)  $3.2 \times 10^{-10}$  (B)  $1.024 \times 10^{-19}$

(C)  $1.78 \times 10^{-5}$  (D)  $4.32 \times 10^{-18}$

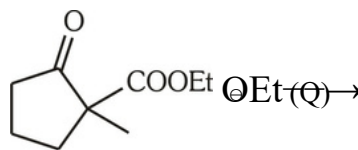
6. The compound which undergo nucleophilic substitution fastest would be :



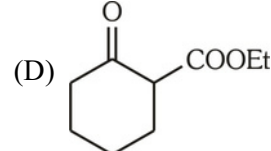
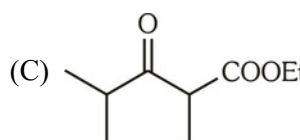
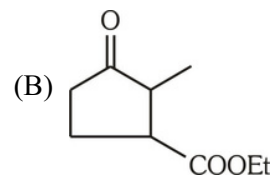
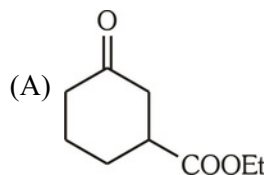
7. Which of the following compound will not give  $\text{CO}_2$  gas on heating ?



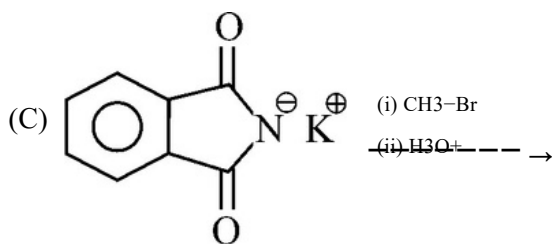
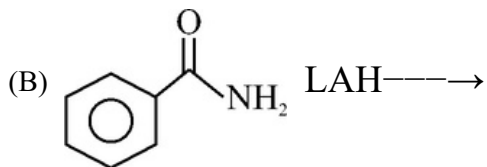
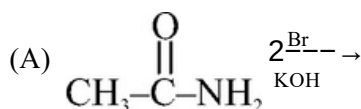
8. Ester having  $\alpha$ -H' gives  $\beta$ , keto ester in presence of alkoxide ion. This reaction is known as Claisen condensations reaction.



(P) Possible structure of "Q" is

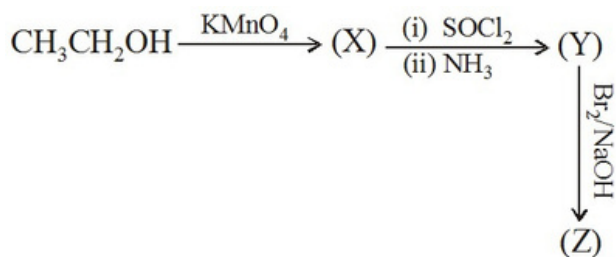


9. In which of the following reaction, one of the product obtained will give isocyanide test ?



(D) All of these

10. In the following sequence of reactions 'Z' will be :



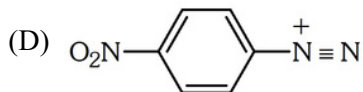
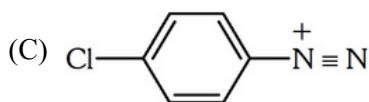
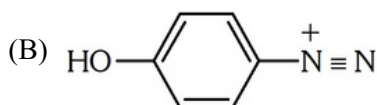
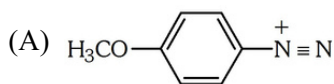
(A) Acetic acid

(B) Acetone

(C) Methyl amine

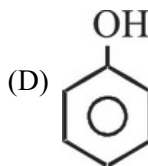
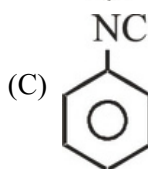
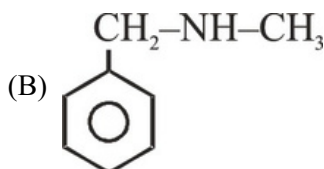
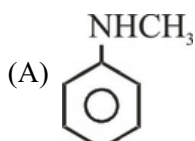
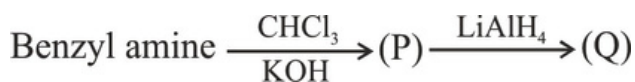
(D) Ethyl amine

