Master JEE CLASSES

Kukatpally, Hyderabad.

JEE-ADVANCE-2017-P2-Model
Max.Marks:183

2017_PAPER-II

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-P2-Model

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 Single Correct Options	+3	-1	7	21
Sec – II (Q.N : 8 – 14)	One of More Correct Options Type (partial marking scheme) (+1)	+4	-2	7	28
Sec – III (Q.N : 15 – 18)	Questions with Comprehension Type (2 Comprehensions – 2 + 2 = 4Q)	+3	0	4	12
Total				**18**	**61**

CHEMISTRY

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I (Q.N : 19 – 25)	Questions with Single Correct Options	+3	-1	7	21
Sec – II (Q.N : 26 – 32)	One of More Correct Options Type (partial marking scheme) (+1)	+4	-2	7	28
Sec – III (Q.N : 33 – 36)	Questions with Comprehension Type (2 Comprehensions – 2 + 2 = 4Q)	+3	0	4	12
Total				**18**	**61**

MATHEMATICS

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I (Q.N : 37 – 43)	Questions with Single Correct Options	+3	-1	7	21
Sec – II (Q.N : 44 – 50)	One of More Correct Options Type (partial marking scheme) (+1)	+4	-2	7	28
Sec – III (Q.N : 51 – 54)	Questions with Comprehension Type (2 Comprehensions – 2 + 2 = 4Q)	+3	0	4	12
Total				**18**	**61**

PHYSICS **Max. Marks: 61**

SECTION – I
(SINGLE CORRECT CHOICE TYPE)

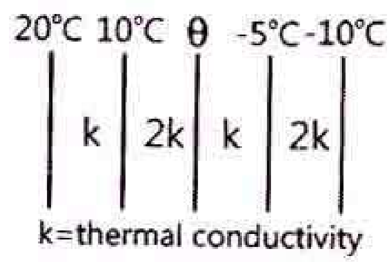
This section contains **7 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE is correct.**

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

1. A thin walled metal tank of surface area $5m^2$ is filled with water and contains an immersion heater dissipating 1kW. The tank is covered with 4 cm thick layer of insulation whose thermal conductivity is 0.2 W/m/K. the outer face of the insulation is 25^0C . Find the temperature of the tank in the steady state.

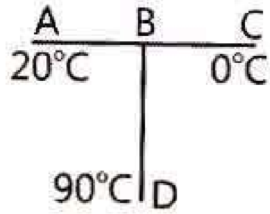
A) 35^0C B) 65^0C C) 45^0C D) 55^0C

2. The figure shows the face and interface temperature of a composite slab containing of four layers of two materials having identical thickness. Under stady state condition, find the value of temperature θ



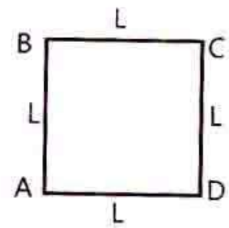
A) 5^0C B) 2^0C C) 1^0C D) 4^0C

3. Three conducting rods of same material and cross-section are shown in figure. Temperature of A,D and C are maintained at $20^0C, 90^0C \ and \ 0^0C$. Find the ratio of length BD and BC if there is no heat flow in AB



A) 7.8 B) 1.2 C) 3.5 D) 3

4. In the square frame of side L of metallic rods, the corners A and C are maintained at $T_1 \ and \ T_2$ respectively. The rate of heat flow from A to C is W. if A and D are instead maintained at $T_1 \ and \ T_2$ respectively, find the total rate of heat flow.

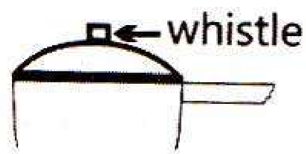


A) $\frac{1}{4}W$ B) $\frac{1}{3}W$ C) $\frac{3}{4}W$ D) $\frac{4}{3}W$

5. One end of copper rod of uniform cross-section and of length 1.5 meters is in contact with melting ice and the other end with boiling water. At what point from the boiling water side along the length should a temperature of 200^0C be maintained, so that in steady state, the mass of ice melting is equal to that of stream produced in the same interval of time ? Assume that the whole system is insulated from the surroundings. Use $L_f = 80$ units and $L_V = 540$ **units**

A) 10.34 cm B) 7.4 cm C) 1.34 cm D) 9.34 cm

6. An empty pressure cooker of volume 10 liters contains air at atmospheric pressure 10^5 Pa and temperature of $27^0C.$ It contains a whistle which has area of 0.1 cm^2 and weight of 100 gm. What should be temperature of air inside so that the whistle is just lifted up?



A) 127^0C B) 227^0C C) 327^0C D) 427^0C

7. Spheres P and Q are uniformly constructed from the same material which is a good conductor of heat and the radius of Q is thrice the radius of P, the rate of fall of temperature of P is x times that of Q when both are at the same surface temperature. The value of x is

A) 1/4 B) 1/3 C) 3 D) 4

SECTION-II
(ONE OR MORE OPTIONS CORRECT TYPE)

This section contains 7 multiple choice equations. Each question has four choices (**A**) (**B**),(**C**) and (**D**) out of which **ONE** or **MORE THAN ONE** are correct.

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

8. Two metallic spheres A and B are made of same material and have got identical surface finish. The mass of sphere A is four times that of B. Both the spheres are heated to the same temperature and placed in a room having lower temperature but thermally insulated from each other.

A) The ratio of initial rate of heat loss to the surroundings, of A to that of B is $2^{4/3}$

B) The ratio of initial rate of heat loss to the surroundings, of A to that of B is $2^{2/3}$

C) The ratio of the initial rate of cooling of A to that of B is $2^{-2/3}$

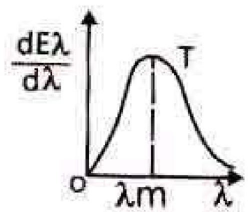
D) The ratio of the initial rate of cooling of A to that of B is $2^{-4/3}$

9. Two bodies A and B have thermal emissivity of 0.01 and 0.81 respectively. The outer surface areas of the two bodies are the same. The two bodies radiate energy at the same rate. The wavelength λ_B, corresponding to the maximum special radiancy in the radiation from B, is shifted from the wavelength corresponding to the maximum spectral radiancy in the radiation from A by 1.00 μm. If the temperature of A is 5802K,

A) temperature of B is 1934 K   B) $\lambda_B = 1.5\mu m$

C) temperature of B is 11604 K   D) temperature of B is 2901K

10. The figure shows a radiant energy spectrum graph for a black body at a temperature T. Choose the correct statement (s)



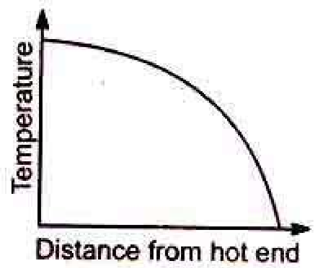
A) The radiant energy is not equally distributed among all the possible wavelengths

B) For a particular wavelength the spectral intensity is maximum

C) The area under the curve is equal to the rate at which heat is radiated by the body at that temperature

D) only B & C correct

11. The ends of a long homogeneous bar are maintained at different temperatures and there is no loss to heat from the sides of the bar due to conduction or radiation. The graph of temperature against distance of the bar when it has attained steady state is shown here. The graph shows:



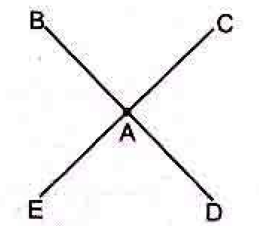
A) the temperature gradient is not constant

B) the bar has uniform cross- sectional area

C) the cross- sectional area of the bar increases as the distance from the hot end increases

D) the cross- sectional area of the bar decreases as the distance from the hot end increases

12. Four identical rods which have thermally insulated lateral surfaces are joined at point A. points B, C, D and E are connected to large reservoirs. If heat flows into the junction from point B at rate of 1 W and from point C at 3 W inside, flows out from D at 5 W, which relation (s) is/are correct for temperature of these points ?



