MasterJEE

IIT-JEE | Medical | Foundations

Master JEE CLASSES

Kukatpally, Hyderabad.

JEE-ADVANCE-2017-P1-Model **Max.Marks:183**

2017-PAPER -I

IMPORTANT INSTRUCTIONS:

1) This booklet is your Question Paper.
2) Use the Optical Response Sheet (ORS) provided separately for answering the questions
3) Blank spaces are provided within this booklet for rough work.
4) Write your name, roll number and sign in the space provided on the back cover of this booklet.
5) You are allowed to take away the Question Paper at the end of the examination.

OPTICAL RESPONSE SHEET:

6) Darken the appropriate bubbles on the ORS by applying sufficient pressure. This will leave an impression at the corresponding place on the Candidate's sheet.
7) The ORS will be collected by the invigilator at the end of the examination.
8) Do not tamper with or mutilate the ORS. **Do not use the ORS for rough work**.
9) Write your name, roll number and code of the examination center, and sign with pen in the space provided for this purpose on the ORS. **Do not write any of these details anywhere else** on the ORS. Darken the appropriate bubble under each digit of your roll number.

DARKENING THE BUBBLES ON THE ORS

10) Use a **BLACK BALL POINT PEN** to darken the bubbles on the ORS.
11) Darken the bubble **COMPLETELY**.
12) The correct way of darkening a bubble is as:
13) The ORS is machine-gradable. Ensure that the bubbles are darkened in the correct way.
14) Darken the bubbles ONLY IF you are sure of the answer. There is NO WAY to erase or "un-darken" a darkened bubble.

JEE-ADVANCE-2017-P1-Model

Time: 03:00 Hr's **IMPORTANT INSTRUCTIONS** **Max Marks: 183**

PHYSICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I (Q.N : 1 – 7)	Questions With Multiple Correct Choice (partial marking scheme) (+1,0)	+4	-2	7	28
Sec – II (Q.N : 8 – 12)	Questions With Integer Answer Type	+3	0	5	15
Sec – III (Q.N : 13 – 18)	Questions With Single Answer Type	+3	-1	6	18
Total				**18**	**61**

CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I (Q.N : 19 – 25)	Questions With Multiple Correct Choice (partial marking scheme) (+1,0)	+4	-2	7	28
Sec – II (Q.N : 26 – 30)	Questions With Integer Answer Type	+3	0	5	15
Sec – III (Q.N : 31 – 36)	Questions With Single Answer Type	+3	-1	6	18
Total				**18**	**61**

MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I (Q.N : 37 – 43)	Questions With Multiple Correct Choice (partial marking scheme) (+1,0)	+4	-2	7	28
Sec – II (Q.N : 44 – 48)	Questions With Integer Answer Type	+3	0	5	15
Sec – III (Q.N : 49 – 54)	Questions With Single Answer Type	+3	-1	6	28
Total				**18**	**61**

space for rough work

PHYSICS **Max. Marks:61**

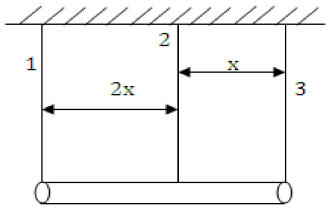
SECTION – I

(MULTIPLE CORRECT ANSWER TYPE)

This section contains 7 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONE OR MORE than ONE option can be correct.

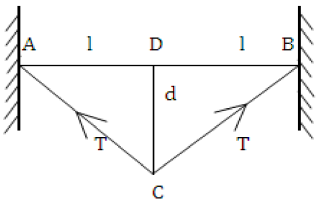
Marking scheme: +4 for all correct options & +1 partial marks, 0 if not attempted and -2 in all wrong cases

1. Three vertical wires 1,2,3 are supporting a rod of mass M in horizontal position as shown. All wires are of equal length and equal area of cross-section. Given $Y_2 = Y_3$. Wires 1 and 3 are attached to extreme ends of rod. Choose the correct options(s) (T_1, T_2 and T_3 are tensions in wires 1, 2 and3 respectively).



A) $T_1 = 2T_3$ B) $2T_1 = T_3$ C) $T_2 = T_3$ D) $T_1 = \frac{Mg}{5}$

2. A wire AB of length $2l$ and cross-section area a is stretched without tension between fixed points A and B. The wire is pulled at the centre into shape ACB such that d<<l, The tension in the string is T and the strain produced in it is ε. If the Young's modulus of the material of wire is Y. Then



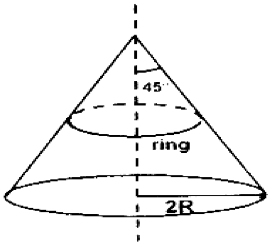
A) $\varepsilon = \frac{d}{2l}$

B) $\varepsilon = \frac{d^2}{2l^2}$

C) $T = aY\left(\frac{d}{2l}\right)$

D) $T = aY\left(\frac{d^2}{2l^2}\right)$

3. A uniform metallic ring of mass m, radius R, cross sectional area 'a' and Young's modulus Y is kept on a smooth cone of radius 2R and semi vertical angle 45^0, as shown in the figure. Assume that the extension in the ring is small.



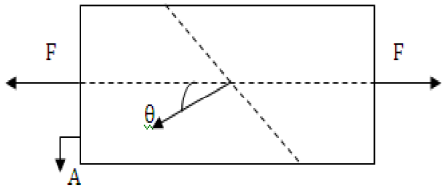
A) The tension in the ring will be same throughout

B) The tension in the ring will be independent of the radius of ring (of constant mass) if radius of the ring is less than 2R

C) The extension in the ring will be $\frac{mgR}{aY}$

D) Elastic potential energy stored in the ring will be $\frac{m^2g^2R}{8\pi Ya}$

4. A bar of cross section A is subjected to equal and opposite tensile forces at its end. Consider a plane section of the bar whose normal makes an angle θ with the horizontal axis of bar