11. Which of the following is most reactive ion in azocoupling reaction ?



the

12. (Q) in following sequence is :



13. In milk sugar which linkage is presence.

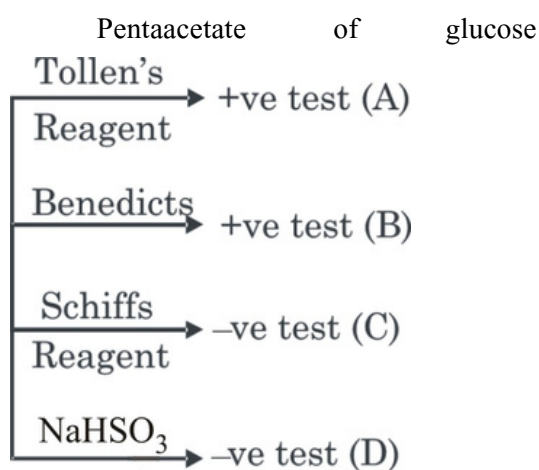
(A) C1 - C4  $\alpha$ -glycosidic linkage

(B) C1 - C2  $\alpha$ -glycosidic linkage

(C) C1 - C4  $\beta$ -glycosidic linkage

(D) C1 - C2  $\beta$ -glycosidic linkage

14. Which of the following is correct.



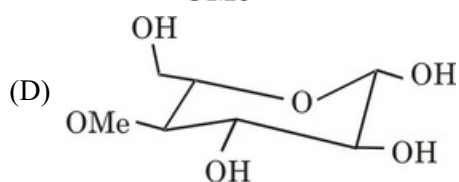
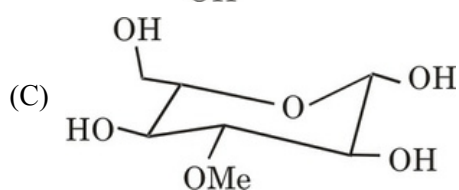
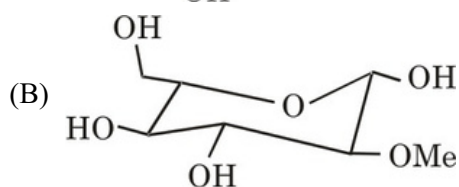
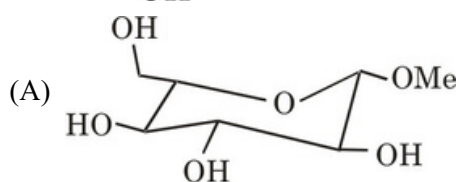
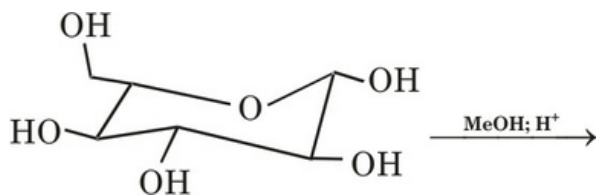
(A) A and D are correct

(B) B and C are correct

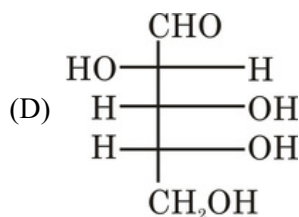
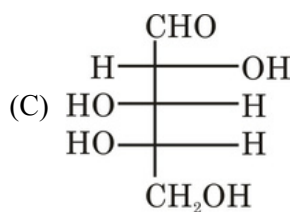
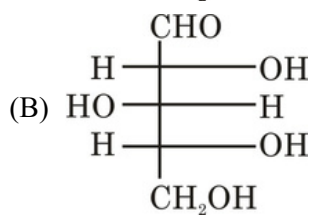
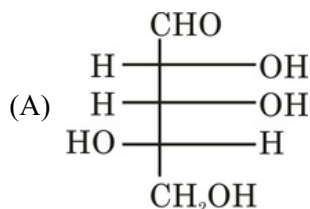
(C) A and B are correct