A) $T_A < T_E$ B) $T_B = T_C$ C) $T_C > T_D$ D) $T_B = T_E$

13. Two spherical black-bodies A and B, having radii r_A *and* r_B, where $r_B = 2r_A$ emit radiations with peak intensities at wavelengths 400 nm and 800 nm respectively. If their temperature are T_A *and* T_B respectively in Kelvin scale, their emissive powers are E_A *and* E_B and energies emitted per second are P_A and P_B then:

A) $T_A / T_B = 2$ B) $P_A / P_B = 4$ C) $E_A / E_B = 8$ D) $E_A / E_B = 4$

14. The net rate of heat loss by a hot body depends upon:

A) temperature of body B) temperature of surroundings

C) material of body D) nature of the surface

SECTION – III
(PARAGRAPH TYPE)

This section contains **2 groups of questions.** Each group has 2 multiple choice questions based on a paragraph. Each question has 4 choices A), B), C) and D) for its answer, out of which **ONLY ONE** is **correct.**

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

Paragraph For Questions 15 and 16

Two rods A and B of same cross- sectional area A and length L connected in series and having thermal conductivities as 3K and K respectively, between a source $\left(T_1 = 100^0 C\right)$ and a sink $\left(T_2 = 0^0 C\right)$ as shown in figure. The rod is laterally insulated

15. The ratio of the thermal resistance of the rod is

A) $\frac{R_A}{R_B} = \frac{1}{3}$ B) $\frac{R_A}{R_B} = 3$ C) $\frac{R_A}{R_B} = \frac{3}{4}$ D) $\frac{4}{3}$

16. If $T_A \, and \, T_B$ are the temperature drops across the rod A and B, If G_A *and* G_B are the temperature gradients across the rod A and B, then

A) $\frac{T_A}{T_B} = \frac{3}{1}, \frac{G_A}{G_B} = \frac{3}{1}$ B) $\frac{T_A}{T_B} = \frac{1}{3}, \frac{G_A}{G_B} = \frac{1}{3}$

C) $\frac{T_A}{T_B} = \frac{3}{4}, \frac{G_A}{G_B} = \frac{3}{4}$ D) $\frac{T_A}{T_B} = \frac{4}{3}, \frac{G_A}{G_B} = \frac{4}{3}$

Paragraph For Questions 17 and 18

In fluids heat transfer takes place and molecules of the medium take very active part. The molecules take energy from high temperature zone and move towards low temperature zone. This method is known as convection, when we require heat transfer with fast phase, we use some mechanism to make the flow of fluid on the body fast. The rate of loss of heat is proportional to velocity of fluid (v). and temperature difference (ΔT) between the body and fluid, of course more surface area of body, more rate of loss of heat. We can write the rate of loss of heat as $\frac{dQ}{dt} = KAv\Delta T$ Where K is Positive constant. Now answer the following questions.

17. A body is being cooled with fluid when we increase the velocity of fluid 4 times and decrease the temperature difference $1/2$ time, the rate of loss of heat increases

A) four times B) two times C) six times D) no change

18. In the above question, if mass of the body increased two times, without change in any of the other parameters, the rate of cooling

A) Decreases B) increases

C) No effect of change of mass D) None of these

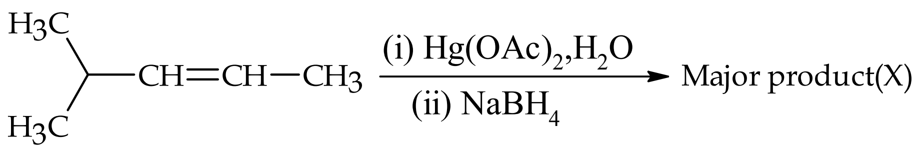
CHEMISTRY **Max. Marks: 61**

SECTION – I
(SINGLE CORRECT CHOICE TYPE)

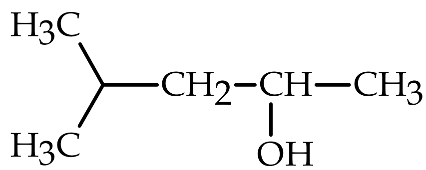
This section contains **7 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE is correct.**

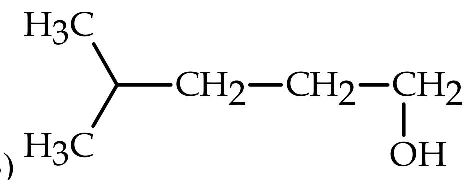
Marking scheme +3 for correct answer , 0 if not attempted and -1 in all other cases.

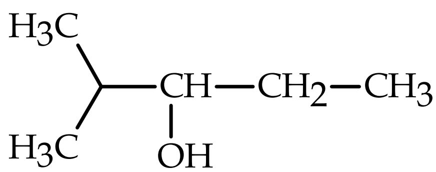
19. In the reaction

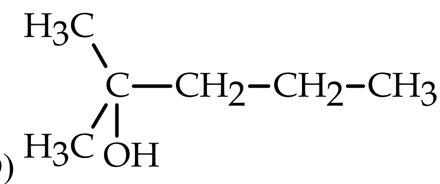


X will be

A) 

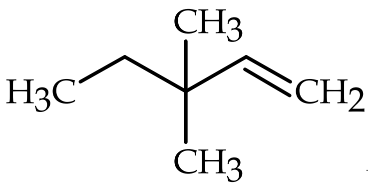
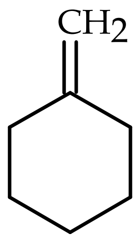
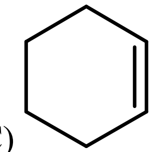
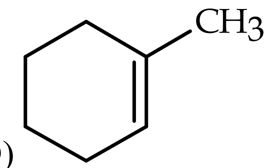
B) 

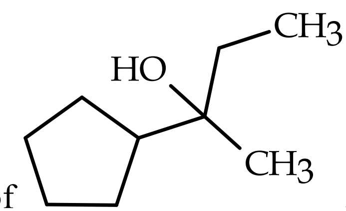
C) 

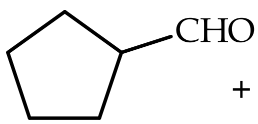
D) 

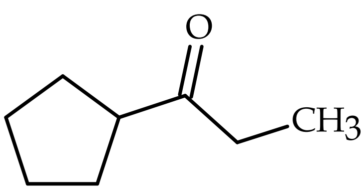
space for rough work

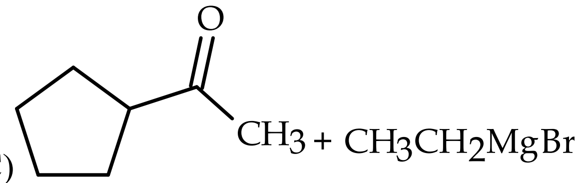
20. Which of the following alkenes give same product in HBO, oxymercuration – demercuration and acid catalysed hydration

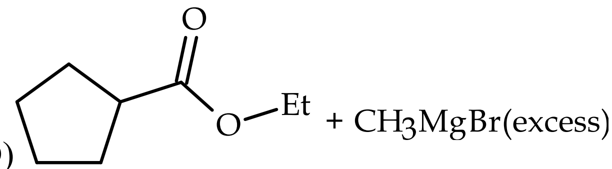
A)  B)  C)  D) 

21. For preparation of , which of the following combination is most suitable

A)  + CH_3CH_2MgBr

B)  + CH_3CH_2MgBr

C) 

D) 

22. Primary alcohol can easily be prepared from primary alkyl halide via S_N2 reaction with aqueous $NaOH$. However. Similar method does not work for the preparation of tertiary alcohol. Which reaction can be used for the efficient preparation of tertiary alcohol (tertiary butanol) from tertiary butyl bromide ?

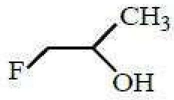
A) $(CH_3)_3CBr + KOH \xrightarrow{C_2H_5OH} \xrightarrow[Heat]{H_2SO_4}$

B) $(CH_3)_3CBr + CH_3COOAg(aq) \rightarrow \xrightarrow{H_3O^+}$

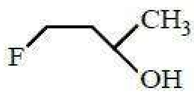
C) $(CH_3)_2CHCH_2Br \xrightarrow[(C_2H_5)_2O]{Mg} \xrightarrow[(ii)H_3O^+]{(i)O_2}$

D) $(CH_3)_3CBr \xrightarrow{KOH / Ethanol} \xrightarrow[(ii)H_2O_2 / NaOH]{(i)B_3H_6}$

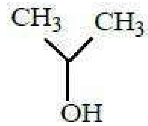
23. The order of reactivity of the following alcohols towards conc. HCl is



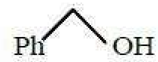
(I)



(II)



(III)



(IV)

A) I > II > III > IV B) I > III > II > IV

C) IV > III > II > I D) IV > III > I > II

24. Which one/ones of the following reactions will yield 2-propanol? Choose the right answer from (A), (B), (C) and (D)

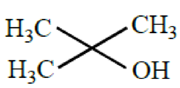
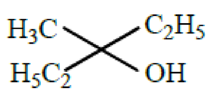
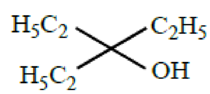
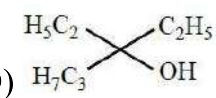
i) $CH_2 = CH - CH_3 + H_2O \xrightarrow{H^+}$ ii) $CH_3 - CHO \frac{(i)CH_3MgI}{(ii)H_2O}$

iii) $CH_2O \frac{(i)C_2H_5MgI}{(ii)H_2O}$ iv) $CH_2 = CH - CH_3 \xrightarrow{Netural\ KmnO_4}$

A) I and II B) II and III C) III and I D) II and IV

25.