A) The tensile stress on this plane is $\frac{F}{A}\cos^2\theta$

B) The shearing stress on this plane is $\frac{F}{2A}\sin 2\theta$

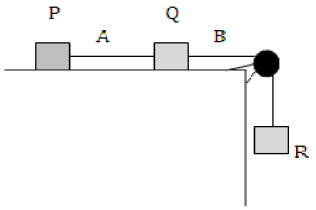
C) Tensile stress is maximum when $\theta = 90^0$

D) Shearing stress is maximum when $\theta = 45^0$

5. A copper wire $\left(Y = 10^{11} N/m^2\right)$ of length 8m and steel wire $\left(Y = 2\times10^{11} N/m^2\right)$ of length 4m each of $0.5\,cm^2$ cross-sections are fastened end to end and stretched with a tension of 500N

A) Elongation in copper wire in 0.8mm
B) Elongation in steel wire is $1/4^{th}$ mm the elongation in copper wire
C) Total elongation in 1.0mm
D) Elastic potential energy of the system in 0.25 joule

6. Each of the three blocks P,Q and R shown in figure has a mass of 3kg. Each of the wires A and B has cross-sectional area $0.005\,cm^2$ and Young's modulus $2\times10^{11} N/m^2$. Neglect friction. Find the longitudinal strain developed in each of the wires. Take g=$10 m/s^2$.



A) Strain in wire 'A' is 0.2 mm B) Strain in wire 'B' is 0.4 mm
C) Strain in wire A is 0.1 mm D) Strain in wire B is 0.2 mm

7. A light rod of length 2m is suspended from a ceiling horizontally by means of two vertical wires A and B of equal length tied to its ends. Wire 'A' is made of steel and is of cross section $10^{-3}m^2$ and the wire 'B' of brass of cross section $2\times10^{-3}m^2$. 'X' is the distance from steel wire end, at which a weight may be hung.

$Y_{steel}=2\times10^{11}pa\ and\ Y_{brass}=10^{11}pa$. Which of the following are correct?

A) X=1.2m, if strains of both wires are to be equal

B) X=1.42m, if stresses of both wires are to be equal

C) X=1m, if strains of both wires are to be equal

D) X=1.33m, if stresses of both wires are to be equal

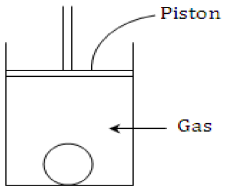
SECTION-II

(INTEGER ANSWER TYPE)

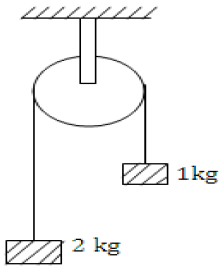
This section contains 5 questions. The answer is a single digit integer ranging from 0 to 9 (both inclusive).

Marking scheme +3 for correct answer , 0 if not attempted and 0 in all other cases.

8. The bulk stress on the spherical object of radius 10/π cm if area and mass of piston are $50cm^2$ and 50 kg, respectively, for a cylinder filled with gas as shown in fig. is $x\times10^5Nm^{-2}$. Then x= $\left(g=10ms^{-2}\ and\ 1atm=10^5\frac{N}{m^2}\right)$ (Assuming the object is in normal state when it is in the atmosphere on the surface of earth)

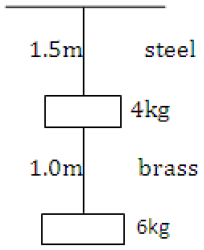


9. Two blocks of masses1 kg and 2 kg are connected by a metal wire going over a smooth pulley as shown in fig. The breaking stress of the metal is $(40/3\pi)\times10^{6} N/m^{2}$. If $g = 10 ms^{-2}$. The minimum radius of the wire used if it is not to break, is $x\times10^{-3} m$. Then x is



10. Two wires of diameter 0.25 cm, one made of steel and other made of brass, are loaded as shown in the figure. The unloaded length of the steel wire is 1.5 m and that of brass

is 1.0m. Young's modulus of steel is 2×10^{11} pa and Young's modulus of brass is $10^{11}\,Pa$. The ratio of elongations of steel and brass wires, is $\frac{x}{4}$. Then x is….



11. A uniform rod of mass m and length ℓ is rotating with constant angular velocity ω about an axis which passes through its one end and perpendicular to the length of rod. The area of cross section of the rod is A and its young's modulus is Y. Neglect gravity. The strain at the midpoint of the rod is $\frac{3m\omega^2\ell}{KAY}$. Then the value of 'K' is

12. Average depth of Indian Ocean is about 3000m. Bulk modulus of water is $2.2\times10^9\,pa$ and density of water is $1000\,kgm^{-3}$. The fractional compression of water of the bottom of the ocean is $\beta(0.68)\%$. Then the value of β rounded to nearest integer is……

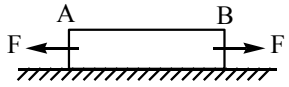
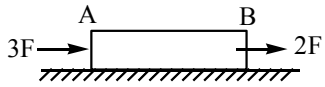
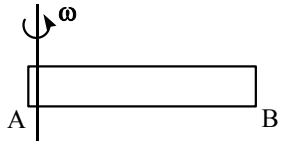
SECTION – III

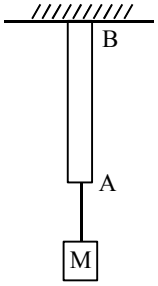
(SINGLE CORRECT ANSWER TYPE)

This section contains 6 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Four identical rods (AB) each of mass m, length *l*, cross sectional area 'a' and Young's modulus Y are taken in column-I in different situations. Mark the most appropriate option

	Column-I		Column-II		Column-III
A)	 Surface is smooth and F is the external force	I)	Longitudinal strain is non uniform	P)	Strain energy density is uniform
B)		II)	Magnitude of longitudinal strain decreases continuously from A to B	Q)	Strain energy density is not uniform
C)	 The rod is rotating about end A with constant	III)	Magnitude of longitudinal strain increases continuously from A to B	R)	Strain energy density continuously increases from A to B

	angular velocity ω on a smooth horizontal surface				
D)	 End B is fixed to the ceiling and a block of mass M is connected to end A by a massless spring	IV)	There is net compression in the rod	S)	Strain energy density continuously decreases from A to B