(D) C and D are correct

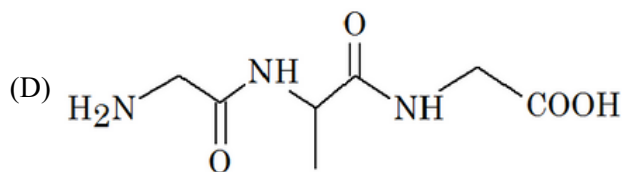
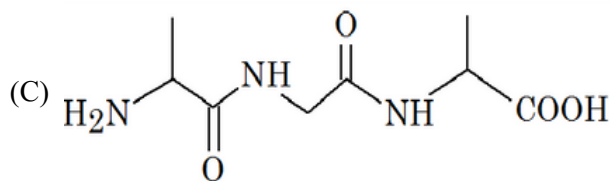
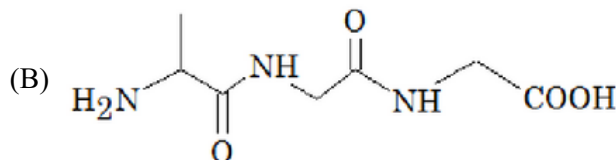
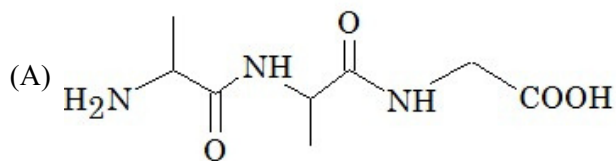
15. Predict the product



16. Which of the following gives an optically inactive aldaric acid on oxidation with dilute  $\text{HNO}_3$  acid ?



17. The correct structure of tripeptide made up of Alanine-Glycine-Alanine is :



18. Acetic acid forms dimer in vapour phase due to

(A) Intramolecular H-Bonding

(B) Inter molecular H-bonding

(C) Orbital-overlapping

(D) None of these

19. Which of the following acids has the smallest dissociation constant?

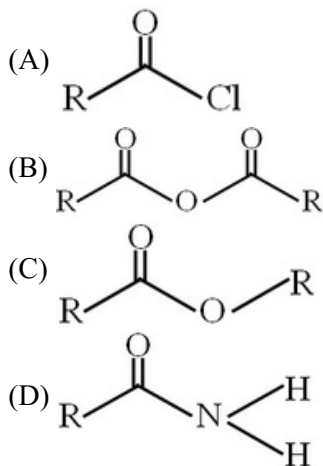
(A)  $\text{CH}_3\text{CHF}\text{COOH}$

(B)  $\text{FCH}_2\text{CH}_2\text{COOH}$

(C)  $\text{BrCH}_2\text{CH}_2\text{COOH}$

(D)  $\text{CH}_3\text{CHBr}\text{COOH}$

20.



The correct order of their reactivity towards hydrolysis at room temperature is :

- (A) (A) > (B) > (C) > (D)  
 (B) (D) > (A) > (B) > (C)  
 (C) (D) > (B) > (A) > (C)  
 (D) (A) > (C) > (B) > (D)

SECTION-II : (Maximum Marks: 20)

This section contains 05 questions.

The answer to each question is a Numerical Value.

For each question, enter the correct integer value (In case of non-integer value, the answer should be rounded off to the nearest Integer).

Answer to each question will be evaluated according to the following marking scheme:

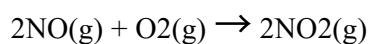
*Full Marks* : +4 If correct answer is entered.

*Zero Marks* : 0 If the question is unanswered.

*Negative Marks* : -1 If wrong answer is entered.