Ethyl ethanoate $\xrightarrow[(i)H_3O^+]{(i)CH_3MgBr(excess)} P.$ The product P is

A)  B)  C)  D) 

SECTION-II
(ONE OR MORE OPTIONS CORRECT TYPE)

This section contains 7 multiple choice equations. Each question has four choices (**A**) (**B**),(**C**) and (**D**) out of which **ONE** or **MORE THAN ONE** are correct.

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

26. Which of the following can be reduced to alcohol on reaction with $LiAlH_4$ followed by acidification?

A) RCOCl B) RCOOCOR

C) RCOOH D) RCOOR

27. The correct order of decreasing case of acid catalysed esterification.

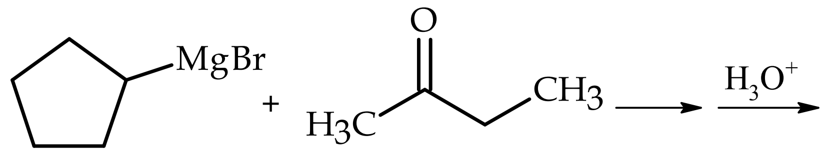
A) $CH_3(CH_2)_3OH > CH_3-CH_2-\underset{}{\overset{OH}{\overset{|}{C}H}}-CH_3 > CH_3-\overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}}-OH$

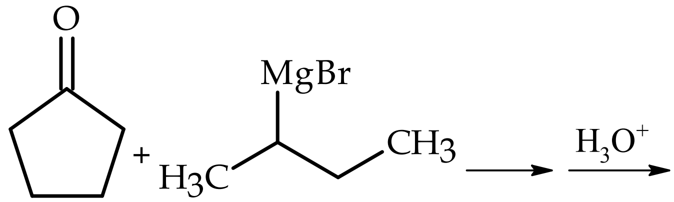
B) $CH_3-\overset{OH}{\overset{|}{C}H}-CH_2-CH_3 > CH_3(CH_2)_3OH > (CH_3)_3COH$

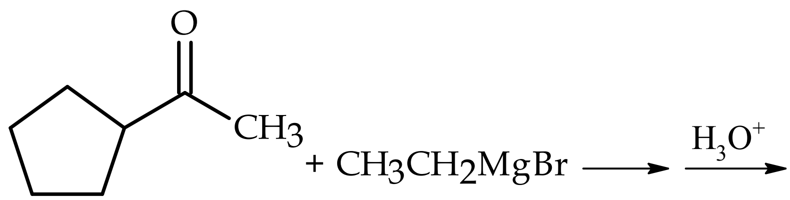
C) $(CH_3)_3COH > CH_3-CH_2-\overset{OH}{\overset{|}{C}H}-CH_3 > CH_3(CH_2)_3OH$

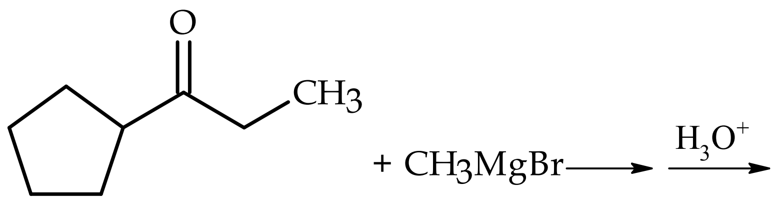
D) $(CH_3)_3COH > CH_3(CH_2)_3OH > CH_3CH_2CH(OH)CH_3$

28. Which of the following Grignard's synthesis can result into 2 – cyclopentyl -2 butanol ?

A) 

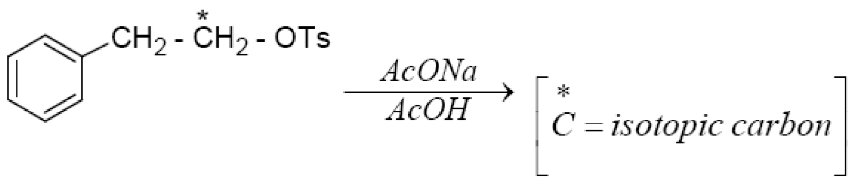
B) 

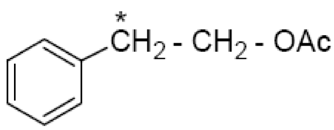
C) 

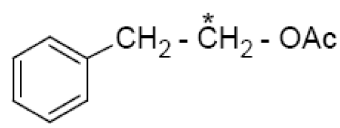
D) 

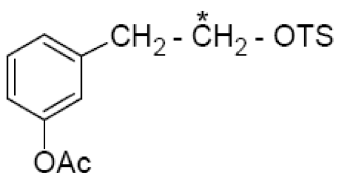
29.

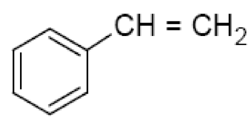
Product (s) formed during this reaction are



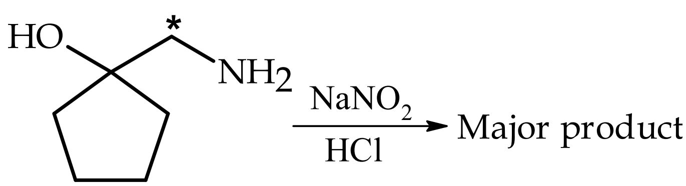
A) 

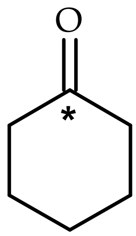
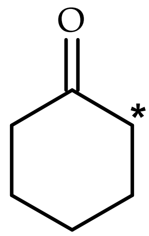
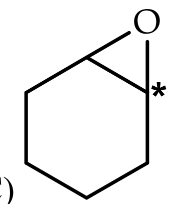
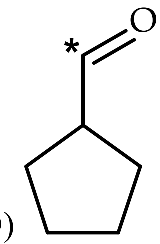
B) 

C) 

D) 

30. The major product of the following reaction is



A)  B)  C)  D) 

31. The reagent used to prepare alcohol form carbonyl compounds is/are

A) $LiAlH_4$ B) Na/C_2H_5OH C) $NaBH_4$ D) CH_3MgBr

32. Consider the following substituted ethanol $G-CH_2CH_2OH$ which group(s) when present as G gives greater equilibrium of gauche conformer than its anti counterpart ?

A) $-OH$ B) $-F$ C) $-NH_2$ D) $-NO_2$

SECTION – III
(PARAGRAPH TYPE)

This section contains **2 groups of questions.** Each group has 2 multiple choice questions based on a paragraph. Each question has 4 choices A), B), C) and D) for its answer, out of which **ONLY ONE** is **correct.**
Marking scheme: +3 for correct answer, 0 if not attempted and 0 in all other cases.

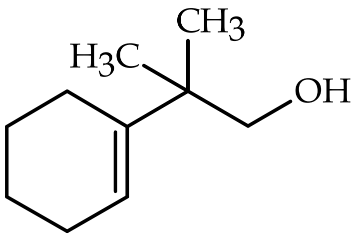
Paragraph For Questions 33 and 34

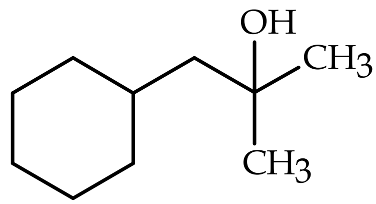
Consider the following sequence of reaction, compound

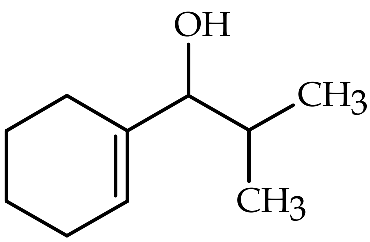
$$C_7H_{11}Br\ (A) \xrightarrow[Et_2O]{Mg} \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } CH_3COCH_3} B$$

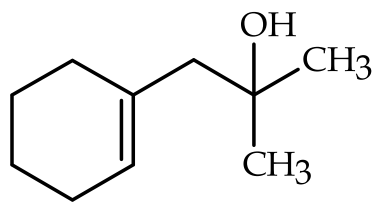
$$B \xrightarrow[\text{heat}]{H_2SO_4} C_{10}H_{16}(C) \xrightarrow[\text{Pt},\Delta]{H_2} \text{2-methylpropylcyclohexane}$$

33. The structure of compound B is

A) 

B) 

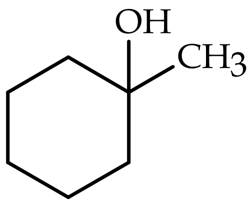
C) 

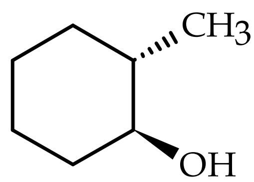
D) 

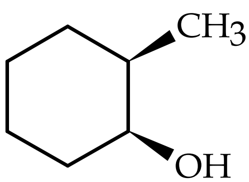
34.