13. For the rod given in (B) in Column-I

A) I, IV, P B) I, IV, Q C) I, III, R D) None of these

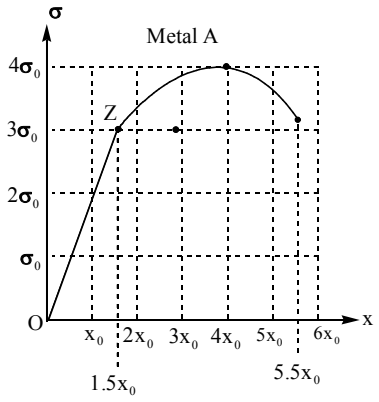
14. For the rod given in (C) in Column-II

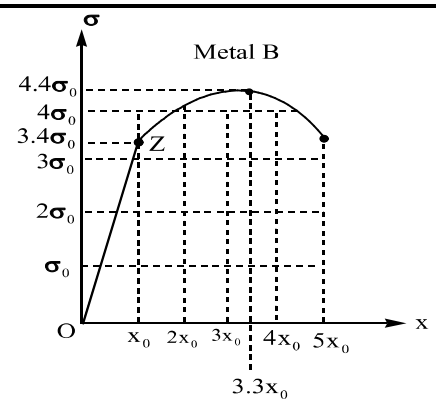
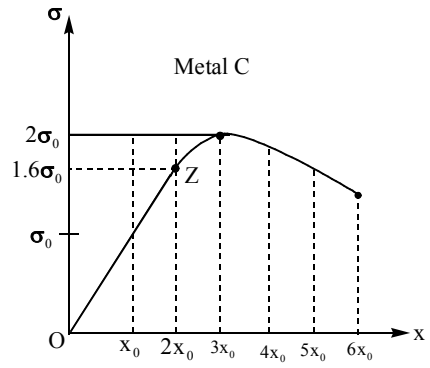
A) I, II, P B) I, III, Q, S C) I, II, Q, S D) None of these

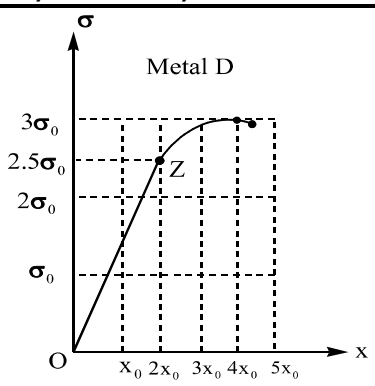
15. For the rod given in (D) in Column-I

A) III, P B) I, III, P, R C) I, III, Q, R D) None of these

In column I stress (y-axis) – strain (x-axis) graph of four metallic wires A, B, C and D of same natural length and same cross-sectional area are shown. OZ is a straight line and end point of the curve represents fracture point

	Column-I		Column-II		Column-III
A)		I)	Young's modulus is maximum among the four	P)	Breaking stress is maximum among the four

B)		II)	Young's modulus is minimum among the four	Q)	Breaking stress is minimum among the four
C)		III)	More ductile among the four	R)	Within the proportionality limit strain energy that can be stored in the wire is maximum among the four

D)		IV)	More brittle among the four	S)	Within the proportionality limit strain energy that can be stored in the wire is minimum among the four

16. Which of the following are correct for wire D

A) I, IV, S B) II, IV, S C) IV, R D) II, Q, S

17. Which of the following are correct for wire B

A) I, III, Q, R B) I, IV, Q, R C) I, P, R D) I, P

18. Which of the following are correct for wire C

A) III, Q, S B) IV, Q, S C) II, III, Q, S D) None of these

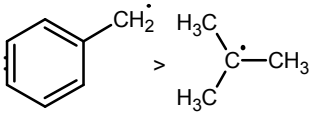
SECTION – I

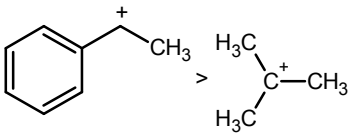
(MULTIPLE CORRECT ANSWER TYPE)

This section contains 7 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONE OR MORE than ONE option can be correct.

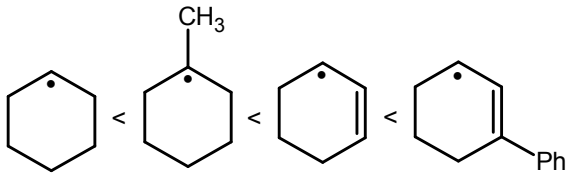
Marking scheme: +4 for all correct options & +1 partial marks, 0 if not attempted and -2 in all wrong cases

19. Which among the following statements are correct?

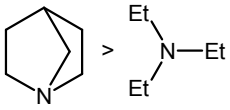
A) Free radical stability : 

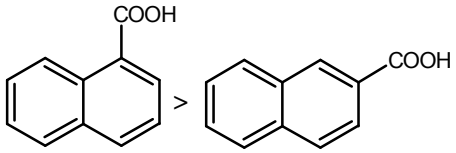
B) Hydride affinity : 

C) Anion stability $H_3C-\overset{-}{C}H_2 < H_2C=\overset{-}{C}H < HC\equiv C^-$

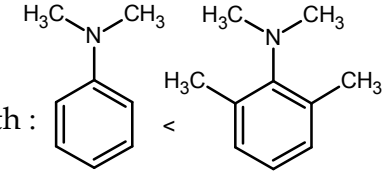
D) Free radical stability : 

20. Select the correct option against mentioned property

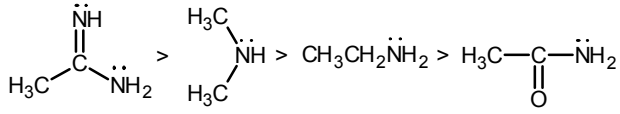
A) Basic strength :  >

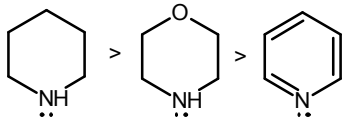
B) Acidic strength : 

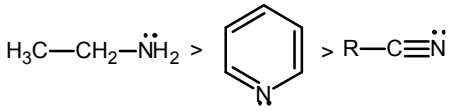
C) Anion stability :  < $HC{\equiv}C^-$

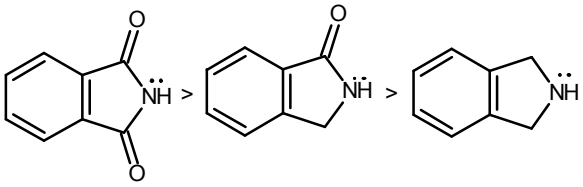
D) Basic strength : 

21. The correct basic order (s) among the following is / are

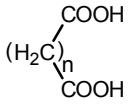
A) 

B) 

C) 

D) 

22. Which of the following is/are correct about given dicarboxylic acids.



where n = 0, 1, 2, 3 and 4.