1. For the reversible reaction  $A(g) + B(s) \rightleftharpoons 2C(g)$ ,  
 $\frac{K_p}{K_c} = (RT)^x$ . Hence x is :

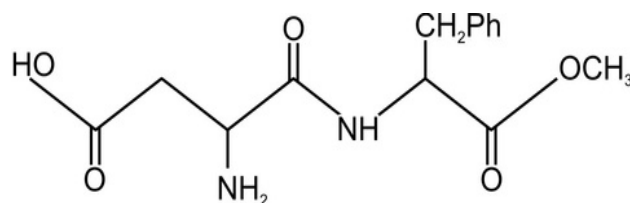
2. Calculate the change in pressure (in atm) when 2 mole of NO and 16 g O<sub>2</sub> in a 6.25 litre originally at 27°C react to produce the maximum quantity of NO<sub>2</sub> possible according to the equation.



(Take  $R = \frac{1 \text{ ltr. Atm/mol K}}{12}$ )

3. The acid ionization (hydrolysis) constant of  $Zn^{2+}$  is  $1.0 \times 10^{-9}$  then the pH of a 0.001 M solution of ZnCl<sub>2</sub> is

4. Aspartane is an artificial sugar has following structure. How many functional groups are present in the molecule.



5. Identify total number of esters having molecular formula C<sub>6</sub>H<sub>12</sub>O<sub>2</sub> which give "EtOH" as one of the product on acidic hydrolysis :

## PART 3 : MATHEMATICS

### SECTION-I : (Maximum Marks: 80)

This section contains 20 questions. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) Only one option is correct. For each question, marks will be awarded as follows:

**Full Marks** : +4 If correct answer is selected.

**Zero Marks** : 0 If none of the option is selected.

**Negative Marks** : -1 If wrong option is selected.

1. If the lines  $3x - 4y + 10 = 0$  and  $3x - 4y - 15 = 0$  are tangents to a circle, then the radius of the circle is :-

- (A) 5 (B)  $25/2$   
(C)  $5/2$  (D) None of these

2. A uni-modular tangent vector on the curve  $x = t^2 + 2$ ,  $y = 4t - 5$ ,  $z = 2t^2 - 6t$  at  $t = 2$  is :-

- (A)  $\frac{1}{3} \frac{(2\hat{i} + 2\hat{j} + \hat{k})}{(2\hat{i} + 2\hat{j} + \hat{k})}$   
(B)  $\frac{1}{3}$   
(C)  $\frac{1}{6}$   
(D)  $\frac{2}{3}$

3. A line with positive direction cosines passes through the point  $P(2, -1, 2)$  and makes equal angles with the co-ordinate axes. The line meets the plane  $2x + y + z = 9$  at point Q. The length of the line segment PQ equals

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

4. If the circles  $x^2 + y^2 + 2x + 2ky + 6 = 0$  and  $x^2 + y^2 + 2ky + k = 0$  intersect orthogonally, then k is -

- (A) 2 or  $+\frac{3}{2}$  (B) 2 or  $-\frac{3}{2}$   
(C) -2 or  $-\frac{3}{2}$  (D) -2 or  $\frac{3}{2}$

5. Vector  $\hat{a}$  in the plane of  $\vec{b} = -2\hat{i} + \hat{j}$  and  $\vec{c} = \hat{i} - \hat{j} + \hat{k}$  is such that it is equally inclined to  $\vec{b}$  and  $\vec{c}$  where  $\vec{d} = \hat{j} + 2\hat{k}$ . The value of  $\hat{a}$  is :-

- (A)  $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{3}}$   
(B)  $\frac{\sqrt{3}}{\hat{i} - \hat{j} + \hat{k}}$   
(C)  $\frac{2\hat{i} + \hat{j}}{\sqrt{5}}$   
(D) None

6. The locus of the mid-points of the chords of the circle  $x^2 + y^2 - ax - by = 0$ , which subtends a right

angle at  $(\frac{a}{2}, \frac{b}{2})$  is :