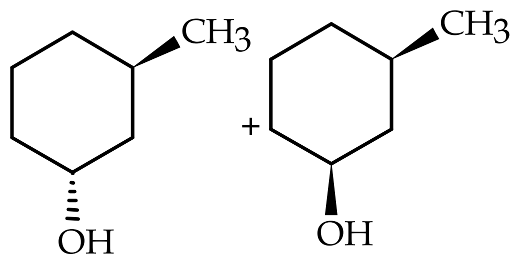
$$A \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } LiAlH_4} \xrightarrow[\text{(ii) } H_2O_2\text{,NaOH}]{\text{(i) } B_2H_6\text{.THF}} X$$

Hence, X is

A) 

B) 

C) 

D) 

Paragraph for Questions 35 and 36

An organic compound $X(C_9H_{12}O)$ gives the following reactions :

i) Na- Slow gas bubble formation

ii) Acetic anhydribe – Pleasant smelling liquid

iii) $CrO_3 - H_2SO_4 -$ Blue – green solution

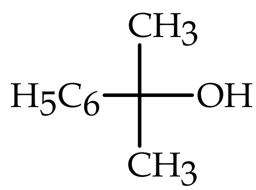
iv) Hot $KMnO_4$ – Benzoic acid

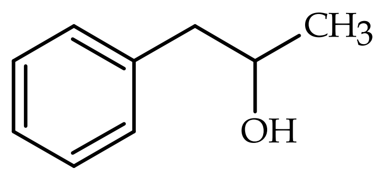
v) $Br_2 - CCl_4 -$ No decolouration

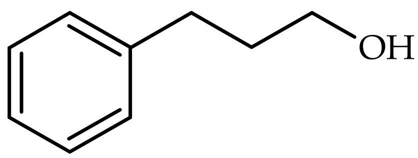
vi) can give pseudonitrol acid in Victor Meyer's test.

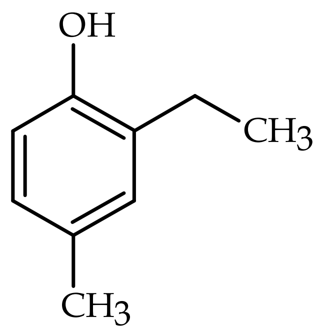
vii) X rotates the plane polarized light

35. The structure of X is

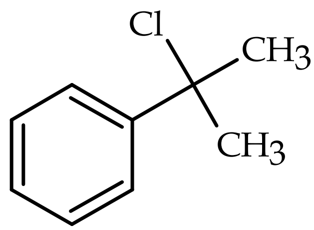
A) 

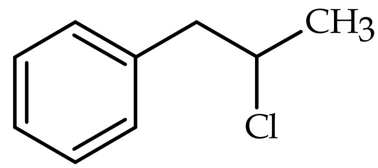
B) 

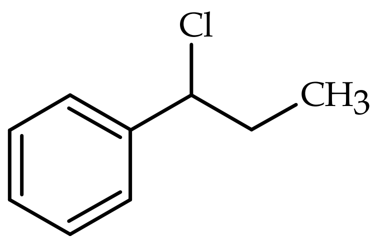
C) 

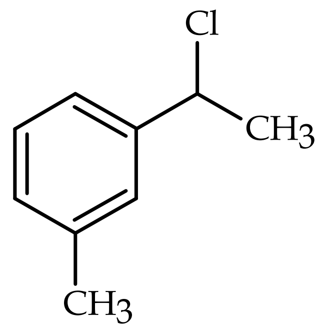
D) 

36. If X is treated with HCl in the presence of $ZnCl_2$, the major product would be

A) 

B) 

C) 

D) 

MATHS **Max.Marks:61**

SECTION – I

(SINGLE CORRECT CHOICE TYPE)

This section contains **7 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE is correct.**

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

37. Consider a parabola $y^2 = 4ax$, the length of focal chord is l and the length of the perpendicular from vertex to the chord is p then

A) $l.p$ is constant
B) $l.p^2$ is constant
C) $l^2.p$ is constant
D) none of these

38. Two straight lines $y - b = m_1(x + a)p$ and $y - b = m_2(x + a)$ are the tangents of $y^2 = 4ax$. Then $m_1 m_2 =$

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

39. The triangle PQR of area ‘A’ is inscribed in the parabola $y^2 = 4ax$ such that the vertex P lies at the vertex of the parabola and the base QR is a focal chord. The modulus of the difference of the ordinates of the points Q and R is:

A) $\frac{A}{2a}$
B) $\frac{A}{a}$
C) $\frac{2A}{a}$
D) $\frac{4A}{a}$

40. TP & TQ are tangents to the parabola, $y^2 = 4ax$ at P & Q. If the chord PQ passes through the fixed point (-a,b) then the locus of T is:

A) $ay = 2b(x-b)$ B) $bx = 2a(y-a)$ C) $by = 2a(x-a)$ D) $ax = 2b(y-b)$

41. The straight line joining any point P on the parabola $y^2 = 4ax$ to the vertex and perpendicular from the focus to the tangent at P, intersect at R, then the equation of the locus of R is

A) $x^2 + 2y^2 - ax = 0$ B) $2x^2 + y^2 - 2ax = 0$

C) $2x^2 + 2y^2 - ay = 0$ D) $2x^2 + y^2 - 2ay = 0$

42. If A_1B_1 and A_2B_2 are two focal chords of the parabola $y^2 = 4ax$, then the chords A_1A_2 and B_1B_2 intersect on

A) directrix B) axis

C) tangent at vertex D) none of these

43. The mirror image of the parabola $y^2 = 4x$ in the tangent to the parabola at the point (1,2) is

A) $(x-1)^2 = 4(y+1)$ B) $(x+1)^2 = 4(y+1)$

C) $(x+1)^2 = 4(y-1)$ D) $(x-1)^2 = 4(y-1)$

SECTION-II
(ONE OR MORE OPTIONS CORRECT TYPE)

This section contains 7 multiple choice equations. Each question has four choices (**A**) (**B**),(**C**) and (**D**) out of which **ONE** or **MORE THAN ONE** are correct.

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

44. Let PQ be a chord of the parabola $y^2 = 4x$. A circle drawn with PQ as a diameter passes through the vertex V of the parabola. If area of triangle PVQ = 20 sq units, then the coordinates of P are

A) $(16,8)$ B) $(16,-8)$ C) $(-16,8)$ D) $(-16,-8)$

45. The focus and directrix of the parabola $9x^2 - 24xy + 16y^2 - 20x - 15y - 60 = 0$ is

A) $\left(-\frac{43}{25},-\frac{129}{100}\right)$ B) $\left(\frac{43}{25},\frac{129}{100}\right)$ C) $4x+3y+\frac{53}{4}=0$ D) $4x+3y-\frac{53}{4}=0$

46. Variable circle is described to pass through point (1,0) and tangent to the curve $y = \tan\left(\tan^{-1} x\right)$. The locus of the centre of the circle is a parabola whose:

A) length of the latus rectum is $2\sqrt{2}$

B) axis of symmetry has the equation $x + y = 1$

C) vertex has the co-ordinates (3/4,1/4)

D) None of these

47. The locus of the midpoint of the focal distance of a variable point moving on the parabola, $y^2 = 4ax$ is a parabola whose

A) latus rectum is half the latus rectum of the original parabola

B) vertex is $\left(\frac{a}{2}, 0\right)$

C) directrix is y-axis

D) focus has the co-ordinates (a,0)

48. P is a point on the parabola $y^2 = 4x$ and Q is a point on the line $2x + y + 4 = 0$. If the line $x - y + 1 = 0$ is the perpendicular bisector of PQ, then the co-ordinates of P can be:

A) (1,-2) B) (4,4) C) (9,-6) D) (16,8)

49. If two distinct chords of a parabola $y^2 = 4ax$ passing through the point (a, 2a) are bisected by line $x + y = 1$, Then the length of the latusrectum cannot be:

A) 2 B) 4 C) 5 D) 7

50. Let there be two parabolas with the same axis, focus of each being exterior to the other and the latusrecta being 4a and 4b. The locus of the middle points of the intercepts between the parabolas made on the lines parallel to the common axis is a

A) Straight line if a=b B) Parabola if $a \neq b$

C) Parabola $\forall\, a,b \in R$ D) none of these

SECTION – III
(PARAGRAPH TYPE)

This section contains **2 groups of questions.** Each group has 2 multiple choice questions based on a paragraph. Each question has 4 choices A), B), C) and D) for its answer, out of which **ONLY ONE** is **correct.**

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

Paragraph For Questions 51 and 52

If l, m are variable real number such that $5l^2 + 6m^2 - 4lm + 3l = 0$, then variable line $lx + my = 1$ always touches a fixed parabola, whose axes is parallel to x-axis.