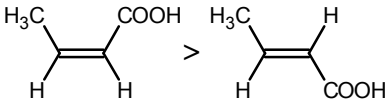
A) pKa_1 for all the dicarboxylic acids is smaller than the pKa for mono carboxylic acids with the same number of carbon atoms

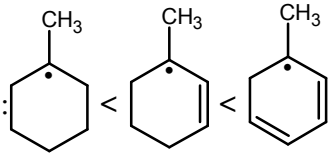
B) The difference between pKa_1 and pKa_2 for dicarboxylic acids decreases as 'n' increases

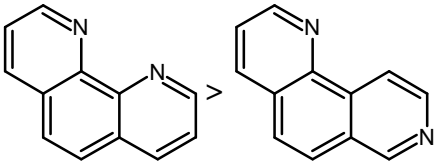
C) pKa_1 for all the dicarboxylic acids is higher than the pKa_2

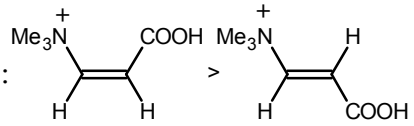
D) Ka_1 for all dicarboxylic acid is higher than the Ka_2.

23. Which of the following is correct?

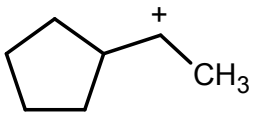
A) Acidic strength : 

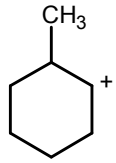
B) Free radical stability : 

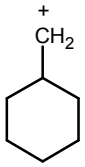
C) Basic strength :  >

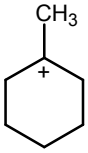
D) Acidic strength :  >

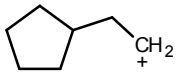
24. The possible carbocations that can be formed on rearrangement for the following carbocation is/are….



A) 

B) 

C) 

D) 

25. Which of the following behave both as a nucleophile and an electrophile?

A) $H_3C—NH_2$ B) $H_3C—Cl$ C) $H_3C—C\equiv N$ D) $H_3C—CH=O$

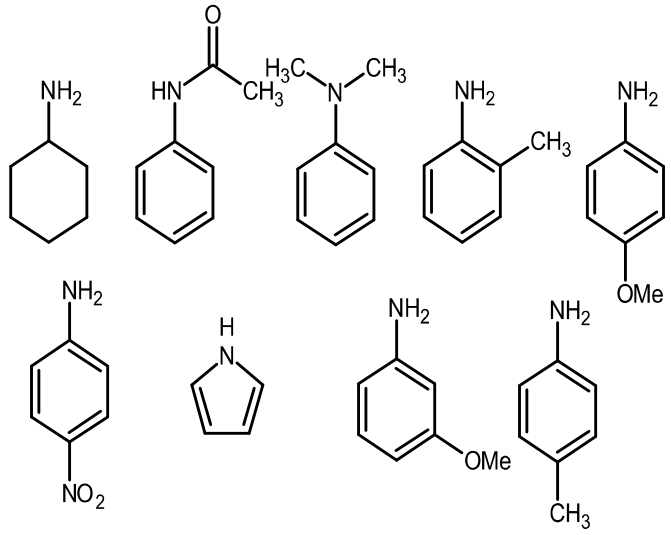
SECTION-II

(INTEGER ANSWER TYPE)

This section contains 5 questions. The answer is a single digit integer ranging from 0 to 9 (both inclusive).

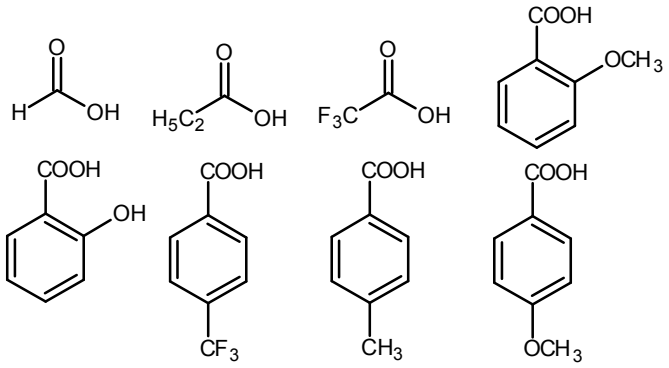
Marking scheme +3 for correct answer , 0 if not attempted and 0 in all other cases.

26. Among the following compounds,how many of them is more basic than aniline?

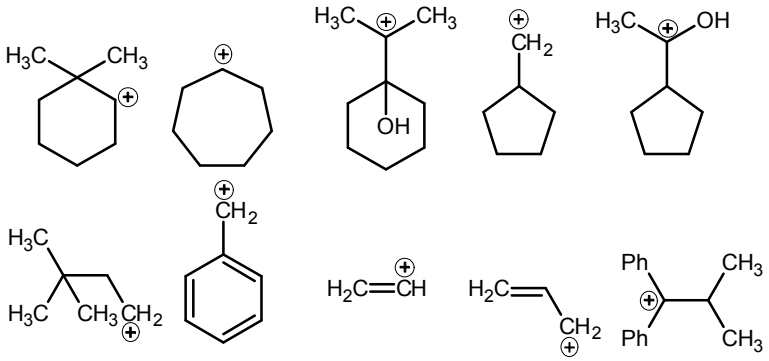


space for rough work

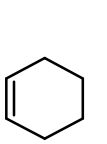
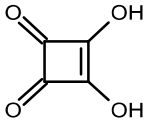
27. How many of the following acids are more acidic than benzoic acid?