- (A)  $ax + by = 0$   
(B)  $ax + by = a^2 + b^2$   
(C) 2

$$x - y - \frac{2ax - by}{8} - \frac{a^2 + b^2}{8} = 0$$

(D)  $2x + y - \frac{2ax - by}{8} + \frac{a^2 + b^2}{8} = 0$

7. If  $\vec{a}$  and  $\vec{c}$  are non-coplanar vectors and  $\vec{a} \times \vec{c}$  is perpendicular to  $\vec{a} \times (\vec{b} \times \vec{c})$ , then the value of  $[\vec{a} \times (\vec{b} \times \vec{c})] \times \vec{c}$  is equal to :-

- (A)  $[\vec{a} \times \vec{b}] \vec{c}$  (B)  $[\vec{a} \times \vec{c}] \vec{b}$   
(C)  $\vec{0}$  (D)  $[\vec{a} \times \vec{b} - \vec{c}] \vec{a}$

8.  $y = mx$  is a chord of a circle of radius 'a' and the diameter of the circle lies along x-axis and one end of this chord is origin. The equation of the circle described on this chord as diameter is :-

- (A)  $(1 + m^2)(x^2 + y^2) - 2ax = 0$   
(B)  $(1 + m^2)(x^2 + y^2) - 2a(x + my) = 0$   
(C)  $(1 + m^2)(x^2 + y^2) + 2a(x + my) = 0$   
(D)  $(1 + m^2)(x^2 + y^2) - 2a(x - my) = 0$

9. Given three non-zero, non-coplanar vectors  $\vec{a}, \vec{b}$  and  $\vec{c}$ ,  $\vec{r} = p\vec{a} + q\vec{b} + r\vec{c}$  and  $\vec{r} = \frac{1}{3}\vec{a} + p\vec{b} + q\vec{c}$ . The vectors  $\vec{r}_1 = 2\vec{r}_2$  and  $2\vec{r}_1 + \vec{r}_2$  are collinear then  $(p, q)$  is :-
- (A) (0,0)  
 (B) (1,-1)  
 (C) (-1,1)  
 (D) (1, 1)
10. Tangents are drawn from the point (4, 3) to the circle  $x^2 + y^2 = 9$ . The area of the triangle formed by them and the line joining their points of contact is :-
- (A)  $\frac{24}{25}$   
 (B)  $\frac{64}{25}$   
 (C)  $\frac{192}{25}$   
 (D)  $\frac{192}{5}$
11. If  $4\hat{i} + 7\hat{j} + 8\hat{k}$ ,  $2\hat{i} + 3\hat{j} + 4\hat{k}$  and  $2\hat{i} + 5\hat{j} + 7\hat{k}$  are the position vectors of the vertices A, B and C, respectively, of triangle ABC, then the position vector of the point where the bisector of angle A meets BC is :-
- (A)  $\frac{2}{3}(-6\hat{i} - 8\hat{j} - 6\hat{k})$   
 (B)  $\frac{2}{3}(6\hat{i} + 8\hat{j} + 6\hat{k})$   
 (C)  $\frac{1}{3}(6\hat{i} + 13\hat{j} + 18\hat{k})$   
 (D)  $\frac{1}{3}(5\hat{j} + 12\hat{k})$
12. The number of integral values of  $\lambda$  for which  $x^2 + y^2 + \lambda x + (1 - \lambda)y + 5 = 0$  is the equation of a circle whose radius cannot exceed 5, is :- (A) 14 (B) 18 (C) 16 (D) None of these
13. The equation of the plane passing through the lines  $\frac{x-4}{1} = \frac{y-3}{1} = \frac{z-2}{2}$  and  $\frac{x-3}{1} = \frac{y-2}{-4} = \frac{z}{5}$  is :-
- (A)  $11x - y - 3z = 35$   
 (B)  $11x + y - 3z = 35$   
 (C)  $11x - y + 3z = 35$   
 (D) none of these
14. The cartesian equation of the plane  $\vec{r} = (1 + \lambda - \mu)\hat{i} + (2 - \lambda)\hat{j} + (3 - 2\lambda + 2\mu)\hat{k}$  is :-
- (A)  $2x + y = 5$   
 (B)  $2x - y = 5$   
 (C)  $2x + z = 5$   
 (D)  $2x - z = 5$
15. Let  $A \equiv (1, 2)$ ,  $B \equiv (3, 4)$  and let  $C \equiv (x, y)$  be a point such that  $(x - 1)(x - 3) + (y - 2)(y - 4) = 0$ . If area  $(\Delta ABC) = 1$  then maximum number of positions of C in the x - y plane is :-
- (A) 2 (B) 4  
 (C) 8 (D) 10
16. A line segment has length 63 and dr's are 3, -2, 6. If the line makes an obtuse angle with x-axis. The components of the line vector are :-
- (A) 27, -18, 54  
 (B) -27, 18, -54  
 (C) -27, 18, 54  
 (D) 27, -18, -54
17. The equation of the circle passing through the point (-1, -3) and touching the line  $4x + 3y - 12 = 0$  at the point (3, 0) is :-
- (A)  $x^2 + y^2 - 2x + 3y - 3 = 0$   
 (B)  $x^2 + y^2 + 2x - 3y - 5 = 0$   
 (C)  $2x^2 + 2y^2 - 2x + 5y - 8 = 0$   
 (D) None of these