51. Vertex of the parabola is

A) $\left(-\frac{5}{3}, \frac{4}{3}\right)$ B) $\left(-\frac{7}{4}, \frac{3}{4}\right)$ C) $\left(\frac{5}{6}, -\frac{7}{6}\right)$ D) $\left(\frac{1}{2}, -\frac{3}{4}\right)$

52. Focus of the parabola is

A) $\left(\frac{1}{6}, -\frac{7}{6}\right)$ B) $\left(\frac{1}{3}, \frac{4}{3}\right)$ C) $\left(\frac{3}{2}, -\frac{3}{2}\right)$ D) $\left(-\frac{3}{4}, \frac{3}{4}\right)$

Paragraph For Questions 53 and 54

Let the two parabola $y^2 = 4ax$ and $x^2 = 4ay, a > 0$ intersect at O and A (O being origin). Parabola P whose directrix is the common tangent to the two parabolas and whose focus is the point which divides OA internally in the ratio $\left(1+\sqrt{3}\right):\left(7-\sqrt{3}\right)$

53. The equation of the parabola P is:

A) $(x-y)^2 = \left(2+\sqrt{3}\right)a\left(x+y-\left(\sqrt{3}\right)a\right)$

B) $(x-y)^2 = \left(2+\sqrt{3}\right)a\left(2x+2y-\left(2+\sqrt{3}\right)a\right)$

C) $(x-y)^2 = \left(2+\sqrt{3}\right)a\left(2x+2y-\left(\sqrt{3}\right)a\right)$

D) $(x-y)^2 = \left(2-\sqrt{3}\right)a\left(x+y-\left(1+\sqrt{3}\right)a\right)$

54. Extremities of latusrectum of P are:

A) $\left(\frac{a}{2},\frac{\left(3+2\sqrt{3}\right)a}{2}\right),\left(\frac{\left(3+2\sqrt{3}\right)a}{2},\frac{a}{2}\right)$

B) $\left(-\frac{a}{2},\frac{\left(3-\sqrt{3}\right)a}{2}\right),\left(\frac{\left(3-\sqrt{3}\right)a}{2},-\frac{a}{2}\right)$

C) $\left(\frac{a}{2},\frac{\left(3-\sqrt{3}\right)a}{2}\right),\left(\frac{\left(3-\sqrt{3}\right)a}{2},\frac{a}{2}\right)$

D) $\left(-\frac{a}{2},\frac{\left(3+2\sqrt{3}\right)a}{2}\right),\left(\frac{\left(3+2\sqrt{3}\right)a}{2},-\frac{a}{2}\right)$

Master JEE CLASSES

Kukatpally, Hyderabad.

Jee-Advanced 2017_P2 MODEL **Max.Marks:183**

KEY SHEET

PHYSICS

1	**B**	2	**A**	3	**C**	4	**D**	5	**A**
6	**C**	7	**C**	8	**AC**	9	**AB**	10	**AB**
11	**AD**	12	**ACD**	13	**AB**	14	**ABD**	15	**A**
16	**B**	17	**B**	18	**A**				

CHEMISTRY

19	**C**	20	**C**	21	**C**	22	**B**	23	**C**
24	**A**	25	**A**	26	**ABCD**	27	**A**	28	**ACD**
29	**AB**	30	**B**	31	**ABCD**	32	**ABCD**	33	**D**
34	**B**	35	**B**	36	**C**				

MATHS

37	**B**	38	**B**	39	**C**	40	**C**	41	**B**
42	**A**	43	**C**	44	**AB**	45	**AC**	46	**BC**
47	**ABCD**	48	**AC**	49	**BCD**	50	**AB**	51	**A**
52	**B**	53	**C**	54	**D**				

SOLUTIONS

PHYSICS

1. continuously 1 kW of heat is being dissipated from $25^0 C$ tank

$$\therefore \frac{dQ}{dt} = 10^3 = \frac{-KA[25-T]}{\ell}$$

$$\Rightarrow \frac{dQ}{dt} = 10^3 = \frac{-0.2\times5\times[25-T]}{4\times10^{-2}}$$

$$\Rightarrow 25-T = -40; \Rightarrow T = 65^0 C$$

2. For 1st layer $\frac{dQ}{dt} = \frac{-KA\Delta T}{\ell} = \frac{-KA(10-20)}{\ell} = \frac{+KA\times10}{\ell}$

For 2nd layer $\frac{dQ}{dt} = \frac{-(2K)A(\theta-10)}{\ell} = \frac{-2AK}{\ell} = (\theta-10)$

Rate for both layers must be equal

$$\therefore \frac{kA\times10}{\ell} = \frac{-2kA}{\ell}(\theta-10); \Rightarrow \theta = 5^0 C$$

3. if $\left(\frac{dQ}{dt}\right)_{AB} = 0$

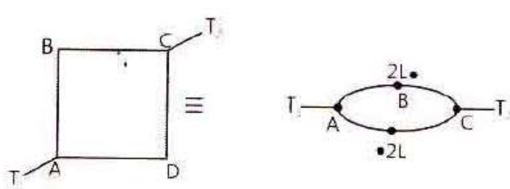
Then rate of heat flow from D to B must be equal to rate heat flow from B to C

i.e. $\left(\frac{dQ}{dt}\right)_{DB} = \left(\frac{dQ}{dt}\right)_{BC}$

$$\Rightarrow -\frac{kA(T_B-T_D)}{\ell_{DB}} = \frac{-kA(T_C-T_B)}{\ell_{BC}}$$

$$\Rightarrow \frac{(20-90)}{\ell_{DB}} = \frac{(0-20)}{\ell_{BC}}; \Rightarrow \frac{\ell_{BD}}{\ell_{BC}} = \frac{-70}{-20} = 3.5$$

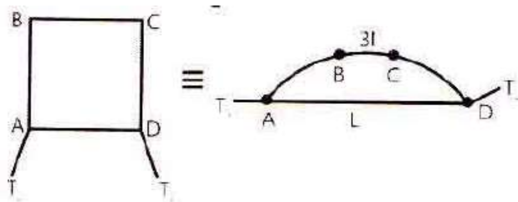
4.



$$\therefore \left(\frac{dQ}{dt}\right)_{AC} = \left(\frac{dQ}{dt}\right)_{ABC} + \left(\frac{dQ}{dt}\right)_{ADC}$$

$$\Rightarrow W = \frac{-kA(T_2-T_1)}{2L} + \frac{-kA(T_2-T_1)}{2L}$$

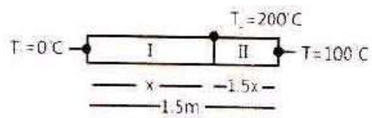
$$\Rightarrow W = \frac{-kA(T_2 - T_1)}{L}$$



$$\therefore \left(\frac{dQ}{dt}\right)_{AD} = \frac{-kA(T_2 - T_1)}{3L} + \frac{-kA(T_2 - T_1)}{L}$$

$$= \frac{-4kA(T_2 - T_1)}{L} = \frac{4}{3}W$$

5.