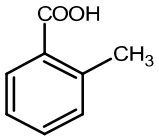


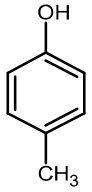
28. How many carbocations undergo rearrangements?

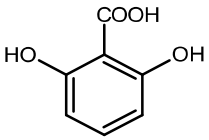


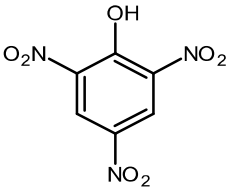
29. How many compounds are soluble in aqueous NaOH ?

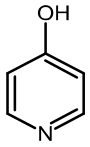



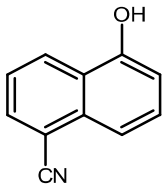




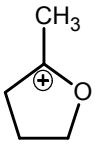


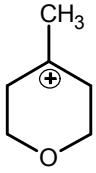


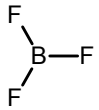


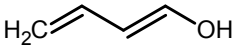


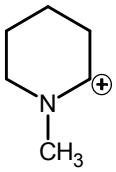
30. Among the following, find out number of ions / molecules that can show backbonding.

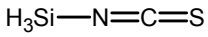












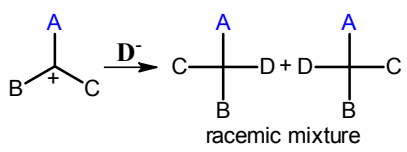
SECTION – III

(SINGLE CORRECT ANSWER TYPE)

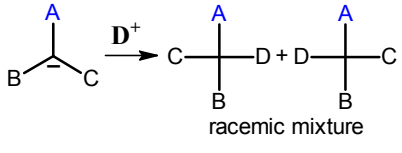
This section contains 6 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

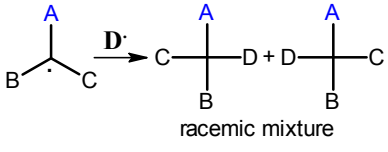
Answer Q.31, Q.32 and Q.33 by appropriately matching the information given below.



racemic mixture

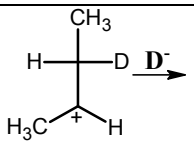


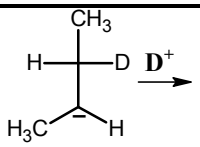
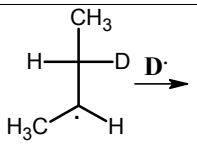
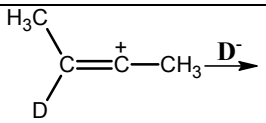
racemic mixture



racemic mixture

Do not consider rearrangements if possible for given intermediate in column-I. Consider the given information and solve the given problems.

	Column – I		Column – II (Regarding reactant)		Column – III
(I)		(i)	Can be stabilized by inductive effect	(P)	Racemic mixture will be formed

(II)		(ii)	Can be stabilized by hyper conjugation	(Q)	Meso is one of the product
(III)		(iii)	Destabilized by inductive effect	(R)	Diastereomeric mixture will be formed
(IV)		(iv)	sp hybridized carbon atom	(S)	One of the product is optically active

31. Which of the following option is correct?

A) I-iii-Q B) II-ii-P C) III-iii-P D) IV-iv-R

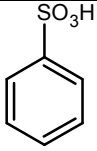
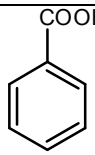
32. Which of the following option is incorrect?

A) I-i-S B) II-iii-Q C) III-ii-R D) IV-iii-R

33. Which of the following option is correct?

A) I-iv-R B) II-iii-P C) III-ii-S D) IV-i-Q

Answer Q.34, Q.35 and Q.36 by appropriately matching the information given in the three columns of the following table (pka values are given relative to water).

	Column – I		Column – II(pK_a)		Column – III
(I)		(i)	16	(P)	Give effervescence with $NaHCO_3$
(II)		(ii)	15.2	(Q)	React with NaOH
(III)		(iii)	-6.5	(R)	More acidic than water
(IV)	CH_3OH	(iv)	4.2	(S)	Gives H_2 gas on reaction with sodium metal

34. Which of the following option is correct?
A) I-iii-P B) II-ii-P C) III-iv-Q D) IV-i-P

35. Which of the following option is incorrect?
A) I-iii-R B) II-i-S C) III-i-S D) IV-ii-R

36. Which of the following option is correct?
A) I-ii-Q B) II-iii-R C) III-i-S D) IV-ii-P

SECTION – I
(MULTIPLE CORRECT ANSWER TYPE)

This section contains 7 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONE OR MORE than ONE option can be correct.

Marking scheme: +4 for all correct options & +1 partial marks, 0 if not attempted and -2 in all wrong cases

37. Let $\bar{a},\bar{b}$ be two vectors perpendicular to each other and $|\bar{a}|=2,|\bar{b}|=3,\bar{c}\times\bar{a}=\bar{b}$ such that the least value of $|\bar{c}-\bar{a}|$ is $\frac{m}{n}$ where m and n are relatively prime, then

A) $m-n=1$ B) $\sin^{-1}\left(\frac{m}{n}-1\right)=\frac{-\pi}{6}$

C) $\cos^{-1}(2m-3n)=\frac{\pi}{2}$ D) None of these

38. If $\bar{a},\bar{b}$ and $\bar{c}$ are three non-zero vectors, then which of the following statements is/are true?

A) If $\bar{a}+\bar{b}+\bar{c}=\bar{0},$ then $\frac{(\bar{a}\times\bar{b}).(\bar{b}\times\bar{c})}{(\bar{b}\times\bar{c}).(\bar{a}\times\bar{c})}=-1$

B) If $\bar{a}+\bar{b}+\bar{c}=\bar{0},$ then $\bar{a}.\bar{b}+\bar{b}.\bar{c}+\bar{c}.\bar{a}<0$