18. The equation of a line which passes through point A(1,0,-1) and perpendicular to the straight lines  $\mu=2i-j+k$  and  $\lambda(2i+7j-3k)$  and  $\mu=3i-j+3k$  and  $\lambda(2i-2j+5k)$ , is :-

(A)  $\frac{x-2}{29} = \frac{y}{-16} = \frac{z+1}{18}$

(B)  $\frac{x-1}{29} = \frac{y}{-16} = \frac{z+1}{-18}$

(C)  $\frac{x-1}{16} = \frac{y}{29} = \frac{z-1}{-18}$

(D) None of these

19. A variable circle passes through the fixed point P(a, b) and touches y-axis. The locus of the other end of the diameter through P is :-

(A)  $(x-a)^2 = 4by$

(B)  $(x-b)^2 = 4ay$

(C)  $(y-a)^2 = 4bx$

(D)  $(y-b)^2 = 4ax$

20. The intercepts made on the axes by the plane which bisects the line joining the points (1, 2, 3) and (-3, 4, 5) at right angles are

(A)  $(-\frac{9}{2}, 9, 9)$

(9, 9, 9)

(B)  $(\frac{9}{2}, -9, 9)$

(C)  $(\frac{9}{2}, 9, 9)$

(D) -

## SECTION-II : (Maximum Marks: 20)

This section contains 05 questions.

The answer to each question is a Numerical Value.

For each question, enter the correct integer value (In case of non-integer value, the answer should be rounded off to the nearest Integer).

Answer to each question will be evaluated according to the following marking scheme:

*Full Marks* : +4 If correct answer is entered.

*Zero Marks* : 0 If the question is unanswered.

*Negative Marks* : -1 If wrong answer is entered.

- If the circle  $x^2 + y^2 + 2ax + 2by + c = 0$  and  $x^2 + y^2 + 2cx + 2ay + c = 0$  where  $c > 0$ , have exactly one point is common, then the value of  $\frac{(a+b)^2}{2c}$  is :
- If  $a=i-j-k$  and  $b=\lambda i-3j+k$  and the projection of  $\vec{b}$  on  $\vec{a}$  is  $\frac{4}{3}(i-j-k)$ , then  $\lambda$  is equal to :-
- If the line  $3x - 4y - k = 0$  ( $k > 0$ ) touches the circle  $x^2 + y^2 - 4x - 8y - 5 = 0$  at (a, b) then  $k + a + b$  is equal to :-
- If the shortest distance between the lines  $\frac{x-3}{3} = \frac{y-8}{1} = \frac{z-3}{1}$  and  $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$  is  $\lambda\sqrt{30}$  units then the value of  $\lambda$  is
- The radius of the larger circle lying in the first quadrant and touching the line  $4x + 3y - 12 = 0$  and the coordinate axes is-