Mass of ice melting per second = mass of steam produced per sec

$$\Rightarrow \frac{-kA(0 - 200)}{x \times 80} = \frac{-kA(100 - 200)}{(1.5 - x)(540)}$$

$$\Rightarrow \frac{1.5 - \times}{\times} = \frac{1}{2} \times \frac{80}{540}$$

$$\Rightarrow \times = \frac{27 \times 1.5}{29} = 1.3966m$$

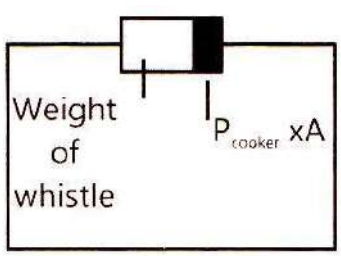
$$\therefore 1.5 - \times = 0.1034m = 10.34\,cm$$

6. Mass of whistle = 100 gm = 0.1 kg

$\therefore$ Weight of whistle = 1 N

To just lift the whistle. Pressure in pressure cooker must be equal to = Atmospheric pressure + pressure due to weight of whistle

$$= 10^5 + \frac{1N}{0.1 \times 10^{-4} m^2} = 2 \times 10^5\,Pa$$



Free - body diagram of whistle Patm A

By Force – balance

P atm $\times$ A + weight of whistle = P cooker $\times$ A

$\Rightarrow$ P cooker = Patm + $\dfrac{weigh\ of\ whistle}{A}$

Initially, it is given $P = 10^5 Pa, V = 10L, T = 300K$

$$\therefore P.V. = nRT; \Rightarrow nR = \frac{10\times10^5}{300} Pa.L/K \quad ......300K$$

Finally, we require $P = 2\times10^5 Pa, V = 10L, T = ?$

$\therefore$ By gas equation : - PV = nRT

$$\Rightarrow 2\times10^5\times10 = \frac{10\times10^5}{300}\times T\left[u\sin g\ (1)\right]$$

$$\Rightarrow T = 600K = 327^0 C$$

7. $r_\theta = 3r_p$

$$P = eA\sigma T^4$$

$$\Rightarrow mc\frac{dT}{dt} = eA\sigma T^4$$

(C : specific heat, m : mass of sphere)

$$\Rightarrow \frac{dT}{dt} = \frac{-eA\sigma T^4}{mc} = \frac{-eA\sigma T^4}{(pV)c} = \frac{-e4\pi r^2\sigma T^4}{\frac{4}{3}\pi r^3 c}$$

(V : volume of sphere)

$$\Rightarrow \frac{dT}{dt} = \frac{1}{r}\times\left[\frac{-3e\sigma T^4}{c}\right]$$

[Quantity in parenthesis is Constant for both spheres]

$$\therefore \frac{\left(\frac{dT}{dt}\right)_P}{\left(\frac{dT}{dt}\right)_Q} = \frac{\frac{1}{r_P}}{\frac{1}{r_Q}} = 3 = \times$$

8. $\rho = \dfrac{m}{V}$

$$\Rightarrow \rho\times\frac{4}{3}\pi r^3 = m; \Rightarrow r \propto (m)^{1/3}$$

and Area of sphere (A) $\propto r^2$

$$\therefore \frac{A_A}{A_B} = (4)^{2/3} = (2)^{4/3}$$

$$\therefore \text{ Ratio of heat loss } = \frac{eA_A\sigma(T-T_0)^4}{eA_B\sigma(T-T_0)^4}$$

$$= \frac{A_A}{A_B} = (2)^{4/3}$$

By Newton's law of cooling :

$$\frac{dQ}{dt} = ms\frac{dT}{dt} = -k(T-T_0)$$

Where k = 4e A σ T_0^3

$$\therefore \frac{dT}{dt} \propto \frac{A}{m}$$

$$\therefore \frac{\left(\frac{dT}{dt}\right)_A}{\left(\frac{dT}{dt}\right)_B} = \frac{\frac{A_A}{m_A}}{\frac{A_B}{m_B}} = \frac{(2)^{4/3}}{4} = 2^{-2/3}$$

9. $eA = 0.01 \ and \ eB = 0.81$

$$A_A = A_B$$

$$E_A = E_B$$

$$\Rightarrow eA\sigma A_A T_A{}^4 = e_B\sigma A_B T_B{}^4$$

$$\Rightarrow 0.01T_A^4 = 0.81T_B^4$$

$$\Rightarrow \quad T_B = \frac{1}{3}\times T_A$$

$$\Rightarrow T_B = \frac{1}{3}\times 5802 = 1934 \ K$$

By Wien's displacement law

$$\lambda mT = const. = 2.93\times10^{-3} mK$$

$$\therefore \quad \lambda_{m_A} = 0.5\mu m$$

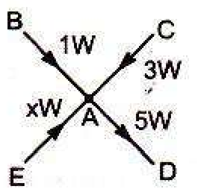
Since, it is given in the question that

$$\lambda_{m_B} = 1\mu m + \lambda_{m_A}$$

$\therefore \quad \lambda_{m_B} = 1.5\mu m$

10. Area under the curve gives the rate at which heat per unit surface is radiated by the body i.e. total rate of heat radiation = (Area under the curve) × (surface area of the body)

11. In graph $\frac{dT}{dx}$ is not constant it is changing. $\frac{dT}{dx}$ is increasing continuously then A is decreasing.

12. 

Heat flow

At A

$x + 1 + 3 = 5$

$x = 1$ Heat in flows from E

$\therefore T_E > T_A$

$\therefore T_C > T_A > T_D$

$T_B - T_A = T_E - T_A$

$\therefore T_B = T_E$

13. $\frac{T_A}{T_B} = \frac{\lambda_B}{\lambda_A} = \frac{800}{400} = 2$

$\frac{E_A}{E_B} = \frac{\sigma T_A^4}{\sigma T_B^4} = 16$

$\frac{P_A}{P_B} = \frac{\sigma T_A^4 \times 4\pi r_A^2}{\sigma T_B^4 \times 4\lambda r_B^2} = 4$

14 Heat loss $= [Heat\ loss]_{radiation} + [Heat\ loss]_{convection}$

$= eA\sigma T^4 + k[T - T_0]^n$

Where e = surface property ;

$T =$ body temperature

$T_0 =$ surrounding temperature

15. $A_A = A; \quad A_B = A$

$\ell_A = \ell; \quad \ell_B = \ell$

$k_A = 3k; \quad k_B = k$

$$\therefore Ra = \frac{\ell_A}{k_A A_A} = \frac{\ell}{3kA}; Ra = \frac{\ell_B}{k_B A_B} = \frac{\ell}{k_A}$$

$$\therefore \frac{R_A}{R_B} = \frac{1}{3}$$

16. Rate at which heat flows from A = Rate at which heat flows from B

$$\Rightarrow \left(\frac{dQ}{dt}\right)_A = \left(\frac{dQ}{dt}\right)_B$$

$$\Rightarrow \frac{T_A}{R_A} = \frac{T_A}{R_B} \Rightarrow \frac{T_A}{T_B} = \frac{R_A}{R_B} = \frac{1}{3}$$

$$G_A = \frac{T_A}{L_A} = \frac{T_A}{L} \; and \; G_B = \frac{T_B}{L_B} = \frac{T_B}{L}$$

$$\therefore \frac{G}{G_B} = \frac{T_A}{T_B} = \frac{1}{3}$$

17. $\left(\frac{dQ}{dt}\right)_{initially} = KAv\Delta T$

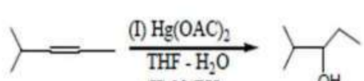
$$\left(\frac{dQ}{dt}\right)_{finally} = KA(4V)\left(\frac{\Delta T}{2}\right) = 2\left(\frac{dQ}{dt}\right)_{initially}$$

18. If all the parameters are kept constant then

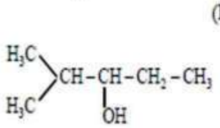
$$\frac{dQ}{dt} = ms\frac{dT}{dt} = kA\,v\,\Delta T$$

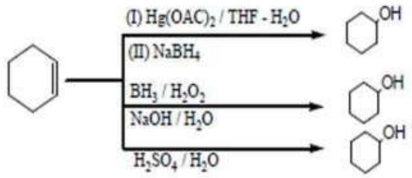
$$\therefore \frac{dT}{dt} = \frac{kAv\Delta T}{ms}$$

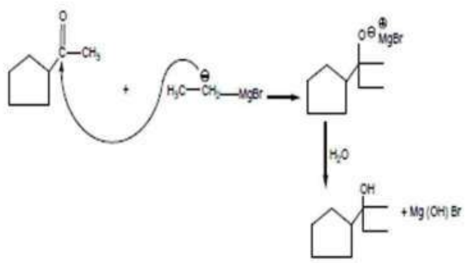
CHEMISTRY



(or)

19. 

20. 

21. 