C) $\bar{a}\times(\bar{b}\times\bar{c}),\bar{b}\times(\bar{c}\times\bar{a}),\bar{c}\times(\bar{a}\times\bar{b})$ form a right handed system

D) $\bar{c},(\bar{a}\times\bar{b})\times\bar{c},\bar{a}\times\bar{b}$ form a right handed system

39. Let unit vectors $\bar{a}$ and $\bar{b}$ are perpendicular and unit vector $\bar{c}$ be inclined at an angle 'θ' to both $\bar{a}$ and $\bar{b}$. If $\bar{c} = \alpha\bar{a} + \beta\bar{b} + \gamma\left(\bar{a} \times \bar{b}\right),$ then

A) $\alpha^2 - \beta^2 = \gamma^2$ B) $\alpha = \beta$ C) $1 - 2\alpha^2 = \gamma^2$ D) $2\alpha^2 = 1 + \cos 2\theta$

40. Let $\bar{a} = 2\bar{i} + \bar{k}, \bar{b} = \bar{i} + \bar{j} + \bar{k}$ and $\bar{c} = 4\bar{i} - 3\bar{j} + 7\bar{k}$ and $\bar{r}$ be a vector such that $\bar{r} \times \bar{b} = \bar{c} \times \bar{b}$ and $\bar{r}.\bar{a} = 0,$ then

A) $\bar{r} = -\bar{i} + 8\bar{j} - 2\bar{k}$ B) $|\bar{r}| = |\bar{b}|\sqrt{4|\bar{a}|^2 + |\bar{b}|^2}$

C) $\bar{r} = -\bar{i} - 8\bar{j} + 2\bar{k}$ D) $|\bar{r}| = |\bar{b}|\sqrt{7|\bar{b}|^2 + 2}$

41. The vectors $\bar{a}$ and $\bar{b}$ are perpendicular to each other. If $\bar{r} = l\bar{b} + m\left(\bar{a} \times \bar{b}\right)$ is a vector such that $\bar{r}.\bar{a} = 0, \bar{r}.\bar{b} = 1$ and $\left[\bar{r}\,\bar{a}\,\bar{b}\right] = 1,$ then

A) $l = \frac{1}{|\bar{b}|}, m = \frac{1}{|\bar{a} \times \bar{b}|^2}$ B) $l = \frac{1}{|\bar{b}|^2}, m = \frac{1}{|\bar{a} \times \bar{b}|}$

C) $l = \frac{1}{|\bar{b}|^2}, m = \frac{1}{|\bar{a} \times \bar{b}|^2}$ D) $l = m|\bar{a}|^2$

42. The volume of a right triangular prism $ABCA_1B_1C_1$ is equal to 3. If the position vectors of the vertices of the base ABC are A (1, 0, 1), B (2, 0, 0) and C (0, 1, 0), then the position vector of the vertex A_1 can be

A) (0, 2, 0) B) (0, –2, 0) C) (0, –2, 2) D) (2, 2, 2)

43. Let $\bar{a},\bar{b},\bar{c}$ be the position vectors of the points A, B, C respectively. Let α, β, γ be the inclinations between, $\bar{b},\bar{c}$; $\bar{a},\bar{b}$ and $\bar{a},\bar{c}$ respectively, then the volume 'V' of the tetrahedron, 'OABC' is given by

A) $V^2 = \frac{abc}{36}\begin{vmatrix} 1 & \cos\beta & \cos\gamma \\ \cos\beta & 1 & \cos\alpha \\ \cos\gamma & \cos\alpha & 1 \end{vmatrix}$ B) $V^2 = \frac{a^2b^2c^2}{36}\begin{vmatrix} 1 & \cos\beta & \cos\gamma \\ \cos\beta & 1 & \cos\alpha \\ \cos\gamma & \cos\alpha & 1 \end{vmatrix}$

C) $V = \frac{a^2b^2c^2}{36}\begin{vmatrix} 1 & \cos\beta & \cos\gamma \\ \cos\beta & 1 & \cos\alpha \\ \cos\gamma & \cos\alpha & 1 \end{vmatrix}$ D) None of these

SECTION-II
(INTEGER ANSWER TYPE)

This section contains 5 questions. The answer is a single digit integer ranging from 0 to 9 (both inclusive).
Marking scheme +3 for correct answer , 0 if not attempted and 0 in all other cases.

44. The points D, E, F respectively divide the sides BC, CA, AB of a triangle 'ABC' in the ratio 1:2. The pairs of lines AD, BE; BE, CF; CF, AD meet at P, Q, R respectively such that area of $\Delta PQR = \frac{K}{l}(\text{area of } \Delta ABC)$ where K and *l* are relatively prime, then $K + l =$

45. Let 'a' be the perpendicular distance of a corner of a unit cube from a diagonal not passing through it and 'θ' be the angle between any edge and a face not containing that edge of a regular tetrahedron such that $\cos\theta = b,$ then $a^2 + b^2 =$

46. Let $\bar{a}, \bar{b}, \bar{c}$ and $\bar{a}', \bar{b}', \bar{c}'$ be the two sets of non-coplanar reciprocal system of vectors such that i) $\left[\bar{a}\,\bar{b}\,\bar{c}\right]\left[\bar{a}'\bar{b}'\bar{c}'\right] = m$ & ii) $\bar{a}.\bar{a}' + \bar{b}.\bar{b}' + \bar{c}.\bar{c}' = n,$ then $m + n =$

47. A new operation * is defined between two non-zero vectors $\bar{\alpha}$ and $\bar{\beta}$ as $\bar{\alpha} * \bar{\beta} = |\bar{\alpha}||\bar{\beta}| \tan\frac{\theta}{2}$ where $(\bar{\alpha}, \bar{\beta}) = \theta$. Let $m = \bar{\alpha} * \bar{\alpha}$ and the condition for which $\bar{\alpha}$ and $\bar{\beta}$ are perpendicular is $n = \frac{\bar{\alpha} * \bar{\beta}}{|\bar{\alpha}||\bar{\beta}|},$ then $m + n =$

48. Let $\bar{r}_1 = a\bar{i} + b\bar{j} + c\bar{k}\ (a < b < c)$ where a, b, c are the solutions of $2[x] = x + 2\{x\}$ and $\bar{r}_2 = d\bar{i}$ where d is the unit's digit of $\left[\frac{10^{20000}}{100^{100} + 3}\right]$ and $|3\bar{r}_1 \times \bar{r}_2| = m\sqrt{n}$ where m and n are relatively prime, then $\left[\frac{m}{n}\right] =$

([.] is G.I.F and { } is F.P.F)

SECTION – III

(SINGLE CORRECT ANSWER TYPE)

This section contains 6 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Answer Q.49, Q.50 and Q.51 by appropriately matching the information given in the three columns of the following table.

Column:1 $\bar{a} =$	Column:2 $\bar{b} =$	Column:3 $\lvert\bar{a} \times \bar{b}\rvert = x\sqrt{y}$ x and y are relatively prime
I) $2\bar{i} + \bar{j} - \bar{k}$	i) $-\bar{i} + 2\bar{j} - \bar{k}$	P) $x + y = 3$
II) $\bar{i} - \bar{j} + \bar{k}$	ii) $\bar{i} + 2\bar{j} + 3\bar{k}$	Q) $x + y = 5$
III) $-\bar{i} + 3\bar{j} + 2\bar{k}$	iii) $2\bar{i} - \bar{j} + \bar{k}$	R) $x + y = 15$
IV) $\bar{i} + \bar{j} + \bar{k}$	iv) $3\bar{i} - 2\bar{j} + \bar{k}$	S) $x + y = 8$

49. Which of the following options is the only correct combination?

A) (I), (iv), (S) B) (III), (ii), (R) C) (IV), (i), (P) D) (III), (iii), (Q)

50. Which of the following options is the only correct combination?

A) (III), (iii), (P) B) (I), (iv), (Q) C) (IV), (i), (Q) D) (II), (i), (R)

51. Which of the following options is the only correct combination?

A) (II), (i), (Q) B) (II), (i), (P) C) (IV), (iv), (R) D) (IV), (iv), (S)

Answer Q.52, Q.53 and Q.54 by appropriately matching the information given in the three columns of the following table.

Column:1 $\bar{a} =$	Column:2 $\bar{b} =$	Column:3 $\left\|\left[\bar{a}\bar{b}\bar{c}\right]\right\| = xy$ Where 'xy' is the two digit number
I) $\bar{i} + 2\bar{j} + 3\bar{k}$	i) $2\bar{i} - \bar{j} - 4\bar{k}$	P) $x + y = 3$
II) $\bar{i} - \bar{j}$	ii) $\bar{i} + \bar{j} + \bar{k}$	Q) $x + y = 8$
III) $3\bar{i} - 4\bar{j} + \bar{k}$	iii) $2\bar{i} - 3\bar{j} + 4\bar{k}$	R) $x(y) = 7$
IV) $2\bar{i} + 4\bar{k}$	iv) $\bar{i} + 2\bar{j} + 4\bar{k}$	S) $y - 2x = 8$

52. If $\bar{c} = \bar{i} + 3\bar{j} - \bar{k}$, then which of the following options is the only correct combination?

A) (I), (iii), (Q) B) (I), (iii), (P) C) (II), (iv), (P) D) (II), (iv), (Q)

53. If $\bar{c} = 2\bar{i} - 4\bar{j} + 3\bar{k}$, then which of the following options is the only correct combination?

A) (III), (i), (P) B) (III), (i), (S) C) (II), (iv), (S) D) (II), (iv), (Q)

54. If $\bar{c} = \bar{i} + 4\bar{j} + 3\bar{k}$, then which of the following options is the only correct combination?

A) (II), (i), (R) B) (III), (i), (P) C) (III), (i), (S) D) (II), (iii), (Q)

Master JEE CLASSES

Kukatpally, Hyderabad.

JEE-ADVANCE-2017-P1-Model **Max.Marks:183**

KEY SHEET

PHYSICS

1	**C**	2	**BD**	3	**ABC**	4	**ABD**	5	**ABCD**
6	**CD**	7	**CD**	8	**1**	9	**1**	10	**5**
11	**8**	12	**2**	13	**B**	14	**C**	15	**C**
16	**C**	17	**D**	18	**C**				

CHEMISTRY

19	**ACD**	20	**ABD**	21	**ABC**	22	**ABD**	23	**ABCD**
24	**AC**	25	**CD**	26	**4**	27	**5**	28	**6**
29	**7**	30	**5**	31	**D**	32	**D**	33	**C**
34	**A**	35	**B**	36	**C**				

MATHS

37	**C**	38	**ABD**	39	**BD**	40	**BCD**	41	**C**
42	**BD**	43	**B**	44	**7**	45	**1**	46	**4**
47	**1**	48	**2**	49	**A**	50	**C**	51	**B**
52	**B**	53	**D**	54	**C**				

SOLUTIONS
PHYSICS

1. $T_1(2x) = T_3(x)$ [for rotational equilibrium]

   $T_1 + T_2 + T_3 = Mg$ [for translational equilibrium]

2. $e = \sqrt{l^2 + d^2} - L = L\left[i + \frac{d^2}{2l^2} - 1\right]$

   $T = \frac{YAc}{L}$

3. $2T\sin\frac{d\theta}{2} = \frac{N}{\sqrt{2}} = dmg \;\; Td\theta = \frac{m}{2\pi R}(Rd\theta)g \;\; T = \frac{mg}{2\pi}$

   Elongation=$\left(\frac{T}{aY}\right)2\pi R = \frac{mgR}{aY} \;\; Energy = \frac{1}{2}\times stress \times strain = \frac{m^2g^2}{8\pi^2a^2Y}$

4. Tensile stress=$\frac{F\cos\theta}{A'}$ $where\ A' = \frac{A}{\cos\theta}$ $Shearstress = \frac{F\cos\theta}{A'}$

5. $\Delta L = \frac{FL}{AY} = \Delta L_C + \Delta L_S$; $U = \frac{1}{2}(strain)^2[Y_C + Y_S]A$

6. $T_1 - T_2 = 3a$; $T_2 = 3a$ and $\frac{e}{L} = \frac{Stress}{Y}$

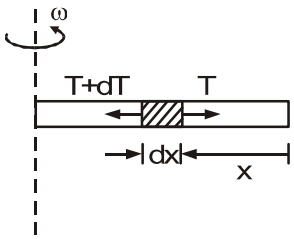
7. Conceptual

8. Bulk Stress=$\frac{Mg}{A} + P_{atm}$

9. $2g - T = 2a;\ P - g = a$

   $B.stress = \frac{T}{A}$

10. $\Delta L = \frac{FL}{AY}$

11. 