22.

$$(CH_3)_3CBr + CH_3COOAg(aq) \rightarrow \underset{\text{Ester}}{CH_3-\overset{\overset{O}{\|}}{C}-O-C(CH_3)_3}$$

$$\Big\downarrow H_3O^{\oplus}$$

$$CH_3COOH + CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-OH$$

23. When Alcohol reacts with Hx, the carbocations formed in these cases are

1. $F-CH_2-CH^+-CH_3$ 2. $F-CH_2-CH_2-CH^+-CH_3$

3) $CH_3-CH^+-CH_3$ 4) $C_6H_5-CH_2^+$

24.

$$CH_2=CH-CH_3+H_2O\xrightarrow[\text{Marko.Rule}]{H^+}CH_3-\overset{\overset{OH}{|}}{CH}-CH_3$$

$$CH_3CHO\xrightarrow[(ii)H_2O/H^+]{(i)CH_3MgI}CH_3-\overset{\overset{OH}{|}}{CH}-CH_3$$

α - propanol

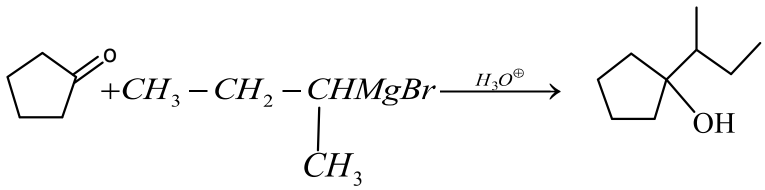
25.

$$CH_3-COOR\xrightarrow[\text{excess}]{CH_3MgBr}CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3$$

26. conceptual

27. case of acid catalysed esterifaction $1^0 > 2^0 > 3^0$

28. Option (b) does not give 2-cyclopentyl-2-butanol as



1-(1-methyl propyl) cyclopentanol

29. ngp MECHANSIM

30. conceptual

31. All are coverts carbonyl compounds to alcohols

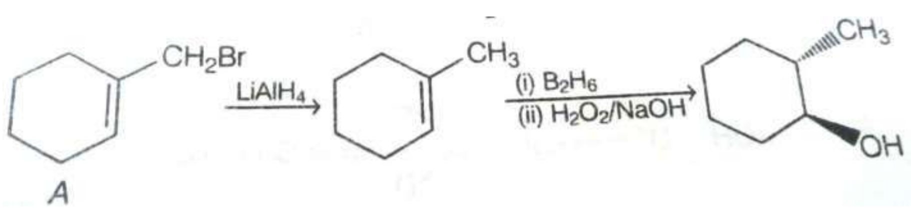
32. All these groups increases the stability of gauche conformer due to stable intramolecular H-bonding.

33. B is an alcohol formed by the attack of Grignard's reagent on acetone. Hence, alcohol must have the skeleton

$$R-\underset{CH_3}{\overset{OH}{\underset{|}{\overset{|}{C}}}}-CH_3$$

Also, R is C_7H_{11} with two degree of unsaturation it must be cyclohexenyl methyl not cyclohexyl methyl.

34. Hydroboration oxidation at double bond gives anti-Markownikoff's addition of H_2O in syn orientation.



35. CONCEPTUAL

$$Ph-CH_2-\underset{OH}{\underset{|}{CH}}-CH_3 \xrightarrow[-H_2O]{H^+} Ph-CH_2-\overset{\oplus}{C}H-CH_3$$

$$\downarrow H^{\ominus} \text{ Shift}$$

36.

$$Ph-\overset{\oplus}{C}H-CH_2CH_3$$

Benzylic

$$\Big\downarrow Cl^-$$

$$Ph-\underset{}{\overset{Cl}{\overset{|}{C}}}H-CH_2CH_3$$

MATHS

37. $\ell =$ length of focal chord $= a\left(t+\frac{1}{t}\right)^2$, Let $P\left(at^2, 2at\right), Q\left(\frac{a}{t^2}, \frac{-2a}{t}\right)$ be the ends of focal chord Equation of PQ is $y\left(t-\frac{1}{t}\right) = 2\left(x-a\right)$

$$\therefore p = \frac{2a}{\sqrt{\left(t-\frac{1}{t}\right)^2+2^2}} = \frac{2a}{\left(t+\frac{1}{t}\right)}$$

$$\therefore \ell p^2 = \frac{4a^2}{\left(t+\frac{1}{t}\right)^2} a\left(t+\frac{1}{t}\right)^2 = 4a^3$$

38. Let the equation of tangent passing through $p\left(x_1 y_1\right)$ is

$$y = mx + \frac{a}{m} \Rightarrow \left(y_1 - mx_1\right) = \frac{1}{m} \quad \Rightarrow x_1 m^2 - \left(y_1\right)m + 1 = 0$$

Let m_1 *and* m_2 are roots $\Rightarrow m_1 + m_2 = \frac{y_1}{x_1}$ *and* $m_1 m_2 = \frac{1}{x_1}$

but $m_1 = \tan\theta_1$ *and* $m_2 = \tan\theta_2$ and $\theta_1 + \theta_2 = \frac{\pi}{4} \Rightarrow \frac{m_1 + m_2}{1 - m_1 m_2} = 1$

$$\Rightarrow \frac{\left(y_1 / x_1\right)}{1 - \frac{1}{x_1}} = 1 \Rightarrow y_1 = x_1 - 1$$

$\therefore$ locus is $y = x - 1$

39. Q R is a focal chord $\Rightarrow Q = \left(at_1^2, 2at_1\right)$ *and* $R = \left(at_2^2, 2at_2\right) \Rightarrow t_1 t_2 = -1$

$$A = t_2 \begin{vmatrix} 0 & 0 & 1 \\ at_1^2 & 2at_1 & 1 \\ at_2^2 & \theta 2at_2 & 1 \end{vmatrix} = \left|a^2 t_1 t_2 \left(t_1 - t_2\right)\right| = -\left|a^2\left(t_1 - t_2\right)\right| \Rightarrow \left|2a\left(t_1 - t_2\right)\right| = \frac{2A}{a}$$

40. Chord of contact of T(x_1y_1) is PQ

i.e $yy_1 = 2a(x+x_1)$ passes through $(-a,b)$

$\Rightarrow by_1 = 2a(-a+x_1)$

$\therefore$ locus is by $= 2a(x-a)$

41. Tangent at $p(t) is \ \ yt = x + at^2$ ______________ (1)

Line $\perp$er to (1) and passing through $(a,0)$ is

$y - 0 = -t(x-a) \Rightarrow y = t(a-x)$ ___________ (2)

Equation of OP is $y = \frac{2}{t}x$ ___________________ (3)

Eliminating t from (2) and (3) we get $2x^2 + y^2 - 2ax = 0$

42. A_1B_1 is a focal chord $\Rightarrow A_1 = (at_1^2, 2at_1) \Rightarrow B_1 = \left(\frac{a}{t_1^2}, \frac{-2a}{t_2}\right)$

A_2B_2 is a focal chord $\Rightarrow A_2 = (at_1^2, 2at_2) \Rightarrow B_2 = \left(\frac{a}{t_2^2}, \frac{-2a}{t_2}\right)$

Equation of A_1A_2 is $y(t_1+t_2) - 2x - 2at_1t_2 = 0$ _________________ (1)

Equation of B_1B_2 is $y\left(\frac{-1}{t_1} - \frac{1}{t_2}\right) - 2x - 2a\left(\frac{-1}{t_1}\right)\left(\frac{-1}{t_2}\right) = 0$

$\Rightarrow y(t_1+t_2) + 2xt_1t_2 + 2a(t_1t_2+1) = 0$ ______________________ (2)

$(1),(2) \Rightarrow (x+a)(t_1t_2+1) = 0 \quad \Rightarrow x + a = 0$

43. Equation of tangent at $(1,2)$ *is* $x - y + 1 = 0$ (1)

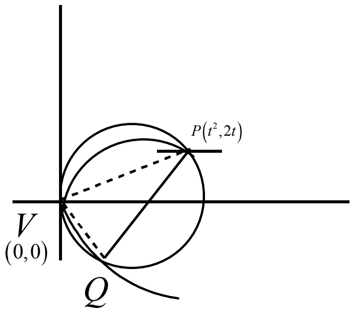
Let $P = (t^2, 2t)$ *is a* point on $y^2 = 4x$

Image of P w.r.t (1) is $((2t-1), t^2+1)$

$x = 2t - 1 \ \ and \ \ y = t^2 + 1$

$\Rightarrow (x+1)^2 = 4(y-1)$

44.