    $dT = dm(\ell - x)w^2 \;\; dT = \frac{m}{\ell}.dx(\ell - x)\omega^2$

$$\int_0^T dT = \int_0^{\ell/2} \frac{m\omega^2}{\ell}(\ell - x)\,dx$$

$$= \frac{m\omega^2}{\ell}\left[\ell x - \frac{x^2}{2}\right]_0^{\ell/2} = \frac{m\omega^2}{\ell}\left[\frac{\ell^2}{2} - \frac{\ell^2}{8}\right]$$

$\therefore$ Tension at mid point is :s

$$T = \frac{3}{8}m\ell\omega^2 \Rightarrow stress = \frac{3m\ell\omega^2}{8A} \Rightarrow strain = \frac{3m\ell\omega^2}{8AY}$$

12. $B = \dfrac{\frac{\Delta P}{\Delta V}}{\frac{V}{V}} = \dfrac{h\rho g}{\frac{\Delta V}{V}}$

13 to 18: Conceptual

CHEMISTRY

19. conceptual
20. conceptual
21. basic character ά electron density on nitrogen
22. pKa2 of dicarboxylic acids increases due to the formation of intramoleclar H-bond.
23. conceptual
24. conceptual
25. π-bonded electrons are transferred to more electronegative atom.
26. 1,3,5,9.
27. in VIIIthmolecule hyper conjugative effect, in IXth molecule electron donating resonance effect decreases acidity
28. (i),(ii),(iii),(iv),(vi),&(x).
29. except 'a' all are soluble in sodium hydroxide
30. 1,3,4,5,6.
31. conceptual
32. conceptual
33. conceptual
34. conceptual
35. conceptual
36. conceptual

37. $|\bar{c}\times\bar{a}|=|\bar{b}|,(\bar{c},\bar{a})=\theta$

$|\bar{c}-\bar{a}|^2=\frac{9}{4}+\left(\frac{3}{2}\cot\theta-2\right)^2\geq\frac{9}{4}$

38. $\bar{a}+\bar{b}+\bar{c}=\bar{0}$

$\Rightarrow\bar{a}\times\bar{b}=\bar{b}\times\bar{c}=\bar{c}\times\bar{a}$ & $a^2+b^2+c^2=-2\left(\bar{a}.\bar{b}+\bar{b}.\bar{c}+\bar{c}.\bar{a}\right)$

$\because\bar{a}\times\left(\bar{b}\times\bar{c}\right)+\bar{b}\times\left(\bar{c}\times\bar{a}\right)+\bar{c}\times\left(\bar{a}\times\bar{b}\right)=\bar{0}$

$\Rightarrow$ they are coplanar

Similarly $\left[\bar{c},\left(\bar{a}\times\bar{b}\right)\times\bar{c},\bar{a}\times\bar{b}\right]>0$

$\Rightarrow$ they form a RHS

39. $\bar{a}.\bar{b}=0$

$\bar{a}.\bar{c}=\bar{b}.\bar{c}=\cos\theta$

Also $\bar{a}.\bar{c}=\alpha,\bar{b}.\bar{c}=\beta$ and $\bar{c}.\bar{c}=2\alpha^2+\gamma^2$

40. $(\bar{r}-\bar{c})\times\bar{b}=\bar{0}$

$\bar{r}.\bar{a}=0$

$\Rightarrow\bar{r}=-\bar{i}-8\bar{j}+2\bar{k}$

41. $\bar{r}=\frac{(\bar{r}.\bar{a})}{|\bar{a}|^2}\bar{a}+\frac{(\bar{r}.\bar{b})}{|\bar{b}|^2}\bar{b}+\frac{\left\{\bar{r}.\left(\bar{a}\times\bar{b}\right)\right\}}{|\bar{a}\times\bar{b}|^2}\left(\bar{a}\times\bar{b}\right)$

42. Conceptual

43. $V^2=\frac{1}{36}\left[\bar{a}\bar{b}\bar{c}\right]^2=\frac{1}{36}\begin{vmatrix}\bar{a}.\bar{a} & \bar{a}.\bar{b} & \bar{a}.\bar{c}\\ \bar{b}.\bar{a} & \bar{b}.\bar{b} & \bar{b}.\bar{c}\\ \bar{c}.\bar{a} & \bar{c}.\bar{b} & \bar{c}.\bar{c}\end{vmatrix}$

44. Take A as origin of reference and $\overline{AB}=\bar{b},\overline{AC}=\bar{c}$ then position vector of P is $\frac{2}{7}\left(2\bar{b}+\bar{c}\right)$.

Similarly position vectors of Q and R are respectively $\frac{\bar{b}+4\bar{c}}{7},\frac{2\bar{b}+\bar{c}}{7}$.

45. $a=\frac{\sqrt{2}}{\sqrt{3}},b=\cos\theta=\frac{1}{\sqrt{3}}$

46. $\left[\bar{a}\bar{b}\bar{c}\right]=\frac{1}{\left[\bar{a}'\bar{b}'\bar{c}'\right]}$

$\bar{a}.\bar{a}'=\bar{b}.\bar{b}'=\bar{c}.\bar{c}'=1$

47. $\frac{\bar{\alpha}*\bar{\beta}}{|\bar{\alpha}||\bar{\beta}|}=1$ and $\bar{\alpha}*\bar{\alpha}=0$

48. $a=0,b=\frac{4}{3},c=\frac{8}{3}$ and $d=3$

49 to 54. Conceptual.