$, y^2 = 4x$ ______________________ (1)

Slope of $PV = \frac{2}{t}$

Equation Q V is $y = \left(-\frac{t}{2}\right)x$ ________ (2)

$(1),(2) \Rightarrow Q = \left(\frac{16}{t^2}, \frac{-8}{t}\right)$

Area of Δ PVQ $= \frac{1}{2}.pV.VQ = 20$

$\Rightarrow PV^2.QV^2 = 40^2$

$\Rightarrow (t^2-16)(t^2-1) = 0 \Rightarrow t = \pm 4, \pm 1$

$\Rightarrow = Q(16,8)(or)(16,-8)$

45. $(3x-4y)^2 - 5(4x+3y+12) = 0$

$\Rightarrow \left(\frac{3x-4y}{5}\right)^2 .25 = 5\left(\frac{4x+3y+12}{5}\right).5$

$\Rightarrow \left(\frac{3x-4y}{5}\right)^2 = \left(\frac{4x+3y+12}{5}\right)$ ________________________________ (1)

Is of the from $Y^2 = 4AX$ $where$ $Y = \frac{3x-4y}{5}, X = \frac{4x+3y+12}{5}, 4A = 1$

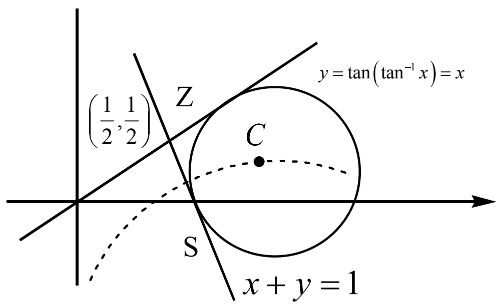
$\Rightarrow$ Directrix is $X = -A \Rightarrow \frac{4x+3y+12}{5} = \frac{-1}{4} \Rightarrow 4x+3y+\frac{53}{4} = 0$ _______ (2)

Axis is $Y = 0 \Rightarrow 3x-4y = 0$ ____________________________________ (3)

Focus is on $X = A \Rightarrow \frac{4x+3y+12}{5} = \frac{1}{4} \Rightarrow 4x+3y+\frac{43}{4} = 0$ __________ (4)

$(3),(4) \Rightarrow S = \left(\frac{-43}{25}, \frac{-129}{100} \right)$

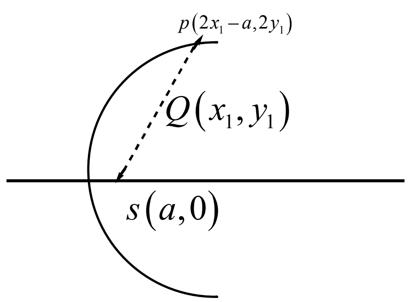
46.



Center of the circle C is equidistant from y =x and (1, 0) $\Rightarrow y = x$ directrix and $(1,0)$ is the focus $\therefore 4a = 2(SZ) = \sqrt{2}$

Axis is $x + y = 1, vertex = \left(\frac{3}{4}, \frac{1}{4} \right)$

47.



Let $Q(x_1 y_1)$ be the mid point of SP $\Rightarrow P = (2x_1 - a, 2y_1)$ lies on $y^2 = 4ax$

$\Rightarrow 4y_1^2 = a(2x_1 - a) \qquad \Rightarrow y_1^2 = 2ax_1 - a^2$

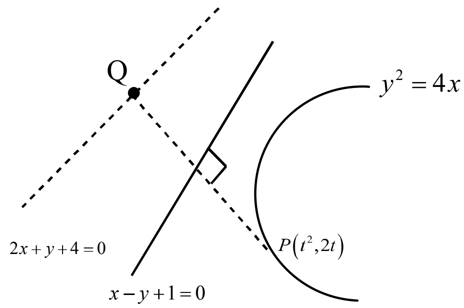
Locus is $y^2 = 2a\left(x - \frac{a}{2} \right)$

Vertex $= \left(\frac{a}{2}, 0 \right)$

Directrix is $x - a/2 = -a/2 \Rightarrow x = 0$

Focus $= (a,0)$

48.



$y^2 = 4x$ (1)

$2x + y + 4 = 0$ (2)

Let $P = (t^2, 2t)$

But Q is image of P .w.r.t $x - y + 1 = 0$

$$\frac{h - t^2}{1} = \frac{k - 2t}{-1} = -2\frac{(t^2 - 2t + 1)}{2}$$

$\Rightarrow Q = (2t - 1, t^2 + 1)$

Q lies on $(2) \Rightarrow t = -1, -3$

$\Rightarrow P = (1, -2)(or)(9, -6)$

49. Let $P(a, 2a)$ and Q be the ends of a chord of $y^2 = 4ax$ ____________ (1)

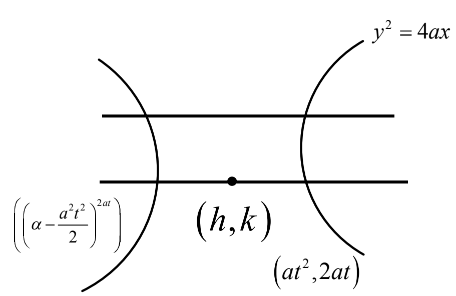
Let $R(x_1, y_1)$ be the mid point of PQ lies on $x + y = 1$ ____________ (2)

$\Rightarrow Q = (2x_1 - a, 2 - 2x_1 - 2a)$ lies m (1)

$\Rightarrow x_1^2 - 2x_1 + (2a^2 - 2a + 1) = 0$ has real roots $\Rightarrow \Delta > 0 \Rightarrow a(a - 1) > 0$

$\Rightarrow a \in (0, 1) \Rightarrow 4a \in (0, 4)$

50.



$$K = 2at \; and \; 2h = at^2 + \alpha - \frac{a^2t^2}{b}$$

$$\Rightarrow y^2\left(\frac{b-a}{4ab}\right).\frac{k^2}{4a^2}+\alpha=2x$$

If $a=b$ *then* $2x=\alpha$ a straight line

If $a\pm b$ then $y^2(b-a)=8abx-4ab\alpha$ a parabola

PASSAGE I

The equation of parabola is $(y-a)^2=4b(x-c)$ ____________________ (1)

$\ell x+my=1$ can be written at

$$y-a=\frac{-\ell}{m}(x-c)+\frac{\ell-am-\ell c}{m} \qquad (2)$$

2 touch (1) $\Rightarrow \dfrac{\ell-am-\ell c}{m}=\dfrac{b}{-\ell/m}\Rightarrow c\ell^2-bm^2-a\ell m-\ell=0$ ________ (3)

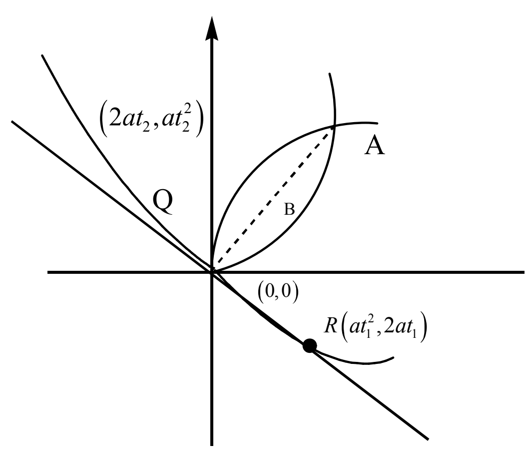
but $5\ell^2+6m^2-4\ell m+3\ell=0$ ________________________________ (4)

$$(3),(4)\Rightarrow\frac{c}{5}=\frac{-b}{6}=\frac{a}{-4}=\frac{-1}{3}$$

$\therefore$ The parabola is $\left(y-\dfrac{4}{3}\right)^2=8(x+5/3)$

Answers 51) A 52) B

PASSAGE II



Equation of tangent at Q is $xt_2-y=at_2^2$ (1)

P is $xt_1-y=at_1^2$ (2)

(1) and (2) are identical $\Rightarrow -t_1=\dfrac{-1}{t_2}=\dfrac{at_1^2}{at_2}$

$\Rightarrow t^4 = -t \Rightarrow t = -1$

$\therefore$ common tangent is $x + y + a = 0$

$A = (4a, 4a)$

$$B = \left(\left(1+\frac{\sqrt{3}}{2}\right)a, \left(1+\frac{\sqrt{3}}{2}\right)a\right)$$

Latusrectum of parabola $= 2\left[\dfrac{\left(1+\frac{\sqrt{3}}{2}\right)a + \left(1+\frac{\sqrt{3}}{2}\right)}{\sqrt{2}}\right] = \sqrt{2}\left(2+\sqrt{3}\right)a$

Equation of parabola P is $\dfrac{(y-x)^2}{2} = \sqrt{2}\left(2+\sqrt{3}\right)a\left[\dfrac{x+y-\left(\frac{1+\sqrt{3}}{2}\right)a}{\sqrt{2}}\right]$

$\left(y - x^2\right) = \left(2+\sqrt{3}\right)a\left(2x+2y-\left(1+\sqrt{3}\right)a\right)$

Final the extremities of latusrecturm

Answer

53) C

54) D